STORM WATER MANAGEMENT GUIDELINES FOR CONSTRUCTION ACTIVITIES

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Prepared by

The Environmental Affairs Division
Water Resources Management Branch
And
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1.0 Introduction to Storm Water Management

Construction and urbanization are two major causes of water pollution. Disturbance of the soil resulting from construction can accelerate the erosion process and increase the sediment load in runoff and adversely affect receiving waters. In addition, increased impermeable surface due to urbanization can alter the quantity and quality of storm water runoff by facilitating the transportation of runoff and accumulated sediments from paved surfaces. The water-related impacts of construction and urbanization can include habitat alteration, higher peak flows and flooding, erosion, and increased pollutant loads (sediment, metals, nutrients, bacteria, etc.).

Involvement in construction and urbanization makes TxDOT a key player in the control of storm water pollution. As a key player, it is TxDOT's responsibility to be aware of the problem and to take measures to minimize and/or prevent storm water pollution. Therefore, it is the goal of TxDOT to prevent the degradation of receiving waters due to storm water runoff from highway operations. TxDOT is developing a comprehensive storm water management program aimed at achieving this goal. It is the purpose of this document to serve as part of this larger program, but construction activities deserve particular attention. Although other issues are mentioned such as project planning and maintenance, the focus of this document is to provide guidance on the use of storm water management measures during highway construction.

With this document, the user can develop a storm water management plan tailored to the needs of a particular project. In addition, the measures in this document will assist in meeting regulatory requirements where storm water is a concern. Although runoff control measures are required by law in some instances, these measures are applicable anywhere soil is disturbed and erosion and sedimentation are potential problems. The material in this manual is derived primarily from storm water guidance documents developed and adopted by the Texas Natural Resource Conservation Commission. In addition, a variety of recommended and approved sources of information were utilized to produce this document including, but not limited to:

- The Environmental Protection Agency's (EPA) Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices

- AASHTO's Highway Drainage Guidelines/Volume III

- EPA's Guidance on Specifying Management Measures of Sources of Nonpoint Source Pollution in Coastal Waters

- TNRCC's Description of BMPs for Tier I Projects

- Texas Transportation Institute's Research Report 1837-1, "Design Methods, Selection, and Cost-Effectiveness of Stormwater Quality Structures"

With the references compiled into this document, the user has a tool that serves as an integral part of TxDOT's storm water management program.

1.1 Purpose

The purpose of storm water management during construction is to allow the development of a highway while also accomplishing the three general erosion and sediment control objectives of:

- Preventing degradation of receiving waters
- Facilitating project construction and minimizing overall costs
- Complying with federal, state and local regulations

The first objective is to minimize effects to receiving waters. One problem with this approach is that, not only are many of the effects uncertain, there is no universal agreement as to what constitutes an undesirable effect. However, many offsite conditions are readily definable relative to the levels of sediment that may cause damage. Examples include clear water streams, impoundments, and developed areas. The designer of the erosion and sediment control measures should attempt to make some determination of the type and magnitude of offsite effects to be expected, to determine whether the effects will be detrimental, beneficial, or neutral, and temper the design accordingly. This determination may require some prediction or estimates of the quantity of eroded material that would be expected from the construction site. This information will allow an evaluation of what, if any, control measures are required and their size and extent of application.

The second objective deals with integration of the erosion control measures into the construction processes to facilitate construction and afford an overall cost-effective program. Control measures should be simple to construct, afford as little interruption to normal construction procedures as practicable, and be effective in their operation. Much is lost when a shotgun approach is taken, where the designer attempts to achieve total control of both erosion and sediment by calling for rigorous or inflexible design plan measures of questionable effectiveness.

Central to the preparation of an erosion and sediment control plan is an evaluation of each site for possible actions and their consequences. It is necessary to analyze the probable effects to be expected from both the implementation of the control measures as well as their omission, the location of the effects, whether or not the potential damage is acceptable, and the cost effectiveness of the chosen action. This analysis will establish if, and to what extent, a plan for erosion and sediment control is necessary.

The third objective is complying with federal, state, and local regulations. As a result of the National Environmental Policy Act of 1969 and the Clean Water Act of 1972, much attention has been directed to the control of erosion and sedimentation. Promulgated by

this concern are numerous state and federal regulations and controls governing land disturbance activities. At the federal level, several Executive orders and regulations address erosion and sediment control requirements on federally supported highway activities. There are also federal control requirements exerted by numerous agencies (Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, etc.) through their administration of various permitting requirements (Section 404 and Section 402 of the Federal Water Pollution Control Act or Clean Water Act, and Sections 9 and 10 of the River and Harbor Act).

Section 402 of the Clean Water Act implements the National Pollutant Discharge Elimination System (NPDES) program. Under the NPDES storm water program, the EPA has issued a General Permit for Construction Activities. Information relating to the General Permit is included in Section 10.0

1.2 Objectives

In planning and design:

- Plan and design roadway projects to protect areas that provide important water quality benefits or are particularly susceptible to erosion and sediment loss

- Limit land disturbance such as clearing, grading, and cut and fill to reduce erosion and sediment loss

- Limit disturbance of natural drainage features and vegetation

The best time to address control of storm water pollution from roads and highways is during the initial planning and design phase. New roads and highways should be located with consideration of natural drainage patterns and planned to avoid encroachment on surface waters and wet areas. Where this is not possible, appropriate controls will be needed to minimize the impacts of storm water runoff on surface waters.

This principle emphasizes the importance of planning to identify potential water quality problems early in the design process. This process involves a detailed analysis of environmental features most associated with storm water pollution including topography, drainage patterns, soils, climate, existing land use, estimated traffic volume, and sensitive land areas. Highway locations selected, planned, and designed with considerations of these features will greatly minimize erosion and sedimentation and prevent storm water pollutants from entering waterways during and after construction. An important consideration in planning is the distance between a highway and watercourse that is needed to buffer the runoff flow and prevent potential contaminants from entering surface waters. Other design elements such as project alignment, gradient, cross section, and the number of stream crossings also must be taken into account to achieve successful control or erosion and nonpoint sources of pollution.

Designing for bridges requires that runoff impacts on surface waters from bridge decks be assessed and that appropriate management and treatment be employed to protect critical habitats, wetlands, fisheries, shellfish beds, and domestic water supplies. The siting of bridges should be a coordinated effort between TxDOT, the FHWA, and where applicable, the US Coast Guard and the US Army Corps of Engineers, as necessary.

Additionally, since bridge pavements are extensions of the connecting highway, runoff waters from the bridge decks can deliver loadings of heavy metals, hydrocarbons, toxic substances, and deicing chemicals to surface water as a result of discharge through scupper drains with no overland buffering. Bridge maintenance can also contribute heavy loads of lead, rust particles, paint, abrasives, solvents, and cleaners into surface waters. Protection against possible pollutant overloads can be afforded by minimizing the use of scuppers on bridges traversing very sensitive waters and conveying deck drainage to land for treatment. Whenever practical, bridge structures should be located to avoid crossing over sensitive areas to prevent washing of polluted runoff through scuppers into the waters below. Also, bridge design should account for potential scour and erosion, which may affect aquatic habitat and channel alignment.

In construction projects:

- Prevent erosion to the maximum extent practicable by the implementation of soil stabilization practices

- Control sedimentation by minimizing runoff velocities and retaining sediment onsite to the maximum extent practicable

- Prepare a storm water pollution prevention plan (SW3P) prior to construction; during construction, subject the SW3P to continuous reevaluation and revision based on the success or failure of the control measures

- Ensure the proper storage and disposal of toxic materials

Erosion and sedimentation from construction of roads, highways, and bridges, and from unstabilized cut and fill areas, can significantly impact surface waters and wetlands with silt and other pollutants including heavy metals, hydrocarbons, and toxic substances. Erosion and sediment control plans are effective in describing procedures for mitigating erosion problems at construction sites before any land disturbing activity begins.

Bridge construction projects include grade separations (bridges over roads) and waterbody crossings. Erosion problems at grade separations can result from water running off the bridge deck and runoff flowing onto the bridge deck during construction. Controlling this runoff can prevent erosion of slope fills and the undermining failure of the concrete slab at the bridge approach. Bridge construction over waterbodies requires careful planning to limit the disturbance of streambanks. Soil materials excavated for footings in or near the water should be removed and relocated to prevent the material from being washed back into the waterbody. Protective berms, diversion ditches, and silt

fences parallel to the waterway can be effective in preventing sediment from reaching the waterway.

Wetland areas will need special consideration if affected by highway construction, particularly in areas where construction involves adding fill, dredging or installing pilings. Highway development is most disruptive in wetlands since it may cause increased sediment loss, alteration of surface drainage patterns, changes in the subsurface water table, and loss of wetland habitat. To safeguard these fragile areas, the best practice is to locate roads and highways with sufficient setback distances between the highway right of way and any wetland or riparian areas. Bridge construction also can impact water circulation and quality in wetland areas, making special techniques necessary to accommodate construction.

To ensure the proper storage and disposal of toxic materials, the objective is to guard against toxic spills and hazardous loadings at construction sites from equipment and fuel storage sites. Toxic substances tend to bind fine soil particles; however, by controlling sediment mobilization, it is possible to limit the loadings of these pollutants. Also, some substances such as fuels and solvents are hazardous and excess applications or spills during construction can pose significant environmental impacts. Proper management and control of toxic substances and hazardous materials should be the adopted procedure for all construction projects and should be established by erosion and sediment control plans.

For maintenance:

- Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutants entering receiving waters

Substantial amounts of eroded material and other pollutants can be generated by operation and maintenance procedures for highways, bridges, and from sparsely vegetated areas, cracked pavements, potholes, and poorly operating urban runoff control structures. This principle is intended to ensure that pollutant loadings from roads, highways, and bridges are minimized by the development and implementation of a program and associated practices to ensure that sediment and toxic substance loadings from operation and maintenance activities do not impair receiving waters. The program to be developed, using the practices described in this management measure should consist of and identify standard operating procedures for nutrient and pesticide management, road salt use minimization, maintenance guidelines (e.g., capture and contain paint chips and other particulates from bridge maintenance operations, resurfacing, and pothole repairs), and vegetation management.

2.0 Storm Water Pollution Prevention Plans (SW3Ps)

The purpose of a Storm Water Pollution Prevention Plan (SW3P) prepared for a construction project is to:

- Provide for the design and planning of environmental protection control measures during highway construction projects

- Ensure minimal impact on the environment from highway projects by:
  - Preventing sediment-laden runoff from discharging from a construction site
  - Minimizing construction activity pollutants from entering waters of the US

Earlier practices of specifying that the contractor be responsible for erosion and sediment control are no longer satisfactory. Now, the designer must provide adequate information, control measures, and guidance within the plans and specifications to ensure a practical, economical, and effective plan for the control of erosion and sedimentation.

2.1 Contents of an SW3P

A storm water pollution prevention plan should be developed for any project where soil disturbing activities will occur. Any project which will disturb more than 5 acres of land will also be required to meet the requirements of the EPA NPDES General Permit (see Section 10.0). Any SW3P should describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water associated with the construction site.

At a minimum any SW3P developed for a construction activity should include the following information:

- A description of the nature of the construction activity and the intended sequence of major soil disturbing activities.

- A site map indicating:
  - Drainage patterns
  - Areas not to be disturbed
  - Locations of major controls measures
  - Locations of areas that will be stabilized
  - Surface waters (including wetlands)
  - Locations where storm water is discharged to a surface water

- Limits of construction and disturbed areas

- Erosion control BMPs

- Sediment control BMPs

- Other controls, such as for waste disposal, hazardous and sanitary wastes and offsite vehicle tracking of sediments

- A description of the procedures to ensure the timely maintenance and inspection of erosion and sediment control measures and other protective measures identified in the SW3P

2.2 Development of a SW3P

The major considerations in the development of an effective and economical SW3P are:

- Project sequencing and phasing

- Grade management

- Drainage features

- Limiting disturbed areas

- Stabilization practices

- Storm water management

- Basic principles of the erosion and sedimentation process

2.3 Project Sequencing and Phasing

Proper sequencing and phasing of a project are important considerations in controlling the erosion and sedimentation problems associated with a construction project. The following is a list of some items to consider when planning the sequence and phasing of highway construction operations:

- Sustain a manageable area of construction activities. For example, limit the area of erodible soil exposed at any given time.

- Complete and employ permanent structures, controls, and stabilized areas as soon as practical for use as erosion and sediment control measures for the remaining construction operations. For example, grade and revegetate ditch early on in the project so they can assist in reducing the effects of later construction operations.

- Maintain the maximum amount of existing vegetation to assist in the control of and to minimize the exposed erodible area. For example, do not clear or grub an area until work is necessary.

- Limit the types of construction operations, including access and hauling, allowed in certain areas of the project that may be more susceptible to erosion. For example, do

not allow unlimited vehicle crossing of streams: provide a temporary crossing at a single location and only when access is necessary.

- Plan and designate areas that are not to be disturbed at all, or at which phase in the project the area is to be disturbed. This can include limiting the type of access or operation in a given area. For example, consider only hand clearing operations in areas susceptible erosion and fencing off areas that are not to be disturbed.

2.4 Grade Management Considerations

Proper planning and management of highway construction grading operations can significantly lower the erosion problems associated with these activities. No operation in highway construction increases the potential for erosion as much as excavation and embankment activities. The erosion potential of an area is increased as erodible areas are exposed and slopes are steepened and lengthened. The following is a list of items to consider when managing grading operations:

- Excavation and embankments should be completed to final grade and stabilized in a continuous operation; piles of loose material should be minimized at all times

- Offsite flow should be prevented from crossing into excavated areas by intercepting and/or diverting flows into and through undisturbed or controlled areas (see Figure 2.1)

- Perimeter controls should be installed at the toe of the slope in embankment sections to prevent sediment-laden runoff from leaving the site (see Figure 2.2)

- Small berms or dikes should be placed at the end of each days grading operations in cut and fill sections to divert or intercept runoff to controlled areas

- Prompt grading and stabilization of ditches will greatly reduce the potential sediment load

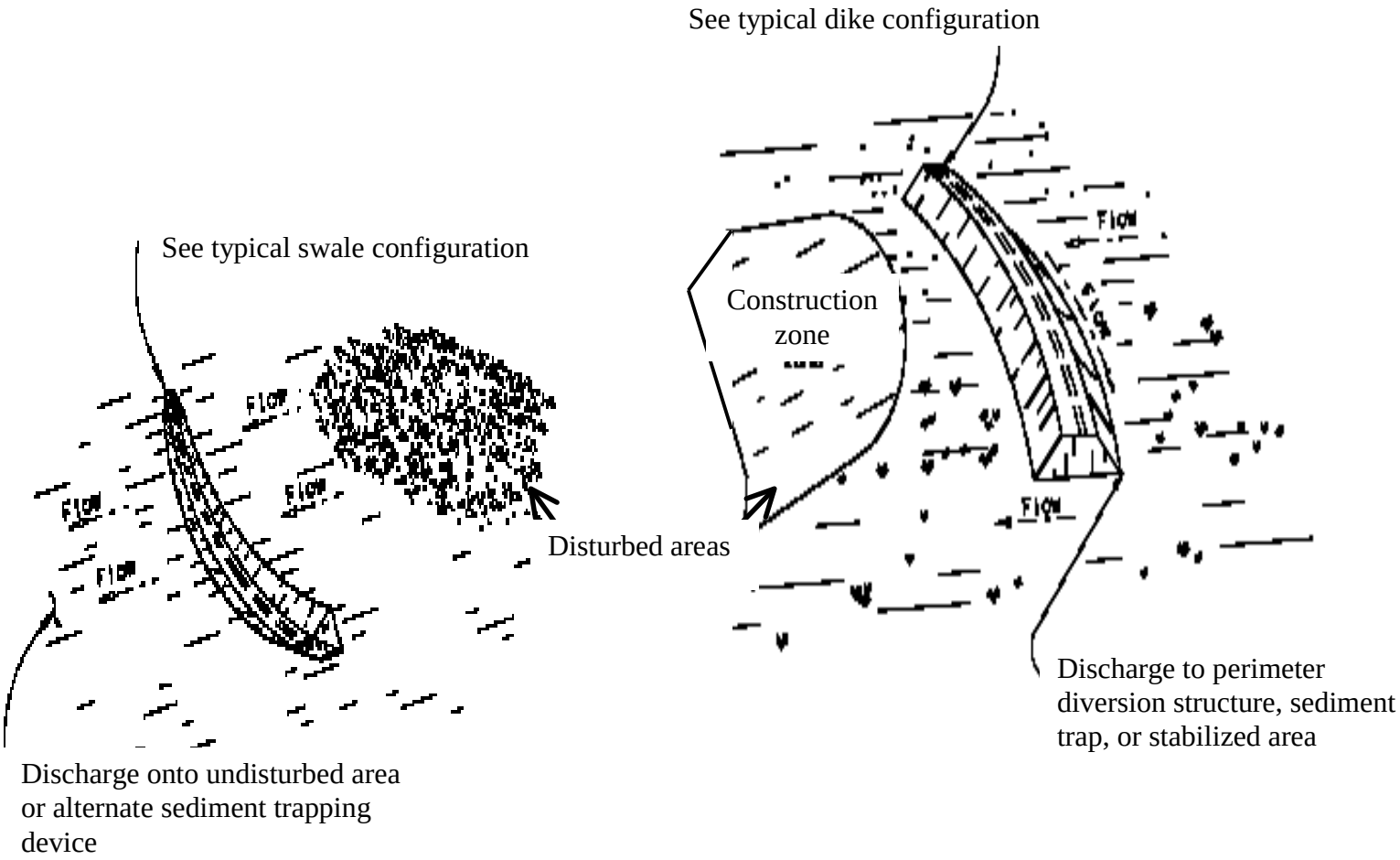


Figure 2.1 - Typical plan for limiting disturbed area by diverting/intercepting runoff to controlled outlets or stabilized areas.

2.5 Drainage Feature Considerations

Construction operations within existing drainageways and the construction of drainage structures (e.g. culverts, channels, and enclosed storm drain systems) increase the potential for erosion from a construction site. The major factors affecting erosion potential are the increasing velocities and concentrating of flows associated with construction of drainage structures and the exposure of erodible soil to frequent concentrated flow. The following list of items should be considered when constructing drainage features and operating within drainageways:

- Minimize the disturbance of and access to existing waterways. Provide planned and protected stream crossings during construction activities.

- When constructing cross drainage structures in existing waterways, provide a controlled diversion through the disturbed area as opposed to allowing uncontrolled flow through the construction area. This could be done by temporarily diverting the

existing stream through a channel made from sandbag berms or even just protected with plastic sheathing. Divert the stream until the permanent structure is completed or partially completed (e.g. completing one barrel or a multi-barrel culvert installation and allowing the flow to cross through the partially completed portion.)

- Appropriate coordination should be conducted in accordance with Section 404 of the Clean Water Act regarding the placement of fill material in the Waters of the U.S. (including wetlands).

- Maximize the storage volume afforded in ditches, etc. for use as temporary sediment traps or ponds to contain sediment-laden runoff on the site.

- Prevent sediment-laden runoff from entering the drainage system by installing controls at each storm drain inlet and culvert entrance.

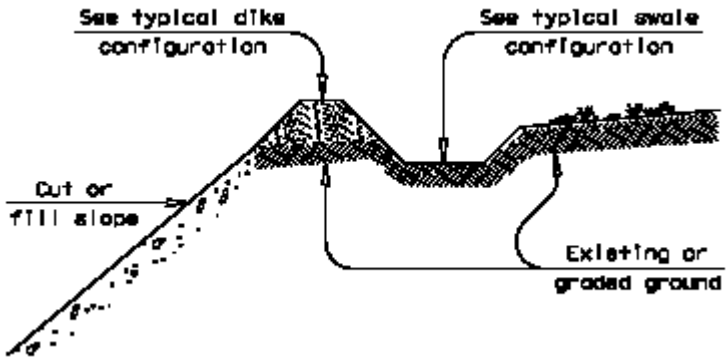


Figure 2.2 - Typical cut section depicting dike and/or swale intercepting runoff at the top of slope.

2.6 Limiting Disturbed Areas

The benefits in limiting disturbed areas during construction are fourfold:

- Maintaining existing vegetation preserves natural habitats that reduce the potential impact of the existing highway

- Areas left undisturbed may not warrant any pollution prevention practices since their erosion potential may not increase

- Existing vegetation can be utilized as an erosion control device acting as a vegetative buffer filtering and settling out sediment

- Smaller disturbed areas are more manageable when trying to control runoff and erosion (see Figure 2.3)

Figure 2.3 - Example of limiting disturbed area. Note the extent of vegetation left in place.

2.7 Erosion Control

Stabilizing areas disturbed during construction in an expeditious manner is one of the best erosion control measures available (discussed in detail in Section 4.0). Establishing a ground cover protects the soil surface from the erosive force of raindrops, promotes infiltration, and provides a barrier to protect against sediment removal due to sheet runoff. The items to consider when determining stabilization practices are:

- Give priority to completing and stabilizing slopes and ditches to reduce erosion potential

- Stabilize areas where grading is complete or work has ceased (or is expected to cease) for 21 days within 14 days of stoppage. In regions receiving less than 20 inches of rain annually, stabilization is to be initiated as soon as possible, but not necessarily within 14 days

- Stabilization can be enhanced by mulching, soil retention blankets, soil tackifiers, geotextile fabrics, grass sodding, and/or any combination of these measures (see Figure 2.4)

- Effects to stabilize disturbed areas should be initiated as soon as possible sequencing permits. This promotes timely completion of the project since a project is not actually complete until the disturbed areas are stabilized. This will assist in obtaining 70% vegetative cover required by the EPA in order to terminate the NPDES permit. An additional benefit is that contractors can be released in a timely fashion, and State Force maintenance work at the end of the project will be minimized

Figure 2.4 - Example of temporary erosion control (matting) and temporary sediment control (silt fence) installed between phases of construction.

2.8 Sediment Control

Temporary sediment controls and post-construction total suspended solid (TSS) controls (discussed in detail in Section 5.0) are the last means of defense to prevent sediment problems associated with construction activities. Consideration should first be given to minimizing the erosion potential. Then, sediment controls should be planned and implemented according to the specific project needs. The devices used in the control of sedimentation are rather simple; it is the planning, design, installation, and maintenance that presents the biggest challenge. The planning, selection, and design of sediment controls is not an exact science but rather an acquired talent with which experience and good judgement lead to successful results.

The types and implementation of devices should not be limited to those discussed herein. Innovative designs and solutions are encouraged because no single device can solve all design situations. Bearing in mind the principles of erosion and sediment control, the purpose of different devices, and the intent of the SW3P, solutions to storm water management problems may be found that are not included in this or any other technical reference.

2.9 Storm Water Management

The SW3P should include a description of "storm water management" measures. For the General Permit, this refers to controls that will reduce the discharge of pollutants in storm water from sites after completion of construction activities. The permit addresses only the installation and maintenance of controls during construction activities.

The purpose of storm water management is to minimize any increase in storm water discharge volumes and peak velocities as well as reduce the amount of pollutants discharged after construction operations have been completed. The prevention of increased streambed scour and bank erosion and maintenance of physical and biological characteristics of receiving waters is an expected result of good management practices. Such practices can include:

- Flow attenuation features such as open vegetated swales, natural depressions, and detention/retention structures
- Outfall velocity dissipation devices
- Constructed wetlands
- Extended detention structures for water quality improvement

The SW3P should provide a description of the permanent storm water management practices utilized on the project.

2.10 Modifications to the SW3P

The SW3P is a working document and should not be considered a fixed plan within the contract documents. The most important aspect of the SW3P is that it functions properly, satisfies the intent of an SW3P, and conforms to applicable regulations. It is unlikely than an SW3P will remain unchanged during a construction project because:

- It is difficult to plan effective structural controls in the office
- It is difficult to foresee differing construction sequences and phases
- Plans and specifications cannot always account for different field conditions encountered

Therefore, it is imperative that the plan be continually evaluated and modified in the field if controls or practices are considered ineffective.

For projects under the EPA regulations, the SW3P need not be submitted with the NOI; however, the EPA may request submittal of the specific plan or plans. The EPA may

notify TxDOT that a plan does not meet one or more of the minimum requirements. If so, within seven days of notification, suitable modifications should be made to the plan and a written certification of the modification should be submitted to the EPA. Additionally, any procedures that have been undertaken but found ineffective or insufficient should be addressed by modifying the SW3P.

3.0 Design of Control Measures (BMPs)

Erosion Control Measures (BMPs): Adverse impacts from construction sites can be reduced if some forethought is given to controlling the resultant erosion. One method to accomplish this is to limit the extent of native vegetation that is disturbed. This will often significantly reduce the volume of material eroded from a site. Planning the necessary locations of the disturbance and restricting construction traffic to those locations is an example of this type of planning.

Another method of reducing erosion potential is to revegetate any disturbed areas as soon as possible. To make this effective, construction activity should be planned to progress as rapidly and completely as possible. This will reduce the length of time when there is a high potential for erosion. A related method would be to revegetate between phases of a project, when there will be a delay between these phases.

Sediment control Measures (BMPs): There are several methods, structural and nonstructural, available to reduce the negative effects of sediment. Most of the common structural methods used (e.g. silt fence, rock dams, etc.) take advantage of the reduced ability of water to carry sediment when its velocity is reduced (see Figure 3.1). The reduction in velocity can be produced by constructing berms, sediment basins, or similar structural controls. The velocity can also be reduced by establishing vigorous stands of vegetation on relatively flat slopes through which the sediment-laden water must flow.

Figure 3.1 - Silt fences in series, on a relatively flat slope, pool water and decrease its velocity.

3.1 Design Methodology

The design methods for developing control measures consist of evaluating the proposed changes in erosion and sediment yields and the cost and probable effectiveness of controls for each particular site. The design of each control is not required but may be considered when dealing with very sensitive projects, evaluating control alternatives, or rating the actual effectiveness of an SW3P. A goal of reducing the sediment from disturbed areas by 70 to 80% with the use of erosion and sediment controls is considered realistic and attainable. The following sections address the technical aspects of the erosion process and the effectiveness of various controls. The procedure for designing controls is not a mandatory process but may be useful for evaluating devices or documenting the effectiveness of an SW3P.

3.2 Factors Affecting the Erosion Process

The procedures for computing the amounts of erosion are not an exact science. The processes that govern soil erosion are complicated and interact in changing and undefined ways. The complicated nature of the processes yields methodologies with many simplified assumptions in order to create a manageable problem. The Universal Soil Loss Equation (USLE) was developed using this approach. It is unlikely that any equation, statistical or otherwise, could accurately predict the response of all soil types to all the natural or man-made forces affecting the erosion process. Therefore, the USLE may be utilized as a tool, considering the limitations, to estimate erosion.

The Universal Soil Loss Equation (USLE):

Equation 1

$$A = R \times K \times L \times S \times C \times P$$

where:

A = the computed soil loss per unit area usually measured in tons per acre
R = rainfall erosion factor
K = soil erodibility factor
L = slope length factor
S = slope-gradient factor
C = cropping/management factor
P = erosion control practice factor

In adapting the USLE for use on highway projects the terms C and P are eliminated because they relate to agricultural lands and replaced with an erosion control factor VM. The L and S factors can be combined to form LS, the length-slope factor, which depends on the length and steepness of the slope. Therefore, a modified equation (Modified Universal Soil Loss Equation or MUSLE) is presented in this manual to predict soil loss

due to erosion on highway construction sites and to determine the effectiveness of various erosion control devices.

Equation 2

$$A = R \times K \times LS \times VM$$

where:

A = rate of soil loss in tons per acre per year
R = rainfall erosion factor
K = soil erodibility factor
LS = length/slope factor
VM = erosion control factor (vegetative and mechanical measures)

Rainfall Erosion Factor (R): The average rainfall erosion factor (R) [often referred to as the mean annual ISO erodent (R) value] varies dependent on region and time of year. It is a measurement of the erosive force of a specified rainfall event.

Soil Erodibility Factor (K): The soil erodibility factor (K) is a numeric representation of the ability of the soil to resist the erosive forces of rain. Values of "K" range from 0.1 to 0.7 and may be found in most soil surveys. In the event the soil surveys do not contain values for K, use Appendix M which indicates more ranges of K based on location.

Topographic Factor (LS): The only portions of the soil loss equation which can be affected by construction activities are LS and VM; the R and K values are fixed by nature and cannot be altered by man. The LS factor is a numerical representation of the length-steepness combination used to estimate the erosion potential for a specific slope. Since the slope and length are determined during the design process, knowledge of the LS factor will assist in selection of erosion control devices. The equation for computing the LS is as follows:

Equation 3

$$LS = \left(\frac{l}{72.6}\right) \times \left(\frac{65.41 \times s^2}{s^2 + 10{,}000} + \frac{4.56 \times s}{\sqrt{s^2 + 10.000}} + 0.065\right)$$

where:

LS = length/slope factor
l = slope length (ft)
s = slope in (ft/ft)
m = exponent dependent on slope
= 0.2 for $s \leq 1\%$
= 0.3 for $1\% \leq s \leq 3.5\%$
= 0.4 for $3.5\% \leq s \leq 4.5\%$
= 0.5 for $s \geq 4.5\%$

The graph in Figure 3.2 was developed to solve Equation 3 and is used as follows:

1. Locate the slope length on the bottom.
2. Follow vertically to the correct slope gradient curve.
3. The corresponding LS value can be read from the left side.

The amount of erosion is very sensitive to the length and slope factors (e.g. cutting the slope length in half will cut the erosion by approximately one-third).

