



PDHonline Course C142 (4 PDH)

**Stormwater: Storm Water Pollution
Prevention Plans and Best Management
Practices**

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Stormwater: Storm Water Pollution Prevention Plans and Best Management Practices

Course Content

Activities that take place at industrial facilities, such as material handling and storage, are often exposed to storm water. The runoff from these activities discharges industrial pollutants into nearby storm sewer systems and water bodies, which may adversely impact water quality. The Environmental Protection Agency has issued rules under the Clean Water Act (CWA) regulating the discharge of storm water including discharges from certain industrial facilities.

This course includes three parts. Part 1 discusses storm water permitting and the requirements for Storm Water Pollution Prevention (SWPP) Plans for industries with storm water permits. Part 2 discusses Best Management Practices (BMPs) available for storm water controls; BMPs are specifically required as a condition of the storm water permit and must be described in the SWPP Plan. Part 3 includes references with more detail on the topics covered in this course.

This information will be useful for industry representatives and for their consultants in better understanding the requirements for SWPP Plans and the available BMPs. This information will also enable the student to better understand why BMPs are necessary and when the various BMPs are most appropriate.

PART 1 The Storm Water Pollution Prevention Plan

1. Overview – Why Storm Water Permits

Activities that take place at industrial facilities, such as material handling and storage, are often exposed to storm water. The runoff from these activities discharges industrial pollutants into nearby storm sewer systems and water bodies where this may adversely impact water quality.

In response to the need for comprehensive National Pollutant Discharge Elimination System (NPDES) requirements for discharges of storm water, Congress amended the Clean Water Act (CWA) in 1987 to require the Environmental Protection Agency (EPA) to establish phased NPDES requirements for storm water discharges. To implement these requirements, EPA published Phase I rules on November 16, 1990 (55 FR 47990). These Phase I rules included the initial permit application requirements for certain categories of storm water discharges associated with industrial activity, storm water discharges from larger site construction sites, and discharges from municipal separate storm sewer systems located in municipalities with a population of 100,000 or more (Phase I sources). Storm water discharge permits provide a mechanism for monitoring the discharge of

pollutants from Phase I sources to waters of the United States and for establishing appropriate controls.

The Phase II Final Rule, published in the Federal Register on December 8, 1999, requires NPDES permit coverage for storm water discharges from:

- Certain regulated small **municipal separate storm sewer systems (MS4s)**
- Construction activity disturbing between 1 and 5 acres of land (i.e., small construction activities).

In addition to expanding the NPDES Storm Water Program, the Phase II Final Rule revises the no exposure exclusion and the temporary exemption for certain industrial facilities under Phase I of the NPDES Storm Water Program.

This course addresses industrial storm water permits for sources identified in the Phase I rules as well as changes in permit conditions in response to the Phase II rules.

2. Types of Storm Water Permits

The NPDES Phase I Storm Water Program promulgated in 1990 included an industrial storm water permitting component. Operators of **industrial facilities** included in one of 11 categories of "storm water discharges associated with industrial activity" (40 CFR 122.26 (b)(14)(i)-(xi)) that discharged storm water to a municipal separate storm sewer system (MS4) or directly to waters of the United States required authorization under a NPDES industrial storm water permit.

An industrial facility with a Standard Industrial Classification (SIC) code listed in the 11 categories, or meeting the narrative description listed in the 11 categories must address storm water permits in one of three ways. The facility operator may determine:

- The facility is eligible for coverage under a general NPDES permit
- The facility is eligible for coverage under an individual NPDES industrial storm water permit.
- The facility is eligible for a conditional (or temporary) exclusion from permitting requirements (e.g., the "no exposure" exemption).

2.1 General Permits

Most industrial facilities have permit coverage under a general permit because it is the most efficient permit option. General permits contain requirements for numerous types of industrial activities, allowing a facility operator to quickly obtain permit coverage. EPA has developed a general permit termed the **Multi-Sector General Permit (MSGP)** available for industrial facilities. The conditions of this permit are in the October 30, 2000, Federal Register. Where EPA is the NPDES permitting authority, the **MSGP** describes the requirements that must be satisfied to permit storm water discharges from

industrial facilities. The MSGP defines the required contents for the mandatory Storm Water Pollution Prevention (SWPP) Plan including a description of BMPs. The SWPP Plan is discussed in Section 4 of Part 1 of this course, and BMPs are discussed in Part 2 of this course. General permits available in NPDES authorized states may impose additional conditions; contact the appropriate NPDES permitting authority to obtain more information on general permits in delegated states.

2.2 Individual Permits

There are certain circumstances where a general permit is either not available or not applicable to a specific facility. In this type of situation, a facility operator must obtain coverage under an individual permit that the NPDES permitting authority will develop with requirements specific to the facility.

2.3 Conditional Exemption for No Exposure

Under the conditional no exposure exclusion, operators of industrial facilities in any of the 11 categories of "storm water discharges associated with industrial activity," (except construction activities, which are addressed under the construction component of the NPDES Storm Water Program) have the opportunity to certify to a condition of "no exposure" if their industrial materials and operations are not exposed to storm water. As long as the condition of "no exposure" exists at a certified facility, the operator is excluded from NPDES industrial storm water permit requirements.

3. The Storm Water Permit Process

The MSGP general permit provides facility-specific requirements for several types of industrial facilities within one permit. This permit presents all requirements up front, allowing facility operators to become familiar with, and prepare for, activities such as Storm Water Pollution Prevention Plan implementation and monitoring prior to applying for permit coverage. The SWPP Plan requirements included in the MSGP are described in detail in Section 4.

The MSGP covers 30 industrial sectors, with Standard Industrial Classification (SIC) codes and narrative descriptions identifying the industrial facilities within each of the 30 sectors. The MSGP is generally effective in areas where EPA is the permitting authority in EPA Regions 1, 2, 3, 4, 6, 8, 9, and 10. State and other jurisdictions with authority to issue storm water NPDES permits must at least meet the minimum requirements in the MSGP. The MSGP contains general permit requirements (i.e., requirements that pertain to all sectors) and sector-specific requirements (i.e., requirements applicable only to facilities within each of the 30 industrial sectors). Most industrial sectors have visual, analytical, and/or compliance monitoring requirements.

To apply for permit coverage under the MSGP, a facility operator must complete and submit to the appropriate NPDES permitting authority a **Notice of Intent (NOI)** form. The NOI requests a variety of information, including latitude/longitude of the facility,

and information related to the Endangered Species Act and the National Historic Preservation Act. Permit applicants can access EPA's searchable database of threatened and endangered species to identify if listed species are located in or around the facility that may have to be addressed as part of the NPDES permit application process.

To discontinue permit coverage, a facility operator must complete and submit to the appropriate NPDES permitting authority a **Notice of Termination (NOT)** form. This could include a change in ownership or if all storm water discharges exposed to industrial activities have been terminated.

4. SWPP Plan Requirements in the Multi Sector General Permit

This section describes in detail the general requirements for the SWPP Plan that is required for every industrial facility covered by the MSGP. As discussed above, storm water permits issued by State regulatory agencies may add conditions but must at least include all of these requirements. Also, the MSGP includes additional requirements for several industrial categories. These are not described in this course. The MSGP or State permit conditions should be reviewed to determine if there are additional requirements.

The information in this section enclosed in boxes is derived from the MSGP language included in the October 30, 2000, Federal Register notice (65 FR 64802 – 862) (electronic version available at: <http://www.epa.gov/npdes/pubs/msgp2000-final.pdf>). Key points are emphasized in text following the boxed sections.

4.1 Storm Water Pollution Prevention Plan Requirements

Reference: 65 FR 64812, October 30, 2000

4.1 Storm Water Pollution Prevention Plan Requirements

You must prepare a Storm Water Pollution Prevention (SWPP) Plan for your facility before submitting your Notice of Intent for permit coverage. Your SWPP Plan must be prepared in accordance with good engineering practices. Use of a registered professional engineer for SWPP Plan preparation is not required by the permit, but may be independently required under state law and/or local ordinance. Your SWPP Plan must:

- 1 Identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from your facility;
- 2 Describe and ensure implementation of practices which you will use to reduce the pollutants in storm water discharges from the facility; and
- 3 Assure compliance with the terms and conditions of the storm water permit.

Note: At larger installations such as military bases where there are well-defined industrial versus non-industrial areas, the SWPP Plan required under this Part need only address those areas with discharges of storm water associated with industrial activity. (*e.g.*, under this permit, a U.S. Air Force Base would need to address the vehicle maintenance areas

associated with the “airport” portion of the base in the SWPP Plan, but would not need to address a car wash that served only the on-base housing areas.)

Important points:

- SWPP Plan is required before you apply for (via Notice of Intent) your permit
- Check state requirements regarding Professional Engineer certification

4.2 Contents of Plan

4.2.1 Pollution Prevention Team

Reference: 65 FR 64812, October 30, 2000

4.2.1 Pollution Prevention Team

You must identify the staff individual(s) (by name or title) that comprise the facility’s storm water Pollution Prevention Team. Your Pollution Prevention Team is responsible for assisting the facility/plant manager in developing, implementing, maintaining and revising the facility’s SWPP Plan. Responsibilities of each staff individual on the team must be listed.

Important points:

- Pollution prevention team “assists” management – complete responsibility can not be delegated
- Suggestion - Many facilities define “individuals” by title, and then furnish a current list of names for the positions

4.2.2 Site Description

Reference: 65 FR 64812, October 30, 2000

4.2.2 Site Description

Your SWPP Plan must include the following:

1 *Activities at Facility.* Description of the nature of the industrial activity(ies) at your facility;

2 *General Location Map.* A general location map (*e.g.*, U.S.G.S. quadrangle, or other map) with enough detail to identify the location of your facility and the receiving waters within one mile of the facility;

3 *A legible site map identifying the following:*

3.1 Directions of storm water flow (*e.g.*, use arrows to show which direction storm water will flow);

3.2 Locations of all existing structural Best Management Practices (BMPs);

- 3.3 Locations of all surface water bodies;
- 3.4 Locations of potential pollutant sources identified under 4.2.4 and where significant materials are exposed to precipitation;
- 3.5 Locations where major spills or leaks identified under 4.2.5 have occurred;
- 3.6 Locations of the following activities where such activities are exposed to precipitation: fueling stations, vehicle and equipment maintenance and/or cleaning areas, loading/unloading areas, locations used for the treatment, storage or disposal of wastes, and liquid storage tanks;
- 3.7 Locations of storm water outfalls and an approximate outline of the area draining to each outfall;
- 3.8 Location and description of non-storm water discharges;
- 3.9 Locations of the following activities where such activities are exposed to precipitation: processing and storage areas; access roads, rail cars and tracks; the location of transfer of substance in bulk; and machinery;
- 3.10 Location and source of runoff from adjacent property containing significant quantities of pollutants of concern to the facility (an evaluation of how the quality of the storm water running onto your facility impacts your storm water discharges may be included).

Important points:

- General location map must show receiving waters within one mile of the facility (This is considered as one mile from the facility boundaries, not the center of the facility.)
- Site map should be linked with the descriptions in the SWPP Plan text, for example, with symbols showing various activities (part 4.2.2.36)
- Suggestion – use tables that list the required site features and then use the same designation for the site map (e.g., PPS-1, for potential pollution source 1).
- Suggestion – use the terminology listed in the General Permit conditions, such as fueling stations, to describe site activities since these terms are also used to identify possible Best Management Practices

4.2.3 Receiving Waters and Wetlands

Reference: 65 FR 64812, October 30, 2000

4.2.3 Receiving Waters and Wetlands

You must provide the name of the nearest receiving water(s), including intermittent streams, dry sloughs, arroyos and the areal extent and description of wetland or other "special aquatic sites" that may receive discharges from your facility.

["Special aquatic sites" are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region (see 40 CFR 230.10(a)(3).]