Erosion Control Factor (VM): The erosion control factor is applied to account for the effects of erosion control measures and devices used on a construction site. The lower the VM factor the more effective the device or control measure is in controlling erosion. Table 3.1 includes typical values based on the control device or measure utilized:

Table 3.1 - Erosion Control Factors (VM) for Various Erosion Control BMPs

Vegetative Management Practice	VM Value
Bare Soil – freshly disked to 6-8 inches	1.00
Bare Soil – after one rain	0.89
Compacted Fill	1.24-1.71
Undisturbed Soil – except for scraped	0.66-1.30
Soil Retention Blankets	0.015
Mulching (depends on application rate)	0.01-0.05
Hydromulch	0.05-0.10
Asphalt Emulsion (depends on application rate)	0.01-0.57
Silt Fence	0.25
Hay Bale	0.33
Triangular Sediment Dike	0.25
Inlet Protection	0.25-0.33*
Sediment Trap – Stone Outlet	0.15-0.30*
Sediment Basin	0.10*
Sandbag Berm	0.30*
Rock Berm	0.30*

*The VM values for structural controls listed must be adjusted for the type of cover that lies within the watershed for which they are treating runoff. Table 3.2 indicates the correction factors to use depending on the percent grass and canopy cover.

Equation 4

$$VM = VM_{Practice} \times Cover\ Factor$$

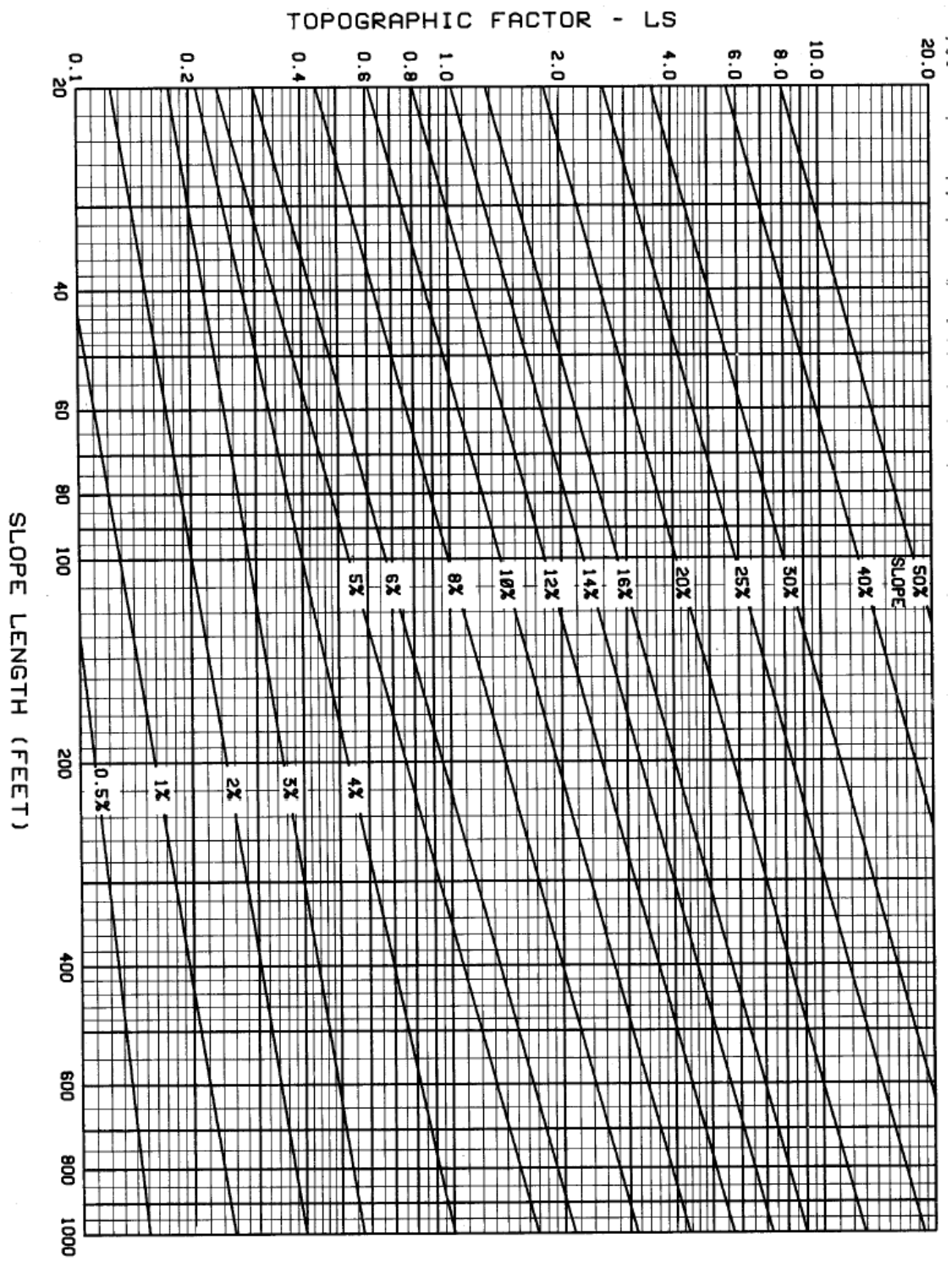


Figure 3.2 – Graphical Solution for the Slope Length Factor (LS). From Wischmeier and Smith (1978)

The cover factor considers the protection of natural ground cover in preventing soil erosion. The factor is dependent on the type of vegetation (grasses or trees) and the density of the vegetation. The canopy cover is the percent of ground cover from the trees, brush or tall weeds. For construction sites stripped of natural vegetation, a cover factor of 1.0 should be used. Note: The table will produce a cover factor of 0.45 for an area with 0% canopy and 0% cover of grass. This value represents undisturbed bare soil. On construction sites the bare soils are typically disturbed and/or compacted or otherwise altered. A value of 1.0 is recommended in the areas of disturbed bare soil.

Table 3.2 - Watershed Cover Factors

Canopy Cover, %	Undisturbed Soil Percent Ground Cover of Grass				
	0	20	40	60	>80
0	0.45	0.20	0.10	0.04	0.02
25	0.36	0.17	0.08	0.04	0.02
50	0.26	0.13	0.07	0.03	0.02
75	0.17	0.10	0.06	0.03	0.02

4.0 Erosion Control BMPs

Storm Water Pollution Prevention Plans must include descriptions of both temporary and permanent stabilization/erosion control practices. Temporary erosion controls should be considered the first line of defense for prevention of water pollution during construction activities. It is much simpler to maintain the soil cover than to trap the sediment once it has been mobilized. In addition, effective erosion prevention can result in cost savings, since repair of erosion damage can be minimized. The primary goal of erosion control is to divert runoff away from unstable areas or to provide a stable surface that will resist the effects of rain and runoff.

Figure 4.1 – Note extent of vegetation left in place.

Preserving existing vegetation or revegetating disturbed soil as soon as possible during construction is one of the most important and cost effective erosion control measures. A vegetative cover reduces the erosion potential by shielding the soil surface from the direct impact of rainfall, improves the soil water storage capacity, slows the runoff allowing sediment to settle out of suspension, and tends to hold the soil in place. Vegetative covers may consist of grass, trees, mulch, straw, or retention blankets. The following measures always should be considered for site stabilization:

- Existing vegetation should be preserved as much as practicable. Areas not to be disturbed should be indicated on plans.

- Disturbed areas should be minimized to the extent practicable by staging construction operations.

- As required by the Construction General Permit, disturbed areas on which construction activity has ceased (temporarily or permanently) and that will be

exposed for more than 21 days shall be stabilized within 14 days. Areas receiving less than 20 inches of annual rainfall should be stabilized as soon as practicable.

The most common Best Management Practices (BMPs) for erosion control are:

- Temporary vegetation
- Mulch
- Blankets and matting
- Permanent seeding and sodding
- Interceptor and perimeter swales
- Diversion, interceptor, and perimeter dikes
- Stone outlet structures
- Pipe slope drain

Refer to "A Practical Guide to the Establishment of Vegetative Cover on Highway Rights-of-way" (July 1993) prepared by the Division of Maintenance and Operations – Landscape Section for additional information on stabilization practices.

Table 4.1 - Erosion Control BMPs: Advantages and Disadvantages

Measure	Characteristics	Advantages	Disadvantages
Temporary Seeding	Establish temporary vegetative cover	• Inexpensive and easy to perform • Reduces the number of other controls required and maintenance costs	• Depends heavily on location, season and rainfall • Requires protection from construction activities once seeded
Mulching	Used to increase infiltration, decrease runoff and protect soil surface from raindrops. Application rate very important. Can be used in conjunction	• Provides immediate and effective protection to soils • Retains moisture which can reduce need for watering • Inexpensive and easy to perform • Requires no removal because of natural deterioration	• May delay germination of some seeds because of the cover • More costly than seeding

	with soil tackifiers or binders.		
Blankets	Retains soil until vegetation becomes established	• Provides quick and effective protection until vegetation is established • Design methods available for channel liners • Good protection to final graded slopes > 3:1	• If not properly selected, designed and installed, effectiveness is reduced • Can be costly on some applications – e.g. temporary installations
Vegetative Buffers	Strip of dense vegetation used to prevent erosion and promote sedimentation of eroded material	• Can be inexpensive, especially if created from existing vegetation • Water quality, aesthetic, and habitat benefits	• Not feasible if land is not available • Requires plant growth before it is effective
Preserving Natural Vegetation	Provides natural buffer zones and limits disturbed area	• Can handle higher quantities of runoff than seeded areas • Increases filtering capacity due to denser root structure • Water quality, aesthetic, and habitat benefits • Natural areas do not warrant pollution control devices thereby reducing the cost of control measures	• Requires substantial planning to protect areas

4.1 Temporary Vegetation

Description: Vegetation can be used as a temporary or permanent stabilization technique for areas disturbed by construction. Vegetation effectively reduces erosion in swales, stockpiles, berms, mild to medium slopes, and along roadways. Other techniques such as matting, mulches, and grading may be required to assist in the establishment of vegetation.

Materials:

- The type of temporary vegetation used on a site is a function of the season and the availability of water for irrigation.

- Temporary vegetation should be selected appropriately for the area.

- County agricultural extension agents are a good source for suggestions for temporary vegetation.
- All seed should be high quality, U.S. Dept. of Agriculture certified seed.

Installation:

- Grading must be completed prior to seeding.
- Slopes should be minimized.
- Erosion control structures should be installed.
- Seedbeds should be well pulverized, loose, and uniform.
- Fertilizers should be applied at appropriate rates.
- Seeding rates should be applied as recommended by the county agricultural extension agent.
- The seed should be applied uniformly.
- Steep slopes should covered with appropriate soil stabilization matting.

Figure 4.2 – Rye grass used to temporarily stabilize a slope.

Considerations: Planting should take place when conditions are most favorable for growth (as long as the planting does not interfere with the schedule of other activities

and/or regulatory requirements). Before seeding, install other erosion control devices such as dikes, basins, and surface runoff control measures (e.g. gradient terraces, interceptor dikes/swales, and level spreaders). Temporary seeding may not be an effective practice in arid and semi-arid regions where the climate prevents fast plant establishment. In those areas, mulching may be a more appropriate temporary erosion control measure.

Proper seedbed preparation and the use of high quality seed are needed to grow plants for effective erosion control. Soil that has been compacted by heavy traffic or machinery may need to be loosened. All temporary seeding should be in accordance with applicable portions of the Standard Specifications.

In cold weather regions, if seeds are planted in the fall or winter, the areas should be covered with mulch to provide protection from the weather. On slopes of 3:1 or more, or where adverse soil conditions such as in the presence of excessively hot or dry weather, seeding should be followed by spreading mulch (see section 4.2). Frequent inspections are necessary to ensure that conditions for growth are good. If the plants do not grow quickly or thick enough to prevent erosion, the area should be reseeded as soon as possible. Seeded areas should be kept adequately moist. If normal rainfall will not be sufficient, mulching, matting and controlled watering should be performed. Care should be taken to avoid over-irrigation of seeded areas.

Seeds appropriate for the season and location should be selected. The following tables describe the cool and warm season grass mixtures recommended for differing areas of the state.

Table 4.2 - Cool Season Grass Mixtures for Temporary Erosion Control (in pounds of live seed per acre)

Districts	Dates	Common Name	Rate
1, 2, 3, 4, 5, 8, 18, 23, 25	August 15-November 30	Tall Fescue Western Wheatgrass Wheat (Red, Winter)	4.0 5.0 30.0
6, 7, 24	August 15-November 30	Western Wheatgrass Wheat (Red, Winter)	7.5 45.0
9, 10, 11, 14, 15, 17, 19	September 1-November 30	Tall Fescue Oats* Wheat (Red, Winter)	4.0 21.0 30.0
12, 13, 16, 20, 21	September 1-November 30	Oats*	64.0

* Note: Barley may be substituted for oats. Sow at 72 pounds of live seed per acre divided by the number of species in the mix.

Table 4.3 - Warm Season Grass Mixture for Temporary Erosion Control (in pounds of live seed per acre)

Districts	Dates	Common Name	Rate
2, 3, 7, 15, 16, 18, 21, 24	May 1– August 31	Foxtail Millet	30.0
1, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 17, 19, 20, 23, 25	May 15- August 31	Foxtail Millet	30.0

The plans and specifications should reflect temporary seeding locations, quantities, and pay items. Consideration also should be given to placement of the permanent vegetation in areas that received temporary seeding.

4.2 Mulch

Description: Mulching is the process of applying a material to the exposed soil surface to protect it from erosive forces and to conserve soil moisture until plants can become established. When seeding critical sites, sites with adverse soil conditions or seeding on other than optimum seeding dates, mulch material should be applied immediately after seeding. Seeding during optimum seeding dates and with favorable soils and site conditions will not need to be mulched.

Materials:

- Mulch may be small grain straw that should be applied uniformly.
- On slopes 15 percent or greater, a binding chemical must be applied to the surface.
- Wood-fiber or paper-fiber mulch may be applied by hydroseeding.
- Mulch nettings may be used.
- Wood chips may be used where appropriate.

Installation: Mulch anchoring should be accomplished immediately after mulch placement. This may be done by one of the following methods: peg and twine, mulch netting, mulch anchoring tool, or liquid mulch binders.

Considerations: Mulches are applied to the ground surface to conserve soil properties and promote vegetative growth. A surface mulch is one of the most effective means of controlling erosion on disturbed areas. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place.

Mulching operations shall conform to the applicable portions of Standard Specification No. 164, “Seeding for Erosion Control.” See Table 4.4 for details regarding mulch types.

Final grading is necessary before mulching. The area should be inspected often to identify loosened or missing mulch cover. Such areas should be reseeded (if necessary) and the mulch cover replaced immediately. Binders may consist of organic soil tackifiers, cutback asphalt, emulsified asphalt, or synthetic liquid binders. The use of asphalt as a tackifying agent is not prohibited by law; however, if runoff from these areas exhibit excess levels of pollutants such as hydrocarbons, oils, etc., the stream standards may be violated.

Table 4.4 - Mulch Types

Mulches	Rates	Notes
Straw	1.5 – 2.0 tons/acre	Free from weeds and coarse matter. Anchored with tracking, netting or liquid tackifiers.
Hay	1.5 – 2.0 tons/acre	
Cellulose Fiber	1.0 – 1.5 tons/acres	Apply as slurry – effective in quick vegetative cover
Chemical Binders	Manufacturer Specifications	Asphalt, emulsions, synthetic binders (e.g. vinyl and acrylic)
Organic Tackifiers	Manufacturer Specifications	

4.3 Blankets and Matting

Description: Blankets and matting material can be used as an aid to control erosion on critical sites during the establishment period of protective vegetation. The most common uses are in channels, interceptor swales, diversion dikes, short, steep slopes, and on tidal or stream banks.

Materials: New types of blankets and matting materials are continuously being developed. TxDOT has defined the critical performance factors for these types of products and has established minimum performance standards which must be met for any product seeking to be approved for use within any of TxDOT's construction or maintenance activities. The products that have been approved by TxDOT are also appropriate for general construction site stabilization. TxDOT maintains a web site at:

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/erosion/contents.httm

The site is updated as new products are evaluated.

Installation:

- Install in accordance with the manufacturer's recommendations.

- Ensure proper anchoring of the material (see Figures 4.3 and 4.4).
- Prepare a friable seedbed relatively free from clods, rocks, and any foreign material.
- Fertilize and seed in accordance with seeding guidelines or other type of planting plan.
- Erosion stops should extend beyond the channel liner to full design cross-section of the channel.
- A uniform trench perpendicular to line of flow may be dug with a spade or a mechanical trencher.
- Erosion stops should be deep enough to penetrate solid material or below level of ruling in sandy soils.
- Erosion stop mats should be wide enough to allow turnover at bottom of trench for stapling, while maintaining the top edge flush with channel surface.

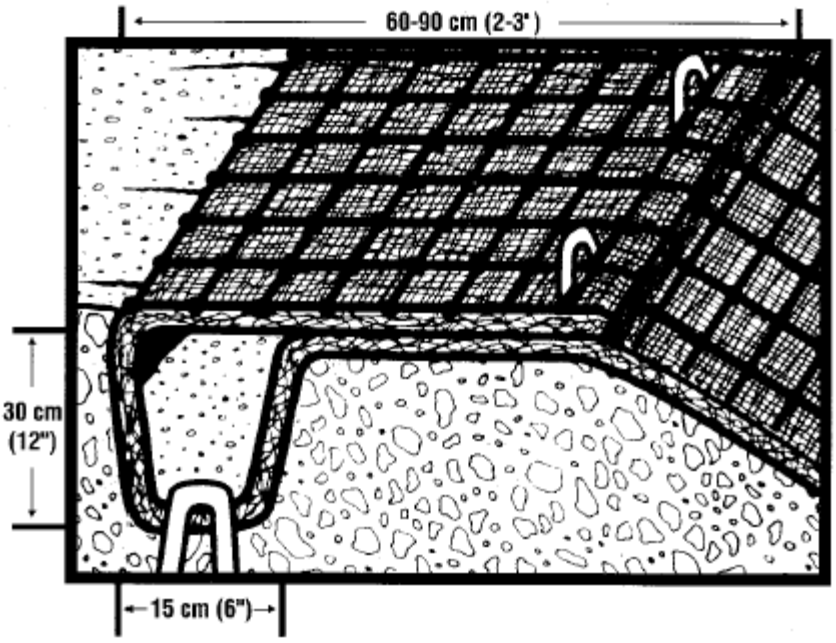


Figure 4.3 - Initial Anchor Trench for Blankets/Matting

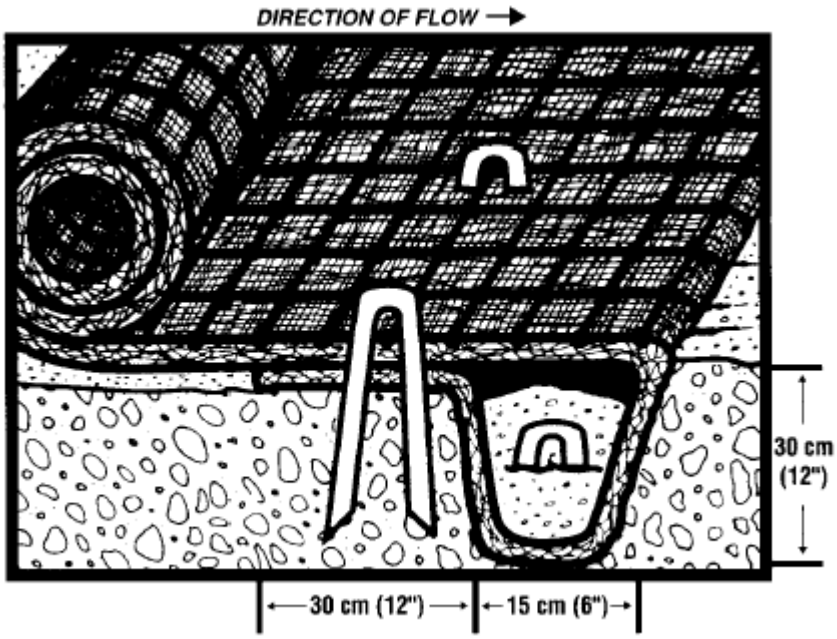


Figure 4.4 - Terminal Anchor Trench for Blankets/Matting

Considerations: The selection and use of soil retention blankets should be appropriate for the amount of runoff, steepness of the slope, and type of substrate (see Figure 4.5). The two main applications for soil retention blankets are for slope protection and as flexible channel liner protection. For slope protection applications, the blankets are useful in preventing the loss of topsoil, thereby reducing surface erosion and promoting the establishment of grass cover.

Figure 4.5 – Soil retention blankets used, in conjunction with silt fence, to stabilize a slope.

The use of blankets should be in accordance with applicable Standard Specifications.

Based on testing at the Texas Transportation Institute (TTI), the following criteria have been established for the use of soil retention blankets for slope protection:

Table 4.5 – Soil Retention Blanket Types (Slope Protection)

Type	Slope Class	Soil Type
Type A	3:1 or flatter	Clay
Type B	3:1 or flatter	Sandy
Type C	Steeper than 3:1	Clay
Type D	Steeper than 3:1	Sandy

Soil retention blankets may be used to stabilize drainage ditches as a flexible channel when more severe measures such as concrete rip rap or rock revet mattresses are not appropriate. The purpose of the blankets in this application is to protect the integrity of the ditches while the vegetative cover is established.

The selection of erosion control blankets for flexible channel liners depends greatly on the hydraulic characteristics of the area. The average shear stress resulting from flow in the channel or ditch must be estimated to ensure the proper selection:

$$t_d = \mu \ x \ d \ x \ S$$

where:

t_d = shear stress in lbs/sq. ft
μ = weight of water (62.4 lb/ cu. ft)
d = depth of water (feet)
S = average slope of the channel bottom (ft/ft)

Based on this value, Table 4.6 indicates the type of soil retention blankets to specify:

Table 4.6 – Soil Retention Blanket Types (Channel Liner)

Type	Shear Stress
Type E	< 1.0
Type F	1.0 – 2.0
Type G	2.0 – 5.0
Type H	> 5.0

4.4 Permanent Seeding and Sodding

Description: Sod is appropriate for disturbed areas that require immediate vegetative covers, or where sodding is preferred to other means of grass establishment. Locations particularly suited to stabilization with sod are waterways carrying intermittent flow areas around drop inlets or in grassed swales, and residential or commercial lawns where rapid establishment and aesthetics are factors. Sod is composed of living plants and those plants must receive adequate care in order to provide vegetative stabilization on a disturbed area.

Materials:

- Sod should be machine cut at a uniform soil thickness.
- Pieces of sod should be cut to the supplier's standard width and length.
- Torn or uneven pads are not acceptable.
- Sections of sod should be strong enough to support their own weight and retain their size and shape when suspended from a firm grasp.
- Sod should be harvested, delivered, and installed within a period of 36 hours.

Installation:

- Areas to be sodded should be brought to final grade.
- The surface should be cleared of all trash and debris.
- Fertilize according to soil tests.
- Fertilizer should be worked into the soil.
- Sod should not be cut or laid in excessively wet or dry weather.
- Sod should not be laid on soil surfaces that are frozen.
- During periods of high temperature, the soil should be lightly irrigated.
- The first row of sod should be laid in a straight line with subsequent rows placed parallel to and butting tightly against each other.
- Lateral joints should be staggered to promote more uniform growth and strength.
- Wherever erosion may be a problem, sod should be laid with staggered joints and secured.

- Sod should be installed with the length perpendicular to the slope (on the contour).
- Sod should be rolled or tamped.
- Sod should be irrigated to a sufficient depth.
- Watering should be performed as often as necessary to maintain soil moisture.
- The first mowing should not be attempted until the sod is firmly rooted.
- Not more than one third of the grass leaf should be removed at any one cutting.

Considerations: Vegetation cannot be expected to prevent soil erosion on a soil that is not stable due to its texture, structure, runoff patterns, or excessively steep slopes. Permanent seeding can be accomplished by broadcast seeding, mulch seeding, cellulose fiber mulch seeding, or as part of the installation of soil retention blankets.

A problem with permanent seeding is the control of erosion during the establishment period and the seasonal fluctuation and maintenance requirements. The quicker the final grade can be treated with the permanent vegetation, the sooner the final stabilization can be achieved. The use of mulches and blankets assists the establishment time by trapping soil particles, retaining soil moisture, and protecting seeds from the erosive forces of raindrops.

The establishment of permanent vegetation requires careful consideration of seasonal and geographic conditions and the irrigation, fertilizer, and maintenance requirements of the selected materials.

4.6 Interceptor and Perimeter Swales

Description: Interceptor and perimeter swales are excavated drainageways located across disturbed areas or right-of-ways or along the perimeter of a construction site. Their purpose is to protect exposed slopes by intercepting runoff. Perimeter swales prevent offsite runoff from entering the disturbed areas or prevent sediment-laden runoff from leaving the construction site or disturbed area (see Figures 4.6 and 4.7). The outflow of sediment-laden runoff from a swale must be directed to a stabilized outlet or sediment trapping device.

Considerations:

- The drainage area should be less than 5 acres.
- The bottom width should be 4 feet minimum and the bottom should be level.
- The depth should be a minimum of 1 foot.

- Side slopes should be 2:1 or flatter. Swales within the safety zone should have side slopes of 6:1 or flatter.

- The grade should be sufficient to have positive drainage to an adequate outlet.

- Channel stabilization should be provided when erosive velocities are expected.

- All points where vehicles will cross swales must be stabilized. If a stone lining is used, it should be at least 6 inches in thickness for the full width of the traffic crossing.

- Spacing table:

Table 4.7 - Swale Spacing

Slope of right-of-way of disturbed area	> 10%	5% - 10%	< 5%
Minimum Distance	100 feet	200 feet	300 feet

- Runoff diverted from a protected or stabilized upland area should outfall directly onto an undisturbed or stabilized area.

- Runoff diverted from a disturbed or exposed upland area should be conveyed to a sediment trapping device such as a rock berm, stone outlet structure, sediment trap or sediment basin or to an area protected by any of these practices.

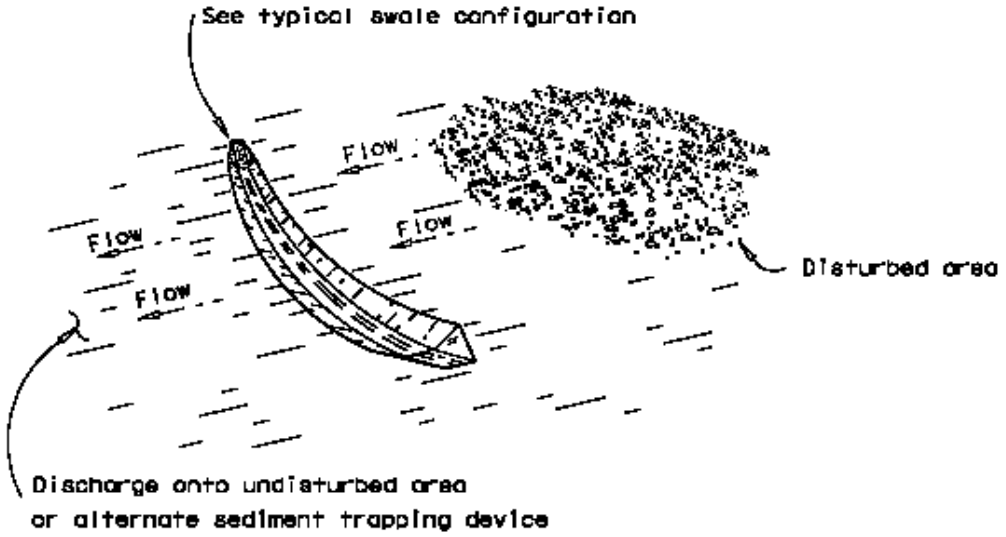


Figure 4.6 - Interceptor Swale
(see Appendix G for TxDOT Standard EC (5)-93)

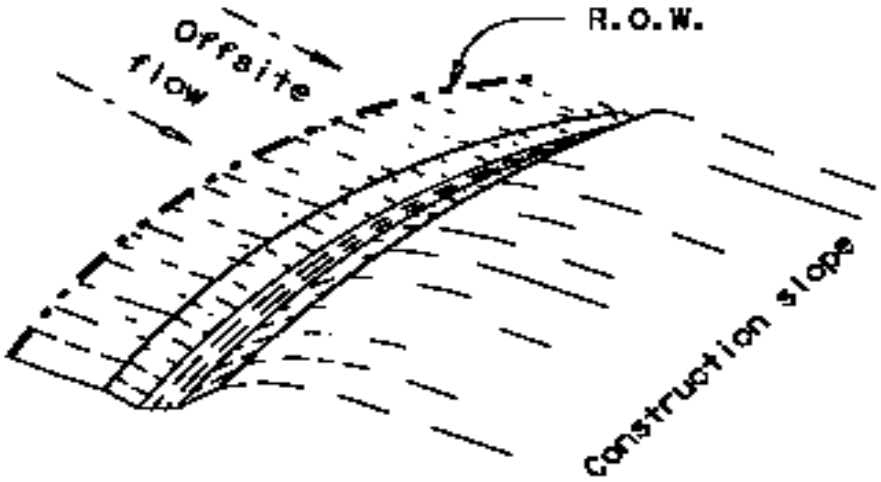


Figure 4.7 - Perimeter Swale
(see Appendix G for TxDOT Standard EC (5)-93)

4.6 Diversion, Interceptor, and Perimeter Dikes

Description: A temporary diversion dike is a temporary ridge of compacted soil located either (1) immediately above cut or fill slopes, (2) across disturbed areas or rights-of-way, or (3) along the perimeter of the site or disturbed areas. A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to stabilized areas to prevent flow through disturbed areas. An interceptor dike protects exposed slopes by intercepting runoff and diverting it to a stabilized outlet away from the exposed area. A perimeter dike prevents offsite runoff from entering the disturbed area and prevents sediment-laden runoff from leaving the construction site or disturbed area. A diversion or interceptor dike can be utilized to divert sediment-laden runoff to a stabilized outlet and minimize the need for other costly perimeter devices (e.g. silt fences).