Important points:

- The type of receiving waters must be described in the Plan
- The name of the nearest receiving water must be described
- Suggestion – when the water is not named, refer to as “unnamed tributary to ‘name’”

4.2.4 Summary of Potential Pollutant Sources

Reference: 65 FR 64812

4.2.4 Summary of Potential Pollutant Sources

You must identify each separate area at your facility where industrial materials or activities are exposed to storm water. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, byproducts, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product. For each, separate area identified, the description must include:

1 *Activities in Area.* A list of the activities (*e.g.*, material storage, equipment fueling and cleaning, cutting steel beams); and

2 *Pollutants.* A list of the associated pollutant(s) or pollutant parameter(s) (*e.g.*, crankcase oil, iron, biochemical oxygen demand, pH, *etc.*) for each activity. The pollutant list must include all significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water between the time of three (3) years before being covered under this permit and the present.

Important points:

- Pollutant sources are areas within the site
- Activities and pollutants within each area must be listed
- Suggestion – match areas to site drainage features and existing or planned structural controls

4.2.5 Spills and Leaks

Reference: 65 FR 64812

4.2.5 Spills and Leaks

You must clearly identify areas where potential spills and leaks, which can contribute pollutants to storm water discharges, can occur, and their accompanying drainage points. For areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility to be covered under this permit, you must provide a list of significant spills and leaks of toxic or hazardous pollutants that occurred during the three

(3) year period prior to the date of the submission of a Notice of Intent (NOI). Your list must be updated if significant spills or leaks occur in exposed areas of your facility during the time you are covered by the permit. Significant spills and leaks include, but are not limited to releases of oil or hazardous substances in excess of quantities that are reportable under CWA § 311 (see 40 CFR 110.10 and 40 CFR 117.21) or section 102 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Significant spills may also include releases of oil or hazardous substances that are not in excess of reporting requirements.

Important points:

- List must be updated to reflect significant spills and leaks
- Significant means “reportable” as defined by CWA or CERCLA

4.2.6 Sampling Data

Reference: 65 FR 64812

4.2.6 Sampling Data

You must provide a summary of existing storm water discharge sampling data taken at your facility. All storm water sampling data collected during the term of this permit must also be summarized and included in this part of the SWPP Plan.

Important points:

- Summary of existing storm water data must be included in the Plan
- Storm water data collected during the term of the permit must be included in the Plan

4.2.7 Storm Water Controls

Reference: 65 FR 64812

4.2.7 Storm Water Controls

1 *Description of Existing and Planned BMPs.* Describe the type and location of existing non-structural and structural best management practices (BMPs) selected for each of the areas where industrial materials or activities are exposed to storm water. All the areas identified in Part 4.2.4 (Summary of Potential Pollutant Sources) should have a BMP(s) identified for the area’s discharges. For areas where BMPs are not currently in place, describe appropriate BMPs that you will use to control pollutants in storm water discharges. Selection of BMPs should take into consideration:

1.1 The quantity and nature of the pollutants, and their potential to impact the water quality of receiving waters;

1.2 Opportunities to combine the dual purposes of water quality protection and local flood control benefits (including physical impacts of high flows on streams—*e.g.*, bank erosion, impairment of aquatic habitat, etc.);

1.3 Opportunities to offset the impact of impervious areas of the facility on ground water recharge and base flows in local streams (taking into account the potential for ground water contamination).

Important points:

- BMPs should be described for all areas where industrial materials or activities are exposed to storm water

Reference: 65 FR 65813

4.2.7 Storm Water Controls

2 BMP Types to be Considered. The following types of structural, nonstructural and other BMPs must be considered for implementation at your facility. Describe how each is, or will be, implemented. This requirement may have been fulfilled with the area-specific BMPs identified under Part 4.2.7.2, in which case the previous description is sufficient. However, many of the following BMPs may be more generalized or non site-specific and therefore not previously considered. If you determine that any of these BMPs are not appropriate for your facility, you must include an explanation of why they are not appropriate. The BMP examples listed below are not intended to be an exclusive list of BMPs that you may use. You are encouraged to keep abreast of new BMPs or new applications of existing BMPs to find the most cost effective means of permit compliance for your facility. If BMPs are being used or planned at the facility which are not listed here (*e.g.*, replacing a chemical with a less toxic alternative, adopting a new or innovative BMP, etc.), include descriptions of them in this section of the SWPP Plan.

Important points:

- The Plan must consider BMPs that are: (1) non-structural, (2) structural, and (3) other controls
- If you do not include one of these BMPs at the facility, you need to explain why it is not appropriate

4.2.7.1 Non-Structural BMPs.

Reference: 65 FR 64813

4.2.7.2.1 Non-Structural BMPs

1 Good Housekeeping:

You must keep all exposed areas of the facility in a clean, orderly manner where such exposed areas could contribute pollutants to storm water discharges. Common problem areas include: around trash containers, storage areas and loading docks. Measures must also include: a schedule for regular pickup and disposal of garbage and waste materials; routine inspections for leaks and conditions of drums, tanks and containers.

2 Minimizing Exposure:

Where practicable, industrial materials and activities should be protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, or runoff.

Note: Eliminating exposure at all industrial areas may make the facility eligible for the 40 CFR 122.26(g) “No Exposure” exclusion from needing to have a permit.

3 Preventive Maintenance:

You must have a preventive maintenance program which includes timely inspection and maintenance of storm water management devices, (*e.g.*, cleaning oil/water separators, catch basins) as well as inspecting, testing, maintaining and repairing facility equipment and systems to avoid breakdowns or failures that may result in discharges of pollutants to surface waters.

4 Spill Prevention and Response Procedures:

You must describe the procedures which will be followed for cleaning up spills or leaks. Those procedures, and necessary spill response equipment, must be made available to those employees that may cause or detect a spill or leak. Where appropriate, you must explain existing or planned material handling procedures, storage requirements, secondary containment, and equipment (*e.g.*, diversion valves), which are intended to minimize spills or leaks at the facility. Measures for cleaning up hazardous material spills or leaks must be consistent with applicable RCRA regulations at 40 CFR Part 264 and 40 CFR Part 265.

5 Routine Facility Inspections:

In addition to or as part of the comprehensive site evaluation required under Part 4.9 (Comprehensive Site Compliance Evaluation), you must have qualified facility personnel inspect all areas of the facility where industrial materials or activities are exposed to storm water. The inspections must include an evaluation of existing storm water BMPs. Your SWPP Plan must identify how often these inspections will be conducted. You must correct any deficiencies in implementation of your SWPP Plan you find as soon as practicable, but not later than within 14 days of the inspection. You must document in your SWPP Plan the results of your inspections and the corrective actions you took in response to any deficiencies or opportunities for improvement that you identify.

6 Employee Training:

You must describe the storm water employee training program for the facility. The description should include the topics to be covered, such as spill response, good housekeeping and material management practices, and must identify periodic dates (*e.g.*, every 6 months during the months of July and January) for such training. You must provide employee training for all employees that work in areas where industrial materials or activities are exposed to storm water, and for employees that are responsible for implementing activities identified in the SWPP Plan (*e.g.*, inspectors,

maintenance people). The employee training should inform them of the components and goals of your SWPP Plan.

Important points:

- Good housekeeping is required
- Minimizing exposure of pollutants to storm water is required
- Preventive maintenance is required
- Spill prevention and response procedures are required
- Routine facility inspections are required
- Employee training is required

4.2.7.2 Structural BMPs.

Reference: 65 FR 64813

4.2.7.2.2 Structural BMPs

1 Sediment and Erosion Control:

You must identify the areas at your facility which, due to topography, land disturbance (*e.g.*, construction), or other factors, have a potential for significant soil erosion. You must describe the structural, vegetative, and/or stabilization BMPs that you will be implementing to limit erosion.

2 Management of Runoff:

You must describe the traditional storm water management practices (permanent structural BMPs other than those which control the generation or source(s) of pollutants) that currently exist or that are planned for your facility. These types of BMPs typically are used to divert, infiltrate, reuse, or otherwise reduce pollutants in storm water discharges from the site. All BMPs that you determine are reasonable and appropriate, or are required by a State or local authority; or are necessary to maintain eligibility for the permit must be implemented and maintained. Factors to consider when you are selecting appropriate BMPs should include: (1) the industrial materials and activities that are exposed to storm water, and the associated pollutant potential of those materials and activities; and (2) the beneficial and potential detrimental effects on surface water quality, ground water quality, receiving water base flow (dry weather stream flow), and physical integrity of receiving waters. Structural measures should be placed on upland soils, avoiding wetlands and floodplains, if possible. Structural BMPs may require a separate permit under section 404 of the CWA before installation begins.

3 Example BMPs:

BMPs you could use include but are not limited to: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices).

Important points:

- Areas with soil erosion or subject to soil erosion (e.g., construction areas, topography) must have structural, vegetative, and/or stabilization BMPs.
- Structural measures used to divert, infiltrate, reuse, or otherwise reduce pollutants must be described
- Wetlands and floodplains should be avoided
- Structural BMPs may require a separate permit under section 404 of the CWA before installation

4.2.7.3 Other Controls.

Reference: 65 FR 64814

4.2.7.2.3 Other Controls

No solid materials, including floatable debris, may be discharged to waters of the United States, except as authorized by a permit issued under section 404 of the CWA. Off-site vehicle tracking of raw, final, or waste materials or sediments, and the generation of dust must be minimized. Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas must be minimized. Velocity dissipation devices must be placed at discharge locations and along the length of any outfall channel if they are necessary to provide a non-erosive flow velocity from the structure to a water course.

Important points:

- Solid and floating materials may not be discharged
- Dust and off-site tracking of material must be minimized
- Dust and tracking of material from areas of no exposure to exposed areas must be minimized
- Velocity dissipation devices must be placed where needed to provide non-erosive flow velocities

4.3 Maintenance

Reference: 65 FR 64814

4.3 Maintenance

All BMPs you identify in your SWPP Plan must be maintained in effective operating condition. If site inspections required by Part 4.9 (Comprehensive Site Compliance Evaluation) identify BMPs that are not operating effectively, maintenance must be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. In the case of non-structural BMPs, the effectiveness of the BMP must be maintained by appropriate means (e.g., spill response supplies available and personnel trained, etc.).

Important points:

- Meeting this maintenance requirement requires documentation and records, discussed in Part 4.9 Comprehensive Site Compliance Evaluation

4.4 Non-Storm Water Discharges

4.4.1 Certification of Non-Storm Water Discharges

Reference: 65 FR 64814

4.4.1 Certification of Non-Storm Water Discharges

1 Your SWPP Plan must include a certification that all discharges (*i.e.*, outfalls) have been tested or evaluated for the presence of non-storm water. The certification must be signed in accordance with conditions of the permit, and include:

- 1.1 The date of any testing and/or evaluation;
- 1.2 Identification of potential significant sources of non-storm water at the site;
- 1.3 A description of the results of any test and/or evaluation for the presence of non-storm water discharges;
- 1.4 A description of the evaluation criteria or testing method used; and
- 1.5 A list of the outfalls or onsite drainage points that were directly observed during the test.

2 You do not need to sign a new certification if one was already completed for either the 1992 baseline Industrial General Permit or the 1995 Multi-sector General Permit and you have no reason to believe conditions at the facility have changed.

3 If you are unable to provide the certification required (testing for non-storm water discharges), you must notify the Director 180 days after submitting an NOI to be covered by this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification must describe:

- 3.1 Reason(s) why certification was not possible;
- 3.2 The procedure of any test attempted;
- 3.3 The results of such test or other relevant observations; and
- 3.4 Potential sources of non-storm water discharges to the storm sewer.

4 A Copy of the notification must be included in the SWPP Plan at the facility.

Non-storm water discharges to waters of the United States which are not authorized by an NPDES permit are unlawful, and must be terminated.

Important points:

- Non-storm water discharges are NOT covered by the storm water permit
- You must certify there are NO non-storm water discharges in the outfalls
- Certification must specify: date of test/observations; potential significant non-storm water sources; results of the test/observations; and a list of the outfalls directly observed during the test/observation
- Suggestion – the easiest certification is to observe “no discharge” during a dry period; this certification must include description of the potential significant non-storm water sources to demonstrate they were in operation at the time of the test but were not observed in the storm water outfall

4.4.2 Allowable Non-Storm Water Discharges

Reference: 65 FR 64814

4.4.2 Allowable Non-Storm Water Discharges

1 Certain sources of non-storm water are allowable under this permit. In order for these discharges to be allowed, your SWPP Plan must include:

- 1.1 Identification of each allowable non-storm water source;
- 1.2 The location where it is likely to be discharged; and
- 1.3 Descriptions of appropriate BMPs for each source.

2 Except for flows from fire fighting activities, you must identify in your SWPP Plan all sources of allowable non-storm water that are discharged under the authority of this permit.

3 If you include mist blown from cooling towers amongst your allowable non-storm water discharges, you must specifically evaluate the potential for the discharges to be contaminated by chemicals used in the cooling tower and determined that the levels of such chemicals in the discharges would not cause or contribute to a violation of an applicable water quality standard after implementation of the BMPs you have selected to control such discharges.

Important points:

- Allowable non-storm water discharges include (Reference: 65 FR 64807):
 - Discharges from fire fighting activities
 - Fire hydrant flushings
 - Potable water including water line flushings
 - Uncontaminated air conditioning or compressor condensate
 - Irrigation drainage
 - Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with manufacturer’s instructions
 - Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed)

- Routine external building wash down which does not use detergents
- Uncontaminated ground water or spring water
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of your facility but NOT intentional discharges from the cooling tower (e.g., “piped” cooling tower blowdown or drains)
- The SWPP Plan needs to include a description of these non-storm discharges for them to be covered under the permit, including: identification, location of discharge, and description of BMPs for each

4.5 Documentation of Permit Eligibility Related to Endangered Species

Reference: 65 FR 64814

4.5 Documentation of Permit Eligibility Related to Endangered Species

Your SWPP Plan must include documentation supporting your determination of permit eligibility with regard to Endangered Species, including:

- 1 Information on whether listed endangered or threatened species, or critical habitat, are found in proximity to your facility;
- 2 Whether such species may be affected by your storm water discharges or storm water discharge-related activities;
- 3 Results of your endangered species screening determinations; and
- 4 A description of measures necessary to protect listed endangered or threatened species, or critical habitat, including any terms or conditions that are imposed under the eligibility requirements of the permit. If you fail to describe and implement such measures, your discharges are ineligible for coverage under this permit.

Important points:

- The MSGP does not authorize any discharges or discharge-related activities that are likely to jeopardize the continued existence of any species that are listed as endangered or threatened under the ESA (Reference: 65 FR 64809)
- The MSGP does not authorize any discharges or discharge-related activities that are likely to result in the adverse modification or destruction of habitat that is designated or proposed to be designated as critical under the ESA (Reference: 65 FR 64809)
- Screening for listed endangered or threatened species must be documented in the SWPP Plan – see References 1.3 or 3.6 in Part 3 References for sources of lists
- Statement must be included in the SWPP Plan on how you determined that no listed species or critical habitat was in proximity to your discharge

- Other criteria are available, including US Fish and Wildlife Service determination or previous operators determination

4.6 Documentation of Permit Eligibility Related to Historic Places

Reference: 65 FR 64814

4.6 Documentation of Permit Eligibility Related to Historic Places

Your SWPP Plan must include documentation supporting your determination of permit eligibility with regard to Historic Places, including:

1 Information on whether your storm water discharges or storm water discharge-related activities would have an effect on a property that is listed or eligible for listing on the National Register of Historic Places;

2 Where effects may occur, any written agreements you have made with the State Historic Preservation Officer, Tribal Historic Preservation Officer, or other Tribal leader to mitigate those effects;

3 Results of your historic places screening determinations; and

4 Description of measures necessary to avoid or minimize adverse impacts on places listed, or eligible for listing, on the National Register of Historic Places, including any terms or conditions that are imposed under the eligibility requirements of the permit. If you fail to describe and implement such measures, your discharges are ineligible for coverage under this permit.

Important points:

- The MSGP does not authorize any discharges or discharge-related activities that affect a property that is listed or is eligible for listing on the National Register of Historic Places (Reference: 65 FR 64809)
- Existing industrial facilities that do not need to construct a BMP may be able to rely on a visual inspection to determine if historical properties are affected
- New construction may require further investigation, such as search of the National Register of Historical Places

4.7 Copy of Permit Requirements

Reference: 65 FR 64814

4.7 Copy of Permit Requirements

You must include a copy of the permit in your SWPP Plan.

Note: The confirmation of coverage letter you receive from the NOI Processing Center assigning your permit number IS NOT your permit—it merely acknowledges that your NOI has been accepted and you have been authorized to discharge subject to the terms and conditions of the permit.

Important points:

- Copy of the General Permit for the authorized regulatory agency must be included, typically the State permit

4.8 Applicable State, Tribal or Local Plans

Reference: 65 FR 64814

4.8 Applicable State, Tribal, or Local Plans

Your SWPP Plan must be consistent (and updated as necessary to remain consistent) with applicable State, Tribal and/or local storm water, waste disposal, sanitary sewer or septic system regulations to the extent these apply to your facility and are more stringent than the requirements of this permit.

Important point:

- Conditions in the applicable State permit must be addressed in the Plan

4.9 Comprehensive Site Compliance Evaluation

4.9.1 Frequency and Inspectors

Reference: 65 FR 64815

4.9.1 Frequency and Inspectors

You must conduct facility inspections at least once a year. The inspections must be done by qualified personnel provided by you. The qualified personnel you use may be either your own employees or outside consultants that you have hired, provided they are knowledgeable and possess the skills to assess conditions at your facility that could impact storm water quality and assess the effectiveness of the BMPs you have chosen to use to control the quality of your storm water discharges. If you decide to conduct more frequent inspections, your SWPP Plan must specify the frequency of inspections.

Important points:

- Plan must support the qualification of the inspector
- Plan should specify the time period for the inspection

4.9.2 Scope of the Compliance Evaluation

Reference: 65 FR 64815

4.9.2 Scope of the Compliance Evaluation

Your inspections must include all areas where industrial materials or activities are exposed to storm water, as identified in 4.2.4 (Summary of Potential Pollutant Sources), and areas where spills and leaks have occurred within the past 3 years. Inspectors should look for:

- (a) industrial materials, residue or trash on the ground that could contaminate or be washed away in storm water;
- (b) leaks or spills from industrial equipment, drums, barrels, tanks or similar containers;
- (c) offsite tracking of industrial materials or sediment where vehicles enter or exit the site;
- (d) tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas; and
- (e) evidence of, or the potential for, pollutants entering the drainage system.

Results of both visual and any analytical monitoring done during the year must be taken into consideration during the evaluation. Storm water BMPs identified in your SWPP Plan must be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they must be inspected to see whether BMPs are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations must be inspected if possible.

Important points:

- Suggestion – include inspection form in the Plan
- Include copies of completed inspections with the Plan

4.9.3 Follow-Up Actions

Reference: 65 FR 64815

4.9.3 Follow-Up Actions

Based on the results of the inspection, you must modify your SWPP Plan as necessary (*e.g.*, show additional controls on map required by Part 4.2.2.3; revise description of controls required by Part 4.2.7) to include additional or modified BMPs designed to correct problems identified. You must complete revisions to the SWPP Plan within 14 calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation must be completed before the next anticipated storm event, if practicable, but not more than twelve (12) weeks after completion of the comprehensive site evaluation.

Important points:

- Suggestion - include on the inspection form the requirement that the inspector comment on adequacy of BMPs

4.9.4 Compliance Evaluation Report

Reference: 65 FR 64815

4.9.4 Compliance Evaluation Report

You must insure a report summarizing the scope of the inspection, name(s) of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation of the SWPP Plan is completed and retained as part of the SWPP Plan for at least three years from the date permit coverage expires or is terminated. Major observations should include: the location(s) of discharges of pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location; and location(s) where additional BMPs are needed that did not exist at the time of inspection. You must retain a record of actions taken in accordance with Part 4.9 (Comprehensive Site Compliance Evaluation) of the permit as part of the Storm Water Pollution Prevention Plan for at least three years from the date that permit coverage expires or is terminated. The inspection reports must identify any incidents of non-compliance. Where an inspection report does not identify any incidents of non-compliance, the report must contain a certification that the facility is in compliance with the Storm Water Pollution Prevention Plan and the permit. Both the inspection report and any reports of follow-up actions must be signed in accordance with reporting requirements of the permit.

Important points:

- Scope of the inspection must be summarized – suggestion: use a form
- Actions required must be identified in the inspection report
- Follow-up actions and their completion must be documented
- All reports must be retained for three years after the permit expiration – essentially this is permanent retention of these records

4.9.5 Credit as a Routine Facility Inspection

Reference: 65 FR 64815

4.9.5 Credit as a Routine Facility Inspection

Where compliance evaluation schedules overlap with inspections required under Part 4.2.7.2.1.5 (Non-structural BMPs, Routine Facility Inspections), your annual compliance evaluation may also be used as one of the routine inspections.

Important points:

- Suggestion – include a master schedule for inspections if the facility has substantial BMP requiring inspection
- Suggestion - include with compliance inspections a statement on the permit requirement being fulfilled

4.10 Maintaining Updated SWPP Plan

Reference: 65 FR 64815

4.10 Maintaining Updated SWPP Plan

You must amend the Storm Water Pollution Prevention Plan whenever:

1 there is a change in design, construction, operation, or maintenance at your facility which has a significant effect on the discharge, or potential for discharge, of pollutants from your facility;

2 During inspections, monitoring, or investigations by you or by local, State, Tribal or Federal officials it is determined the SWPP Plan is ineffective in eliminating or significantly minimizing pollutants from sources identified under 4.2.4 (Summary of Potential Pollutant Sources), or is otherwise not achieving the general objectives of controlling pollutants in discharges from your facility.

Important point:

- Suggestion – Plan should be reviewed and the review documented at least annually to confirm it remains current

4.11 Signature, Plan Review, and Making Plans Available

Reference: 65 FR 64815

4.11 Signature, Plan Review, and Making Plans Available

1 You must sign your SWPP Plan in accordance with permit conditions, and retain the plan on-site at the facility covered by this permit (requirement is at least three years from the date that the facility's coverage under this permit expires or is terminated)

2 You must keep a copy of the SWPP Plan on-site or locally available to the Director for review at the time of an on-site inspection. You must make your SWPP Plan available upon request to the Director, a State, Tribal or local agency approving storm water management plans, or the operator of a municipal separate storm sewer receiving discharge from the site. Also, in the interest of the public's right to know, you must provide a copy of your SWPP Plan to the public if requested in writing to do so.

3 The Director may notify you at any time that your SWPP Plan does not meet one or more of the minimum requirements of this permit. The notification will identify

provisions of this permit which are not being met, as well as the required modifications. Within thirty (30) calendar days of receipt of such notification, you must make the required changes to the SWPP Plan and submit to the Director a written certification that the requested changes have been made.

4.11.4 You must make the SWPP Plan available to the US Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) upon request.

Important points:

- Plan is a public document, upon request, and should not include business confidential information
- Copy of Plan must be maintained at the facility

4.12 Additional Requirements for Facilities Subject to EPCRA Section 313 Reporting Requirements

Reference: 65 FR 64815

4.12 Additional Requirements for Storm Water Discharges Associated with Industrial Activity From Facilities Subject to EPCRA Section 313 Reporting Requirements
Potential pollutant sources for which you have reporting requirements under EPCRA 313 must be identified in your summary of potential pollutant sources as per Part 4.2.4 (Summary of Potential Pollutant Sources). Note this additional requirement only applies if you are subject to reporting requirements under EPCRA 313.