Generally, dikes are used during the construction period to intercept and re-route runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized (see Figures 4.7, 4.8 and 4.9). These devices can often result merely from the excavation and embankment construction activities. Therefore, consideration to the earthwork requirements of a project may indicate the location for these devices.

Design Guidelines:

- The drainage area should be less than 5 acres.

- The top width should be a minimum of 2 feet.

- The height (compacted fill) should be 18 inches minimum measured from the top of the existing ground at the top of the dike.

- Side slopes should be 2:1 or flatter. Dikes within the safety zone should have side slopes of 6:1 or flatter.

- Channel stabilization should be provided when erosive velocities are expected. The dikes themselves should be stabilized.

- Drainage diversions should not be directed to adjacent property.

- Runoff diverted from a protected or stabilized area should outfall directly to an undisturbed or stabilized area.

- Runoff diverted from a disturbed or exposed upland area should be conveyed to a sediment trapping device such as a rock berm, stone outlet structure, sediment trap, sediment basin, or to an area protected by any of these practices.

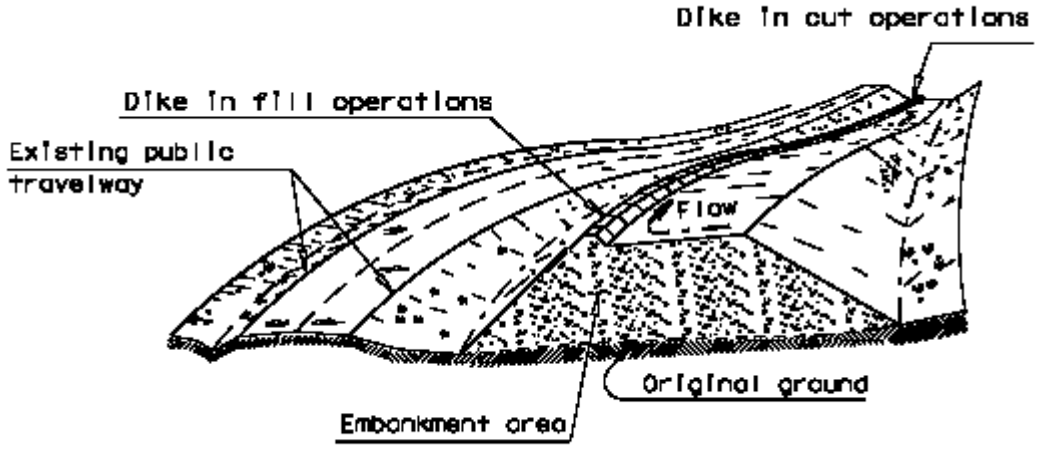


Figure 4.7-Diversion Dike
(see Appendix G for TxDOT Standard EC (4)-93)

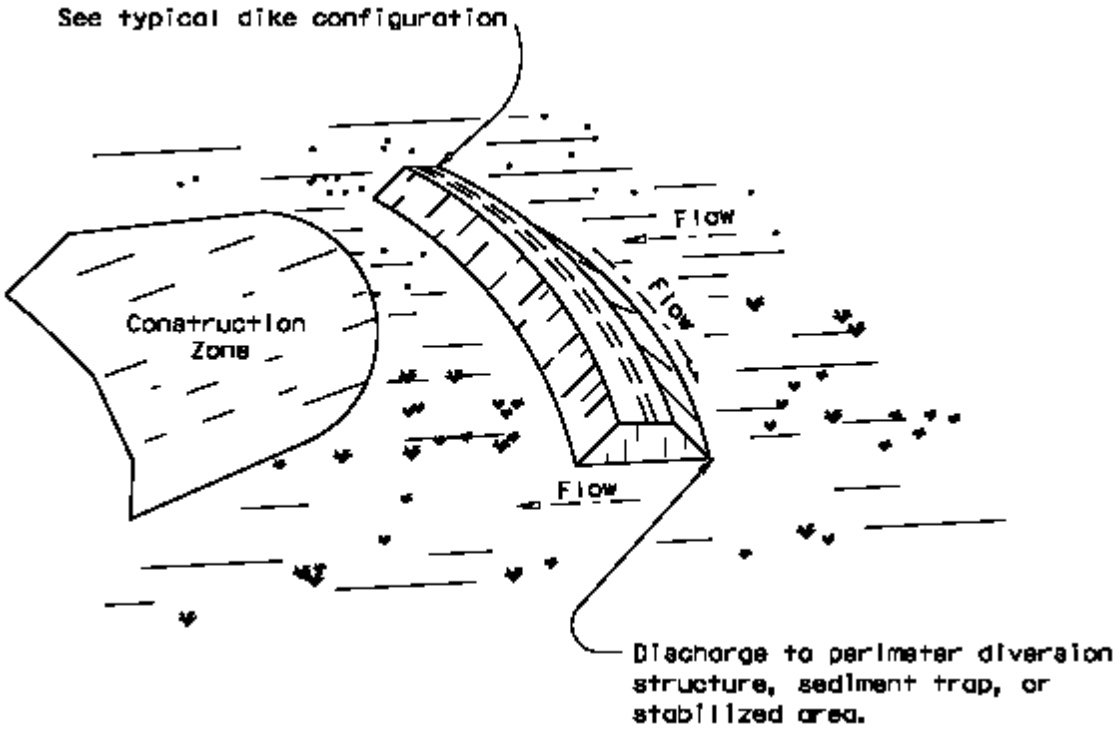


Figure 4.8 - Interceptor Dike
(see Appendix G for TxDOT Standard EC (4)-93)

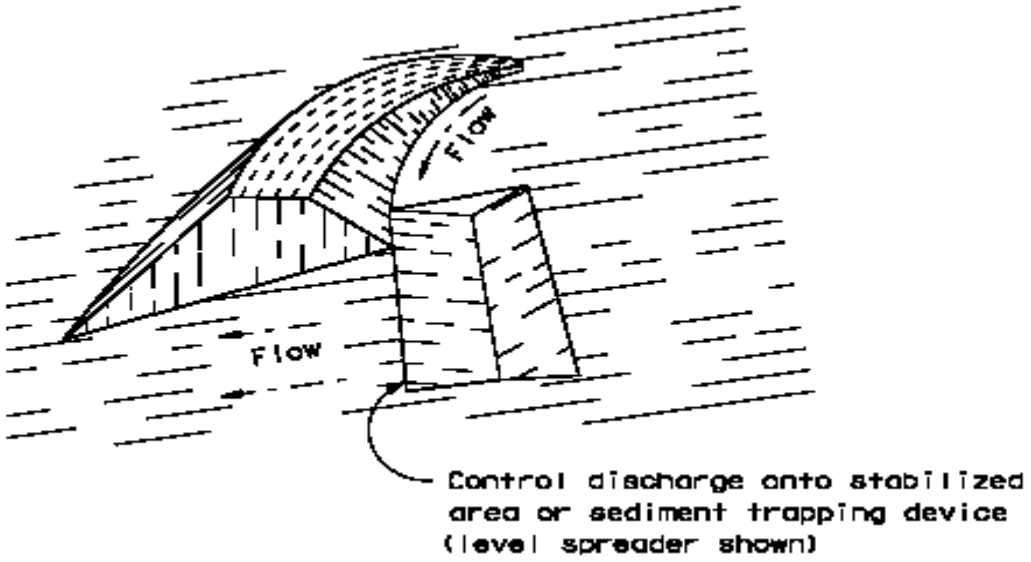


Figure 4.9 - Perimeter Dike
(see Appendix G for TxDOT Standard EC (4)-93)

4.8 Stone Outlet Structures

Description: A stone outlet structure is a temporary crushed stone filter dam installed in conjunction with and as part of a diversion dike, interceptor dike, perimeter dike, pipe slope drain, or sediment trap or basin (see Figure 4.10). The purpose of the stone outlet structure is to provide a protected outlet for any measure that requires velocity dissipation and diffusion of concentrated flow. Stone outlet structures apply to any point of discharge where there is need to dispose of runoff at a protected outlet or to diffuse concentrated flow for the duration of the construction period.

Design Guidelines: The drainage area above the structure is recommended to be less than 5 acres. The minimum length, in feet, of the crest of the stone outlet structure should be equal to 6 times the number of acres of contributing drainage area. Maximum allowable flow through rate is 60 gallons per minute per square foot. The crest of the stone dike should be at least 6 inches lower than the lowest elevation of the top of the earth dike and should be level. The stone should be crushed stone. Unless otherwise specified, all aggregate used in a stone outlet structure should be 3 to 5 inches open graded rock. A fabric core consisting of filter fabric may be incorporated into the structure provided maintenance of the core is made possible. If a fabric core is used, the maximum flow through rate is 40 gallons per minute per square foot. The stone outlet structure should be located so as to discharge onto an already stabilized area or into a stable watercourse. Stabilization shall consist of a complete vegetative cover, paving, etc. sufficiently established to be erosion resistant.

Maintenance: The area upstream from the stone outlet structure should be maintained in a condition that will allow sediment to be removed following the runoff of a rainfall event. Periodic inspections (after each rainfall) should be made by the Contractor and when the silt reaches a depth equal to 1/3 the height of the structure or 1 foot, whichever is less; accumulated silt should be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The structure should be reshaped as needed during inspection. The structure should be left in place until all upstream areas are stabilized and accumulated silt is removed.

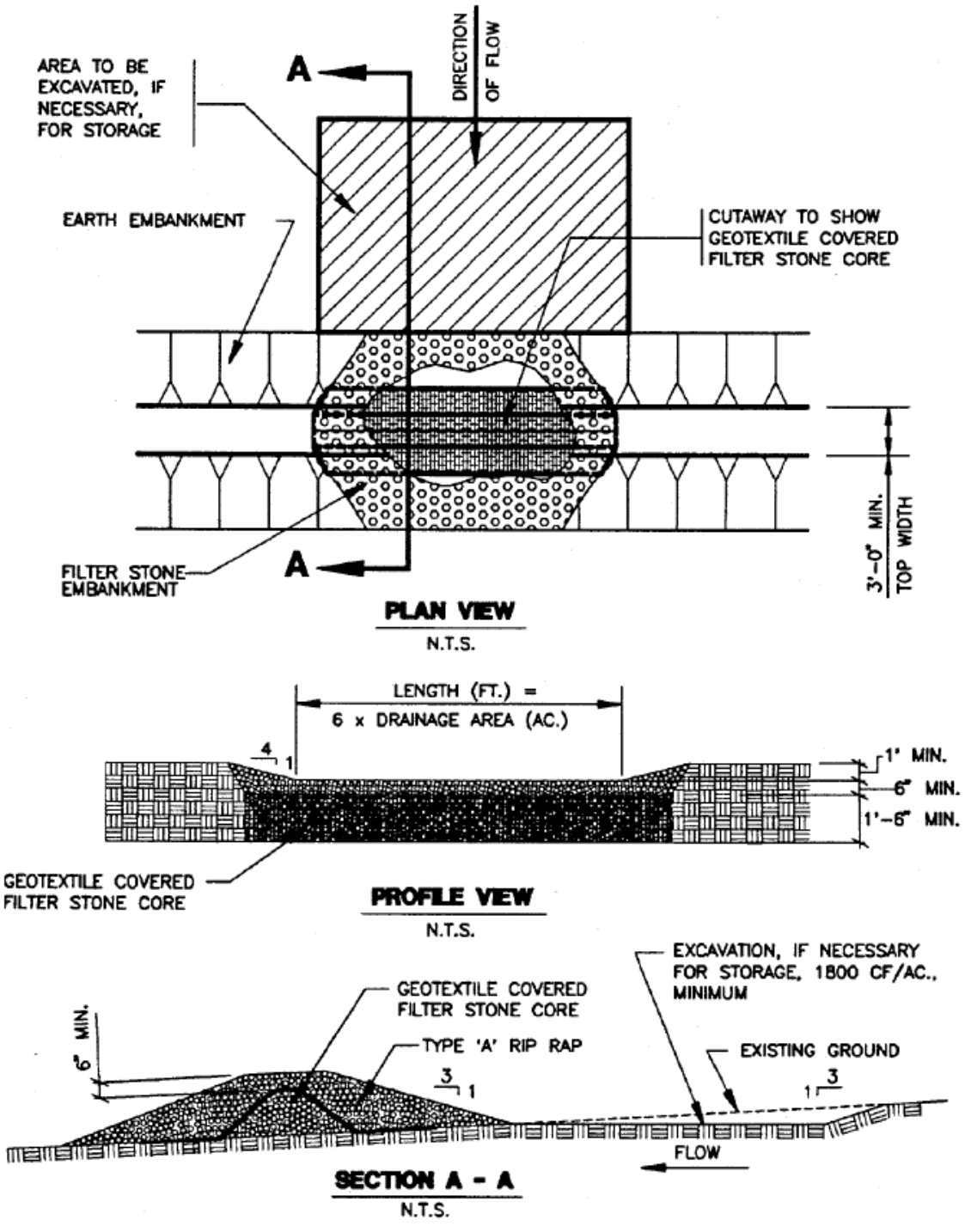


Figure 4.10 - Stone Outlet Structure Installed in Conjunction with a Sediment Trap

4.9 Pipe Slope Drain

Description: A pipe slope drain is a flexible tubing and/or rigid pipe with prefabricated entrance section temporarily placed to extend from the top of a slope to the bottom of the slope (see Figure 4.11). The purpose of the pipe slope drain is to convey surface runoff safely down slopes without causing erosion. Pipe slopes drains are used where concentrated runoff must be conveyed down a slope in order to prevent erosion.

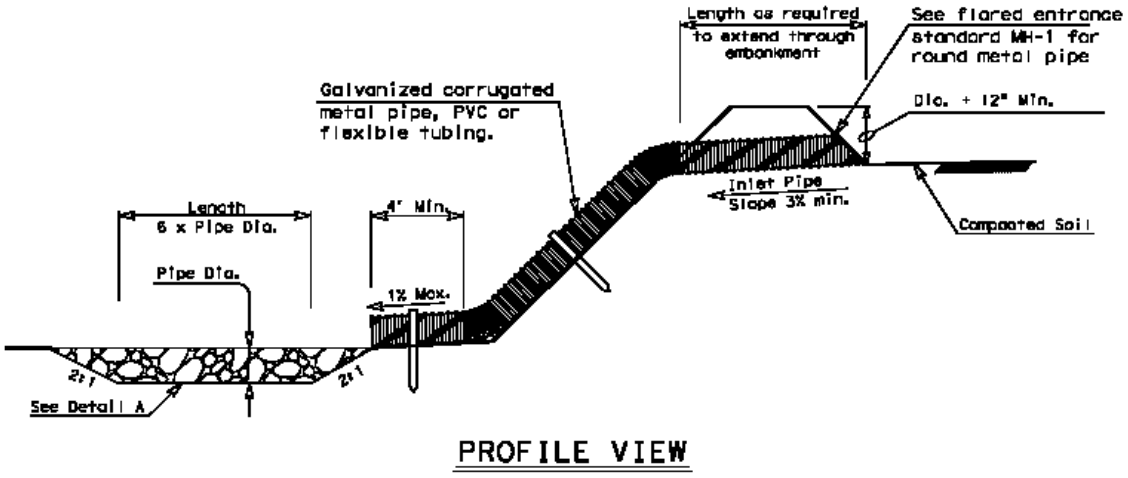


Figure 4.11 - Pipe Slope Drain with Energy Dissipater (see Appendix G for TxDOT Standard EC (7)-93)

Considerations:

- The recommended maximum drainage area is 5 acres.
- Unless otherwise specified, pipe slope drains may be sized as follows:

Table 4.8 - Pipe Slope Drain Sizes

Pipe/Tubing Size	Diameter	Maximum Drainage Area
PSD 12	12 inches	0.5 acres
PSD 18	18 inches	1.5 acres
PSD 21	21 inches	2.5 acres
PSD 24	24 inches	3.5 acres
PSD 30	30 inches	5.0 acres

- The height of the earth dike at the entrance to the pipe slope drain should be equal to or greater than the diameter of the pipe (D), plus 12 inches and should be adequate to prohibit overtopping by the 25-year storm.

- The pipe slope drain should outlet onto a stabilized area or stable watercourse. A sediment trapping device shall be used to trap sediment from any sediment-laden storm water runoff conveyed by the pipe slope drain unless the runoff is directed to a sediment basin.

5.0 Sediment Control BMPs

Sediment control is any practice that traps soil particles after they have been detached and moved by the erosive forces of wind or water. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the wind or water that is transporting them. Although filtration is an important component of sediment removal, almost all reduction in sediment load is the result of particles settling under low velocity conditions.

For construction purposes, sediment control practices can be divided into two categories:

- Temporary sediment control BMPs that function to confine sediment to the project area during the construction phase.

- Permanent sediment control BMPs that function to control sediment, i.e. total suspended solids (TSSs), after the project has been completed and the site has undergone final stabilization.

The use of sediment control measures during and after construction activities serves to protect the quality of the receiving waters by preventing sediments from moving offsite, reducing the erosive forces of runoff, diverting storm runoff away from exposed areas, and conveying runoff. The use sediment control BMPs does not preclude extensive consideration and compliance with traffic and general safety practices utilized on projects. Additional thought must be given to potential flooding or nuisances created by the control devices during operation and in case of failure of the devices.

All sediment controls should be implemented in accordance with the applicable Standard Specifications and special specifications. The following sections provide the description, purpose, applicability, and other necessary data to properly select and utilize the most common controls.

5.1 Temporary Sediment Control BMPs

Construction activities normally result in site disturbance due to grading operations, clearing and other activities. Temporary sediment control BMPs should be used to contain sediment from disturbed areas that is transported by storm water runoff. Prior to project initiation, the project area must be isolated from adjacent wetlands and water bodies by the use of BMPs to confine sediment. The following temporary sediment control BMPs are recommended for construction sites:

- Sandbag berm

- Silt fence

- Triangular filter dike

- Rock berm
- Hay bale dike
- Stabilized construction exit
- Brush berm
- Sediment trap
- Sediment basin

In accordance with EPA regulations (see Section 10.0), a sedimentation basin with a capacity of 3,600 cubic feet per acre or equivalent control measure is to be provided for disturbed areas greater than 10 acres within the same drainage basin. Where not attainable, suitable erosion and sediment controls are required. For sites disturbing 5 to 10 acres, a sedimentation basin is recommended but may be substituted with other suitable erosion and sediment controls. **At a minimum for all sites, silt fences or equivalent sediment controls (e.g. interceptor or diversion dikes) are required for all sideslope and downslope boundaries of the construction area.**

Proper installation and maintenance should form a key component of any temporary sediment control plan. A list of the temporary sediment controls and their appropriate siting criteria are contained in Table 5.1. More detailed guidance on siting and maintenance are contained in the subsequent sections.

Table 5.1 – Common Temporary Sediment Control BMPs

Measure	Common uses	Notes
Sandbag Berm	• Creates in-system sediment traps when used in channel • Forms diversion channels to route offsite flow through disturbed areas; especially useful at existing drainage crossings	• Good in-channel uses because of the integrity of the sandbags • Can assist in maximizing the volume of stored runoff as dams in ditches
Silt Fence	• Perimeter control for erosive slopes • In small and low flow ditches, to trap and store sediment-laden runoff before leaving the disturbed area.	• Often easy to install and effective if utilized properly; very ineffective if not properly installed or selected • Used for small drainage areas subject to overland flow; can be used in conjunction with rock or sandbags when used in areas of concentrated flow

Triangular Filter Dike	• Intercepts and detains water-born sediment from unprotected areas of limited extent	• Effective on paved areas where installation of silt fence is not possible • Easily moved/reinstalled in order to maintain vehicle access
Rock Berm	• In channel to create in-system storage for sediment-laden runoff to allow sediment to settle and filter through • Along perimeter when other controls are insufficient	• Good in-channel use because of integrity of the rock structure
Hay Bale Dike	• Intercepts and detains small amounts of sediment-laden runoff from relatively small, unprotected areas	• Should be employed only when other controls are not feasible and/or the construction phase will not last more than 3 months • Not effective when used in areas where a hard surface (e.g. rock) prevents sufficient anchoring
Stabilized Construction Exit	• Control offsite tracking of sediment from vehicles leaving the site	• Good housekeeping practice allows for controlled access to the site if located and inspected properly
Brush Berm	• Intercepts and slows sediment-laden runoff from disturbed areas	• There should be an adequate source of woody brush that must be removed during construction. • Repairs may involve additions or complete replacement
Sediment Trap	• Provide temporary storage for sediment-laden runoff to allow for settling of the suspended sediment	• Often easy to construct in ditches and is effective if properly sized and maintained • Used on smaller drainage areas and volumes than a sediment basin
Sediment Basin	• Provide temporary storage for sediment-laden runoff to allow for settling of the suspended sediment	• Provides control of sediment-laden runoff for large drainage areas

5.1.1 Sandbag Berm

Description: The purpose of a sandbag berm is to detain sediment carried in runoff from disturbed areas. This objective is accomplished by intercepting runoff and causing it to pool behind the sandbag berm. Sediment carried in the runoff is deposited on the upstream side of the sandbag berm due to the reduced flow velocity. Excess runoff volumes are allowed to flow over the top of the sandbag berm. Sandbag berms are used only during construction activities in streambeds when the contributing drainage area is between 5 and 10 acres and the slope is less than 15%, i.e., utility construction in channels, temporary channel crossing for construction equipment, etc. Plastic facing should be installed on the upstream side and the berm should be anchored to the streambed by drilling into the rock and driving in "T" posts or rebar (#5 or #6) spaced appropriately (see Figure 5.1).

Materials:

- The sandbag material should be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight 4 oz/yd 2, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70 percent.

- The bag length should be 24 to 30 inches, width should be 16 to 18 inches and thickness should be 6 to 8 inches.

- Sandbags should be filled with coarse grade sand and free from deleterious material. All sand should pass through a No. 10 sieve. The filled bag should have an approximate weight of 40 pounds.

- Outlet pipe should be schedule 40 or stronger polyvinyl chloride (PVC) having a nominal internal diameter of 4 inches.

Installation:

- The berm should be a minimum height of 18 inches, measured from the top of the existing ground at the upslope toe to the top of the berm.

- The berm should be sized as shown in the plans but should have a minimum width of 48 inches measured at the bottom of the berm and 16 inches measured at the top of the berm.

- Runoff water should flow over the tops of the sandbags or through 4-inch diameter PVC pipes embedded below the top layer of bags.

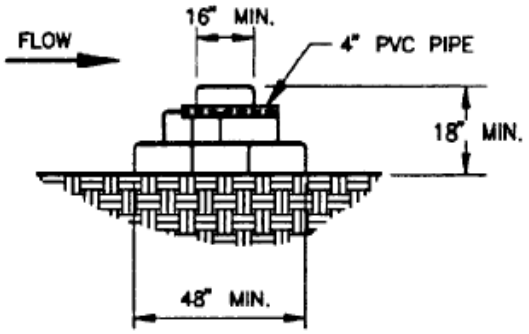
- When a sandbag is filled with material, the open end of the sandbag should be stapled or tied with nylon or poly cord.

- Sandbags should be stacked in at least three rows abutting each other, and in staggered arrangement.

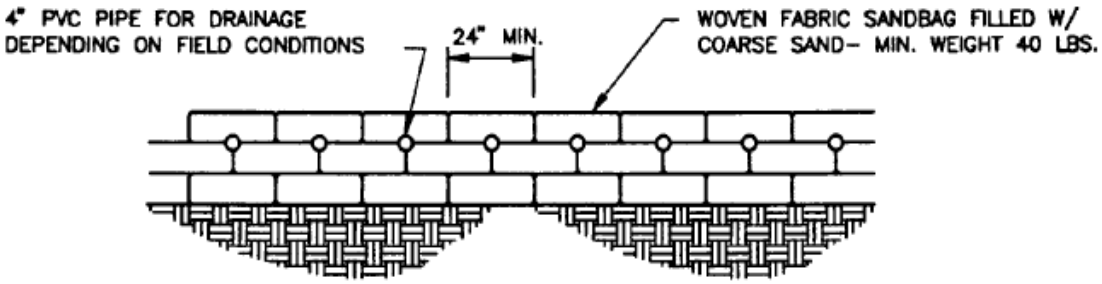
- The base of the berm should have at least 3 sandbags. These can be reduced to 2 and 1 bag in the second and third rows respectively.

- For each additional 6 inches of height, an additional sandbag must be added to each row width.

- A bypass pump-around system, or similar alternative, should be used in conjunction with the berm for effective dewatering of the work area.



CROSS SECTION
N.T.S.



PROFILE VIEW
N.T.S.

Figure 5.1 - Schematic of a Sandbag Berm (NCTCOG, 1993).

5.1.2 Silt Fence

Description: A silt fence is a barrier consisting of geotextile fabric supported by metal posts to prevent soil and sediment loss from a site (see Figures 5.2 and 5.3). When properly used, silt fences can be highly effective at controlling sediment from disturbed areas. They cause runoff to pond, which allows heavier solids to settle. If not properly installed, silt fences are not likely to be effective. The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas of a limited extent. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence should remain in place until the disturbed area is permanently stabilized.

Silt fence should not be used where there is a concentration of water in a channel or drainage way. If concentrated flow occurs after installation, corrective action must be taken such as placing a rock berm in the areas of concentrated flow. Silt fencing within the site may be temporarily moved during the day to allow construction activity provided it is replaced and properly anchored to the ground at the end of the day. Silt fences on the perimeter of the site or around drainage ways should not be moved at any time.

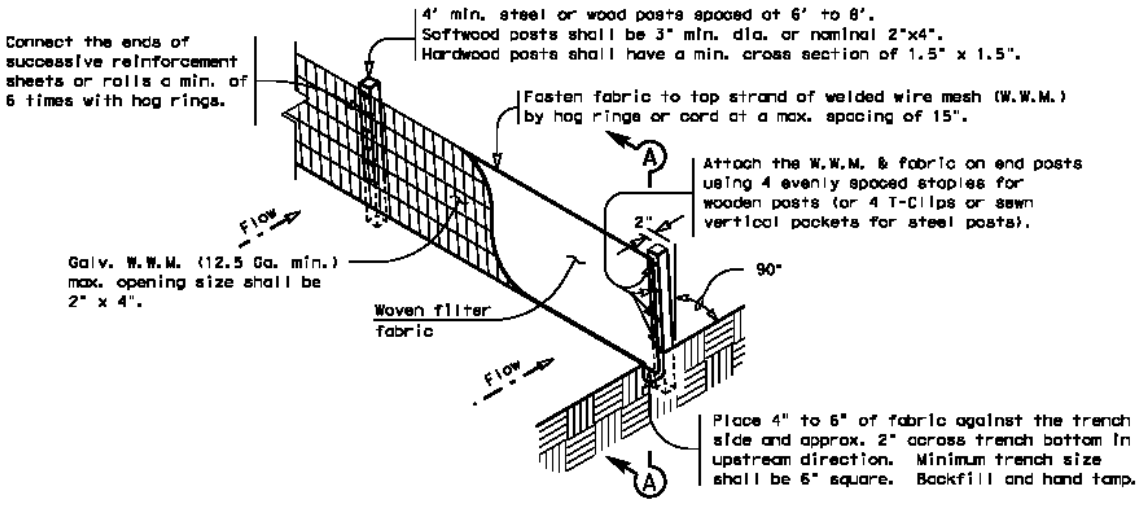


Figure 5.2 - Temporary Silt Fence Installation
(see Appendix G for TxDOT Standard EC (1)-93)

Materials:

- Silt fence material should be polypropylene, polyethylene or polyamide woven or nonwoven fabric. The fabric width should be 36 inches, with a minimum unit weight of 4.5 oz/yd, mullen burst strength exceeding 190 lb/in 2, ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.

- Fence posts should be made of hot rolled steel, at least 4 feet long with Tee or Y-bar cross section, surface painted or galvanized, minimum nominal weight 1.25 lb/ft 2, and Brindell hardness exceeding 140.

- Woven wire backing to support the fabric should be galvanized 2” x 4” welded wire, 12 gauge minimum.

Figure 5.3 - Silt fence installed to protect a stream during bridge construction.

Installation:

- Steel posts, which support the silt fence, should be installed on a slight angle toward the anticipated runoff source. Post must be embedded a minimum of 1 foot deep and spaced not more than 8 feet on center. Where water concentrates, the maximum spacing should be 6 feet.

- Lay out fencing down-slope of disturbed area, following the contour as closely as possible. The fence should be sited so that the maximum drainage area is ¼ acre per100 feet of fence.

- The toe of the silt fence should be trenched in with a spade or mechanical trencher, so that the downslope face of the trench is flat and perpendicular to the line of flow. Where fence cannot be trenched in (e.g., pavement or rock outcrop), weight fabric flap with 3 inches of pea gravel on uphill side to prevent flow from seeping under fence.

- The trench must be a minimum of 6 inches deep and 6 inches wide to allow for the silt fence fabric to be laid in the ground and backfilled with compacted material.

- Silt fence should be securely fastened to each steel support post or to woven wire, which is in turn attached to the steel fence post. There should be a 3-foot overlap, securely fastened where ends of fabric meet.

5.1.3 Triangular Filter Dike

Description: The purpose of a triangular sediment filter dike is to intercept and detain water-borne sediment from unprotected areas of limited extent (see Figures 5.4 and 5.5). The triangular sediment filter dike is used where there is no concentration of water in a channel or other drainage way above the barrier and the contributing drainage area is less than one acre. If the uphill slope above the dike exceeds 10%, the length of the slope above the dike should be less than 50 feet. If concentrated flow occurs after installation, corrective action should be taken such as placing rock berm in the areas of concentrated flow. This measure is effective on paved areas where installation of silt fence is not possible or where vehicle access must be maintained. The advantage of these controls is the ease with which they can be moved to allow vehicle traffic and then reinstalled to maintain sediment

Materials:

- Silt fence material should be polypropylene, polyethylene or polyamide woven or nonwoven fabric. The fabric width should be 36 inches, with a minimum unit weight of 4.5 oz/yd, mullen burst strength exceeding 190 lb/in 2, ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.