Important points:

- Potential pollutant sources must include EPCRA 313 reportable constituents

PART 2 Best Management Practices

1. Relationship to the Storm Water Permit and SWPP Plan

One requirement in Storm Water permits is the preparation of the Storm Water Pollution Prevention (SWPP) Plan, including the description of Best Management Practices (BMPs) for the facility.

BMPs are measures used to prevent or mitigate pollution from any type of activity. These include a very broad class of measures and may include processes, procedures, schedules of activities, prohibitions on practices, and other management practices to prevent or reduce water pollution. In essence, they are anything a plant manager, department foreman, environmental specialist, consultant, or employee may identify as a method, short of actual treatment, to curb water pollution.

The SWPP Plan is required to address classes of BMPs as follows:

- Non-structural Controls
 - Good Housekeeping
 - Minimizing Exposure
 - Preventive Maintenance
 - Spill Prevention and Response
 - Routine Facility Inspections
 - Employee Training
- Structural Controls
 - Sediment and Erosion Controls
 - Management of Runoff
 - Other Controls (e.g., dust, tracking of materials, runoff velocity control)

This Part summarizes information on the Non-structural Controls in Section 2 and information on Structural Controls in Section 3.

2. Summary of Non-structural Control BMPs

These can include operating practices or simple techniques intended to reduce pollution in storm water.

2.1 Good Housekeeping

These are designed to maintain a clean and orderly work environment. Good common sense often dictates these practices. Simple procedures include:

- Improve operation and maintenance of industrial machinery and processes
- Implement careful material storage practices

- Maintain an up-to-date material inventory
 - Identify all chemical substances present in the workplace
 - Label all containers showing name and type of substance
- Schedule routine cleanup operations
- Maintain well-organized work areas
- Train employees about good housekeeping practices

2.2 Minimize Exposure

These are intended to eliminate or minimize the potential for storm water contact with potential pollutant sources. Simple procedures include:

- Vehicle positioning
- Containing spills, leaks, or drips with pans
- Covering with tarps or plastic sheeting

2.3 Preventive Maintenance

A preventive maintenance program must involve inspections and maintenance of storm water management devices and routine inspections of facility operations to detect faulty equipment. Equipment such as tanks, containers, and drums, should be checked regularly for signs of deterioration with repairs or replacement as needed.

2.4 Spill Prevention and Response

Areas where spills are likely to occur and their drainage points must be clearly identified in the Plan. Employees must be aware of spill prevention and response procedures, including material handling and storage requirements. Awareness of and access to spill response equipment must be included in the SWPP Plan.

2.5 Routine Facility Inspections

Regular visual inspections are conducted to ensure that all elements of the Plan are in place and working properly. Inspection plans should consider:

- Qualified and trained facility personnel are necessary
 - Regular inspections need to include facility equipment and areas
 - Results of inspections need to be tracked
 - Recommended changes need to be made
 - Records of all inspections need to be retained
- When completed, inspection records need to include:
 - when completed,
 - who performed the inspection,
 - what areas were inspected,
 - what problems were found, and
 - what steps were taken to correct any problems

2.6 Employee Training

Training must cover such topics as spill prevention and response, good housekeeping, and material management practices. Program should teach personnel at all levels of responsibility the components and goals of the Plan. A schedule of training must be included.

Additional training is required for employees and contractor personnel working in areas where EPCRA Section 313 water priority chemicals are used or stored. The training is required at least annually and must include:

- Preventive measures, including spill prevention and response and preventive maintenance
- Pollution control laws and regulations
- Facility Storm Water Pollution Control Plan
- Features and operations of the facility that are designed to minimize discharge of EPCRA Section 313 water priority chemicals, particularly spill prevention procedures

3. Summary of Structural Control BMPs

These can include physical modifications at the facility intended to reduce pollution in storm water. Structural control BMPs are available for the following:

- Common activities at industrial facilities such as fueling, vehicle cleaning and maintenance, and liquids storage (Section 3.1 describes activities and their BMPs)
- Sediment and Erosion Controls include vegetative practices, structural erosion prevention, and sediment control practices (Section 3.6 describes BMPs)
- Management of Runoff measures can include flow diversion practices (see Section 3.2) and infiltration practices (see Section 3.7)
- Other control measures may be required to:
 - Prevent storm water contact with solid materials (see Section 3.3)
 - Prevent off-site vehicle tracking of raw, final, or waste materials or sediments, and the generation of dust (see Sections 3.4 and 3.5)
 - Minimize tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas (see Sections 3.4 and 3.5)
 - Dissipate velocity at discharge locations and along the length of any outfall channel if they are necessary to provide a non-erosive flow velocity from the structure to a water course (see Section 3.2)

Table 1 Summary of BMPs

3.1 Activity Specific Source Control BMPs

Fueling
Maintaining vehicles and equipment
Painting vehicles and equipment
Washing vehicles and equipment
Loading and unloading materials
Liquid storage in above ground tanks
Industrial waste management and outside manufacturing
Outside storage of raw materials, by-products, or finished products
Salt storage

3.2 Flow Diversion Practices

Storm water conveyances
Diversion dikes
Graded areas and pavement

3.3 Exposure Minimization Practices

Containment diking
Curbing
Drip pans
Collection basins
Sumps
Covering
Vehicle positioning
Loading and unloading by air pressure or vacuum

3.4 Mitigative Practices

Sweeping
Shoveling
Excavation
Vacuum and pump systems
Sorbents
Gelling agents

3.5 Other Preventive Practices

Preventive monitoring practices
Dust control for land disturbing and demolition activities
Dust control for industrial operations

Signs and labels
Security
Area control procedures
Vehicle washing

3.6 Sediment and Erosion Prevention Practices

Vegetative Practices

Preservation of natural vegetation
Buffer zones
Stream bank stabilization
Mulching, matting, and netting
Temporary seeding
Permanent seeding and planting
Sodding
Chemical stabilization

Structural Erosion Prevention and Sediment Control Practices

Interceptor dikes and swales
Pipe slope drains
Subsurface drains
Silt fence (filter fence)
Straw bale barrier
Brush barrier
Gravel or stone filter berm
Storm drain inlet protection
Sediment trap
Temporary sediment basin
Outlet protection
Check dams
Surface roughening
Gradient terraces

3.7 Infiltration Practices

Vegetated filter strips
Grassed swales
Level spreaders
Infiltration trenches
Porous pavements, and concrete grids and modular pavements

3.1 Activity Specific Source Control BMPs

These are specific BMPs for common industrial activities that may contaminate storm water. These BMPs should be considered if any of these activities take place at the industrial facility.

3.1.1 Fueling

The following BMPs are intended to reduce or eliminate storm water contamination from fueling stations. Applicable conditions: a facility has outdoor fueling operations or fueling occurs in areas where leaks or spills could contaminate storm water. Other relevant BMPs are in Section 4.2 Exposure Minimization Practices.

- Consider installing spill and overflow protection
- Discourage topping off of fuel tanks
- Reduce exposure of the fuel area to storm water (e.g., roof; concrete paving; run-on control such as grading, relocating roof downspouts, and gutters)
- Use dry cleanup methods for the fuel area
- Use proper petroleum spill control
- Encourage employee participation

3.1.2 Maintaining Vehicles and Equipment

Activities that can contaminate storm water include:

- Engine repair and service, such as: parts cleaning; shop cleaning; spilled fuel, oil or other materials; replacement of fluids, such as oil, oil filters, hydraulic fluids, transmission fluid, and radiator fluid
- Outdoor vehicle and equipment storage and parking, including dripping engine and automotive fluids
- Disposal of materials or process wastes from vehicle and equipment maintenance, such as greasy rags, oil filters, air filters, batteries, and spent fluids

The following BMPs are intended to reduce pollution from contaminants arising from vehicle and equipment maintenance:

- Check for leaking oil and fluids, including incoming vehicles, “wrecked” vehicles, and routine equipment parking
- Use nontoxic or low-toxicity materials, such as non-caustic detergents and cleaners, or detergent or water-based solvents
- Drain oil filters before disposal or recycling
- Prohibit pouring liquid waste down drains
- Recycle engine fluids and batteries
- Segregate and label wastes

3.1.3 Painting Vehicles and Equipment

Activities that can contaminate storm water include:

- Painting and paint removal
- Sanding or paint stripping
- Spilled paint or paint thinner

The following BMPs are intended to reduce pollution from contaminants arising from vehicle and equipment maintenance:

- Inspect parts prior to painting, since clean and dry surfaces require less painting
- Contain sanding wastes, for example, using tarps, drip pans, or vacuum
- Prevent paint waste from contacting storm water
- Properly store paint, solvents, and wastes
- Evaluate efficiency of equipment, using electrostatic spray equipment, air-atomized spray guns, high-volume/low-pressure spray guns, or gravity-feed guns
- Recycle paint, paint thinner, and solvents, for example: use dirty solvent for initial cleaning; give small amounts of left over paint to customers for touch up; use a commercial recycler; evaluate on-site recycler for large quantities
- Segregate wastes
- Buy recycled products

3.1.4 Washing Vehicles and Equipment

Activities that can contaminate storm water include:

- Outside equipment or vehicle cleaning, such as washing or steam cleaning
- Wash water discharged directly to the ground for storm water drain

The following BMPs are intended to reduce pollution from washing vehicles and equipment:

- Use phosphate-free detergents
- Use only designated cleaning areas, with appropriate controls such as impervious cover with capture for treatment as wastewater (however, this wastewater must be addressed in your direct or indirect NPDES permit for wastewater discharge)
- Recycle wash water

3.1.5 Loading and Unloading Materials

Activities that can contaminate storm water include:

- Pumping of liquids or gases from barge, truck, or rail car to or from a storage facility
- Pneumatic transfer of dry chemicals to or from the loading and unloading vehicles
- Transfer by mechanical conveyor systems
- Transfer of bags, boxes, drums, or other containers by forklift, trucks, or other material handling equipment

The following BMPs are intended to reduce pollution from loading and unloading materials:

- Contain leaks during transfer with location of transfer equipment in areas where leaks can be controlled in containment and diversion systems
- Check equipment regularly for leaks and fix leaks, especially common leak areas such as valves, pumps, flanges, and connections; look for dust or fumes as indicator that materials are being lost during transfer
- Limit exposure of material to rainfall using building overhangs or cover
- Prevent storm water run-on with grading, berming, or curbing, and locating downspouts to direct flow away from exposed areas

3.1.6 Liquid Storage in Above Ground Tanks

Activities that can contaminate storm water include:

- External corrosion and structural failure
- Installation problems
- Spills and overflows due to operator error
- Failure of piping system including pipes, pumps, flanges, couplings, hoses, and valves
- Leaks or spills during pumping of liquids or gases from barges, trucks, or rail cars to or from a storage facility

The following BMPs are intended to reduce pollution from liquid storage in above ground tanks:

- Comply with applicable State and Federal laws, including Spill Prevention, Control, and Countermeasure Plan requirements, secondary containment, integrity and leak detection monitoring, and emergency preparedness plans
- Properly train employees
- Install safeguards against accidental releases such as overflow protection devices, protective guards around tanks and piping, and clear tagging of valves to prevent human error
- Routinely inspect tanks and equipment
- Consider installing secondary containment

3.1.7 Industrial Waste Management and Outside Manufacturing

Activities that can contaminate storm water include:

- Landfills
- Waste piles
- Wastewater and solid waste treatment and disposal
 - Waste pumping
 - Addition of treatment chemicals
 - Mixing
 - Aeration
 - Clarification
 - Solids dewatering
- Land application
- Processes or equipment that generate dusts, vapors, or emissions
- Outside storage of hazardous materials or raw materials
- Dripping or leaking fluids from equipment or processes
- Liquid wastes discharged directly onto the ground or into the storm sewer

The following BMPs are intended to reduce pollution from industrial waste management and outside manufacturing activities:

- Conduct a waste reduction assessment
- Institute industrial waste source reduction and recycling BMPs
 - Production planning and sequencing
 - Process or equipment modification
 - Raw material substitution or elimination
 - Loss prevention and housekeeping
 - Waste segregation and separation
 - Closed-loop recycling
 - Training and supervision
 - Reuse and recycling
- Prevent runoff and run-on from contacting the waste management area
 - Container inspections
 - Closed lids on dumpsters and other containers
 - Covered handling and manufacturing areas
 - Enclosed or bermed areas
- Minimize runoff from land application sites
 - Site selection considering slope and adjacent properties
 - Buffers
 - Erosion controls such as vegetation and cover

3.1.8 Outside Storage of Raw Materials, By-products, or Finished Products

Materials that can contaminate storm water include:

- Fuels
- Raw materials
- By-products
- Intermediates
- Final products
- Process residuals

The following BMPs are intended to reduce pollution from industrial waste management and outside manufacturing activities:

- Cover or enclose materials
- Prevent runoff and run-on from contacting the waste management area
- Properly train employees

3.1.9 Salt Storage

Materials that can contaminate storm water include:

- Salt stored outside in piles or bags that are exposed to rain or snow
- Salt loading and unloading areas located outside or in areas where spilled salt can contaminate storm water

The following BMPs are intended to reduce pollution from industrial waste management and outside manufacturing activities:

- Put the materials under a roof
- Use temporary covers
- Enclose transfer areas
- Berm transfer areas

3.2 Site-Specific: Flow Diversion Practices

Structures that divert stream flow, such as gutters, drains, sewers, dikes, and graded pavement, are used as BMPs in two ways: (1) Flow diversion structures, called storm water conveyances, may be used to channel storm water away from industrial areas so that pollutants do not mix with the storm water; and (2) structures also may be used to carry pollutants directly to a treatment facility.

- Storm water conveyances
 - Examples are: channels, gutters, drains, and sewers
 - Often connected to create a storm water collection system
 - Effective to keep uncontaminated storm water from coming in contact with areas of site that may be contaminated
 - Effective to isolate contaminated storm water and convey to treatment areas

- Design factors include material of construction, durability, compatibility with pollutants, site slopes
- Advantages include low maintenance, erosion control, prevent temporary flooding, and long-term control
- Disadvantages include need to route collected water all the way to discharge, may increase flow velocity, may be space limited, and may not be economical for existing sites or small sites

- Diversion dikes
 - Structures used to block runoff from passing a certain point
 - Typical materials include compacted soil for temporary structures, or concrete, asphalt, or other material for permanent structures
 - Typically used to prevent run-on to industrial areas
 - Design to avoid pooling and seepage
 - Design factors include size of rain event, dike size, slopes, and vegetative cover
 - Advantages include effectiveness in limiting flow onto sites, easy construction, economical especially when constructed from on-site soil, and easy conversion to permanent features
 - Disadvantages include limited to gentle slopes and possible maintenance after heavy rain events

- Graded areas and pavement
 - Direct storm water runoff away from industrial activity area by grading and/or paving land surfaces
 - Effective when slope allows runoff to flow in desired direction
 - Design factors include runoff volume, slope, material of construction (concrete preferred to asphalt because of cracking and compatibility with organics)
 - Advantages include effectiveness in limiting storm water contact with pollutants and inexpensive construction
 - Disadvantages include limited effectiveness in heavy rain events and potential high cost for large areas or difficult terrain

3.3 Site-Specific: Exposure Minimization Practices

Eliminating or minimizing the possibility of storm water coming into contact with pollutants can minimize the contamination of storm water discharges associated with industrial activity. Completely eliminating exposure of materials to storm water is not always possible, because of limited technologies and cost. Several simple and inexpensive techniques are commonly used.

- Containment diking
 - Temporary or permanent concrete or earthen berms or retaining walls designed to hold spills

- Most commonly used for controlling spills or releases from tanks or liquid handling areas
- Design factors include capacity for largest spill plus allowance for major rain event (e.g., 25 year interval, 24 hour duration), materials sufficiently strong and impervious to liquid, and removal system for releases and rain water
- Advantages include containing releases, potential for recycle of captured materials, and common industry practice
- Disadvantages include cost, maintenance, and potential collection of contaminated storm water requiring separate disposal

- Curbing
 - Acts as a barrier around an area for isolating storm water from activity
 - Common at industrial facilities, constructed of concrete, asphalt, synthetic materials, metal, or other impenetrable material
 - Spilled materials should be removed immediately, with pumping or sump system; direct connection to surface drains should not be included
 - Advantages include excellent control for runoff, inexpensive, easily installed, potential to recycle collected materials, and common industry practice
 - Disadvantages include limited effectiveness for holding large spills and fairly high maintenance requirements

- Drip pans
 - Small depressions or pans used to contain very small volumes of leaks, drips, and spills
 - Effective as temporary solution when repair or replacement of leak or drip source is delayed
 - Commonly may consist of depressions in concrete, asphalt, or other impenetrable materials, or metal, plastic or other material that does not react with the dripped materials
 - Factors include location of drip pan, weather, type of material being collected, cleaning of the drip pan, and operator attention
 - Advantages include inexpensive, easily installed, easily operated, may allow for reuse or recycle of contained material, and can use empty or discarded containers
 - Disadvantages include contain only small volumes, must be cleaned and emptied frequently, must be secured during poor weather, and risk of improper management of collected material

- Collection basins
 - Permanent structures to contain large spills or volumes of storm water (but not for treatment of contained materials)
 - Especially useful for areas of high spill potential
 - Factors include nature of material, available space, and largest spill potential

- Advantages include storage of contaminated storm water until treatment and potential for recycle or reuse of contained materials
- Disadvantages include possible need of conveyance system, potential collection of incompatible materials, potential dilution of contained materials with storm water, and need for impermeable bottom to prevent ground water contamination
- Sumps
 - Holes or depressions where liquids can accumulate, typically with a pump to remove accumulated materials
 - Factors include location in low lying area, pumping system for removing materials, controls and alarms to prevent overflowing, impermeable materials of construction, nature of collected materials, and operator attention
 - Advantages include simple systems easily used with containment or other controls, and common at industrial facilities
 - Disadvantages include pumping maintenance and cost
- Covering
 - Partial or total physical enclosure of materials, equipment, process operations, or activities, to prevent storm water contact with potential pollutants
 - Effective for material stockpiles
 - Factors include longevity of cover material, compatibility with material, anchoring the cover, and operations
 - Advantages include simplicity and effectiveness
 - Disadvantages include frequent inspections and potential health and safety issues for some materials when covered
- Vehicle positioning
 - Practice of locating trucks or rail cars to prevent spills of materials onto the ground or other surfaces which may then contaminate storm water
 - Objective is locating a stable and appropriate position to prevent problems such as spills caused by broken storage containers or vehicle movement during transfer, containment of spills, or diversion of spills
 - Approaches include constructing walls that help in positioning vehicles, positioning vehicle to drain to a structure, outlining required vehicle positions on the pavement, using wheel guards or wheel blocks, posting signs requiring use of emergency brakes, and requiring vehicles to shut off engines during material transfer activities
 - Advantages include easy implementation and inexpensive
 - Disadvantages include potential redesign of loading and unloading areas
- Loading and unloading by air pressure or vacuum
 - Air pressure system relies on safety-relief valve and dust collector to separate dry materials from air

- Vacuum system relies on dust collection device and air lock
- Effective by reducing potential dust and exposure of open material
- Advantages include minimization of pollutants to storm water, may be quick and easy to install, and may be economical if materials can be recovered for reuse
- Disadvantages include may be expensive, may not be effective for denser materials, may require site-specific design, and may require Air permit

3.4 Site-Specific: Mitigative Practices

Mitigation involves cleaning up or recovering a substance after it has been released or spilled to reduce the potential impact before it reaches the environment. This is a second line of defense where pollution prevention practices have failed or are impractical. This approach involves planning and preparation for the proper response procedures.

- Sweeping
 - Brooms, squeegees, or other mechanical devices are used to remove small quantities of dry chemicals and dry solids from areas
 - Effectiveness requires timely implementation before rain events or other exposure to storm water
 - Advantages include inexpensive, no special training required, and provides recycling opportunities
 - Disadvantages include labor intensive and limited to small releases of dry materials
- Shoveling
 - Manual cleanup method used to remove larger quantities of dry chemicals and dry solids from areas
 - Effectiveness requires timely implementation before rain events or other exposure to storm water
 - Advantages include inexpensive, no special training required, can remove larger quantities of dry materials, and provides recycling opportunities
 - Disadvantages include labor intensive and not practical for large releases of dry materials
- Excavation
 - Removal of contaminated material typically conducted by equipment such as plows and backhoes to reduce the potential for storm water contamination
 - Useful for large releases of dry materials and liquid material releases
 - Effectiveness requires removal before a large storm event
 - Advantages include cost effectiveness for dry materials, simple, and easy
 - Disadvantages include less recycling and reuse opportunities because of imprecise removal and material segregation

- Vacuum and pump systems
 - Typically portable system to collect spilled or exposed materials, usually available by rental
 - Effective for wet or dry materials, with portable size possibly limiting transport distance of collected materials
 - Advantages include quick and simple removal, accurate removal of materials, and good recycling opportunities
 - Disadvantages include potential high initial cost and equipment maintenance

- Sorbents
 - Materials capable of cleaning up spills through the chemical processes of adsorption and absorption
 - Sorbents include: common materials of clays, sawdust, straw, and fly ash; polyurethane and polyolefin polymers; activated carbon; and silicate glass foams
 - Useful for liquid material spills, with proper sorbent dependent on properties of the material
 - Advantages include working in water environment (booms and socks) and some sorbents offer recycle opportunity
 - Disadvantages include need to match sorbent with liquid properties, may be expensive for large spills, may create disposal problem, and may have limited recycle potential for many sorbents

- Gelling agents
 - Materials that interact with liquids either physically or chemically to become a semisolid initially and then a solid material amenable to manual or mechanical cleanup
 - Useful for cleanup on land; gels cannot be used on water without approval of US Coast Guard or EPA Regional Response Team
 - Immediate application after a spill is required to accomplish effective reduction of liquid surface spread and seeping into soil
 - Advantages include stopping the spread of liquids and no permanent structure required
 - Disadvantages include knowledge of material properties for proper gel selection, usually no recycling opportunity, may be difficult cleanup of the solid material, and disposal of the solid material

3.5 Site-Specific: Other Preventive Practices

A number of preventive measures can be taken at industrial sites to limit or prevent the exposure of storm water runoff to contaminants.