- The dike structure should be 6 gauge 6” x 6” wire mesh folded into triangular form being eighteen (18) inches on each side.

Figure 5.4 -Triangular filter dike

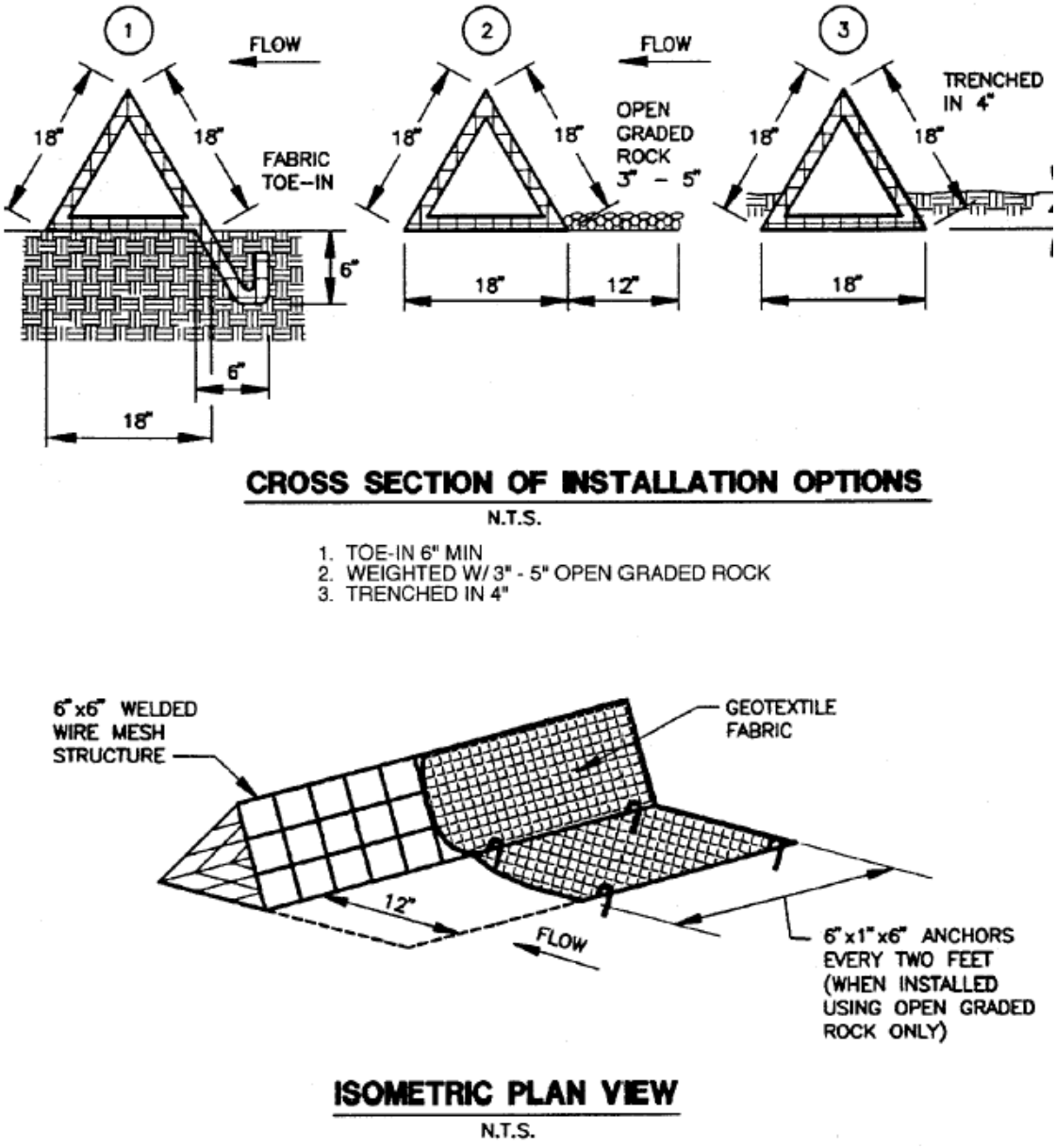


Figure 5.5 - Triangular Filter Dike Installation (NCTCOG, 1993)

Installation:

- The frame of the triangular sediment filter dike should be constructed of 6" x 6", 6 gauge welded wire mesh, 18 inches per side, and wrapped with geotextile fabric the same composition as that used for silt fences.

- Filter material should lap over ends six (6) inches to cover dike to dike junction; each junction should be secured by shoat rings.

- Position dike parallel to the contours, with the end of each section closely abutting the adjacent sections.

- There are several options for fastening the filter dike to the ground. The fabric skirt may be toed-in with 6 inches of compacted material, or 12 inches of the fabric skirt should extend uphill and be secured with a minimum of 3 inches of open graded rock, or with staples or nails. If these two options are not feasible the dike structure may be trenched in 4 inches.

- Triangular sediment filter dikes should be installed across exposed slopes during construction with ends of the dike tied into existing grades to prevent failure and should intercept no more than one acre of runoff.

- When moved to allow vehicular access, the dikes should be reinstalled as soon as possible, but always at the end of the workday.

5.1.4 Rock Berm

Description: The purpose of a rock berm, or rock filter dam, is to serve as a check dam in areas of concentrated flow, to intercept sediment-laden runoff, detain the sediment and release the water in sheet flow (see Figures 5.6, 5.7 and 5.8). The rock berm should be used when the contributing drainage area is less than 5 acres. Rock berms are used in areas where the volume of runoff is too great for a silt fence to contain. They are less effective for sediment removal than silt fences, particularly for fine particles, but are able to withstand higher flows than a silt fence. As such, rock berms are often used in areas of channel flows (ditches, gullies, etc.). Rock berms are most effective at reducing bed load in channels and should not be substituted for other erosion and sediment control measures further up the watershed.

Figure 5.6 – Rock berm properly functioning to pool water.

Figure 5.7 – Rock berms in series, used in conjunction with silt fence.

Materials:

- The berm structure should be secured with a woven wire sheathing having maximum opening of 1 inch and a minimum wire diameter of 20 gauge galvanized and should be secured with shoat rings.

- Clean, open graded 3- to 5-inch diameter rock should be used, except in areas where high velocities or large volumes of flow are expected, where 5- to 8-inch diameter rocks may be used.

Installation:

- Lay out the woven wire sheathing perpendicular to the flow line. The sheathing should be 20 gauge woven wire mesh with 1 inch openings.

- Berm should have a top width of 2 feet minimum with side slopes being 2:1 (H:V) or flatter.
- Place the rock along the sheathing to a height not less than 18".

- Wrap the wire sheathing around the rock and secure with tie wire so that the ends of the sheathing overlap at least 2 inches, and the berm retains its shape when walked upon.

- Berm should be built along the contour at zero percent grade or as near as possible. The ends of the berm should be tied into existing upslope grade and the berm should

be buried in a trench approximately 3 to 4 inches deep to prevent failure of the control.

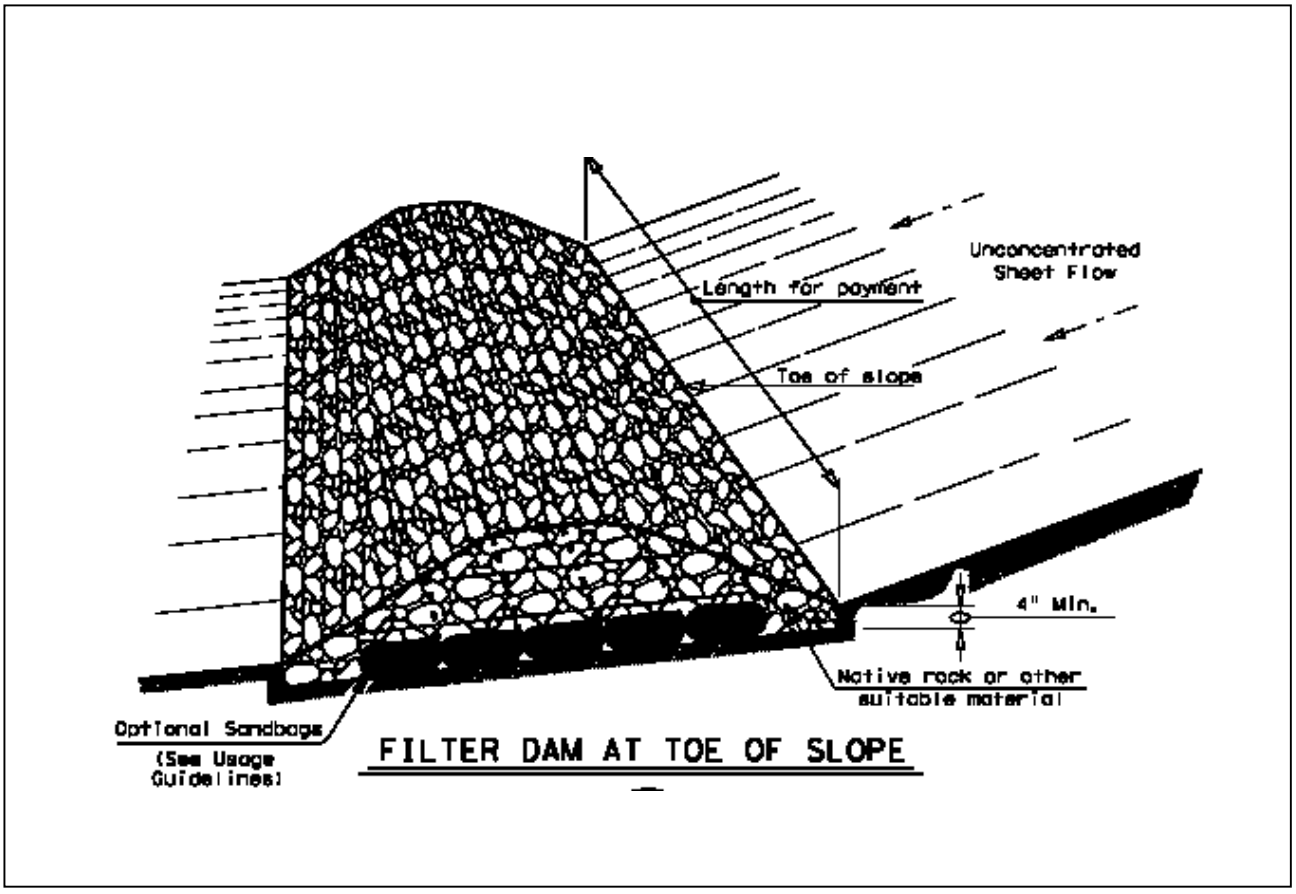


Figure 5.8 - Rock Filter Dam Installation
(see Appendix G for TxDOT Standard EC (2)-93)

5.1.5 Hay Bale Dike

Description: The purpose of a hay or straw bale dike is to intercept and detain small amounts of sediment-laden runoff from relatively small, unprotected areas (see Figures 5.9 and 5.10). Straw bales are to be used when it is not feasible to install other, more effective measures or when the construction phase is expected to last less than 3 months. Straw bales should not be used on areas where rock or other hard surfaces prevent the full and uniform anchoring of the barrier.

Figure 5.9 – Hay bales utilized to retain sediment onsite.

Materials:

Straw: The best quality straw mulch comes from wheat, oats or barley and should be free of weed and grass seed which may introduce undesirable vegetation into the area to be protected. Straw mulch is light and therefore must be properly anchored to the ground.

Hay: Hay is very similar to straw with the exception that it is made of grasses and weeds and not grain stems. This form of mulch is very inexpensive and is widely available but does introduce weed and grass seed to the area. Like straw, hay is light and must be anchored.

- Straw bales should weigh a minimum of 50 pounds and should be at least 30 inches long.

- Bales should be composed entirely of vegetable matter and be free of seeds.

- Binding should be either wire or nylon string, jute or cotton binding is unacceptable. Bales should be used for not more than two months before being replaced.

Installation:

- Bales should be embedded a minimum of 4 inches and securely anchored using 2” x 2” wood stakes or 3/8” diameter rebar driven through the bales into the ground a minimum of 6 inches.

- Bales are to be placed directly adjacent to one another leaving no gap between them.
- All bales should be placed on the contour.
- The first stake in each bale should be angled toward the previously laid bale to force the bales together.

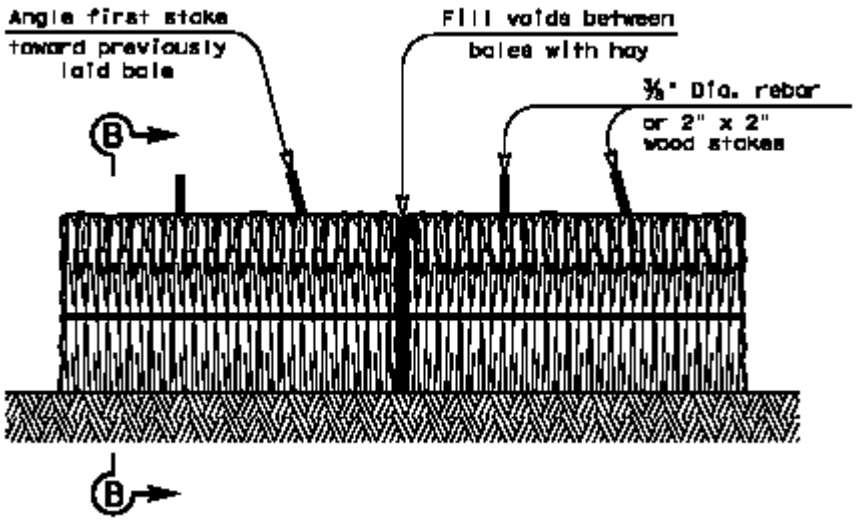


Figure 5.10 - Hay Bale Dike Installation
(see Appendix G for TxDOT Standard EC (1)-93)

5.1.6 Stabilized Construction Exit

Description: A stabilized construction exit is a stabilized pad of crushed stone, timber, or other stabilized surface treatment located at any point where traffic will be leaving a construction site to or from a public right-of-way, street, sidewalk, or parking area. The purpose of the stabilized construction exit is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. A stabilized construction exit applies to all points of construction egress (see Figures 5.11 and 5.12).

Design Guidelines:

- If stone is used as the material, the stone size should be 4- to 8-inch open-graded rock.
- Exit must be properly graded to incorporate a drainage swale to prevent runoff from leaving the construction site.
- The thickness should be no less than 8 inches.

- The width should be no less than the full width of all points of access.
- The length should be as required, but not less than 50 feet.

Figure 5.11 – Stabilized construction exit.

A stabilized construction road should be installed in disturbed areas where there will be a high volume of construction traffic leaving the site. Preferably it should be maintained throughout the construction site, including parking areas. A stabilized construction road should not be located in a cut or fill area until after the grading has been performed. It should be built to conform to site grades but with a minimum amount of cut and fill. It should also be designed so that the side slopes and road grade are not excessively steep. A construction road should not be constructed in areas that are frequently wet, or on highly erodible soils.

Maintenance: The exit should be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone or other materials as conditions demand and repair and/or clean out of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way should be removed immediately by the contractor.

When necessary, wheels should be cleaned to remove sediment prior to exit onto public right-of-way. When washing is required, it should be done on an area stabilized with crushed stone or other stabilized material that drains into a sediment trap or sediment basin. All sediment should be prevented from entering any storm drain, ditch or watercourse using approved methods.

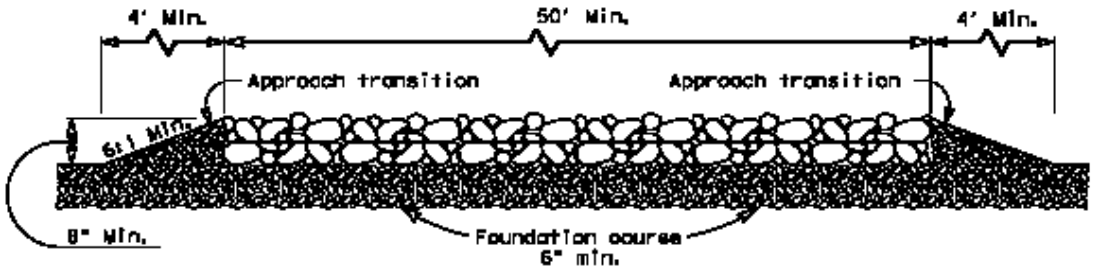


Figure 5.12 - Profile of a Construction Exit
(see Appendix G for TxDOT Standard EC (3)-93)

5.1.7 Brush Berm

Description: A brush berm is a temporary berm constructed of hand-placed brush from woody plants installed at the toe of a slope or the perimeter of a construction area. Machine placement of brush berms is not recommended. The purpose of a brush berm is to intercept and slow sediment-laden storm water runoff from unprotected areas, detain the sediment and release the water in sheet flow (see figure 5.13).

Considerations:

- There should be an adequate source of woody brush that must be removed during construction.

- There should be little or no concentration of water in a channel or other drainageway above the berm and the contributing drainage area is less than 2 acres.

Design Guidelines: A brush berm should be constructed at the perimeter of a disturbed site within the construction area. The following guidelines should be considered:

- The drainage area should be less than 2 acres.

- The maximum flow through rate should be 40 gallons per minute per foot squared frontal area.

- The minimum height should be 18 inches, measured from the top of the existing ground at the toe to the top of the berm.

- Brush berms should be secured using ¼ inch polypropylene or nylon rope tied across the berm in crisscross fashion with a minimum tension of 50 pounds. The rope should be tied securely to 18 inch – 3/8 inch diameter rebar stakes driven into the ground on 4 foot centers on both sides of the berm.

- Berms should be built along contour lines at zero percent grade or as near as possible.

- Materials should be woody brush and branches, preferably juniper or evergreen less than 2 inches in diameter. All material should be hand placed with overlapping to eliminate channelization. Care should be taken to avoid the incorporation of annual weeds and soil into the brush berm.

- Runoff should outfall directly to an undisturbed or stabilized area.

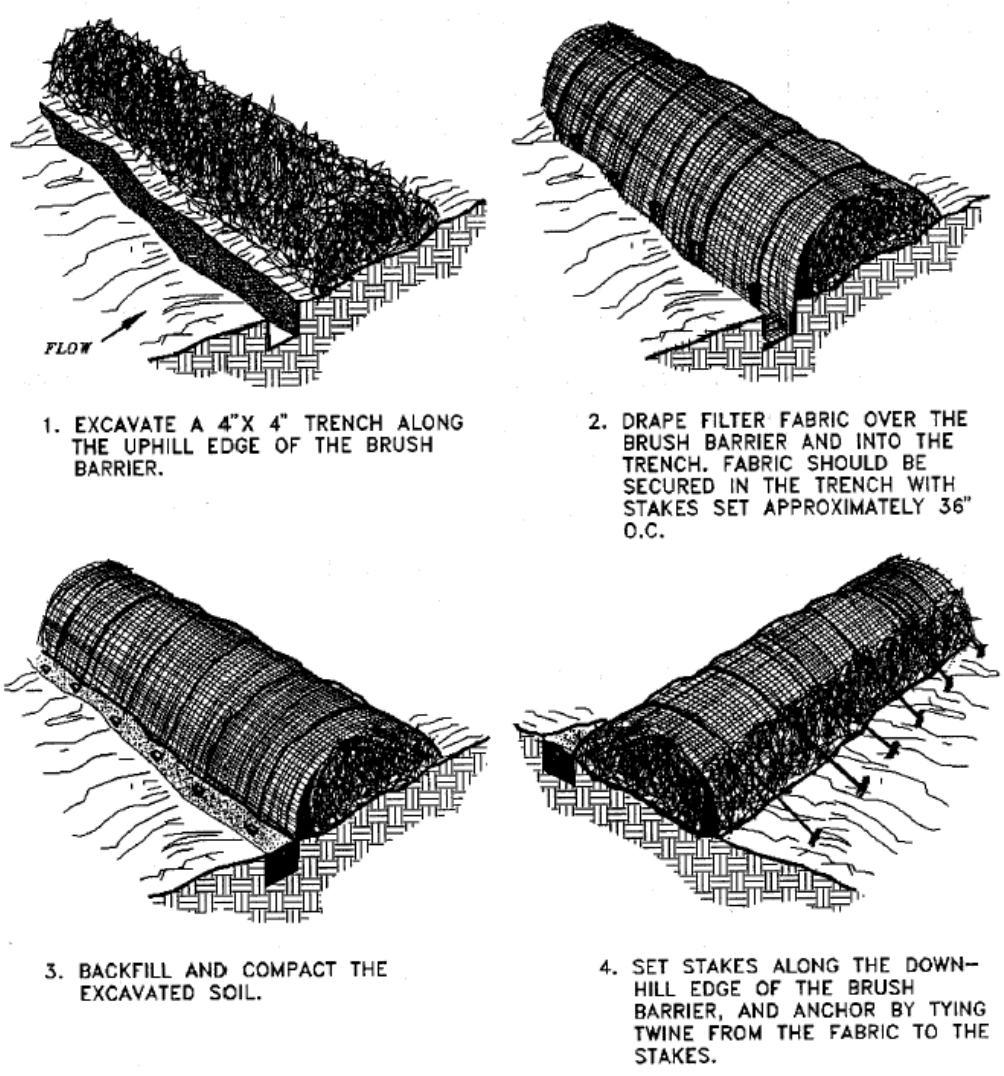


Figure 5.13 - Brush Berm Installation (VA Dept. of Conservation, 1992)

Maintenance: The area upstream of the brush berm should be maintained in a condition that will allow accumulated silt to be removed following the runoff of a rainfall event. Weekly, or after each rainfall event, inspections should be made by the responsible party. When silt reaches a depth equal to 1/3 the height of the berm or 1 foot, whichever is less, the accumulated silt should be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The berm and its anchors should be repaired as needed to restore it to its original condition after each inspection. This may require additions or complete replacement as conditions warrant. The brush berm should be left in place until all upstream areas are stabilized and accumulated silt is removed.

5.1.8 Sediment Trap

Description: A sediment trap is a small temporary basin formed by excavation and/or an embankment to intercept sediment-laden storm water runoff and to trap and retain the sediment-laden runoff. The purpose of the sediment trap is to intercept and retain runoff and allow the suspended sediment to settle out. A sediment trap is usually installed at points of discharge from disturbed areas. Constructing traps within ditches can be easy and effective and may require nothing more than a berm to create the volume and an outlet structure.

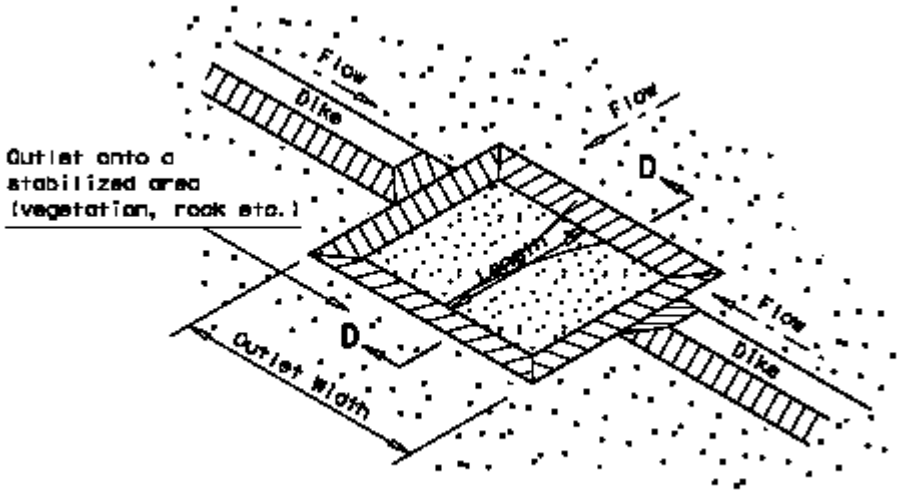


Figure 5.14 - Sediment Trap Installation
(see Appendix G for TxDOT Standard EC (6)-93)

Design Guidelines:

- The drainage area for a sediment trap is recommended to be less than 10 acres.

- The sediment trap should be located to obtain the maximum storage benefit from the terrain, to facilitate removal and disposal of the trapped sediment and to minimize

interference with construction activities. The trap should also be located to prevent offsite flows from draining through the trap to minimize the required volume. Offsite flows can be diverted around the trap with a diversion dike or interceptor swale.

- Traps should be considered for installation within any roadside ditches at frequent intervals, immediately preceding ditch inlets, before drainage enters an existing watercourse, and before the drainage leaves the right-of-way.

- The volume of the sediment trap should be at least 1800 cubic feet per acre of total drainage area (0.5 inches over the watershed). The 1800 cubic feet is desirable, however, any storage volume whatsoever will aid in sediment removal and erosion reduction. Therefore, installing smaller traps more frequently within roadside ditches can be very effective and often does not require additional excavation, only the placement of ditch blocks to form the trap. Disturbed areas greater than 10 acres within the same drainage basin should be provided with a sediment basin (see Section 5.1.9), or equivalent controls, with a capacity of 3600 cubic feet per acre of total drainage area (1.0 inch over the watershed) to meet NPDES regulations.
- The embankment should be mechanically compacted.

- All excavation operations should be carried out in such a manner that erosion and water pollution shall be minimal. Any excavated portion of the sediment trap shall have 2:1 or flatter slopes unless it is located in the safety zone, where slopes would be 6:1 or flatter.

Outlet: The outlet from the sediment trap can be a level stabilized area (e.g. vegetation or rock), a rock berm or a pipe outlet.

A pipe outlet sediment trap consists of a basin formed by an embankment or excavation along with an embankment. The outlet for the trap is through a perforated riser and pipe through the embankment. The length of the riser should be perforated to achieve a 40-hour draw-down time. All pipe connections should be watertight.

The outlet for the trap can be over a level stone section or through a filter dam. The stone outlet for a sediment trap differs from that for a stone outlet structure because of the intentional ponding of water behind the stone. To provide for a ponding area, less coarse stone should be used throughout the outlet structure.

Maintenance: Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to ½ of the design depth of the trap or 1 foot, whichever is less. Sediment removed from the trap should be deposited in an approved spoil area and in such a manner that it will not cause additional siltation.

5.1.9 Sediment Basin

Description: A sediment basin is a basin or barrier constructed within a waterway or at another suitable location to intercept sediment-laden storm water runoff and to trap and retain the sediment. The purpose of the sediment trap is to intercept sediment-laden storm water runoff and reduce the amount of sediment leaving the disturbed area. A sediment basin applies where physical site conditions or land ownership restrictions preclude the installation of barrier-type erosion control measures to adequately control runoff, erosion and sedimentation. It is also used for disturbed areas of more than 10 acres within the same drainage basin in order to comply with NPDES requirements. It may be used below construction operations which expose critical areas to soil erosion.

This applies to the installation of temporary sediment basins on sites where:

- Failure of the structure would not result in the loss of life, damage to homes or buildings, or interruption of use of service of public roads or utilities.
- The drainage area does not exceed 100 acres.
- The basin is removed once all disturbed areas are stabilized and the need for the basin is eliminated.

Figure 5.15 Sediment Basin

Design Guidelines:

- The sediment basin should be located to obtain the maximum storage benefit from the terrain and to facilitate removal of the trapped sediment. It should be located to minimize interference with construction activities and constructed as early as possible in the construction process.

- The volume of the sediment basin should be at least 1800 cubic feet per acre of total drainage area (0.5 inches over the watershed). Disturbed areas greater than 10 acres within the same drainage basin should provide a basin, or equivalent controls, with a capacity of 3600 cubic feet per acre of total drainage area (1.0 inch over the watershed) to meet NPDES regulations.

- The minimum top width of the embankment should be 3 feet. The side slopes should not be steeper than 3:1. Embankment in the safety zone should not exceed 6:1.

- Points of entrance of surface runoff into excavated sediment basins should be protected to prevent erosion. Diversions or other control devices should be installed as necessary to ensure direction of runoff and protect points of entry into the basin.

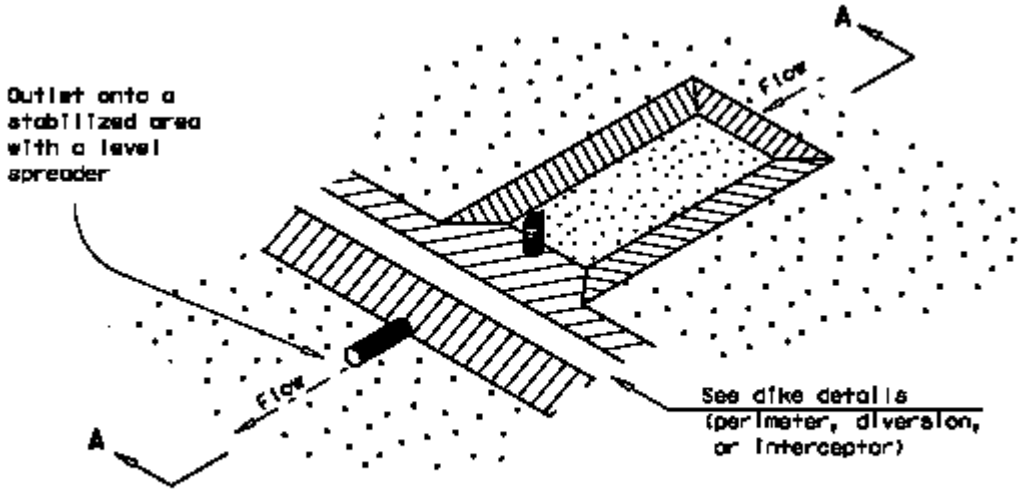


Figure 5.16 - Sediment Basin Installation
(see Appendix G for TxDOT Standard EC (6)-93)

Outlet: Runoff should be computed in accordance with the Department's Hydraulic Manual. Runoff computations shall be based upon the soil cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of the structure. The basin should be designed with a typical retention time of 40 hours. An emergency spillway should be provided to pass the peak rate of runoff from a 25-year

frequency storm. The 100-year storm should be investigated to assure that no loss of life or property is possible.