- Preventive monitoring practices
 - Includes the routine observation of a process or piece of equipment to ensure safe performance and may include the chemical analysis of storm water before discharge to the environment
 - Approaches include:
 - Automatic monitoring system recommended where overflows, spills, and catastrophic leaks are possible; may include devices such as liquid level detectors, pressure and temperature gauges, pressure relief indicators, pressure drop shutoffs; flow meters, thermal probes, valve position indicators, and operation lights
 - Automatic chemical monitoring system for diked areas, sewers, drainage ditches, or holding ponds where diversion to a treatment system might be warranted; typical parameters include pH, turbidity, or conductivity
 - Manned operations typically for material loading and unloading areas where spills or mismanagement can be detected and corrected immediately; often used with Vehicle Positioning BMP
 - Nondestructive testing for tank or pipeline integrity; typical techniques include acoustic testing and hydrostatic pressure testing
 - Advantages include: automatic monitoring and chemical systems allow for early warning if release is imminent and immediate action; manned operations are effective and inexpensive; and nondestructive testing furnishes safety for individuals and early detection of situations that might lead to storm water contamination
 - Disadvantages include expertise and effort to maintain automatic equipment, potential of automatic equipment failure without warning, and cost of automatic systems

- Dust control for land disturbance and demolition activities
 - Controls that reduce the potential for particles being carried through air or water include:
 - Irrigation as a temporary measure involving light application of water to moisten the soil surface, repeated as necessary
 - Minimization of denuded areas to reduce soil exposed for transport and erosion, possibly using existing vegetation, seeding, mulching, topsoiling, crushed stone, gravel, or tree planting
 - Wind breaks as temporary or permanent barriers to reduce airborne particles by slowing wind velocities, using existing trees and large shrubs, or temporary breaks such as solid board fences, snow fences, tarp curtains, bales of hay, crate walls, and sediment walls
 - Tillage to roughen soil surface to bring up to the surface cohesive clods of soil to cover finer soils and dust
 - Chemical soil treatment for temporary control using spray-on adhesives such as anionic asphalt emulsion, latex emulsion, resin-water emulsions, or calcium chloride

- Advantages include quick and inexpensive implementation for some methods, improvement of site appearances, reduced respiratory problems for employees, and permanent improvements with vegetative wind breaks
- Disadvantages include some types are temporary, cost may be high with repeated application of controls, and may take too long to become effective for vegetative wind breaks
- Dust control for industrial operations
 - Controls that prevent pollutants from entering storm water discharges by reducing the surface and air transport of dust caused by industrial activities
 - Typical controls include: water spraying, vacuum systems, bag and cyclone collector systems, filter systems, and street sweepers
 - Useful for any process area, loading and unloading area, material handling areas, and transfer areas; street sweeping is limited to areas that are paved
 - Advantages include potential decrease in respiratory problems for employees around the site, may reduce material losses with money saved, and street sweeper can provide efficient collection of larger dust particles
 - Disadvantages include generally more expensive than manual systems, may be difficult for operator control and maintenance, and may be labor and equipment intensive (especially street sweepers)
- Signs and labels
 - Identify problem areas or hazardous materials at a facility
 - Useful to suggest caution in certain areas, provide instructions on the use of materials and equipment, and organize large amounts of materials, pipes, and equipment particularly on large sites
 - Department of Transportation and US EPA have rules defining label requirements that must be considered
 - Advantages include common use at industrial facilities, ease of use, and cost
 - Disadvantages include need to keep current and maintain legible
- Security
 - Routine patrol, lighting, and access controls, often requiring only training current security personnel about the specifics of the Storm Water Pollution Prevention Plan
 - Advantages include: preventive safeguard to operational malfunctions or other facility disturbances via routine patrols; easier detection of vandals or thieves via lighting; easier detection of spills, leaks, or other releases via lighting; preventing spills by providing good visibility via lighting; and preventing unauthorized access to facility via access control
 - Disadvantages include: limited feasibility for smaller facilities; potential cost of lighting systems; energy costs for lighting; and limited feasibility for extensive access controls at smaller facilities

- Area control procedures
 - Practicing good housekeeping measures such as maintaining indoor or covered material storage and industrial processing areas to reduce accumulation of material on footwear and clothing
 - Effective where material tracking may come into contact with storm water
 - Practices include: brushing off clothing before leaving the area; stomping feet to remove material before leaving the area; using floor mats at area exits; using coveralls, smocks, and other overgarments in areas where exposure to material is of greatest concern with proper management of these garments; and posting signs to remind employees of these practices
 - Advantages include ease of implementation and a cleaner work environment
 - Disadvantages include perception by employees that the procedures are tedious and therefore not followed

- Vehicle washing
 - Removal of residual materials from vehicles and equipment to reduce spread of dust and spilled materials across the site
 - Appropriate for any facility where vehicles come into contact with raw materials on a site
 - Washing should be near the location where the most vehicle activity occurs, wastewater should be directed away from the process materials, and a high-pressure wash system without detergent additives should be considered
 - Truck wash water will result in a non-storm water discharge and will require a separate NPDES permit to cover the discharge
 - Optional approaches include blowers or vacuums for dry materials easily removed by air
 - Advantages include prevention of dispersion of materials across the facility site
 - Disadvantages include cost of construction and operation of a wash system

3.6 Site-Specific: Sediment and Erosion Prevention Practices

Erosion is a natural process in which soil and rock material is loosened and removed. Sedimentation occurs when soil particles are suspended in surface runoff or wind and are deposited in streams and other water bodies. Human activities can accelerate erosion by removing vegetation, compacting or disturbing the soil, changing natural drainage patterns, and by covering the ground with impermeable surfaces such as pavement and buildings. These activities also can increase runoff volume and flow rate resulting in the discharge of more sediment and other pollutants to streams and rivers.

Areas with high potential for soil erosion must be addressed in the SWPP Plan. These areas include heavy activity where vegetation cannot grow, soil stockpiles, stream banks, steep slopes, construction areas, demolition areas, and disturbed or denuded soil subject

to wind and water erosion. A number of preventive measures can be taken at industrial sites to limit or prevent erosion and sedimentation.

3.6.1 Vegetative Practices

Preserving existing vegetation or revegetating disturbed soil as soon as possible after construction is the most effective way to control erosion. A vegetation cover reduces erosion potential in four ways: (1) shielding the soil surface from direct erosive impact of raindrops; (2) improving the soil's water storage porosity and capacity to increase infiltration and reduce runoff; (3) slowing the runoff velocity and allowing the sediment to drop out or deposit; and (4) physically holding the soil in place with plant roots. Typical vegetative cover includes grass, trees, shrubs, bark, mulch, or straw. Vegetative covers can be temporary or permanent.

- Preservation of natural vegetation
 - Permanent control measure that provides natural buffer zones with existing trees, vines, brushes, and grasses
 - Greatest benefits for areas where erosion controls are difficult to establish, install, or maintain, such as floodplains, wetlands, stream banks, and steep slopes
 - Factors include planning before site disturbance begins and good management controls to minimize construction impacts on existing vegetation
 - Advantages include greater storm water runoff handling capacity relative to newly seeded areas; effective immediately; improved filtering from denser vegetation and root structure relative to newly seeded areas; aesthetics; increased areas to reduce quantity and velocity of runoff; wildlife habitat; noise buffers and screens; and usually less maintenance relative to newly seeded areas
 - Disadvantages include required planning to preserve and maintain the existing vegetation, land cost, and restrictions on area available for construction activities

- Buffer zones
 - Vegetated strips of land used for temporary or permanent control to decrease the velocity of storm water runoff
 - Greatest effectiveness on floodplains, next to wetlands, along stream banks, and on steep or unstable slopes
 - Factors include good planning and management to preserve existing vegetation against disturbances such as grade changes, excavation, damage from equipment, and other activities
 - Maintaining planted areas may require debris removal and protection against unintended uses or traffic
 - Advantages include aesthetic and water quality benefits; reduced amount and velocity of storm water runoff; wildlife habitat; potential recreation;

- noise buffers and screens; low maintenance; and low cost when existing vegetation is used
- Disadvantages include land cost, land availability, and need for established vegetation to become effective
- Stream bank stabilization
 - Prevents stream bank erosion from high velocities and quantities of storm water runoff
 - Riprap – large angular stones placed along the stream bank or lake
 - Gabion – rock-filled wire cages that are used to create a new stream bank
 - Reinforced concrete – concrete bulkheads and retaining walls that replace natural stream banks and create a non-erosive surface
 - Log cribbing – retaining walls built of logs to anchor the soils against erosive forces, usually built on the outside of stream beds
 - Grid pavers – precast or poured-in-place concrete units that are placed along stream banks to stabilize the stream bank and create open spaces where vegetation can be established
 - Asphalt – asphalt paving that is placed along the natural stream bank to create a non-erosive surface
 - Used where vegetative stabilization practices are not practical and stream banks subject to heavy erosion from increased flows or disturbance
 - Design by Professional Engineer and permitting may be required
 - Advantages include control against erosive forces, lower maintenance relative to vegetative controls, some wildlife habitat, and can adapt well to uneven surfaces (rip rap)
 - Disadvantages include reduced aesthetics relative to vegetative practices, requires design by qualified Professional Engineer, cost of materials and construction, may require permits, may alter stream dynamics with downstream consequences, and may have negative wildlife impacts
- Mulching, matting, and netting
 - Mulching is temporary soil stabilization or erosion practice where materials such as grass, hay, woodchips, wood fibers, straw, or gravel are placed on the soil surface; typically used to protect seeded and planted areas with slopes steeper than 2:1
 - Matting is material formed into sheets to form more stable form of mulch; typically used on steep slopes and critical areas such as waterways
 - Netting is typically made from jute, other wood fiber, plastic, paper, or cotton; typically used to hold mulch or matting to the ground
 - Inspections needed to confirm mulch remains in place and that erosion is not occurring below matting and netting
 - Advantages include immediate protection to exposed soils and heavy erosion areas, moisture retention, and natural deterioration of mulch and matting

- Disadvantages include possible delay in seed germination due to cooler soil temperature and need to remove netting
- Temporary seeding
 - Short-term vegetative cover with fast-growing grasses whose root systems hold down soil on disturbed site areas in danger of erosion
 - Useful for denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, and temporary road banks
 - Factors include: seed bed preparation usually including tilling, fertilizer, and/or lime; high-quality seed suitable for the area and season; possibly mulch; inspections; and possible irrigation
 - Advantages include easy and generally inexpensive, fast plant cover when conditions are good, aesthetic, good soil stabilization, and reduced maintenance cost for other erosion controls such as sediment basins
 - Disadvantages include reliance on season and rainfall for success, potential need for extensive fertilizer with water quality problems, needs protection from heavy use, and vegetation may need irrigation and maintenance
- Permanent seeding and planting
 - Permanent stabilization of soil with long-lived grass, trees, and/or brush
 - Used with filter strips, buffer areas, vegetated swales, steep slopes, and stream banks
 - Install all other erosion control practices such as dikes, basins, and surface runoff control measures before planting
 - Requires good seed bed, possibly including top soil, fertilizer and/or lime, mulching, and irrigation
 - Advantages include improved aesthetics, excellent stabilization, filtering of sediments, wildlife habitat, and relatively inexpensive
 - Disadvantages include possible irrigation and reliance on climate for initial success
- Sodding
 - Stabilizes an area by establishing immediate permanent vegetation
 - Provides erosion and sedimentation controls and areas where storm water can infiltrate the ground
 - Factors include need to fine-grade soil surface before laying sod, may need topsoil, lime and fertilizer may be needed, avoid planting during very hot or wet weather, and inspect frequently
 - Advantages include immediate vegetative cover and control, lower initial weed growth than seeding, available for site activities in less time than seeding, and can be placed nearly any time of the year
 - Disadvantages include higher purchase and installation cost relative to seeding, and may require irrigation if placed during dry season or on sandy soils

- Chemical stabilization
 - Materials made of vinyl, asphalt, or rubber are sprayed onto the surface of the soil for temporary erosion control
 - Alternative where temporary seeding cannot be used and immediate control is needed
 - Advantages include easy application, effective in areas where plants will not grow, and furnishes immediate protection
 - Disadvantages include potential to create impervious surfaces which can increase the amount and velocity of storm water runoff, may affect water quality if not used correctly, and usually more expensive than vegetative cover

3.6.2 Structural Erosion Prevention and Sediment Control Practices

Structural practices used in sediment and erosion control divert storm water flows away from exposed areas, convey runoff, prevent sediments from moving offsite, and can also reduce the erosive forces of runoff waters. These controls can be permanent or temporary measures.

- Interceptor dikes and swales
 - Interceptor dikes are ridges of compacted soil and swales are excavated depressions; these temporary or permanent measures are used to keep upslope runoff from crossing areas where there is a high risk of erosion
 - Reduce quantity and velocity of runoff and guide to a stabilized discharge point
 - Advantages include simple and effective control to channel runoff away from areas subject to erosion, can handle flows from large drainage areas, and are inexpensive to construct normally using materials and equipment onsite
 - Disadvantages include potential to cause erosion and sediment transport from concentrated flows if constructed improperly, may cause problems to vegetation growth if water flow is too fast, and may require additional maintenance, inspections, and repairs
- Pipe slope drains
 - Flexible or rigid pipe used to carry concentrated runoff from the top to bottom of a slope already damaged by or at high risk for erosion, or to drain saturated slopes that have the potential for soil slides
 - Factors include designing drains to handle the volume of flow, stabilization of the inlet and outlet, and regular inspection after any major storm
 - Advantages include effectiveness to reduce or eliminate erosion from runoff on steep slopes or saturated soils, easy to install, and little maintenance
 - Disadvantages include need to stabilize area of drain installation to prevent erosion and potential to clog during a large storm

- Subsurface drains
 - Perforated pipe or conduit placed beneath the surface of the ground used as a relief drain to lower the water table; placed in a gridiron, herringbone, or random pattern
 - Interceptor drain used to remove water where sloping soils are excessively wet or subject to slippage; usually placed as single pipes
 - Advantages include effectiveness for stabilizing wet sloping soils and lowering water table
 - Disadvantages include potential to be pierced or clogged by tree roots, avoid using under heavy vehicle crossings, and higher installation cost relative to surface drains because excavation is required

- Silt fence (filter fence)
 - Temporary measure for sedimentation control usually consisting of posts with filter fabric stretched across the posts, the lower vertical edge of the fabric in a trench with backfill, and possibly supported with a wire fence; used in small drainage areas to detain sediment
 - Effective for overland flow in a thin even layer or in minor swales or drainage ways for approximately 6 months, with frequent inspection and removal of sediment when it is one-third to one-half the height of the fence or after each storm
 - Advantages include removes sediment and prevents downstream damage from sediment deposits, reduces the velocity of runoff, minimal clearing required for installation, and inexpensive
 - Disadvantages include failure of fence from improper choice of pore size in the filter fabric or installation, should not be used in streams, only appropriate for small drainage areas with overland flow, should not be used with flow rate greater than 0.5 cfs, and frequent inspection and maintenance required to ensure effectiveness

- Straw bale barrier
 - Straw bales placed end to end with no gaps in a shallow excavated trench as a temporary sediment barrier
 - Factors include placing perpendicular to flow, placing in an entrenchment that is backfilled, firmly staking in place, prompt replacement of damaged bales, and removal of sediment after storm events
 - Advantages include preventing downstream damage from sediment deposits if properly installed, used, and maintained, and are inexpensive
 - Disadvantages include not applicable for streams or large swales, risk of washouts if barrier installed improperly or in severe storm, short life span of 3 months, high inspection and maintenance requirement, appropriate only for small drainage areas, and easily subject to misuse which can contribute to sediment problems

- Brush barrier
 - Temporary sediment barrier constructed from materials resulting from onsite clearing and grubbing, normally at the bottom perimeter of the disturbed area
 - Filter fabric sometimes used as an anchor over the barrier to increase filtering efficiency
 - Effective for gentle slopes and small drainage areas but not in a swale or channel
 - Advantages include inexpensive because of construction with onsite materials and requires little maintenance unless there are very heavy sediment deposits
 - Disadvantages include appropriate for only small drainage areas, does not replace a sediment trap or basin, and has very limited sediment retention

- Gravel or stone filter berm
 - Temporary ridge constructed of loose gravel, stone, or crushed rock, used to direct runoff from exposed traffic area or from right-of-way to a stabilized outlet
 - Used when needed to accommodate traffic
 - Advantages include a very efficient method of sediment control
 - Disadvantages include more expensive than methods that use onsite materials, has a very limited life span, and can be difficult to maintain because of clogging with mud and soil on vehicle tires

- Storm drain inlet protection
 - Filtering measure placed around any inlet or drain to trap sediment
 - Usually composed of gravel and stone with a wire mesh filter, block and gravel, filter fabric, or sod
 - Appropriate for small drainage areas where storm drain inlets will be ready for use before final stabilization; block and gravel filters used for higher runoff velocity; gravel and mesh filters used for high flows and potential disturbance by site traffic; sod inlet filters used where sediment in storm water is low
 - Advantages include preventing clogging of existing storm drainage systems and reduces amount of sediment leaving the site
 - Disadvantages include difficulty in removing collected sediment, may cause erosion elsewhere if clogging occurs, and practical only for low sediment, low volume flows

- Sediment trap
 - Excavated pond or earthen embankment placed across a low area or drainage swale, with an outlet using large stones or aggregate to slow the release of runoff; sufficient size to allow most of the silt to settle out
 - Used in conjunction with other temporary measures such as gravel construction entrances, vehicle wash areas, slope drains, diversion dikes

- and swales, or diversion channels; appropriate for sites with short time schedules
- Suitable for small drainage areas, typically no more than 10 acres, and usually for duration of no more than 18 months
- Advantages include inexpensive and simple to install, protects downstream areas from clogging or damage due to sediment deposits, and can simplify design process by trapping sediment at specific onsite spots
- Disadvantages include suitable only for a limited area, effective only if properly maintained, will not remove very fine silts and clays, and has a short life span
- Temporary sediment basin
 - Settling pond with a controlled storm water release structure used to collect and store sediment produced by construction activities
 - Designed to maintain permanent pool or to drain completely dry; gravel outlet or spillway to slow release of runoff and provide some sediment filtration
 - Constructed before construction begins, usually for area no greater than 5 acres with useful life of 12 to 18 months; should be cleaned when no more than one-half full of sediment
 - Advantages include trapping smaller sediment particles because of long detention time and protect downstream areas from clogging or damage due to sediment deposits
 - Disadvantages include suitable only for small areas, requires regular maintenance and cleaning, will not remove very fine silts and clays, is a relatively expensive method, and requires careful safety measures to protect children
- Outlet protection
 - Techniques include stone or riprap, concrete aprons, paved sections, and settling basins installed below the storm drain outlet, to reduce the velocity of storm water flows and lower erosive potential
 - Used at outlets from pipes, interceptor dikes, swales, or channel sections
 - Advantages include relatively low cost protection that is easily installed on most sites, removes sediment in addition to reducing flow speed, can be used at most outlets, and requires less maintenance than many other measures
 - Disadvantages include may be unsightly, may cause problems in removing sediment without removing and replacing the outlet structure itself, and may require frequent maintenance for outlets with high velocity flows
- Check dams
 - Small temporary or permanent dam constructed across a drainage ditch, swale, or channel, to lower the velocity of runoff

- Useful for steeply sloped swales, or in swales where adequate vegetation cannot be established; constructed from logs, stone, or pea gravel-filled sandbags
- Appropriate for open channels draining no more than 10 acres; should not be used in streams without permission from State authorities
- Advantages include inexpensive and easy to install, may be used permanently if designed properly, allow a high proportion of sediment in the runoff to settle, reduce velocity, provide aeration of the water, and may be used where it is not possible to divert the flow or otherwise stabilize the channel
- Disadvantages include may kill grass linings in channels if the water level remains high after rain or significant sedimentation, and only useful for drainage areas no more than 10 acres

- Surface roughening
 - Temporary erosion control practice where soil surface is roughened by the creation of horizontal grooves, depressions, or steps that run parallel to the contour of the land
 - Appropriate for all slopes, can be used with both seeding and planting, and with temporary mulching to stabilize an area
 - Methods include stair-step grading; grooving using disks, spring harrows, or teeth on a front-end loader; and tracking with a crawler tractor where the cleat imprints are parallel to the slope contour; factors include slope, mowing requirements after vegetative cover is established, whether slope was formed by cutting or filling, and available equipment
 - Advantages include immediate erosion protection for bare soil while vegetative cover is being established, inexpensive, and simple for short-term erosion control
 - Disadvantages include limited effectiveness for anything more than a gentle rain and is temporary with need to re-roughen and seed the surface if roughening or vegetative cover is washed away

- Gradient terraces
 - Earth embankments or ridge-and-channels constructed with suitable spacing and with appropriate grade to capture surface runoff and direct to a stable outlet at a non-erosive velocity
 - Usually limited to use on land that has no vegetation and suitable runoff outlets are or will be made available; should not be constructed on slopes with sandy or rocky soils
 - Advantages include reduce runoff speed, increase distance of overland runoff flow, hold moisture better than smooth slopes, and minimize sediment loading of surface runoff
 - Disadvantages include may significantly increase cut and fill costs, may cause sloughing if excessive water infiltrates the soil, and are not practical for sandy, steep, or shallow soils

3.7 Infiltration Practices

Infiltration practices are surface and subsurface measures that allow for quick infiltration of storm water runoff. Rapid infiltration is possible because the structures or soils used in these practices are very porous. Infiltration practices offer an advantage over other practices in that they provide some treatment of runoff, preserve the natural flow in streams, and recharge ground water. Many of the infiltration practices also can reduce the velocity of the runoff so that it will not cause damaging erosion. Another benefit of infiltration practices is that they reduce the need for expensive storm water conveyance systems. Construction and maintenance of these practices may require some level of expertise to prevent clogging and retain high effectiveness.

- Vegetated filter strips
 - Gently sloping areas of natural vegetation or graded and artificially planted areas used to provide infiltration, remove sediments and other pollutants, and reduce the volume and velocity of storm water moving across the terrain
 - Function is similar to vegetated or grassed swales except filter strips are fairly level and treat sheet flow rather than concentrated flows
 - Suited for areas where soils are well drained or moderately well drained, with bedrock and water table well below ground surface
 - Design at least 20 feet wide by at least 50 to 75 feet length; forested strips preferred to vegetated strips; existing vegetation preferred to planted vegetation; dense vegetation; and sediment and replanting may be required
 - Advantages include low to moderate treatment of pollutants while providing a natural look, wildlife habitat, screen noise and views with use of trees or high shrubs, easily constructed and implemented, and inexpensive
 - Disadvantages include not effective for high velocity flows from large paved areas or steep slopes, require significant land space, and may have short useful life due to clogging by sediments and oil and grease
- Grassed swales
 - Vegetated depressions used to transport, filter, and remove sediments; grass reduces runoff velocity and volume of runoff due to infiltration
 - Suitable where storm water runoff is low for sites no greater than 10 acres; permeable soils required but sandy soils do not hold vegetation well nor form stable channel structure
 - Design factors include level grade, use of existing topography and drainage patterns, tilling before planting grass, possible use of check dams, and outlet protection; inspections and maintenance needed to maintain vegetation

- Advantages include easy design and construction, moderate removal of sediments, wildlife habitat, inexpensive, can replace curb and gutter systems, and long useful life if well maintained
- Disadvantages include cannot control runoff from very large storms; can encourage nuisance problems such as mosquitoes, ragweed, dumping, and erosion if they do not drain properly between storms; are not capable of removing significant amounts of soluble nutrients; and cannot treat runoff with high sediment loadings
- Level spreaders
 - Devices used at storm water outlets to spread out collected storm water flows into sheet flow, typically consisting of a depression in the soil surface that spreads flow onto a flat area across a gentle slope
 - Application as an outlet for temporary or permanent storm water conveyances or dikes; sediment trapping devices required prior to release into a level spreader for high sediment loads
 - Factors include amount of water that flows through the conveyance, non-erosive soils, natural soils preferred to fill, entrance to spreader should be level for even spread, and avoid heavy equipment and other traffic to prevent compaction or change to slope
 - Advantages include reduced storm water flow velocity, sedimentation and infiltration, and relatively inexpensive
 - Disadvantages include easily can develop short circuiting with concentration of flow into small streams instead of sheet flow, and cannot handle large quantities of sediment-laden storm water
- Infiltration trenches
 - Long, narrow excavation ranging from 3 to 12 feet deep filled with stone, allowing temporary storage of storm water runoff in the open spaces between the stones
 - Applicable for small sites draining no more than 5 acres; should not be used in soils with high clay content, silt/clay soils, sand/clay loams, or soils that have been compacted; should not be sited over fill soils because such soils are unstable; should have bottom of trench at least 3 feet above bedrock and the seasonal high water table; and may not be suitable in areas where there are cold winters and deep frost levels
 - Advantages include preserve natural water balance of a site, effective for small sites, and remove pollutants effectively
 - Disadvantages include high maintenance when sediment loads are heavy, short life span especially if not maintained properly, and may be expensive due to cost of excavation and fill material
- Porous pavements, and concrete grids and modular pavements
 - Allow storm water to infiltrate and reduce velocity and volume of runoff