Maintenance: The sediment basin should be cleaned when the volume as described above has been reduced by 1/3. This cleanout should restore the original design volume to the sediment basin. The elevation corresponding to the maximum allowable sediment level should be determined during the design of the basin and should be stated on the plans. The sediment removed from the basin should be placed in an approved disposal area or incorporated as embankment material.

Safety: Sediment basins are attractive to children and can be very dangerous. Therefore, they should be fenced or otherwise made inaccessible to people or animals, unless this is deemed unnecessary due to the remoteness of the site or other circumstances.

5.2 Permanent Sediment Control BMPs

Permanent post-construction total suspended solid (TSS) controls are required for Section 401 water quality certification of all Section 404 individual permits and many Section 404 general permits. Recommended post-construction TSS BMPs include:

- Grass swales (borrow ditches and median swales)
- Vegetative filter strips
- Retention/irrigation systems
- Extended detention basins
- Constructed wetland
- Wet basin
- Sand filter

Table 5.2 – Common Permanent Sediment Control BMPs

Measure		
Grass Swale	• Can remove sediments by slowing runoff flow, causing filtration through grass and infiltration into soil	• Effectiveness may be increased by use in conjunction with berms/check dams • Most effective in areas with relatively flat terrain • May be a very cost-effective option
Vegetative Filter Strips/Buffer Strips	• Accepts low velocity runoff as overland sheet flow • Removes sediments via reducing flow velocity, vegetative filtration and soil infiltration	• Primarily useful in rural or low-density areas • Effective for small drainage areas with flat slopes and low to fair permeability of natural subsoil
Retention/Irrigation Systems	• Captures sediment-laden runoff in a holding pond, allowing the suspended sediment to settle • Water, once the sediment	• Requires regular and proper maintenance • Particularly appropriate for arid

	has settled out, is used for irrigation of appropriate landscape areas	regions
Extended Detention Basin	• Normally dry structure used to capture and hold sediment- laden runoff following a storm event, allowing the sediment to settle out	• Must have a release rate that that will not exacerbate downstream flooding or erosion rates • More effective for TSS removal than nutrient or metal removal
Constructed Wetland	• Pollutants removed from runoff by physical (decreases flow velocity), chemical (chelation, precipitation, adsorption) and biological (decomposition, plant uptake) means • Wetlands decrease flow velocities	• Should be designed to require minimal long-term maintenance (i.e. be self-sustaining) • Must be established in an area capable of supporting a wetland (with a reliable source of water, preferablly where the water table is near the surface and that has an appropriate soil/substrate
Wet Basin	• Pollutants removed via the settling of solids, wetland plant uptake, and microbial degradation. • Provides erosion protection for the receiving channel by limiting peak flows during larger storm events.	• The standing pool of water can be a nuisance, as well as a hazard, and requires that the facilities be fenced for reasons of safety and liability. • A watershed area of ten acres or more and a reliable water source are necessary.
Sand Filter	• Pollutants removed via filtration.	• A watershed area of ten acres or more is necessary.

5.2.1 Grass Swales (Borrow Ditches and Median Swales)

Description: Grass channels or swales are a common part of every rural highway section. Driving lanes are usually drained to a borrow ditch that conveys water parallel to the driving lanes until the road intercepts a crossing drainageway or stream. Likewise, most divided highways have a vegetated center median that also carries water parallel to the road in a vegetated channel. The primary difference between these channels and water quality channels is whether they are designed and maintained as water quality BMPs.

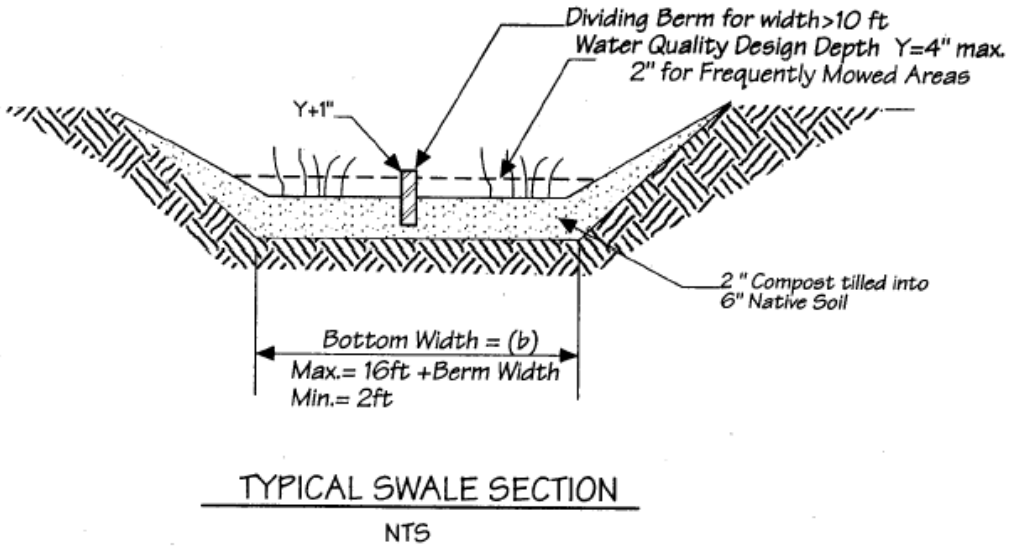


Figure 5.17 - Section of a Typical Swale (King County, 1996 – TNRCC manual)

Applications and Constraints: When site conditions are satisfactory, grass swales and channels are a significant and viable water quality BMP. They are particularly useful where well vegetated borrow ditches and median swales can be developed parallel to a roadway at slopes of 1 percent to 5 percent, and where soils are relatively permeable (NRCS hydrologic soil groups A through C). Soils in hydrologic soil group D may or may not be appropriate. This means that a large percentage of state maintained right-of-way has some potential for water quality purposes.

Vegetative features in general are not particularly useful in removing most nutrients except in those cases where mechanisms are provided to increase infiltration and detention time. While the mechanisms are not clear, research shows that grass channels are quite efficient in removing metals. Properly designed swales also appear to be efficient in removing solids and petroleum hydrocarbons.

Design Requirements: The primary factors that will determine the suitability of a grass swale or channel as a water quality structure are: soil type, slope of the contributing drainage basin, imperviousness of the drainage basin, and the cross section of the swale. Grass channels can be used to service drainage areas of as much as 10 acres (4 ha). Specific criteria for improved grass swales to be used as water quality BMPs include:

- The average slope of the watershed should be 5 percent or less.
- Maximum use should be made of natural topographic features such as natural swales, draws, and depressions.
- Soils should have infiltration rates of 0.18 in/hr (4.5 mm/hr). Heavy clays typical of NRCS Hydrologic Soil Group D are generally not acceptable.
- The seasonal high groundwater table should be at least 10 ft (3 m) below the surface of the channel.
- The cross section of the channel should be designed to carry normal flows at a depth of the normal vegetation height. Mowing heights of 4 in (100 mm) to 6 in (150 mm) are standard for most TxDOT roadsides.
- A longitudinal slope of 1 percent is preferred. LCRA allows slopes of up to 4 percent or where a velocity of 1.5 ft/sec is exceeded. Greater slopes are acceptable with the introduction of check dams to reduce velocity and increase detention times.
- Channel bottom width should be between 2 ft and 6 ft. Channels may be wider but it is difficult to achieve uniform flow over the channel bottom at low flows which can reduce the overall water quality effectiveness.
- Where check dams are used the minimum distance between dams can be determined as follows:

$$L = n/g$$

where:

L = the minimum horizontal distance between check dams
h = the height of the check dam (2 ft or less)
g = the longitudinal gradient of the channel

The LCRA suggests a check dam spacing equal to six times the minimum spacing. Therefore, the recommended spacing based on the LCRA recommendation is:

$$L = 6 \bullet n/g$$

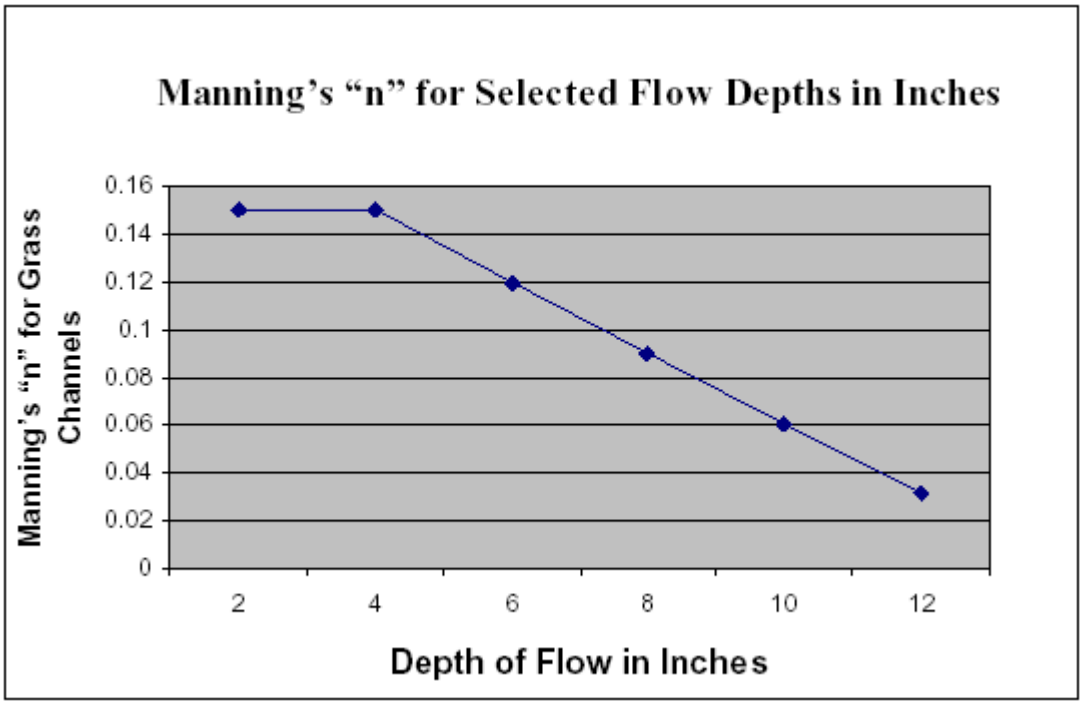


Figure 5.18 - Suggested Values for Manning's "n"

The following procedure is recommended for the design of grass-lined water quality channels:

- The channel capacity should be based on the runoff from a rainfall depth of 1.5 in. (This is the value that would capture the runoff of 90 percent of all storm events.)

- Compute the peak discharge (Q_p) for the design storm by an approved method.

- Use the peak discharge (Q_p) to size the channel or check the size of an existing channel being improved. Use Manning's equation. Figure 5.18 provides suggested values for Manning's "n" for grass-lined channels flowing at various depths.

- The following equation represents LCRA's quick trial and error method for grass channel design.

Find the depth of flow in a channel by:

$$Y = [(Q_p \bullet n) / 1.486 \bullet W \bullet S^{0.5}]^{0.6}$$

where:

Y = the depth of flow in feet

W = the bottom width of the channel (trapezoidal section is assumed)
Q_p = the peak discharge for the design storm in cfs
S = the slope of the channel bottom in ft/ft

The cross sectional area of flow can be determined by:

$$A = W \bullet Y$$

The average velocity of flow is found by:

$$V = Q_p/A$$

- The channel design should also be checked for larger design events to be sure that sufficient capacity is available and that the channel will not likely erode.

- For most roadside vegetation associations in Texas, velocities should not exceed 4 ft/sec in sandy soils or 5 ft/sec in more cohesive clays.

- Provide a minimum of 12 in freeboard above the peak design storm.

- Check dams should be designed for safety and ease of mechanical mowing. Reinforced earth or rock check dams that are backfilled and seeded are recommended. Figure 5.19 provides typical details of grass swale check dams.

Channel length should be at least 200 ft. (60m), or of sufficient length to provide a water residence time of at least 10 minutes. Assuming a minimum residence time of 10 minutes, the required length of swale is calculated by:

$$L_{10} = 600 \bullet Q_p/A$$

where:

L_{10} = the length of swale required for a detention time of 10 minutes
Q_p = the peak discharge for the runoff from a 1.50 in rainfall depth over the watershed
A = the cross-sectional area of the channel

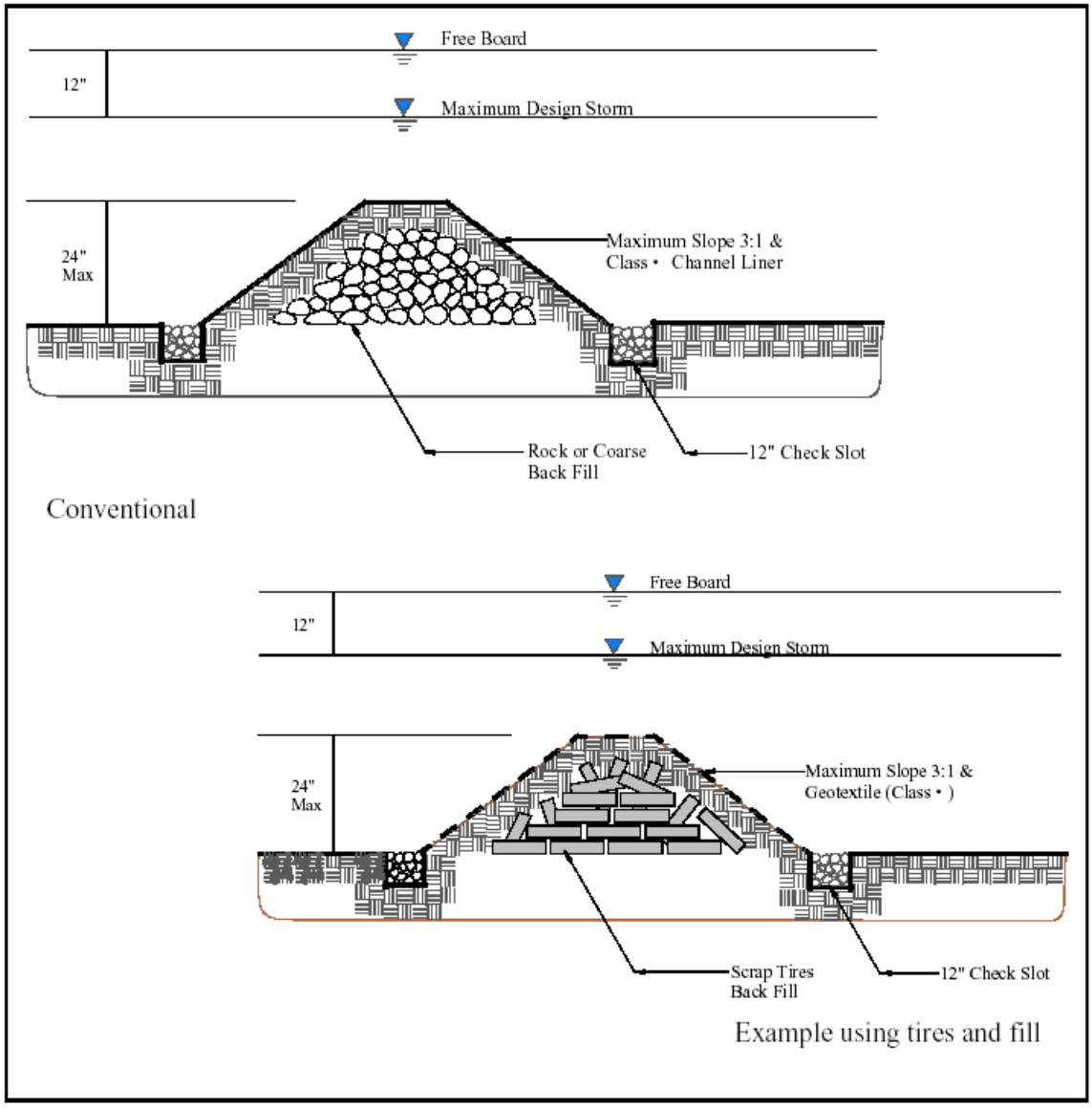


Figure 5.19 - Check Dams for Use in Grass-Lined Channels

Pollutant Removal Performance: The pollutant removal performance depends on whether or not a grass swale or channel has been designed to specifically provide water quality functions. In general, any channel that meets the four basic design criteria related to slope, soil type, vegetative cover, and length will provide some sediment control. It is important to remember that vegetated BMPs have variable performance with respect to the removal of nutrients. The primary removal of nutrients will be due to infiltration or detention of the runoff in the swale. Therefore, the use of check dams is very important to overall success where nutrients are concerned. Likewise, a good vegetative cover and mowing heights maintained above 4 inches will further enhance the performance of a grass channel.

Maintenance Requirements: The maintenance requirements of grass channels are minimal beyond normal roadside maintenance consisting of seasonal mowing and trash pickup. Periodically, sediment will have to be removed from behind the check dams, but this can usually be scheduled as a part of regular ditch maintenance. In rapidly urbanizing areas typical of the urban fringe, some rapid sedimentation of roadside channels is very likely. In these cases, provisions will have to be made for more frequent maintenance of ditches and swales.

It is very important to provide for immediate revegetation after ditch cleaning and sediment removal. This is probably the only significant maintenance-related expense beyond that of normal roadside maintenance.

Costs: For small watersheds and for areas with relatively flat terrain, the grass swale is an extremely effective water quality BMP. Since the normal rural cross-section of a highway almost always includes a grass-lined channel on at least one side of the right-of-way, a great deal of the Clean Water Act, Section 401 water quality requirement could be met by adding some very simple check dams to the roadside channels. In many cases, rock berms are used as a part of the Storm Water Pollution Prevention Plan (SW3P) for construction. Properly located and constructed, these dams could be left in place as part of the long-range water quality management plan.

5.2.2 Vegetative Filter Strips

Description: Filter strips, also known as vegetated buffer strips, are vegetated sections of land similar to grassy swales, except they are essentially flat with low slopes, and are designed only to accept runoff as overland sheet flow. They may appear in any vegetated form from grassland to forest, and are designed to intercept upstream flow, lower flow velocity, and spread water out as sheet flow. The dense vegetative cover facilitates conventional pollutant removal through detention, filtration by vegetation, and infiltration.

Filter strips cannot treat high velocity flows, and do not provide enough storage or infiltration to effectively reduce peak discharges to predevelopment levels for design storms. This lack of quantity control favors use in rural or low-density development; however, they can provide water quality benefits even where the impervious cover is as high as 50%. The primary highway application for vegetative filter strips is along rural roadways where runoff that would otherwise discharge directly to a receiving water, passes through the filter strip before entering a conveyance system. Properly designed roadway medians and shoulders make effective buffer strips. These devices also can be used on other types of development where land is available and hydraulic conditions are appropriate. Flat slopes and low to fair permeability of natural subsoil are required for effective performance of filter strips. Although an inexpensive control measure, they are most useful in contributing watershed areas where peak runoff velocities are low, as they are unable to treat the high flow velocities typically associated with high impervious cover. The most important criteria for selection and use of this BMP are soils, space, and slope.

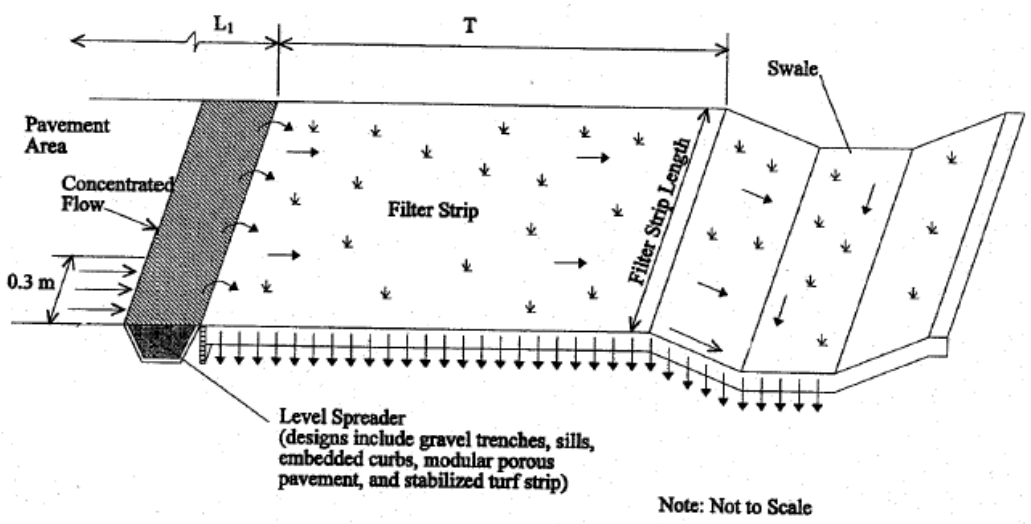


Figure 5.20 Vegetated Filter Strip (modified from Urbonas et al., 1992 – from TNRCC)

Considerations: Vegetative filter strips can remove approximately 85% of the total suspended solids contained within the volume of runoff captured. Design elements of vegetative filter strips include uniform, shallow overland flow across the entire filter strip area, hydraulic loading rate, inlet structures, slope, and vegetative cover. The area should be free of gullies or rills that can concentrate flow. Vegetative filter strips are appropriate for small drainage areas with moderate slopes.

The filter strip can be an area of vegetation that is left undisturbed during construction, or it can be newly planted. If strips are preserved, existing vegetation, good planning, and site management are needed to prevent disturbances such as grade changes, excavation, damage from equipment, and other activities. The creation of new filter strips requires the establishment of a good dense turf. Careful maintenance is important to ensure healthy vegetation. The need for routine maintenance such as mowing, fertilizing, irrigating, and weed and pest control will depend on the species of plants involved, soil types, location within the right-of-way, and climatic conditions. Planted areas may require debris removal and protection against unintended uses or traffic.

Maintenance Requirements: Maintenance requirements for vegetative filter strips include pest management, seasonal mowing and lawn care, routine inspections, debris and litter removal, sediment removal, and grass reseeding and mulching.

5.2.3 Retention/Irrigation Systems

Description: Retention/irrigation systems refer to the capture of runoff in a holding pond, then use of the captured water for irrigation of appropriate landscape areas. Retention/irrigation systems are characterized by the capture and disposal of runoff without direct release of captured flow to receiving streams. Retention systems exhibit

excellent pollutant removal but can require regular, proper maintenance. Collection of roof runoff for subsequent use (rainwater harvesting) also qualifies as a retention/irrigation practice, but should be operated and sized to provide adequate volume. This technology, which emphasizes beneficial use of storm water runoff, is particularly appropriate for arid regions because of increasing demands on water supplies for agricultural irrigation and urban water supply.

Design Considerations: Retention/irrigation practices achieve 100% removal efficiency of total suspended solids contained within the volume of water captured. Design elements of retention/irrigation systems include runoff storage facility configuration and sizing, pump and wet well system components, basin lining, basin detention time, and physical and operational components of the irrigation system. Retention/irrigation systems are appropriate for large drainage areas with low to moderate slopes. The retention capacity should be sufficient considering the average rainfall event for the area.

Maintenance: Maintenance requirements for retention/irrigation systems include routine inspections, sediment removal, mowing, debris and litter removal, erosion control, and nuisance control.

5.2.4 Extended Detention Basin

Description: Extended detention facilities are normally dry structures that temporarily store a portion of storm water runoff following a storm event. Figures 5.21 and 5.22 show an extended detention pond plan and profile. Extended detention basins are normally used to remove particulate pollutants and to reduce the maximum runoff rates associated with development to their pre-development levels. The water quality benefits are the removal of sediment and buoyant materials. Furthermore, nutrients, heavy metals, toxic materials, and oxygen-demanding materials associated with the particles also are removed. The primary means of removing pollutants is sedimentation, which results from the stilling effect of detention, allowing heavier sediments to settle out of suspension. The longer the detention time, the greater the pollutant removal will be. If detention of the water quality volume can be extended to 48 hours or greater, removal of up to 90 percent of suspended solids is possible. The removal of nutrients is also reasonably effective for detention times of 48 hours or more.

The control of the maximum runoff rates serves to protect drainage channels below the device from erosion and to reduce downstream flooding. Although detention facilities designed for flood control have different design requirements than those used for water quality enhancement, it is possible to achieve these two objectives in a single facility.

Applications and Constraints: Detention structures should be sited off the main drainage way and outside of any existing wetlands. A detention structure should be placed low in the watershed near the primary drainage way, which is also an area where wetlands may occur. The removal of TSS and other suspended pollutants is comparable to sand filters, and nutrient removal is as high as 50 percent for detention times of 48 hours. However, detention structures are much less efficient in removing dissolved

pollutants. Likewise, long detention times can be a nuisance in urban settings. Even with the frequent maintenance requirements necessary to remove trapped sediment, the long term effectiveness of extended detention structures tends to make them very cost-effective. The biggest constraint to the use of detention structures is the availability of sufficient right-of-way to accommodate the basin.

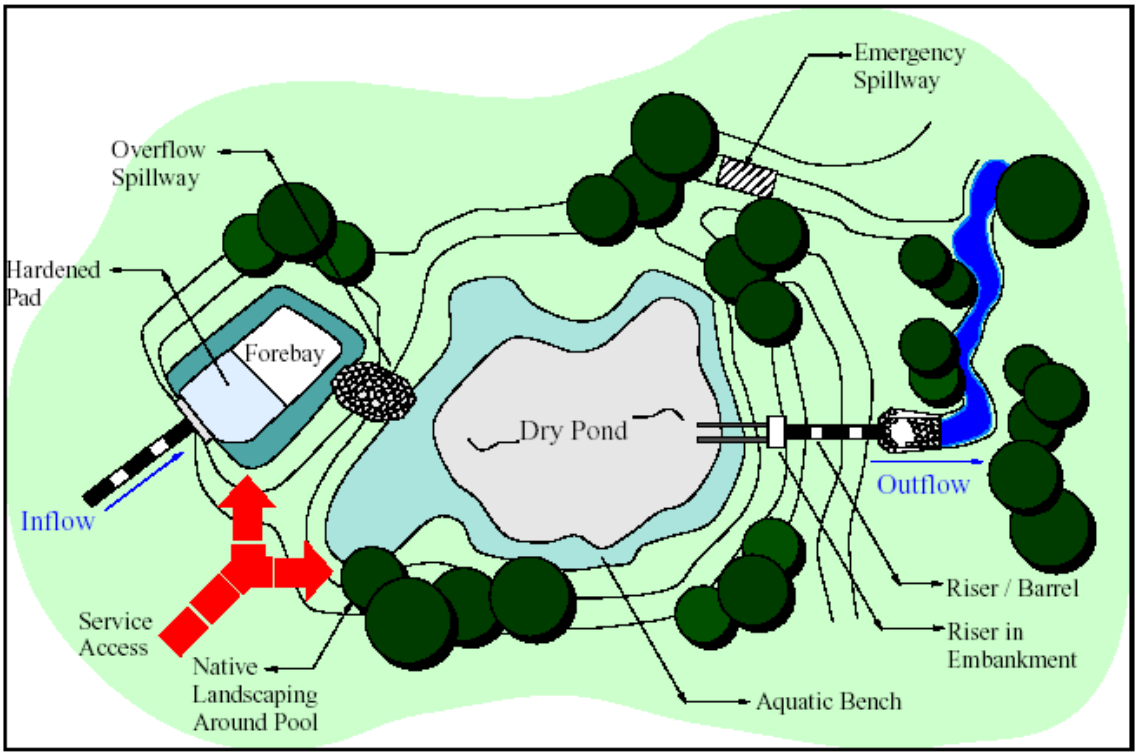


Figure 5.21 - Extended Detention Pond: Plan

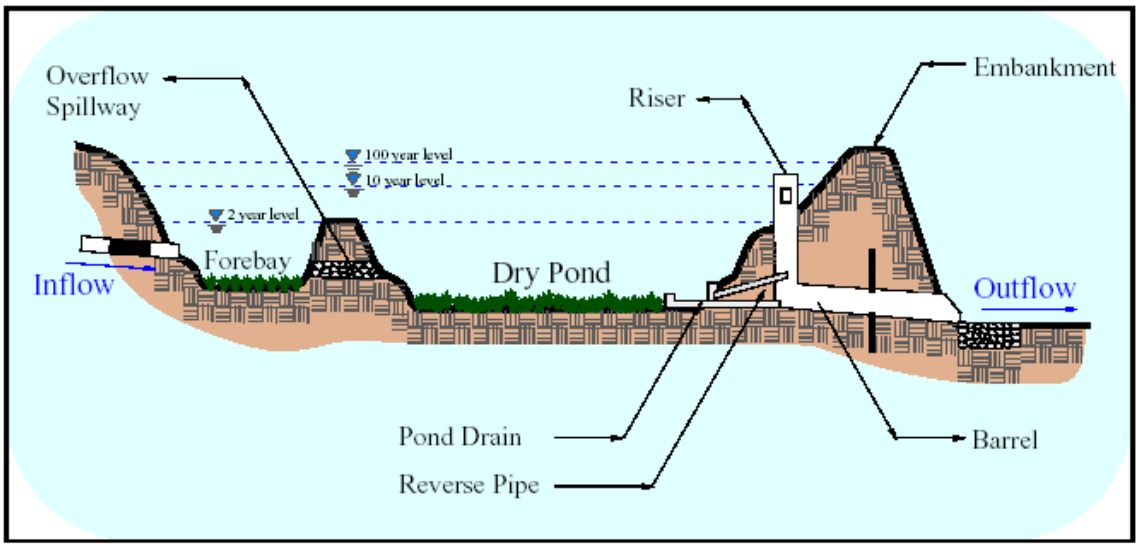


Figure 5.22 - Extended Detention Pond: Profile

Design Considerations: Extended detention basins can remove approximately 75% of the total suspended solids contained within the volume of runoff captured in the basin. Design elements of extended detention basins include basin sizing, basin configuration, basin side slopes, basin lining, inlet/outlet structures, and erosion controls. Extended detention basins are appropriate for large drainage areas with low to moderate slopes. The retention capacity should be sufficient considering the average rainfall event for the area.

Detention basins used for water quality purposes should be off-line structures sized to the full water quality volume. The recommended procedure for determining volume is the same as for sand filters. The discharge structure should be designed to detain the water quality volume for 24 to 48 hours and must have a release rate that will not exacerbate downstream flooding for estimated peak discharges of one or more storm return frequencies. Detention structures can be used for watersheds of 10 acres (4 ha) to 30 acres (12 ha).

- For highway applications, detention basins should be located to minimize intercepting offsite contributions. This may mean actually routing offsite contributions around the detention structure.

- The water flow path through the structure should be maximized to increase the detention time. Most sources recommend a length to width ratio of 3:1 or greater.

- The soil should have low infiltration rates if detention occurs over ground water reservoirs that could be contaminated. Soils in the NRCS HSG D are satisfactory. For soils in HSG A, B, and C, a pond liner may be required.

- Drainage areas may range from 10 acres (4 ha) to greater than 30 acres (12 ha) or more.

- Detention basins cannot be placed in existing wetlands.

- Base flow from any ground water source must be accommodated in the design of the outlet structure.

- Inlet structures should provide energy dissipation and erosion protection.

- Provide permanent emergency spillway to accommodate excessive flows.

Pollutant Removal Performance: The performance of extended detention ponds increases significantly with retention time for TSS and lead. There is little significant change in the removal of other pollutants after a 24-hour period. In general, the longer times result in improved pollutant removal efficiency. Dry detention structures must be used with caution if a particular standard of performance is necessary.

Maintenance: Maintenance requirements for extended detention basins include routine inspections, mowing, debris and litter removal, erosion control, structural repairs, nuisance control, and sediment removal. Beyond these basic considerations, allowance should be made for repairs to the containment structure(s) and regular removal of accumulated sediment. Sediment removal two to three times per year is recommended to help minimize re-suspension of sediment during heavy rainfall events.

Figure 5.23 - Extended Detention Basin

Costs: Extended detention basins appear to be one of the most cost-effective storm water treatment methods. Detention basins will provide TSS removal rates of 70 percent or better as reflected. However, detention basins are not particularly cost-effective in removing other soluble pollutants, particularly nutrients and some metals. In general, detention basins would have to be used in conjunction with some other type of BMP in order to remove a full range of common pollutants found in highway runoff. Given this limitation where water quality is concerned, extended detention structures are less cost-effective than retention or filtration structures.

5.2.5 Constructed Wetland

Description: Constructed wetlands provide physical, chemical, and biological water quality treatment of storm water runoff. Physical treatment occurs as a result of decreasing flow velocities in the wetland, and is present in the form of evaporation, sedimentation, adsorption, and/or filtration. Chemical processes include chelation, precipitation, and chemical adsorption. Biological processes include decomposition,

plant uptake and removal of nutrients, plus biological transformation and degradation. Hydrology is one of the most influential factors in pollutant removal due to its effects on sedimentation, aeration, biological transformation, and adsorption onto bottom sediments. Figures 5.24 and 5.25 show a plan and profile of a constructed wetland.

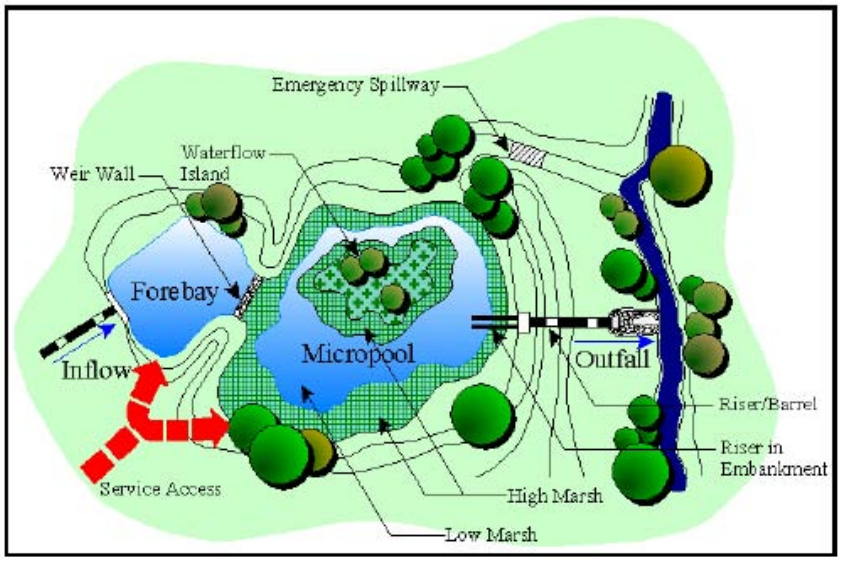


Figure 5.24 - Plan of a Constructed Wetland

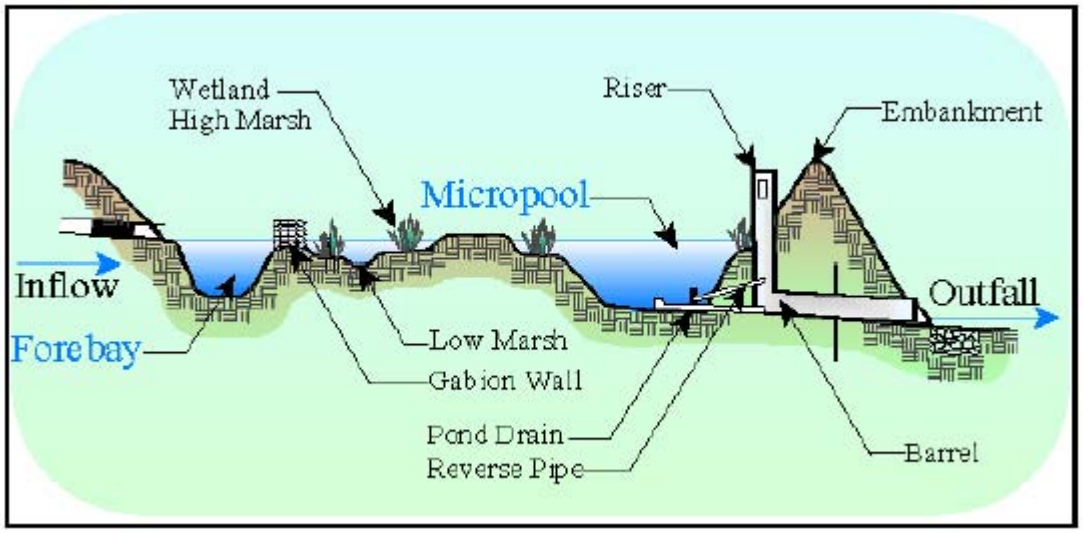


Figure 5.25 - Profile of a Constructed Wetland

The wetland should be designed such that a minimum amount of maintenance is required. The natural surroundings, including such things as the potential energy of a stream or flooding river, should be utilized as much as possible. The wetland should approximate a

natural situation and unnatural attributes, such as rectangular shape or rigid channel, should be avoided.

Site considerations should include the water table depth, soil/substrate, and space requirements. Because the wetland must have a source of flow, it is desirable that the water table is at or near the surface. If runoff is the only source of inflow for the wetland, the water level often fluctuates and establishment of vegetation may be difficult. The soil or substrate of an artificial wetland should be loose loam to clay. A perennial baseflow must be present to sustain the artificial wetland. The presence of organic material is often helpful in increasing pollutant removal and retention. A greater amount of space is required for a wetland system than is required for a detention facility treating the same amount of area.

Figure 5.26 Constructed Wetland

Design Considerations: Constructed wetlands can remove over 90% of the total suspended solids contained within the volume of runoff captured in the wetland. Design elements of constructed wetlands include wetland sizing, wetland configuration, sediment forebay, vegetation, outflow structure, depth of inundation during storm events, depth of micropools, and aeration. Wetlands are useful water quality tools for watersheds of five to 50 acres in size. They may also be designed to provide additional runoff volume storage in integrated storm water management programs. In cases where the water supply may not be sufficient to fully maintain a permanent pool, the vegetation should be selected so that it can withstand a period of drought. Alternatively, the design may provide for artificial irrigation as a means of maintaining the wetland vegetation.

Constructed wetlands are best located where channels or storm lines discharge into drainage ways or on the upstream side of culverts. In some cases, such as large interchanges, it may be possible with minimum modification to use the highway embankment and the drainage structures as a water level control device for establishing a wetland. Some basic design recommendations are as follows:

- Watershed must be large enough to support a permanent pool, or a supplemental water source must be available.

- The water flow path through the structure should be maximized. Provide extensive use of rock on inundated portions of the wetland to support wetland plants in order to improve the removal of nitrogen.

- Soil should have low infiltration rates to maintain the permanent pool. Soils in the NRCS hydrologic soil groups C and D are preferred. If native soils are in NRCS hydrologic soil groups A and B, a clay or geotextile liner will be required.

- The volume of the permanent pool should be equal to the calculated water quality volume of the basin plus 20 percent for sediment storage. The larger the permanent pool, the more effective the structure will be.

- The pond must have a length to width ratio of 2:1 or higher.

- The depth of the permanent pool should be 3 ft (1 m) to 6 ft (2 m). Shallower depths may result in resuspension of pollutants. For safety reasons, a moderately sloped bench (3-4 percent), at least 10 ft wide, should be provided and the 6 ft depth should be considered maximum.

- A sediment pretreatment area should be provided with a volume equal to 25 percent of the water quality volume.

- The margins of the basin should be well vegetated to minimize added sediment and to assist in treatment.

- Planting aquatic species in the permanent pool further enhances the performance of the pond. Lists of appropriate aquatic species are available from the NRCS, TNRCC, and the City of Austin.

- The influent and effluent structures should be sized to meet the hydraulic requirements of the basin. The two structures should be offset.

- An emergency spillway must be provided to pass flows greater than the designed water quality volume.

Applications and Constraints: Wetlands are one of the best means of treating storm water for solids, metals, nutrients and other dissolved pollutants. Due to the expense and

size requirement of a permanent pool, wetlands that do not have a supplemental water source require a watershed area of 10 acres or more. The standing pool of water can be a nuisance, as well as a hazard, and requires that the facilities be fenced for reasons of safety and liability. The permanent water pool must be maintained at all times or trapped pollutants may be re-suspended. Therefore, there must be a reliable water source. In general, it will be difficult to naturally maintain the permanent pool in parts of the state where evaporation potential exceeds annual runoff. This is generally the area west of the 24 in per year line.

Pollutant Removal Performance: The performance of wetlands varies somewhat more than other BMPs based on the size of the permanent pool and the contributing watershed.

Maintenance Requirements: Maintenance requirements for constructed wetlands can include mowing, routine inspections, debris and litter removal, erosion control, nuisance control, structural repairs, sediment removal, harvesting, and maintenance of water levels. Wetlands have some basic requirements that, if observed, will keep the structure operating at or near designed levels. Primary maintenance activities include:

- Drain pond and remove sediment on a regular schedule approximately once per year.
- Provide regular inspection monthly.
- Remove trash and other floatables quarterly.
- Mow and maintain vegetative cover above water line.

Costs: Wetlands are more expensive in terms of cost per pound of TSS removed. Only sand filter systems are more expensive in terms of cost per pound of TSS removed. The type of materials used for the structure also impacts the long-term cost. The cost range is as low as $0.53 per pound with a large watershed and an earthen structure to a high of $5.13. Overall, the cost per pound ratio becomes most efficient when the contributing watershed is 30 acres or greater.

3.2.6 Wet Basin

Description: Wet basins are runoff control facilities that maintain a permanent wet pool and a standing crop of emergent littoral vegetation. These facilities may vary in appearance from natural ponds to enlarged, bermed sections of drainage systems and may function as online or offline facilities, although offline configuration is preferable. Offline designs can prevent scour and other damage to the wet pond and minimize costly outflow structure elements needed to accommodate extreme runoff events. During storm events, runoff inflows displace part or all of the existing basin volume and are retained and treated in the facility until the next storm event. The pollutant removal mechanisms are settling of solids, wetland plant uptake, and microbial degradation. When the wet basin is adequately sized, pollutant removal performance can be excellent, especially for the dissolved fraction. Wet basins also help provide erosion protection for the receiving

channel by limiting peak flows during larger storm events. Wet basins are often perceived as a positive aesthetic element in a community and offer significant opportunity for creative pond configuration and landscape design. Participation of an experienced wetland designer is suggested. A significant potential drawback for wet ponds in arid climates is that the contributing watershed for these facilities is often incapable of providing an adequate water supply to maintain the permanent pool, especially during the summer months. Supplemental water (i.e., well water or municipal drinking water) is sometimes used to supplement the rainfall/runoff process, especially for wet basin facilities treating watersheds that generate insufficient runoff.

Wet basins can be fairly simple structures composed of a pretreatment basin and a main ponding basin with an emergency spillway. They may also incorporate more complex devices such as hazardous material traps, spreader and separator boxes, and filtered outfall structures. In their simplest form, wet basins are designed to retain the full storm water volume of the design event until it is replaced by a subsequent storm event. Primary pollutant removal is accomplished by sedimentation that removes the suspended solids. The permanent pool of water supports aquatic vegetation that utilizes nutrients and can degrade some organic contaminants. The permanent pool also helps prevent the resuspension of sediment that collects in the pond. The storage volume of a wet pond is the volume of water that can be stored above the permanent pool elevation. Figures 5.27 and 5.28 show the basic elements of a wet basin.

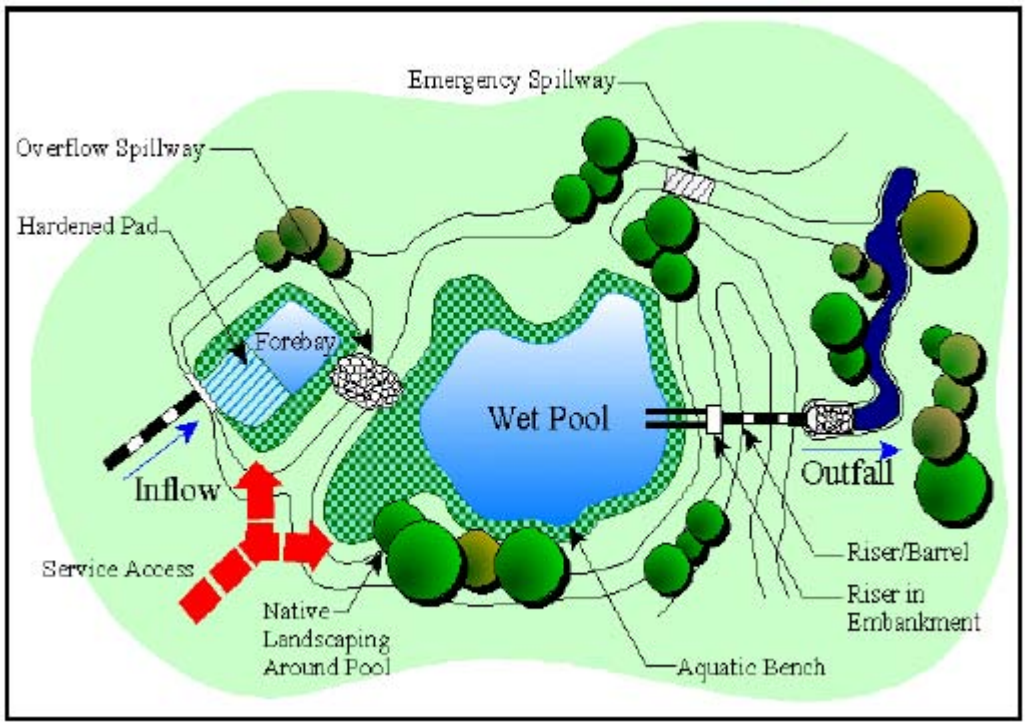


Figure 5.27 - Wet Basin Plan

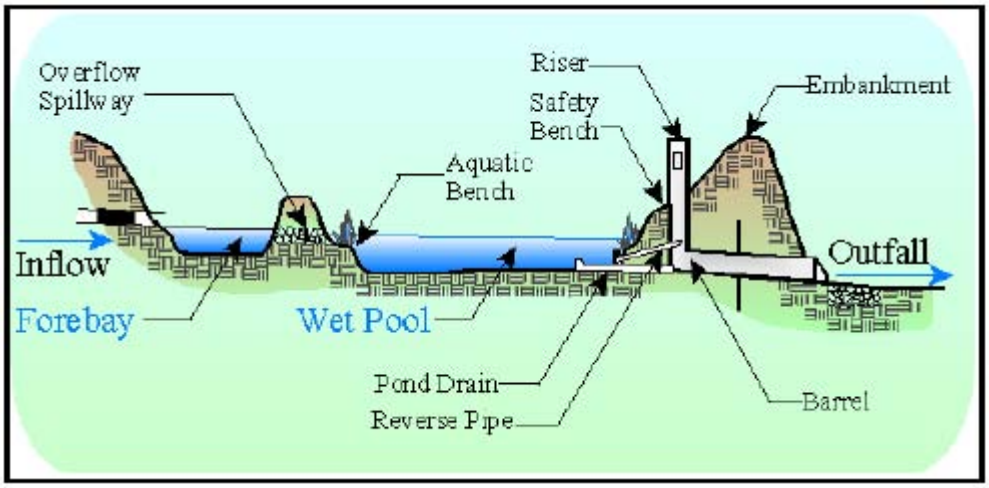


Figure 5.28 -Wet Basin Profile

Applications and Constraints: Wet ponds are one of the best means of treating storm water for solids, metals, nutrients, and other dissolved pollutants. The expense and size requirement of a wet pond requires that they have a watershed area of ten acres or more. The standing pool of water can be a nuisance, as well as a hazard, and requires that the facilities be fenced for reasons of safety and liability. The permanent water pool must be maintained at all times or trapped pollutants may be resuspended. Therefore, there must be a reliable water source. In general, it will be difficult to naturally maintain the permanent pool in parts of the state where evaporation potential exceeds annual runoff. This is generally the area west of the 24 in per year line.

Figure 5.29 - Wet Basin

Design Considerations: Wet basins can remove over 90% of the total suspended solids contained within the volume of runoff captured in the basin. Design elements of wet basins include basin sizing, basin configuration, basin side slopes, sediment forebay, inflow and outflow structures, vegetation, depth of permanent pool, aeration, and erosion control. Wet ponds are useful water quality tools for watersheds of 10 to 50 acres in size. The required site size is in the range of 1.4 acres (0.56 ha) to 4.7 acres (1.9 ha). They are usually best situated immediately upstream from where highway drainage channels or storm lines discharge into natural drainage ways. In some cases, such as large interchanges, it may be possible with minimum modification to use the highway embankment and the drainage structure as a water level control device to establish a wet pond.

In order to maintain the permanent water pool, it is necessary to have a natural base flow to the structure or a means of providing make-up water to the structure. Basic design requirements are as follows:

- Watershed must be sufficient to support a permanent pool, or a supplemental water source must be available.

- Soil should have low infiltration rates to maintain permanent pool. Soils in the NRCS hydrologic soil groups C and D are preferred. If native soils are in NRCS hydrologic soil groups A and B, a clay or geotextile liner will be required.

- The volume of the permanent pool should be equal to the calculated water quality volume of the basin plus 20 percent for sediment storage. The larger the permanent pool, the more effective the structure will be.

- The pond must have a length to width ratio of 2:1 or higher.

- The depth of the permanent pool should be 3 ft (1 m) to 6 ft (2m). Shallower depths may result in resuspension of pollutants. For safety reasons, a moderately sloped bench (3 - 4 percent) at least 10 ft (3 m) wide should be provided and the 6 ft (2 m) depth should be considered maximum.

- A sediment pretreatment area should be provided with a volume equal to 25 percent of the water volume. This recommendation is generally consistent across all sources.

- The margins of the basin should be well vegetated to minimize added sediment and to assist in treatment.

- Planting aquatic species in the permanent pool further enhance the performance of the pond. Lists of appropriate aquatic species are available from the NRCS, TNRCC, and the City of Austin.

- The influent and effluent structures should be sized to meet the hydraulic requirements of the basin. The two structures should be offset.

- An emergency spillway must be provided to pass flows greater than the designed water quality volume.

Pollutant Removal Performance: The performance of wet basins varies somewhat more than other BMPs based on the size of the permanent pool and the contributing watershed. Higher rates of pollutant can be removed if the size of the permanent pool is increased in proportion to the runoff from the mean storm.

Maintenance Requirements: Wet basins have some basic requirements that, if observed, will keep the structure operating at or near designed levels. Maintenance requirements for wet basins include mowing, routine inspections, debris and litter removal, erosion control, nuisance control, structural repairs, sediment removal, and harvesting. The primary concern is to keep excess sediment from moving into the permanent pool resulting in loss of biologic processes. Primary maintenance activities include:

- Drain pond and remove sediment on a regular schedule, approximately once per year.
- Provide regular monthly inspection.
- Remove trash and other floatables quarterly.
- Mow and maintain vegetative cover above water line.

Costs: Wet ponds are more expensive in terms of cost per pound of TSS removed than infiltration basins but somewhat less expensive than filtration structures. This assumes that the basic configuration of the wet pond is an earthen structure with a simple earthen pretreatment basin. If concrete is used for containment and/or other structures are added such as spreaders or separation boxes then the costs will increase accordingly. If a simple earthen structure is used, the cost per pound is as low as $0.52. However, if a concrete structure is used to contain the pond, costs may increase to as much as $5.13 per pound of TSS removed.

3.2.7 Sand Filter

Description: Of all water quality BMPs, filtration structures probably have the greatest variation in size and type. The simplest and most common form of filter is what has become nationally known as the Austin Sand Filter, so named after the design commonly found in Austin, Texas, over the Edwards Recharge Zone. Filtration type structures are some of the most positive long-term performers of all the available BMP technologies. The structural configuration of storm water quality filters is generally consistent in that they consist of an inlet structure, a pretreatment chamber, a filtration bed, and a discharge structure. The primary differences in storm water filtration systems are in the filter medium, size, and the construction materials.

Other variations of the sand filter include the:

- Delaware
- Washington, D.C. Underground Filter
- Delaware Slotted Curb Sand Filter
- Alexandria Dry Vault Underground Filter

The Austin Sand Filter consists of an inlet structure designed to divert the desired water volume into the pretreatment chamber, allowing the excess flow to bypass the structure. The sediment chamber is linked to the filter chamber by way of a perforated riser, which discharges into a spreader box. The spreader box is a level trough that fills and spreads the water onto the filter bed uniformly. The filter bed is 1.5 ft (0.45 m) to 2 ft (0.6 m) underlain with perforated pipe. Discharge is by way of a 6 in to 8 in pipe. The essential parts of the Austin Sand Filter are shown in Figure 5.30.

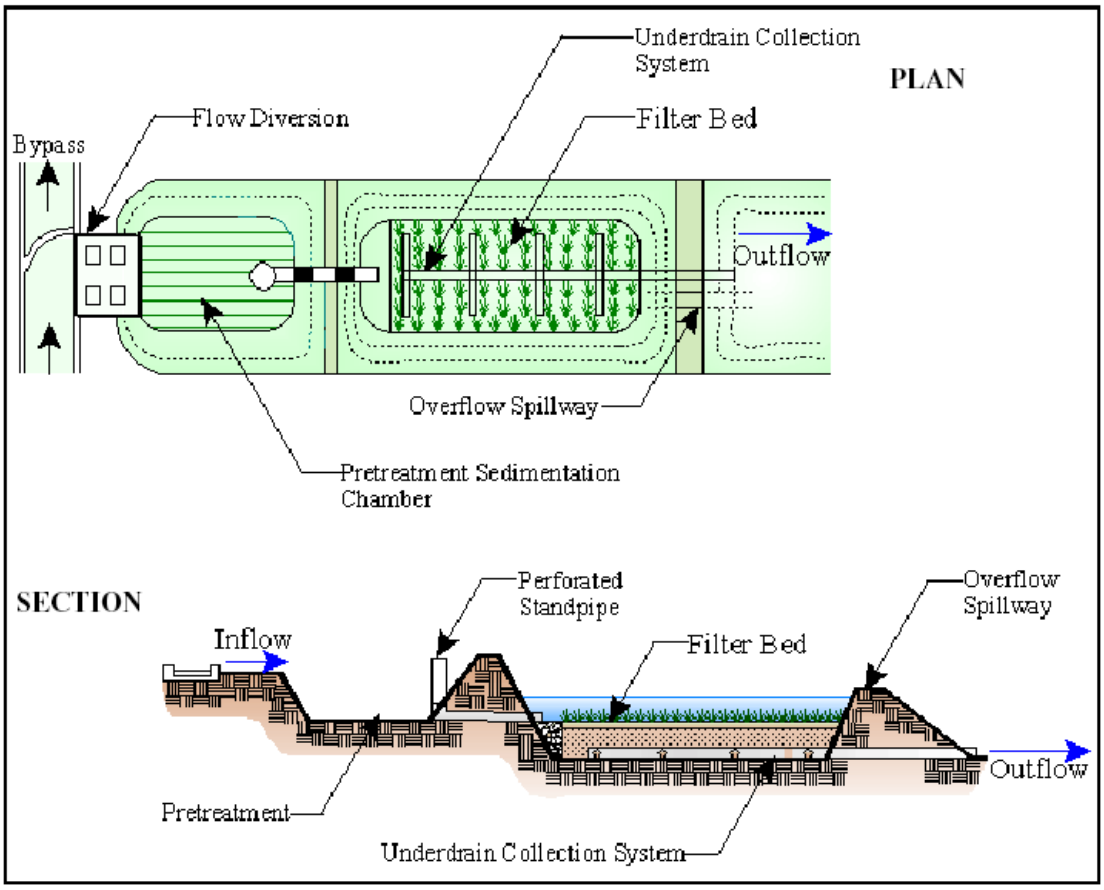


Figure 5.30 - Austin Sand Filter Plan and Section

The most recent version of the Austin Sand Filter uses a simple headwall inlet with energy dissipaters. The pretreatment is provided in a simple earthen basin that is connected to an adjacent sand filtration bed. Water is distributed to the sand bed by way of a concrete spreader box or a gabion separator.

Applications and Constraints: The Austin Sand Filter and its variations are one of the most common and best documented water quality BMPs in Texas. It has been applied successfully in a variety of site conditions and all over the upper section of the Edwards Aquifer Recharge.

Sand filters are most effective for watersheds greater than 10 acres (4 ha) to greater than 50 acres (20 ha). The most desirable sites for sand filters are those with slopes in the range of 3 to 5 percent and sufficient right-of-way to allow all earthen containment. When right-of-way is limited, the cost of using concrete containment structures or underground vaults must be weighed against the cost of acquiring additional right-of-way. Rocky, karst sites will complicate excavation. Therefore, basins must be lined to prevent contamination of the groundwater. Filtration structures must not encroach on natural wetlands.

Design Requirements: Current design methods recommend use of a pretreatment basin. The pretreatment basin may provide full or partial pretreatment. The following design information is based on research by the City of Austin and guidance in the FHWA study, Evaluation and Management of Highway Runoff Water Quality (1995) and the LCRA Non-Point Source Pollution Control Technical Manual (1998).

Pretreatment Capture Area: Two types of pretreatment designs are used for sand filters:

- **Full Sedimentation:** The pretreatment basin is sized to capture the entire water quality volume. It is recommended that the sediment basin used to pretreat a sand filter be large enough to capture the entire water quality volume and meter it to the filter chamber. This is called full sedimentation treatment.

- **Partial Sedimentation:** The pretreatment basin is sized to capture less than the full water quality volume. The LCRA technical manual requires that the volume of the pretreatment basin and the filter basin equal the water quality volume. Most other sources suggest that the pretreatment basin be 25 percent to 75 percent of the total water quality volume.

The partial sedimentation option is recommended to minimize the size of the basin. The full sedimentation option is based on the logical assumption that with a large pretreatment capacity, the filter medium will not become clogged as quickly, therefore less maintenance will be required to maintain the desired level of performance.