- Porous pavement (can include asphalt or concrete) is underlain by a stone reservoir layer draining into the underlying subsoil or into underground pipes that route water away
- Porous concrete pavement is made from a special concrete mix with a high number of open spaces; water infiltrates directly to graded soils or to a subbase of 6 inches sand
- Concrete grids and modular pavement are made from precast concrete, poured-in-place concrete, brick, or granite; water infiltrates through open spaces in pavement directly to graded soils; open spaces can be filled with gravel, sand, or vegetation
- Suitable for low-volume parking areas no more than 10 acres and lightly used access roads; slopes less than 5 percent; not recommended for sites with high water tables, shallow bedrock, fill soils, or localized clay lenses
- Advantages include some treatment of water, reduce velocity and volume of runoff, reduce the need for storm sewer installation and expansion, improve road safety by providing a rougher surface, some recharge to local aquifers, and can be cost effective by replacing more expensive and complex treatment systems
- Disadvantages include cost, easily clogged with sediment and/or oil, may cause ground water contamination, are not structurally suited for high-density traffic or heavy equipment, asphalt affected by gasoline, and reduced effectiveness when subsurface is frozen

4. Special Considerations for Construction Areas

The NPDES Storm water program requires operators of construction sites one acre or larger (including smaller sites that are part of a larger common plan of development) to obtain authorization to discharge storm water under an NPDES construction storm water permit. The development and implementation of storm water pollution prevention plans is the focus of NPDES storm water permits for regulated construction activities.

Construction permit coverage is terminated as soon as the portion(s) of the project are finally stabilized. A definition of "Final Stabilization" is in the permit and is required only of areas that are not otherwise covered by some sort of structure (e.g., buildings, parking lots; roads; gravel equipment pads, sidewalks, runways, etc). All other disturbed areas must be finally stabilized by either vegetative or non-vegetative practices, except disturbed areas on lands that will be returned to an agricultural use such as cropland, rangeland, or silviculture need only be returned to the preexisting agricultural use condition (e.g., tilled land, grass rangeland, agricultural buffer strip, etc.). Where a residential homeowner has decided to install their lawn themselves, only temporary stabilization is required.

Perennial vegetation could include grasses, ground covers, trees, shrubs, etc. Non-vegetative stabilization could include rip-rap, gravel, gabions, etc. Impervious cover such as concrete or asphalt should be avoided as a final stabilization technique.

1. Recommended References

The following references are recommended for more detailed descriptions of the items discussed in this course.

1.1 Storm Water Management for Industrial Activities: Summary Guidance on Developing Pollution Prevention Plans and Best Management Practices

Summary guidance on the Storm Water Pollution Prevention (SWPP) Plan requirements for industrial (non-construction) activity under the NPDES Storm Water Program (EPA 832-R-92-002). **Date Published:** 10/01/1992

[\[Click here to view in PDF format - 2,723KB \]](#)

1.2 Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices

Provides guidance on the Storm Water Pollution Prevention (SWPP) Plan requirements for industrial (non-construction) activity under the NPDES Storm Water Program. Includes a detailed description of BMPs for Activity-Specific source controls (Chapter 3) and BMPs for Site-Specific Industrial Storm Water Control (Chapter 4). Other parts of the document are included in Section 2 Other Industrial Guidance Documents (EPA 832-R-92-006).

- **Chapter 3 Activity-Specific Source Control BMPs**
[\[Click here to view in PDF format - 1207KB \]](#)

- **Chapter 4 Site-Specific Industrial Storm Water BMPs**
[\[Click here to view in PDF format - 3954KB \]](#)

1.3 EPA Most Current Endangered or Threatened Species List

<http://cfpub.epa.gov/npdes/stormwater/endangerspecies.cfm>

1.4 EPA Office of Water Web Page

<http://www.epa.gov/owm/>

1.5 Final Reissuance of National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activities; Notice

Federal Register, October 20, 2000

2. Other Industrial Guidance Documents

2.1 Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices

Provides guidance on the Storm Water Pollution Prevention (SWPP) Plan requirements for industrial (non-construction) activity under the NPDES Storm Water Program.

Includes a set of worksheets, a checklist, and a sample SWPP Plan (EPA 832-R-92-006).

Date Published: 09/01/1992

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- **Appendix F Tests for Non-Storm Water Discharges**
[\[Click here to view in PDF format - 60KB \]](#)

2.2 Guidance Manual for Conditional Exclusion from Storm Water Permitting Based on "No Exposure" of Industrial Activities to Storm Water

Guidance manual for conditional exclusion from storm water permitting based on "No Exposure" of industrial activities to storm water under the Storm Water Phase II Final Rule (EPA 833-B-00-001).

Date Published: 06/01/2000

[\[Click here to view in PDF format - 192KB \]](#)

2.3 Guidance Manual for the Monitoring and Reporting Requirements of the NPDES Storm Water Multi-Sector General Permit

Guidance document to assist facilities subject to monitoring and reporting requirements under the MSGP in complying with their visual, analytical and compliance monitoring requirements, and ensure proper reporting of laboratory results.

Date Published: 01/01/1999

[\[Click here to view in PDF format - 217KB \]](#)

2.4 NPDES Storm Water Sampling Guidance Document

Guidance for collecting samples under the storm water permitting program. This manual is primarily designed to assist industrial and medium and large MS4 operators/owners in planning for and fulfilling the NPDES storm water discharge sampling requirements for individual permit applications, as well as for other storm water sampling needs (EPA 833-8-92-001).

Date Published: 07/01/1992

[\[Click here to view in PDF format - 10,000KB \]](#)

2.5 Auto Salvage Compliance Assistance Tools Developed by States, Regions, and Other Groups

This table, organized by state, lists a variety of tools such as videos, guidance documents, and fact sheets available to the auto salvage industry. **Date Published:** 04/01/2003

[\[Click here to view in PDF format - 169KB \]](#)

2.6 Model State Compliance Assurance Guide for Auto Recycling Facilities

This guidance document helps present the components of a compliance assurance program that integrates compliance assistance and enforcement. **Date Published:** 01/10/2003

[\[Click here to view in PDF format - 790KB \]](#)

3. Other Construction Guidance Documents

3.1 Storm Water Management for Construction Activities: Summary Guidance on Developing Pollution Prevention Plans and Best Management Practices

Summary guidance on the development of Storm Water Pollution Prevention (SWPP) Plans and identification of best management practices (BMPs) for construction activities (EPA 832-R-92-001). **Date Published:** 10/01/1992

[\[Click here to view in PDF format - 2,218KB \]](#)

3.2 Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices

Manual provides detailed guidance on the development of Storm Water Pollution Prevention (SWPP) Plans and identification of best management practices (BMPs) for construction activities. It provides technical assistance and support for all construction activities subject to pollution prevention requirements established under NPDES permits for storm water point source discharges. It includes a set of worksheets, a checklist, and a sample SWPP Plan (EPA 832-R-92-005). **Date Published:** 09/01/1992

- **Cover and Table of Contents**
[\[Click here to view in PDF format - 457KB \]](#)
- **Chapter 1: Introduction**
[\[Click here to view in PDF format - 283KB \]](#)
- **Chapter 2: Storm Water Pollution Prevention Plan**
[\[Click here to view in PDF format - 2,483KB \]](#)
- **Chapter 3: Sediment and Erosion Control**
[\[Click here to view in PDF format - 3,130KB \]](#)
- **Chapter 4: Other Controls**
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- **Chapter 5: Maintenance and Inspection**
[\[Click here to view in PDF format - 238KB \]](#)
- **Chapter 6: Storm Water Management Controls**
[\[Click here to view in PDF format - 10KB \]](#)
- **Appendix A: Storm Water Pollution Prevention Plan Checklists**
[\[Click here to view in PDF format - 181KB \]](#)
- **Appendix B: BMP Fact Sheets**
[\[Click here to view in PDF format - 806KB \]](#)
- **Appendix C: Example Storm Water Pollution Prevention Plan for a Construction Activity**
[\[Click here to view in PDF format - 687KB \]](#)
- **Appendix D: References**
[\[Click here to view in PDF format - 85KB \]](#)
- **Appendix E: Glossary**
[\[Click here to view in PDF format - 631KB \]](#)
- **Appendix F: List of Hazardous Substances and Reportable Quantities**
[\[Click here to view in PDF format - 2,584KB \]](#)

- **Appendix G: Rain Data References**
[\[Click here to view in PDF format - 46KB \]](#)
- **Appendix H: The Pollutant Removal Capacity of Pond and Wetland Systems: A Review**
[\[Click here to view in PDF format - 161KB \]](#)

3.3 Construction Site Storm Water Discharge Control: An Inventory of Current Practices

Information to assist municipalities in preparing the storm water management and sediment and erosion control program portions of their NPDES storm water permit application. **Date Published:** 06/01/1991

[\[Click here to view in PDF format - 2,000KB \]](#)

3.4 Federal Environmental Requirements for Construction

This guide provides information on federal environmental requirements for construction projects. It is written for owners of construction projects or general contractors on a construction project. **Date Published:** Unknown

[\[Click here to view in PDF format - 1,540KB \]](#)

3.5 Oil and Gas Extraction Construction Activities

This letter from the Office of Water clarifies EPA's position on the applicability of NPDES storm water construction permits to clearing, grading, and excavating at oil and gas extraction sites. **Date Published:** 08/01/2001

[\[Click here to view in PDF format - 11KB \]](#)

3.6 Applicability of the NPDES Program to Discharges of Storm Water Associated with Construction Activity at, or Construction of, Livestock Feeding Facilities

Memorandum clarifying the interpretation of the NPDES regulations as they apply to discharges of storm water associated with construction activity, construction of, livestock feeding facilities involving animal feeding operations, concentrated animal feeding operations, and feedlots. **Date Published:** 02/05/1998

[\[Click here to view in PDF format - 127KB \]](#)

3.7 National Menu of Best Management Practices (BMPs) for NPDES Storm Water Phase II

Contains 112 fact sheets that describe best management practices (BMPs) that can be used to fulfill the 6 minimum measures described in the Storm Water Phase II Rule (public education and outreach on storm water impacts, public involvement/participation, illicit discharge detection and elimination, construction site storm water runoff control, post-construction storm water management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations). Regulated small MS4s can select from the menu as they submit a notice of intent (NOI) to be covered by a

general permit. It can also be used by states, the construction industry, and other stakeholders. Each fact sheet contains cost and effectiveness data, applicability, siting and design considerations, benefits, limitations, and case studies and resources for further information. To view the Menu of BMPs visit

<http://www.epa.gov/npdes/menuofbmps/menu.htm>.

Easily downloadable files are located at

http://www.epa.gov/npdes/menuofbmps/BMP_files.htm.

Date Published: 10/27/2000

3.8 Endangered Species Act Review Procedures

Web page maintained by EPA

<http://cfpub.epa.gov/npdes/stormwater/esa.cfm>