A simple method of estimating pond volume is given by LCRA as:

$$V = 1.50 \bullet R_v \bullet A \bullet 43{,}560/12$$

where:

V = the required storm water capture volume (CF)
1.50 = rainfall depth in inches
$R_{v1.50}$ = ratio of runoff to rainfall for a 1.50 in. event over the contributing watershed where $R_{v1.50} = 0.0081$(percent of impervious cover)+0.0011. (See Figure 5.31)
A = watershed area in acres

% Impervious Cover	$R_{V\ 1.50}$
10	0.08
20	0.16
30	0.24
40	0.33
50	0.41
60	0.49
70	0.57
80	0.65
90	0.73

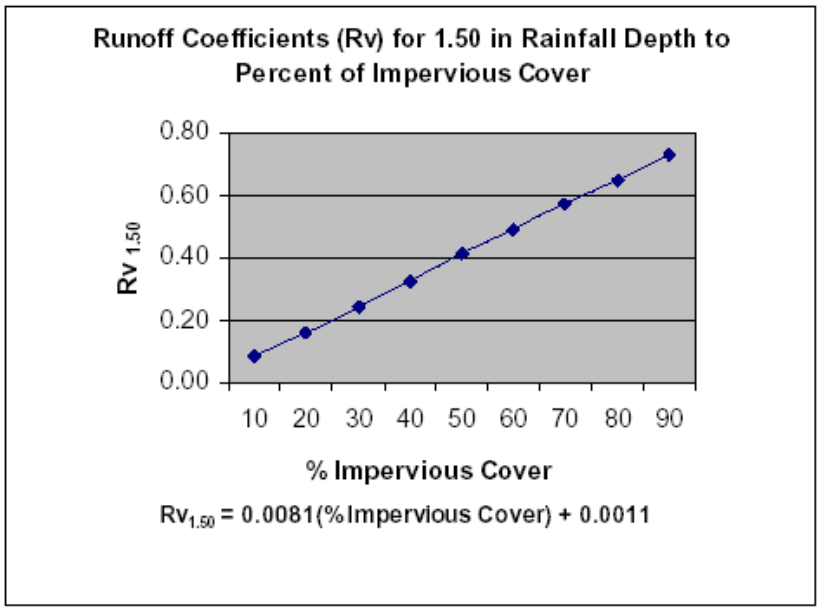


Figure 5.31 - Values of $R_{v1.50}$

The 1.50 in value is based on the statistical fact that 90 percent of all storm events in the central and eastern portion of Texas reach depths of 1.5 inches or less. Therefore, sizing the basin according to this rule assumes that the basin will capture all the runoff from 90 percent of the storm events.

Other methods set basin volume on capture of the first 0.5 in of rainfall. While the first 0.5 in rule has been widely used, some recent research has demonstrated that this allows a significant water volume to bypass the structure. This amount of bypass is significant, and as a result, these smaller volume structures do not appear to meet quality goals. This is particularly true for areas with impervious areas on the order of 70 percent. Therefore, the 1.50 in rule would seem reasonable for a majority of projects.

The method recommended for determining the surface area of the sedimentation basin is derived from the Camp-Hazen Equation:

$$A_s = -(Q_o/w) \bullet 1n\ (1-E)$$

where:

A_s = sedimentation basin surface area in sf
E = trap efficiency or the target pollutant removal efficiency
w = particle settling velocity for target particle size. For impervious areas less than 75 percent of the watershed use silt: w = 0.0004 ft/sec; for impervious areas of 75 percent and greater use w = 0.0033 ft/sec.
Q_o = rate of outflow from the basin. This is equal to the water quality volume *(WQ*V) divided by the desired detention time *(td)*. Claytor recommends 24 hours. However, longer detention times will result in higher sediment removal and reduce the basin size.

Given the basic assumptions above, the required surface areas for sedimentation can be found as follows:

$$Q_o = WQV/t_d$$

$$A_s = WQV/[24^{hr} \bullet 3600^{sec/hr} \bullet 0.0004^{ft/sec}]$$

$$A_s = 0.066 \bullet WQV$$

For watersheds with impervious areas of 75 percent or greater, the sedimentation area required would be:

$$A_s = 0.081 \bullet WQV$$

Each of these equations assumes a detention time of 24 hours and a target removal of 90 percent of suspended solids.

Filter Basin Area: The City of Austin uses the following relationship to determine the surface area of a sand filter bed. This method assumes that the required surface area is a function of the infiltration rate of the filter medium, the depth of the filter bed, the head, and the sediment loading.

$$A_f = WQV \bullet d_f/[k \bullet (h_f + d_f) \bullet (t_f)]$$

where:

A_f = surface area of the filter bed sf
WQV = water quality treatment volume cf
d_f = filter bed depth
k = infiltration rate of the filter medium in ft/day
h_f = average depth of water over the filter bed (0.5 of the maximum depth)
t_f = time for water quality volume to pass through the filter medium

Water quality volume can be found by the simple method given earlier in this section. The depth of the filter bed is usually between 18 and 24 inches (0.45 m - 0.60 m). The average head should be between 2 ft and 6 ft depending on the site conditions. Forty to 48 hours is reasonable for the water to pass through the filter bed.

The infiltration rate through the filter medium should be established by lab testing the proposed material. Experience in the Austin district suggests that there is such wide variation in the performance of natural materials that testing is the only way to determine the infiltration rate *(*k). For preliminary estimates, a value of 3.5 ft/day can be used. This is based on testing conducted by the City of Austin in 1988. However, final design should be based on a tested material available from a known source.

Other design considerations are as follows:

- Provide maintenance access to each chamber of the basin. Depending on the soil type, it may be desirable to stabilize a portion of vegetated area of the sediment basin to facilitate access and sediment removal.

- Ramps into the individual chambers should be stabilized with concrete or turf reinforcing materials.

- The surface of the filter bed must be level. The sand filter materials should be lab tested to determine the optimum compaction density to maintain the design permeability.

- Sand has no specific TxDOT Item, but should follow the criteria outlined in Appendix C.

- Perforated pipe should meet TxDOT Item 556.

- Distribution boxes should be provided and set level to ensure good distribution to the filter media.

- Discharge pipes should be protected with appropriate end treatments.

- Slope of subdrains should be set at a minimum of 0.005 ft/ft.

- Provide cleanout access to underground pipe.

- Hydroseeding the appropriate TxDOT seed mix is recommended for the basins within the recommended planting season. Outside the specified planting season, sodding is recommended.

- Grass should be established on the filter bed. For most situations, sodding over the bed should be avoided since this will likely introduce clay soils and impair the permeability of the sand bed. The sand bed should be seeded during the growing season with an appropriate TxDOT seed mix.

- Headwalls, endwalls, and concrete work that may be required should meet the appropriate TxDOT specification per the Standard Specification for Streets Highways and Bridges.

Pollutant Removal Performance: The pollutant performance of sand filters appears to have been over estimated in early studies. In 1987, Schueler had reported 99 percent removal of TSS and values of up to 70 percent for removal of total nitrogen. Since that time, other studies have reported significantly lower efficiencies.

In their 1996 publication, "Design of Stormwater Filtering Systems," Claytor and Schueler are suggesting significantly lower performance values. For example, they suggest only 35 percent for total nitrogen and 85 percent for TSS. These values are reasonably consistent with the values currently reported in the EPA's National Pollutant Removal Database. These lower values are also consistent with sampling conducted by the City of Austin and by Barrett et al. (1997).

Maintenance Requirements: Regular routine maintenance is essential for all types of storm water filter systems. Normal maintenance tasks consist of trash removal, inspection, and mowing earthen structural components, sediment basins, and the grassed filter surface. It is essential that any surface channels, embankment faces, and berms be maintained in a well-vegetated state and that sediment be removed from the pretreatment basin regularly. Poor vegetation cover in the immediate vicinity of a surface filter or resuspension of sediment in the pretreatment basin will result in excessive sediment transfer to the filter media and reduce the effectiveness of the filter. When this occurs, the filter media will usually have to be removed and replaced.

Specific maintenance activities include:

- Removal of sediment when it reaches a depth of 6 in (150 mm)

- Renovation of filter media when the drawdown time exceeds twice the designed time. Renovation will usually be required every three to five years, depending on the level of sediment reaching the filter bed;

- Removal of trash and debris from the chambers regularly. Actual time depends on the location of the facility. Structures in heavily urbanized areas will likely require more frequent servicing to remove trash and floatables;

- Mowing to maintain acceptable appearance. Mowing heights of four to six inches in most situations, and
- Rutting of the sand filter medium should be avoided since a level surface is essential to efficient operation of the filter.

Costs: Filter type BMPs are most cost-effective for watersheds of 10 acres (4 ha) or greater. Good preventative maintenance that includes frequent removal of trash and sediment and maintaining good vegetative cover around and upstream of the basin is essential to keeping long-term costs reasonable. Poor maintenance will lead to a need for more frequent renovation, which can be a significant cost.

6.0 Other Controls

Proper management and disposal of materials and other construction site wastes is an important part of pollution prevention. Construction site materials that were overlooked as potential sources of storm water contamination in the past should now be managed more carefully. This section will outline the obvious and the not so obvious sources found on sites. These may be materials, practices, or locations where there is a potential risk of pollution. Materials include surplus or refuse building materials as well as hazardous wastes. Practices include trash disposal, material handling, and spill prevention and cleanup measures. Controls and practices should meet any requirements of any federal, state, and local requirements for the project site.

This section discusses some of the waste materials encountered at construction sites and discusses generally how these materials should be stored and handled so that their exposure to storm water is minimized. However, this section does not provide specific detail on how to handle or dispose of these materials. Specific guidance should be obtained from appropriate waste management agencies and/or occupational health and safety agencies.

Typically, there are no specific BMPs that should be used on all construction sites. Only the controls that best address site-specific conditions should be implemented to control erosion and eliminate contamination of storm water. There are three areas of control (in addition to erosion and sediment controls and storm water management) that should be addressed in each SW3P. The controls that should be addressed include:

- Minimization of offsite vehicle tracking of sediments
- Compliance with applicable state or local waste disposal, sanitary sewer, or septic system regulations
- Appropriate pollution prevention measures for allowable non-storm water components of the discharge

These controls are discussed in the following section.

Good Housekeeping

Good housekeeping is basically keeping a clean, orderly construction site. One of the first steps towards preventing storm water contamination is improving housekeeping practices and using good common sense. Good housekeeping practices reduce the possibility of accidental spills, improve response time if there is a spill, and reduce safety hazards as well. Good housekeeping practices are inexpensive, relatively easy to implement, and are often very effective in preventing storm water contamination. Example of good housekeeping practices include:

- Neat and orderly storage of chemicals, pesticides, fertilizers, fuels, etc.

- Regular garbage, rubbish, construction waste, and sanitary waste disposal.
- Prompt cleanup of spills of liquid or dry materials.
- Prompt cleanup of sediments that have been tracked by vehicles or have been transported by wind or storm water onto the site or nearby roadways.
- Control the dumping of excess concrete and concrete wastewater on the site.

Construction Wastes

Construction projects tend to generate a great deal of solid waste material that is unique to this activity. These wastes are sometimes called "construction wastes."

Construction wastes may include but are not limited to:

- Trees and shrubs removed during clearing and grubbing or other phases of construction.
- Packaging materials (including wood, paper, plastic, etc.)
- Scrap or surplus building materials, e.g. scrap metals, rubber, plastic and glass pieces, masonry products, plywood lumber, and other solid waste materials.
- Materials resulting from the demolition of structures (rubble)

The following steps will help ensure proper disposal of construction wastes:

- Select a designated waste collection area onsite.
- Provide an adequate number of containers with lids or covers that can be placed over the container prior to rainfall.
- When possible, locate containers in a covered area.
- Arrange for waste collection before containers overflow.
- If a container does spill, provide cleanup immediately.
- Plan for additional containers and more frequent pickups during the demolition phase of construction.
- Verify that construction waste is collected, removed, and disposed of only at authorized disposal areas.

- Check the local solid waste management agency for specific guidance.

Hazardous Materials

Many of the materials found at construction site may be hazardous to the environment or to personnel. It is always important to read the labels of the materials or products that you have onsite; they may contain warning information that will indicate a potential problem. At a minimum, any products in the categories listed below are considered to be hazardous:

- Paints
- Acids for cleaning masonry surfaces
- Cleaning solvents
- Asphalt products
- Chemical additives used for soil stabilization (e.g. palliative such as calcium chloride)
- Concrete curing compounds and additives

Most problem situations involving hazardous materials are the result of carelessness or lack of common sense. The practices listed here will help avoid problems associated with the disposal of hazardous materials:

- Check with local waste management authorities to determine the requirements for disposal of hazardous materials.
- Use all of the product before disposing of the container.
- Do not remove the original product label from the container.
- If surplus products must be discarded, do not mix products together unless specifically recommended by the manufacturer.
- Follow the manufacturer's recommended method of disposal.

Contaminated soils are soils that have been exposed to and still contain hazardous substances. Contaminated soils may be encountered onsite during earthwork activities or during the cleanup of a spill or leak of a hazardous product. Material storage areas may also have been contaminated by undetected spills. The nature of the contaminants may or may not be known. A state or local solid waste regulatory agency should be contacted concerning information and procedures necessary to treat or dispose of contaminated

soils. Some landfills may accept contaminated soil; however, laboratory tests may be required prior to a final decision.

Concrete trucks should not be wasted out onsite unless sufficient area has been made available to fully contain the wash water. The wash water must be prevented from entering any storm drainage system or waterway.

Sandblasting is a commonly used technique to remove paint, dirt, etc. from surfaces. Sandblasting grits, which consist of both the spent sand and the particles of paint and dirt removed from the surface, are hazardous if they were used to clean old structures where lead, cadmium, or chrome based paints were used. They should not be washed into the storm drain or sanitary sewer. A licensed waste management or transport and disposal firm should be contacted to dispose of this type of grit.

Offsite Vehicle Tracking

Day-to-day practices can have a major impact on storm water contamination because of their potential for generating sediments. A common problem area is offsite vehicle tracking. Two practices are commonly used for minimizing offsite vehicle tracking of sediments: stabilized construction exits and construction access road stabilization.

Controlling offsite tracking of sediments may require attention at most times when there is vehicle traffic at the construction site. The measures listed here are effective if used properly:

- Stabilized construction exits and construction roads are very effective means of reducing offsite tracking of mud, dirt, and rocks.

- Paved streets adjacent to the site should be swept to remove any excess mud, dirt, or rock tracked from the site.

- Deliveries or other traffic should be scheduled at a time when personnel are available to provide cleanup if it is required.

Sanitary Facilities

Consideration should be given to the use of sanitary facilities. The most commonly found facilities are portable facilities that store the sanitary wastes and should be emptied periodically. Other facilities include temporary facilities that employ septic systems for treatment and disposal of the sewage, or temporary facilities that discharge to a sanitary sewer system. Sanitary or septic wastes that are generated onsite should be treated or disposed of in accordance with state and/or local requirements. Depending upon the facilities that will be used onsite, this may require one or more of the following:

- Domestic waste haulers should be contracted to regularly remove sanitary and septic wastes and to maintain the facilities in good working order. This will prevent overloading of the system that could allow discharges to storm water.

- Wastes should be treated to an appropriate level before discharging.

- Facilities should be properly hooked into the sanitary sewer system to prevent illicit discharges.

- Untreated, raw sewage or septage should never be discharged or buried onsite.

Spills

Spills are not only a source of storm water contaminants but can also harm human health. All personnel should be trained in the proper storage and handling of materials. Construction site supervisors should create and adopt a spill control plan that would include measures to:

- Prevent spills.

- Stop the source of a spill.

- Contain a spill.

- Clean up a spill.

- Dispose of contaminated materials properly.

- Identify and train personnel responsible for spill prevention and response plan.

The following measures would be appropriate for a spill prevention and response plan:

- Store and handle materials to prevent spills.
  - Tightly seal containers.
  - Make sure all containers are clearly labeled.
  - Stack containers neatly and securely.

- Reduce storm water contact if there is a spill.
  - Have cleanup procedures clearly posted.
  - Have cleanup materials readily available.
  - Contain any liquid.
  - Stop the source of the spill.
  - Cover spill with adsorbent material such as kitty litter or sawdust.

- Dispose of contaminated materials according to manufacturer's instructions or according to state or local requirements.

- Identify personnel responsible for responding to a spill or toxic or hazardous materials.
  - Provide personnel spill response training.
  - Post names of spill response personnel.

- Keep the spill are well ventilated.

- If necessary, use a private firm that specializes in spill cleanup.

7.0 Maintenance and Inspection of BMPs

The need for continual maintenance of temporary erosion and sediment controls is as important, if not more important, than the initial installation. Maintenance of temporary devices consists of two basic requirements. The first requirement is the frequent and periodic cleanout of accumulated sediment. Devices involved include silt fence, sediment traps and basins, and filter dams. As a general rule, any device that has a capacity of 50% of the original should be cleaned and accumulated silt and sediment removed. The judgement as to maintaining and/or replacing devices should be based on the type of device, type of soil, and expected runoff characteristics. The influence of seasonal changes may necessitate continued adjustment of the frequency of maintenance. The accessibility of a device after a rainfall event must also be taken into account in the frequency of cleaning. The sediment removed from the devices should be properly disposed into controlled areas and prevented from returning to the control device upon subsequent rain events. Areas that pose troublesome maintenance requirements should be re-evaluated and consideration should be given to the selection and use of alternate measures.

The second maintenance requirement includes the repair and replacement of deteriorated materials within the device (i.e. silt fence fabrics and restoring grade of sediment traps). Devices that are continually damaged may indicate the need for additional or alternate devices.

It is also essential that borrow areas, waste areas, contractor work areas, and material storage areas within the right-of-way and easements be routinely inspected. It is often easy to overlook these areas because of their locale, but the same diligence must be afforded these areas.

Within 24 hours after a significant rainfall event, (> 0.5-inch), the contractor and engineer should inspect the entire project to determine the condition of the BMPs. Sediment should be removed from the devices and damaged devices should be repaired as soon as practical.

“As soon as practical” is defined as follows: The surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. In the event of continuous rainfall over a 24-hour period, the contractor will be required to hand carry and install additional backup devices as determined by the engineer. The contractor should remove silt accumulations and deposit the spoil in an area designated by the engineer as soon as practical.

Repeatedly troublesome areas should be analyzed, modified, and reconstructed to minimize maintenance and provide maximum protection. Prior to forecasted heavy rain predictions, the entire area should be inspected to ensure the best possible protection.

The contractor should be required to clean paved surfaces as soon as possible, but no later than seven calendar days after the surrounding exposed ground will have dried sufficiently to prevent further damage from heavy equipment. The areas adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

Qualified personnel should inspect the construction site at least once every fourteen calendar days and within 24 hours of the end of a rainfall event that is 0.5-inch or greater. Where sites have been finally stabilized, or during seasonal arid periods in arid areas (with an average annual rainfall of 0-10 inches) and semi-arid (with an average annual rainfall of 10-20 inches) such inspection shall be conducted at least once every month. The inspection of the device should include an evaluation of the condition of the device, maintenance requirements, an indication of whether the device is functioning correctly, and any corrective measures needed.

- Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. BMPs identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether BMPs are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

- Based on the results of the inspection, the site description identified in the plan and BMPs identified in the plan shall be revised as appropriate, but in not case later than 7 calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.

- A report summarizing the scope of the inspection shall include the following:
  - Name(s) and qualifications of personnel making the inspection
  - The date of the inspection
  - Major observations relating to the implementation of the storm water pollution prevention plan and actions taken

The report shall be made and retained as part of the Storm Water Pollution Prevention Plan for at least three years from the date that the site is stabilized. The report should be signed by the District Engineer or by the person or position designated in writing by the District Engineer.

The inspection form to be used by TxDOT field inspections is included as Appendix J. Each drainage system or critical discharge area can be noted by code as to its performance and/or maintenance requirements.

The TxDOT project inspector should keep a rain gauge on site and check the functional level on a daily basis, recording, if necessary, the amount of rain received. A place is

provided on the inspection form for the recording of rainfall in inches from the last 24-hour period.

Priority maintenance items should be numbered in sequence by the TxDOT inspector. Under no circumstances is the contractor to deviate from this plan without written permission from the engineer. This form provides:

- An easy and effective inspection report
- The contractor with updates for the work required
- A track record of troublesome areas so that they can be identified, analyzed, and modified to minimize maintenance and maximize performance
- A weekly report of activities

8.0 Preconstruction Conference Requirements

The preconstruction Conference shall include a review of environmental concerns, the SW3P, and permanent erosion control measures, and includes:

- Possible conflicts between the Contractor's schedule of work and the SW3P.
- Installation of and payment for the various erosion control devices and procedures.
- Schedule and unscheduled joint field reviews or erosion control devices.
- The Contractor shall submit a list of erosion control measures to be installed and maintained along with the name of the Contractor and/or Subcontractor that will be responsible for installing and maintaining the device and/or measures.

Additionally the following item should be included:

- The District Engineer's Statement designating the Department's person who will be responsible for making the project site inspections, as discussed in Section 7.0. This statement by the District Engineer will be included as part of the SW3P.

9.0 Completion of Project and Release of Contractor

It is the Department's intent to fully release the contractor after the project has been completed and stabilized. Final stabilization is achieved when all soil disturbing activities at the site have been completed and 70% of the native perennial vegetative cover (for unpaved areas and areas not covered by permanent structures) has been established; or equivalent permanent measures, such as the use of rip rap, gabions, soil retention blankets, or other geotextiles have been employed. When estimating vegetative cover for the purposes of determining final stabilization, the percentage should be relative to the existing natural vegetative cover in an adjacent undisturbed area. Where an exposed area is naturally stable with little or no vegetative cover (e.g. rock outcrop), the area can be considered stabilized for the purpose of the Construction General Permit requirements. If the project is complete but the establishment of the 70% perennial vegetative cover has not been achieved, the contractor may be released if the permanent measures with all necessary temporary measures are in place that will control erosion, sedimentation, and water pollution.

In some cases, the release of the contractor and the submission of the Notice of Termination (NOT) may not occur at the same time. The continuation of the SW3P until submittal of the NOT can be by State Forces (Item 261 – State Force Account – Maintenance of Storm Water Pollution Prevention Plan), maintenance contract or another construction-type contract. D-3 should be notified by memo that an NOT is outstanding, request the Control, Section, and Job number (CSJ) remain open and that an Item 261 be set up. When the project is finally stabilized, the NOT will be submitted to the EPA and then the District should notify D-3 to close the CSJ.

10.0 TPDES Construction General Permit

The Clean Water Act (CWA) is the principal law governing pollution control and water quality of the Nation's waterways. The objective of the Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters. EPA established a nationwide permitting program under Section 402 of the CWA, referred to as the National Pollutant Discharge Elimination System (NPDES). Authority to administer this program has been delegated to the states; in Texas, this program is referred to as the Texas Pollutant Discharge Elimination System (TPDES) and is under the authority of the Texas Commission on Environmental Quality (TCEQ).

The CWA makes it unlawful to discharge storm water from construction sites in Texas, unless authorized by a TPDES Construction General Permit (CGP). Unlike an individual permit that authorizes discharge activities for a specific location, the general permits are for a specific activity (i.e. construction). The operator seeking authorization to discharge storm water is required to comply with the terms of the permit.

This section is intended as a supplement, not a replacement, to the language of the TPDES CGP. While this section should provide answers to typical questions related to the CGP requirements, there are unique aspects of the permit associated with each project. Therefore, users of this document are encouraged to become familiar with the actual language of the CGP. A copy of the TPDES CGP is contained in Appendix A.

10.1. Permit Applicability and Coverage

10.1.1 Authorized Discharges

The CGP may be used to authorize:

- *Part II.A.1*
  Discharges of storm water runoff from construction sites of one acre or greater.

- *Part II.A.2*
  Discharges of storm water runoff from construction support activities (e.g. concrete batch plants, asphalt batch plants, equipment staging areas, material stockpiles, material storage yards, material borrow areas, excavated material disposal areas, etc.) provided that:
  - The activity is located with a 1-mile distance from the permitted construction site and directly supports the construction activity.
  - The Storm Water Pollution Prevention Plan (SWP3) includes appropriate controls and measures to reduce erosion and discharge of pollutants in storm water runoff from the supporting site.
  - The activity does not operate beyond the completion date of the construction activity.

- *Part II.A.3, Part II.A.4, and Part III.F.9*
  The following non-storm water discharges are eligible to be combined with the above two storm water discharges provided the SWP3 identifies and ensures appropriate pollution prevention measures for them:
  - Discharges associated with fire fighting activities.
  - Fire hydrant flushing.
  - Waters used to wash vehicles, buildings or pavement where detergents are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless the spilled material has been removed).
  - Water used to control dust.
  - Potable water sources including water line flushing.
  - Air conditioning condensate.
  - Uncontaminated groundwater or spring water, and foundation or footing drains where flows are not contaminated with industrial materials such as solvents.
  - Discharges authorized under another permit.

10.1.2 Unauthorized Discharges

Part II.B.1 through Part II.B.10

The following are not allowed under the TPDES CGP:

- Discharges composed of anything besides the discharges eligible for authorization listed in Section 10.1.1.

- Post construction discharges.

- Discharges from construction sites that would violate an existing laws, rules or regulations.

- Discharges from construction sites located within Indian Country lands (e.g. the Alabama-Coushatta, Tigua, and Kickapoo Reservations).

- Discharges from construction activities that are associated with oil and gas production.

- Storm water discharges from agricultural activities.

10.1.3 Activities Requiring Authorization

Activities such as clearing, grading, and excavating that result in land disturbance of equal to or greater than one (1) acre require authorization under the CGP. However, it is TxDOT's policy is to implement activity-appropriate Best Management Practices (BMPs) for any soil disturbing activity where there is a potential for storm water discharges, regardless of the type of activity or acreage disturbed.

Maintenance Activities

Part I – Definitions: Small construction activity and large construction activity

Some routine maintenance activities, such as that performed to maintain the original line and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance, the routine grading of existing dirt roads, and asphalt overlays of existing roads do not require authorization under the CGP. TxDOT's interpretation of this exclusion exempts shoulder blading to restore the shoulder to its original condition and pavement "reworking" operations if they stay within the limits of the original pavement and do not expose the base or subgrade. Note that if the base or subgrade is exposed or if previously undisturbed land is disturbed (e.g. clearing for staging areas or temporary haul roads) coverage under the CGP could be required.

Project Specific Locations (PSLs) and Utility Installations

Part I – Definitions: Common plan of development, Small construction activity, and Large construction activity, Part III - Introduction

Construction activities that are completed in separate stages, separate phases, or in combination with other construction activities are considered to be "part of a common plan of development" and must be considered cumulatively when determining whether a project should be authorized as a small or large construction activity. However, when activities that are "part of a common plan of development" are under the control of different operators, they may be authorized independently. Individual operators of a site may utilize separate application documents and develop separate SWP3s that cover only their portion of the project provided the SWP3 includes a reference to the other operators of the site.

Earth disturbing activities resulting from either a contractor's Project Specific Location (PSL) or non-joint-bid utility installation within one mile of a project's limits, where TxDOT has neither day-to-day operational control nor the ability to modify the plans and specifications, are part of a "common plan of development" and must therefore be included when determining the total acreage the project will disturb, but, because the activity is not under TxDOT's operational control, TxDOT is not responsible for CGP compliance within these areas. These areas are **not** authorized by TxDOT's application documents (i.e. NOI) and the SWP3s for these areas are the responsibility of the operator of the area. TxDOT's SWP3 should include a statement that the PSL or utility

installation is under the control of the contractor or utility for that activity. The operator of the PSL or utility remains responsible for compliance with the CGP within the boundary of the area in which he/she is the operator.

There are two provisions available that allow TxDOT to require a utility to utilize erosion and/or sediment controls. The first is TxDOT's Utility Accommodation Policy (43 TAC § 21.41), "Site Cleanup", which gives TxDOT the authority to require that:

- Roadways adjacent to utility construction sites shall be kept free from debris, roadway construction material, and mud.
- At the end of every construction day, construction equipment and materials shall be removed as far from the roadway edges as feasible.
- When utility installation is complete, the ROW shall be reshaped to its original condition or better, and the area reseeded or resodded to reduce erosion.
- Should settlement or erosion occur within six months after utility installation is completed, the utility shall reshape, reseed, or resod the area.

The second is TxDOT's Notice of Proposed Installation, TxDOT Form 1023, that requires utility companies agree to use BMPs to minimize erosion and sedimentation resulting from the proposed installation and, that they will revegetate the project area as indicated under the "Revegetation Special Provisions" section of the Notice of Proposed Installation.

10.2 Obtaining Authorization to Discharge

The requirements of the TPDES CGP vary depending on the acreage disturbed. There are three authorization options for small (one to five) acre projects and one procedure for large (five or more acre) projects.

10.2.1 Small Sites: Waivers Based on Self-Calculated Low Erosion Potential

Part II.F

If the project will disturb one (1) or more acres, but less that five (5) acres, it may qualify for a waiver from the CGP requirements. This option, in most cases, will only apply to very short-term projects. Waivers are based on a self-calculated rainfall erosivity factor, as opposed to the pre-calculated option described below.

There are several resources that are helpful when calculating rainfall erosivity factors. The Texas Agricultural Experiment Station at Texas A&M University maintains an on-line erosivity index calculator at:

http://SRPH.brc.tamus.edu/epa/index.html

The EPA has also published a Fact Sheet to assist in the calculation of rainfall erosivity factors. This Fact Sheet can be found at:

http://www.epa.gov/npdes/pubs/fact3-1.pdf

In general, the process for obtaining a waiver from CGP authorization requirements is as follows:

- Calculate that the rainfall erosivity factor for the entire period of the construction project is less than five (5).
- Submit a complete, signed Waiver Application form (see Appendix B) to TCEQ at least two days prior to the commencement of construction.
- If construction activity extends beyond the end date used to calculate the erosivity factor, it must be re-calculated using the same project start date and new projected end date. If the value is still under five (5), a new Waiver Application must be submitted to TCEQ. If it is above five (5), authorization must be obtained as per "Small Sites: Authorization for All Other One to Five Acre Projects" described below.

10.2.2 Small Sites: Authorization Based on Pre-Calculated Low Erosion Potential

Part II.D.1

If the project will disturb one (1) or more acres, but less that five (5) acres, and occurs in a county and during a time frame specifically listed in Appendix A the CGP (see Appendix A), authorization under the CGP may not require the development of an SWP3 or implementation of an inspection routine. The list in the CGP is based on pre-calculated rainfall erosivity factors, as apposed to the self-calculated method described above. This authorization process does not require the implementation of an SWP3 or the submittal of a Waiver Application Form; it minimizes the administrative burden of CGP compliance, **but does not exempt the activity from TCEQ's jurisdiction or waive the requirement to comply with the applicable elements of the CGP.** Details of the process follow:

- Verify that the construction activity will occur in a county that is listed in Appendix A of the CGP (see Appendix A).
- Verify that the construction activity will be initiated and completed within the time frame specified for that county.
- Complete and sign the Special Construction Site Notice (CSN) for Low Erosion Potential (see Appendix B).

- Post a signed copy of the Special CSN for Low Erosion Potential in a publicly accessible location near the construction activity.

- If storm water from the construction site will discharge into a Municipal Separate Storm Sewer System (MS4) send a copy of the Special CSN for Low Erosion Potential to the operator of the MS4 at least two days prior to commencing construction. This requirement does not apply to TxDOT's construction projects that discharge into an MS4 operated by TxDOT.

- Any concrete batch plant or asphalt batch plant must be separately authorized to discharge storm water under another permit.

- Achieve temporary or final stabilization by the end date specified in Appendix A of the CGP. If temporary stabilization measures are utilized, they must be maintained effectively and final stabilization must be achieved within thirty days of the end date that is specified in the CGP.

10.2.3 Small Sites: Authorization for All Other One to Five Acre Projects

Part II.D.2 and Part III.D

If the project will disturb one (1) or more acres, but less than five (5) acres, and does not qualify for authorization under one of the two procedures described above, authorization under the TPDES CGP will require the development of an SWP3, inspections of BMPs, and compliance with all other applicable elements of the CGP. The process is detailed below:

- Develop and implement an SWP3 that meets the requirements of the TPDES CGP and that covers all portions of the site for which TxDOT is an operator and references the operator(s) of any portion(s) of the "common plan of development" for which TxDOT is not the operator. During construction activities, this SWP3 must be retained onsite if there is an onsite location to store the plan.

- Complete and sign the Standard Construction Site Notice (CSN) (see Appendix B).

- Post and maintain a signed copy of the Standard CSN in a publicly accessible location near the actual construction activity at least two days prior to the commencement of construction. This notice may be relocated as necessary.

- If storm water from the construction site will discharge into a Municipal Separate Storm Sewer System (MS4), send a copy of the Standard CSN to the operator of the MS4 at least two days prior to commencing construction. This requirement does not apply to TxDOT's construction projects that discharge into an MS4 operated by TxDOT.

10.2.4 Large Sites: Authorization for All Projects that Disturb Five or More Acres

Part II.D.3 and Part III.D.2(a)

Large construction sites (those that disturb five or more acres) will require the submittal of an NOI, development of an SWP3, inspections of BMPs, and compliance with all other applicable elements of the CGP. In general, the process to authorize large projects under the CGP is as follows:

- Develop and implement an SWP3 that meets the requirements of the CGP and that covers all portions of the site for which TxDOT is an operator and references the operator(s) of any portion(s) of the "common plan of development" for which TxDOT is not the operator. During construction activities, this SWP3 must be retained onsite if there is an onsite location to store the plan.

- Submit the Payment Submittal Form and a signed and completed and Notice of Intent (NOI) to TCEQ (see Appendix B) at least two days prior to the commencement of construction activities.

- Post and maintain a copy of the NOI in a publicly accessible location near the actual construction activity at least two days prior to the commencement of construction.

- If storm water from the construction site will discharge into a Municipal Separate Storm Sewer System (MS4), send a copy of the NOI to the operator of the MS4 at least two days prior to commencing construction. This requirement does not apply to TxDOT's construction projects that discharge into an MS4 operated by TxDOT.

10.3 Application Documents

Authorization for large sites (five or more acres) is achieved through the completion, submittal and posting of a Notice of Intent (NOI); small sites (one to five acre) sites are usually authorization through the completion and posting of a CSN.

10.3.1 Notice of Intent (NOI) Requirements

Parts II.D.3 (d); II.D. (e); II.D.4; III.A; III.D.2

Operators of large (five or more acre) construction projects must individually submit an NOI and Payment Submittal Form to TCEQ to obtain authorization under the CGP. An SWP3 that is compliant with the terms and conditions of the TPDES CGP must be developed prior to submittal of the NOI; however, neither the SWP3 nor the CGP itself should be submitted with the NOI. Copies of the NOI must also be posted in a publicly accessible location near the construction activity and submitted to the operator of any

Municipal Separate Storm Sewer System (MS4) that will receive discharge from the site (if applicable).

Unless notified by TCEQ, operators who submit an administratively completed NOI and Payment Submittal Form in accordance with the requirements of the TPDES CGP are provisionally authorized to discharge storm water from construction activities two days after the date the NOI is postmarked. The CGP does not prohibit the submission of late NOIs. However, when a late NOI is submitted, authorization is only for discharges that occur after CGP coverage is granted. TCEQ may take appropriate enforcement actions for any un-permitted discharges.

NOI Signatory Requirements

Part II.D.6

The NOI must be signed by a person who meets the requirements described under 30 TAC § 305.44. For state agencies, this person would be a principal executive officer, such as a senior executive officer who has responsibility for the overall operations of a principle geographic unit of the agency. TxDOT has interpreted this as the District Engineer (DE), the Division Director, the DE's or Division Director's immediate staff (e.g. Director of Operations), or the Area Engineer (AE). The NOI must be signed by an individual in one of the above positions; 30 TAC § 305.44 does not provide for this responsibility to be delegated.

30 TAC § 305.44 also requires any individual who signs the NOI to sign a certification statement. The NOI itself contains the required certification language and should be used to meet this requirement; a separate certification statement is not required for this purpose.

Changing the NOI

Part II.D.3(c) Part II.D.5 and Part II.E.1

If relevant information that was submitted on the NOI changes or is found to be incorrect, a Notice of Change (NOC) must be submitted to the TCEQ within fourteen (14) days of discovery. Relevant information could include the billing address, contact information, etc. TxDOT would not consider typing errors, for example, to be "relevant" unless the error is such that it could cause a misinterpretation of the information. The certification and signature requirements are the same as for an NOI.

NOCs may not be utilized if the operator, as described on the NOI, changes. If another operator assumes control over all areas of the site that have not been finally stabilized, a Notice of Termination (NOT) must be submitted to TCEQ (see Section 10.8). The new operator must submit a new NOI at least two (2) days before assuming operational control.

Paying the Application Fee

The TCEQ will consider NOIs that are not submitted in conjunction with a $100.00 payment (as documented on the Payment Submittal Form) to be administratively incomplete and therefore invalid. TxDOT is required by law to issue an Interagency Transaction for monies due to another state agency. Contact your District Accounting Office for more details regarding this procedure. Note that the Payment Submittal Form and the NOI must be sent to different addresses.

10.3.2 Construction Site Notice (CSN) Requirements

Parts II.D.1. (e); II.D.2. (f); II.D.2. (c); II.D.2. (d)

In order for a small (one to five acre) construction activity that does not qualify for a waiver to be authorized under the CGP, either a Special CSN for Low Erosion Potential or a Standard CSN must be completed, signed and posted in a publicly accessible location near the construction activity. A copy must also be submitted to the operator of any Municipal Separate Storm Sewer System (MS4) that will receive discharge from the site (if applicable). This notice should not be submitted to TCEQ.

Both the Special CSN for Low Erosion Potential and the Standard CSN require a contact name and phone number. If authorized federal, state or local representatives require information regarding the site, this is the person who should be contacted.

CSN Signatory Requirements

Part II.D.6

CSN signature requirements are the same as for an NOI (see Section 10.3.1). As with the NOI, both CSNs contain the required certification language. However the certification language for the Special CSN for Low Erosion Potential additionally contains a statement that the construction activity will begin and end within a time period designated in the TPDES CGP, and that of the Standard CSN contains a statement that an SWP3 has been developed and implemented according to the terms of the CGP. By signing this language, the authorized signatory is certifying that the relevant condition has been met.

10.4 Storm Water Pollution Prevention Plans (SWP3s)

All large (five or more acre) and most small (one to five acre) construction projects will require the development, implementation and maintenance of a Storm Water Pollution Prevention Plan (SWP3). In addition, if a construction project has more than one operator (e.g., TxDOT, contractor, utility), each operator may utilize separate application documents and develop separate SWP3s provided reference is made to the other operators of the construction project (see Section 10.1.3).

The purpose of the SWP3 is to describe the construction site and activity as well as the control measures that will be implemented as part of the construction activity to minimize pollution in runoff.

10.4.1 Description of Site

The SWP3 must include a site/project description that includes the information specified in *Part III.F.1(a) through Part III.F.1(i)* of the CGP. The items that must be included in the site description follow:

- Description of the nature of the construction activity.
- Description of potential pollutants and sources.
- Intended schedule or sequence of major activities that will disturb soils for major portions of the site.
- The total number of acres of the entire property.
- Total number of acres where construction activities will occur (including PSLs within one mile of the site).
- Data describing the soil or the quality of any discharge from the site.
- A general location map (e.g. a portion of a city or county map).
- A detailed site map (or maps) that indicates the following:
  - Drainage patterns and approximate slopes anticipated after major grading activities.
  - Areas where soil disturbance will occur.
  - Locations of all major structural controls either planned or in place.
  - Locations where stabilization practices are expected to be used.
  - Location of offsite material, waste, borrow, fill or equipment storage areas (i.e. PSLs).
  - Surface waters (including wetlands) either adjacent or in close proximity.
  - Locations where storm water discharges from the site directly to a surface water body.
- Location and description of asphalt plants and concrete plants proving support to the construction site and authorized under this general permit.
- Name of receiving waters at or near the site that will be disturbed or that will receive discharges from disturbed areas of the project.
- A copy of the TPDES CGP (see Appendix A)

10.4.2 Description of BMPs

Best Management Practices (BMPs) are defined as the schedules of activities, prohibitions of practices, maintenance procedures, structural controls, local ordinances, and other management practices to ***prevent or reduce*** the discharge of pollutants. Chapter 26 of the Texas Water Code defines pollutant as "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, filter backwash, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into any water in the state…"

BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spills or leaks, waste disposal, or drainage from raw material storage areas.

Erosion and sediment controls must be designed to retain sediment onsite to the extent practicable with consideration for local topography, soil type and rainfall. Because these controls often require maintenance, replacement and/or other modifications due to changing field conditions, the controls must be frequently inspected and the SWP3 must be regularly updated to better control pollutants in runoff (see Section 10.5.4 and Section 10.6).

Stabilization Practices

Stabilization practices may include establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing vegetation, etc.

The CGP requires that:

- *Part III.F.2 (b)*
  Existing vegetation is preserved where it is possible.

- *Part III.F.2(b)(iii)*
  Stabilization must be initiated *as soon as practicable* in portions of the site where construction activities have temporarily or permanently ceased, and must be initiated *no more than 14 days* after the construction activity in a portion of the site has temporarily or permanently ceased, except as provided below.

- *Part III.F.2(b)(iii)(a) through Part III.F.2(b)(iii)(c)*
  Stabilization practices do not have to be initiated on portions of the site where:
    - Earth disturbing activities will be resumed within twenty-one (21) days.
    - Stabilization practices must be initiated as soon as practicable rather than by the fourteenth day under the following circumstances:

- In arid and semiarid areas (areas with an average rainfall of 0-20 inches) and in areas experiencing droughts where the initiation of stabilization is precluded by seasonably arid conditions.
- In areas where the initiation of stabilization practices precluded by snow cover or frozen ground conditions.

The SWP3 must:

- *Part III.F.2 and III.F.2(b)*
  Include a description of interim and permanent stabilization practices, including an implementation schedule.

- *Part III.F.2 (b)*
  Ensure existing vegetation is preserved where it is possible.

The following records must be maintained and either attached or reference in the SWP3:

- *Part III.F.2(b)(ii)(a)*
  Dates when major grading activities occur.

- *Part III.F.2(b)(ii)(b)*
  Dates when construction activities temporarily or permanently cease on a portion of a site.

- *Part III.F.2(b)(ii)(c)*
  Dates when stabilization measures are initiated.

Structural Control Practices

Structural control practices include any control to divert flows away from exposed soils, to limit the contact of runoff with disturbed areas, or to lessen the offsite transport of eroded soils. Structural controls may include but are not limited to: silt fences, earthen dikes, drainage swales, sediment traps, check dams, subsurface drains, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices within water bodies or wetlands may be subject to Section 404 of the CWA and may require a special permit and/or coordination with the Army Corps of Engineers.

The CGP requires that:

- *Part III.F.3(a)*
  For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, sediment basins that provide storage for a calculated

volume of runoff from a 2-year, 24-hour storm event must be provided where attainable.

- *Part III.F.3(a) and (b)*
  At a minimum (even for drainage locations that serve an area with less than 10 acres disturbed at one time) silt fences, vegetative buffer strips, or equivalent sediment controls are utilized for all **down slope** boundaries of the project site.

- *Part III.F.3(a) and (b)*
  At a minimum (even for drainage locations that serve an area with less than 10 acres disturbed at one time) silt fences, vegetative buffer strips, or equivalent sediment controls are utilized for all **side slope** boundaries deemed appropriate as dictated by individual site conditions.

The SWP3 must include a description of:

- *Part III.F.2*
  The general timing or sequence for BMP implementation.

- *Part III.F.3*
  Any control practices used to divert flows away from exposed soil.

- *Part III.F.3*
  Any control practices used to limit the contact of runoff with disturbed areas.

- *Part III.F.3*
  Any control practices used to lessen the offsite transport of eroded soils.

Other Controls

In addition to stabilization and structural control practices, the CGP also requires that:

- *Part III.F.2(a)(i)*
  Controls must be designed and utilized to reduce the transport of suspended sediments and other pollutants if necessary to pump or channel standing water from the site.

- *Part III.F.2(a)(v)*
  Controls developed to limit, to the extent practicable, offsite transport of litter, construction debris, and construction materials.

- *Part III.F.5(a)*
  Offsite vehicle tracking of sediments must be minimized.

- *Part III.F.5(a)*
  The generation of dust must be minimized.

- *Part III.F.5(d)*
  Velocity dissipation devices must be utilized along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics are maintained and protected.

The SWP3 must:

- *Part III.F.4*
  Include a description of any measures that will be installed during the construction process to control pollutants in storm water discharges that will occur *after* construction operations have been completed.

- *Part III.F.5(b)*
  Include a description of construction and waste materials expected to be stored onsite and a description of controls to reduce pollutants from these materials.

- *Part III.F.5(c)*
  Include a description of pollutant sources from areas other than construction and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

- *Part III.F.9*
  Identify and ensure the implementation of appropriate pollution prevention measures for all eligible non-storm water components of the discharge (see list of eligible non-storm water discharges in Section 10.1.1).

10.5 Inspections and Maintenance

Part III.F.7 of the CGP requires that all erosion and sediment control measures and other protective measures identified in the SWP3 be maintained in effective operating condition.

10.5.1 Areas to be inspected

Personnel performing the inspections should be properly trained in the CGP regulations. The CGP requires in *Part III.F.8 (a)* that the following areas inspected:

- Disturbed areas of the site that have not been finally stabilized.

- Areas used for storage of materials that are exposed to precipitation.

- Structural controls for evidence of, or the potential for, pollutants entering the drainage system.

- All erosion and sediment controls identified in the SWP3 to ensure that they are operating correctly.

- Locations where vehicles enter or exit the site for evidence of offsite vehicle tracking.

10.5.2 Frequency of Inspections

Part III.F.8 (a) of the CGP requires that inspections must be conducted by personnel familiar with the SWP3 according to one of the two following schedules, except as provided below:

- Once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

OR

- Once every 7 days, on a day specifically defined in the SWP3, regardless of whether or not there has been a rainfall event since the previous inspection.

Exceptions to the above described schedules follow:

- Inspection must be conducted at least once every month under the following circumstances:
  - Where sites have been temporarily or permanently stabilized.
  - Where runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists).
  - During seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches).

- Inspections must be conducted as soon as practicable in the event of flooding or other uncontrollable situations which prohibit access to the site.

10.5.3 Inspection Reports

An inspection report, as described in *Part III.F.8 (d)*, of the CGP must be made and retained as part of the SWP3. This documentation must be retained at least three years from the date that the site is finally stabilized. The inspection report must include:

- Names and qualifications of personnel making the inspection.

- Dates of the inspection.

- Major observations relating to the implementation of the SWP3, including the locations of:

- Discharges of sediment or other pollutants.
- BMPs that need to be maintained.
- BMPs that failed to operate as designed or that proved inadequate for a particular location.
- Where additional BMPs are needed.

Actions taken as a result of inspections must be described within and retained as part of the SWP3 for at least three years from the date that the site is finally stabilized. Reports must identify any incidents of non-compliance. When an inspection report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the SWP3 and the CGP.

The report must be signed by the person and in the manner required by 30 TAC § 305.128. Anyone who is authorized to sign NOIs and CSNs (see Section 10.3) may sign inspection reports themselves or delegate a representative to do so. Assistant Area Engineers, Maintenance Supervisors, Project Architects or Engineers down to Project Inspectors with overall responsibility for the project may be delegated in this manner. TxDOT has provided documentation to the Executive Director of TCEQ that individuals in the above listed positions are authorized to sign inspection reports. A copy of this memorandum and the transmittal letter to the TCEQ are to be kept with each project's SWP3 files. Districts and divisions may wish to restrict the delegations further; however, no actions outside of the district or division office are needed to document the restrictions.

30 TAC § 305.128 also requires any individual who signs inspection reports to sign a certification statement. This language must be included on all inspection reports and be signed by a person described above.

10.5.4 Maintenance of BMPs

The CGP requires that:

- *Part III.F.2(a)(ii)*
  Control measures must be installed and maintained according to the manufacturer's or designer's specifications.

- *Part III.F.2(a)(ii)*
  Controls must be replaced or modified as soon as practicable after discovery that the control has been used incorrectly, is performing inadequately, or is damaged.

- *Part III.F.2(a)(iii)*
  Sediment must be removed from sediment traps and sedimentation ponds no later than the time that design capacity has been reduced by 50%.

- *Part III.F.2(a)(iv)*
  If sediment escapes the site, accumulations must be removed at a frequency to minimize further negative effects and, whenever feasible, prior to the next rain event.

- *Part III.F.7*
  Maintenance must be performed before the next anticipated storm event or as necessary to maintain the continued effectiveness of storm water controls.

- *Part III.F.7*
  If maintenance before the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

- *Part III.F.7*
  Erosion and sediment controls that have been intentionally disabled, run-over, removed, or otherwise rendered ineffective must be replaced or corrected immediately upon discovery.

- *Part III.F.8(c)*
  If existing BMPs are modified or if additional BMPs are necessary, an implementation schedule must be described in the SWP3 and, wherever possible, those changes implemented before the next storm event.

10.6 Modifications to the SWP3

The SWP3 must be revised/updated/modified:

- *Part III.E.1*
  Whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants that has not been previously addressed in the SWP3.

- *Part III.E.2*
  Whenever inspections or investigations by site operators, local, state or federal officials indicate that the SWP3 is proving ineffective in eliminating or significantly minimizing pollutants from the construction site or otherwise is not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity.

- *Part III.F.8(c)*
  Based on the results of the inspections, as necessary, to better control pollutants in runoff. Revisions must be completed within 7 days following the inspection.

- *Part III.F.8(d)*
  To include actions taken as a result of inspections.

10.7 Record Keeping, Retention and Accessibility

TxDOT must retain copies of storm water pollution prevention plans and all reports required by this CGP, and records of all data used to complete the NOI for a period of at least three years from the date that the site is finally stabilized. This period may be extended by request at the request of the executive director of TCEQ (see 30 TAC § 319.7(c)).

The CGP requires that the SWP3 (including a copy of the CGP language) be retained **at the construction site** or, if the site is inactive or does not have an onsite location to store the plan, a notice must be posted describing the location of the SWP3. TxDOT and/or contractor personnel with day-to-day operational control over SWP3 implementation must have a copy of the SWP3 available at a central location onsite for the use of all operators and those identified as having responsibilities under the SWP3 whenever they are on the construction site.

The SWP3 must be made readily available at the time of an onsite inspection to: federal, state, or local official agency that approves sediment and erosion plans, grading plans, or storm water management plans; local government officials; and the operator of a municipal separate storm sewer receiving discharges from the site.

The CGP does not provide the public with any right to trespass on a construction site for any reason, including inspection of the site; nor does this CGP require the permittee to allow members of the public access to the construction site.

10.8 Terminating Permit Coverage

Each operator must submit a Notice of Termination (NOT) to TCEQ to terminate their CGP coverage. Compliance with the CGP is required until the NOT is submitted. The permittee's authorization to discharge under the CGP terminates at midnight of the day the NOT is postmarked. All permittee's must submit a NOT within 30 days after one or more of the following conditions have been met:

- Final stabilization has been achieved on all portions of the site for which the permittee is responsible.

OR

- Another operator/permittee has assumed control of all areas of the site that have not been finally stabilized.

Enforcement actions may be taken if a permittee submits a NOT without meeting one or more of these conditions.

10.9 Penalties for Permit Noncompliance or Violations

TxDOT personnel should be aware that we must comply with all applicable conditions of the CGP. Any permit non-compliance constitutes a violation of the Clean Water Act and is grounds for enforcement actions. Enforcement actions may include permit termination, revocation, denial or a permit renewal, monetary fines and/or imprisonment. The amount of the monetary fines varies, depending upon the type and severity of the penalty. The fines can be up to $10,000 per day, per violation (up to $27,500 per day) and/or imprisonment.

Statewide Erosion and Sediment Control Special Specifications and Standard Drawings Index

Special Specifications can be found at:

http://www.dot.state.tx.us/apps/specs/toc.asp?year=1&type=SS&list=all

Standard Drawings can be found at:

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm

Special Specification	Title	Standard Drawing (if applicable)	Notes
5004	Temporary Erosion, Sedimentation and Water Pollution Prevention and Control	EC(1)-93	
5005	Rock Filter Dams for Erosion and Sedimentation Control	EC(2)-93	Special Provision exists
5006	Temporary Pipe Slope Drains for Erosion and Sedimentation Control	EC(7)-93	
5007	Baled Hay for Erosion and Sedimentation Control	EC(1)-93	
5008	Temporary Paved Flumes for Erosion and Sedimentation Control	EC(8)-93	
5010	Construction Exits	EC(3)-93	Special Provision exists
5012	Earthwork for Erosion Control	EC(4)-93, EC(5)-93, EC(6)-93	
5013	Construction Perimeter Fence		
5014	Gabions and Gabion Mattresses		
5249	Temporary Sediment Control Fence	EC(1)-93	Replaces 5009
5145	Sandbags for Erosion Control		

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20022-Instructions).

TCEQ Office Use Only
TPDES Permit Number: TXR15*__*__*__*__* - NO
GIN Number: *__*__*__*__*__*__*__*__*

A. Construction Site Operator ☐ New ☐ No Change Customer Reference Number: CN_____

Name: _____

Mailing Address: _____ City: _____ State: ____ Zip Code: _____

Country Mailing Information (*if outside USA*) Territory: _____ Country Code: _____ Postal Code: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

Type of Operator: ☐ Individual ☐ Sole Proprietorship - D.B.A. ☐ Partnership ☐ Corporation ☐ Federal Government
☐ State Government ☐ County Government ☐ City Government ☐ Other: _____

Independent Operator? ☐ Yes ☐ No Number of Employees: ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 or higher

Federal Tax ID: _____ State Franchise Tax ID Number: _____ DUNS Number: _____

B. Billing Address

Name: _____

Mailing Address: _____ City: _____ State: ____ Zip Code: _____

Country Mailing Information (*if outside USA*) Territory: _____ Country Code: _____ Postal Code: _____

C. Project / Site Information ☐ New ☐ No Change Regulated Entity Reference Number: RN_____

Name: _____

Mailing Address: _____ City: _____ State: ____ Zip Code: _____

Physical Address: _____ City: _____ County: -- _____ Zip Code: _____

Location Access Description: _____

Latitude: ___ ° ___ ' ___ " N Longitude: ___ ° ___ ' ___ " W Degrees (°), Minutes ('), and Seconds (")

Latitude: _____ Longitude: – _____ Decimal Form

Standard Industrial Classification (SIC) code: _____ Also, describe the construction activity at this site *(do not repeat the SIC code)*:

_____

Has a storm water pollution prevention plan been prepared as specified in the general permit (TXR150000)? ☐ Yes ☐ No

Estimated area of land disturbed (to the nearest acre): _____ Is the project / site located on Indian Country Lands? ☐ Yes ☐ No

Does this project / site discharge storm water into a municipal separate storm sewer system (MS4)? ☐ Yes ☐ No

If yes, provide the name of the MS4 operator: _____

Provide the name or segment number of the water body that receives storm water from this project / site: _____

D. Contact - If the TCEQ needs additional information regarding this application, who should be contacted?

Name: _____ Title: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

E. Payment Information - Check / Money Order Number: _____ Name on Check / Money Order: _____

F. Certification

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Construction Site Operator Representative:

Prefix: _____ First: _____ Middle: _____

Last: _____ Suffix: _____ Title: _____

Signature: _____ Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671.
Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOI must be mailed to the following address. Use the attached document to submit the $100 application fee. Please note that the NOI and application fee are submitted separately to different addresses.

Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087

Texas Commission on Environmental Quality
Payment Submittal Form

The storm water application fee shall be sent under separate cover to the Texas Commission on Environmental Quality.

This form must be used to submit your Storm Water Application Fee. Please complete the following information, staple your check in the space provided at the bottom of this document, and mail it to:

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, TX 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, TX 78753

Fee Code: GPA

Storm Water General Permit: TXR150000

Check / Money Order No: _____ Amount of Check/Money Order: _____

Date of Check or Money Order: _____

Name on Check or Money Order: _____

Facility / Site Name: _____

Facility / Site Physical Address: _____

City: _____ Zip Code: _____

Staple Check In This Space

CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program

TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: (Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	
Location of Storm Water Pollution Prevention Plan :	

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

_____ _____

Signature and Title Date

Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

TCEQ Office Use Only
TPDES Permit Number: TXR15*__*__*__*__* - NO
GIN Number: *__*__*__*__*__*__*__*__*

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20023-Instructions).

A. TPDES Permit Number: TXR15_____

B. Construction Site Operator Customer Reference Number: CN _____

Name: _____

Mailing Address: _____

City: _____ State: Zip Code: _____

Country Mailing Information (*if outside USA*) Territory: _____ Country Code: _____ Postal Code: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

C. Project / Site Information Regulated Entity Reference Number: RN _____

Name: _____

Physical Address: _____

Location Access Description: _____

City: _____ County: -- _____ Zip Code: _____

D. Contact - If the TCEQ needs additional information regarding this termination, who should be contacted?

Name: _____ Title: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

E. Certification

I certify under penalty of law that authorization under the TPDES Construction General Permit (TXR150000) is no longer necessary based on the provisions of the general permit. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with construction activity under the general permit TXR150000, and that discharging pollutants in storm water associated with construction activity to waters of the U.S. is unlawful under the Clean Water Act where the discharge is not authorized by a TPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Construction Site Operator Representative:

Prefix: _____ First: _____ Middle: _____

Last: _____ Suffix: _____

Title: _____

Signature: _____ Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671. Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOT must be mailed to the following address:

Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087

TPDES General Permit
NO. TXR150000

This is a new general permit issued pursuant to Section 26.040 of the Texas Water Code and Section 402 of the Clean Water Act.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. BOX 13087
Austin, TX 78711-3087

GENERAL PERMIT TO DISCHARGE WASTE
under provisions of
Section 402 of the Clean Water Act
and Chapter 26 of the Texas Water Code

Construction sites located in the state of Texas

may discharge to surface water in the state

only according to effluent limitations, monitoring requirements and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this general permit does not grant to the permittee the right to use private or public property for conveyance of storm water and certain non-storm water discharges along the discharge route. This includes property belonging to but not limited to any individual, partnership, corporation or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit and the authorization contained herein shall expire at midnight five years after the date of issuance.

ISSUED AND EFFECTIVE DATE:

_____
For the Commission

Table of Contents

Part I. Definitions

Best Management Practices - (BMPs) Schedules of activities, prohibitions of practices, maintenance procedures, structural controls, local ordinances, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spills or leaks, waste disposal, or drainage from raw material storage areas.

Commencement of Construction - The exposure of soils resulting from activities such as clearing, grading, and excavating.

Common Plan of Development - A construction activity that is completed in separate stages, separate phases, or in combination with other construction activities. A common plan of development is identified by the documentation for the construction project that identifies the scope of the project, and may include plats, blueprints, marketing plans, contracts, building permits, a public notice or hearing, zoning requests, or other similar documentation and activities.

Facility or Activity - Any TPDES "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the TPDES program.

Final Stabilization - A construction site status where either of the following conditions are met:

(a) All soil disturbing activities at the site have been completed and a uniform (e.g, evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or goetextiles) have been employed.

(b) For individual lots in a residential construction site by either:

(1) the homebuilder completing final stabilization as specified in condition (a) above; or

(2) the homebuilder establishing temporary stabilization for an individual lot prior to the time of transfer of the ownership of the home to the buyer and after informing the homeowner of the need for, and benefits of, final stabilization.

(c) For construction activities on land used for agricultural purposes (e.g. pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to a surface water and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization conditions of condition (a) above.

Large Construction Activity - Construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than five (5) acres of land. Large construction activity also includes the disturbance of less than five (5) acres of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than five (5) acres of land. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance. Large construction activity does not include the routine grading of existing dirt roads, asphalt overlays of existing roads, the routine clearing of existing right-of-ways, and similar maintenance activities.

Municipal Separate Storm Sewer System (MS4) - A separate storm sewer system owned or operated by a state, city, town, county, district, association, or other public body (created by or pursuant to state law) having jurisdiction over the disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law such as a sewer district, flood control or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization.

Notice of Intent (NOI) - A written submission to the executive director from an applicant requesting coverage under a general permit.

Notice of Termination (NOT) - A written submission to the executive director from a permittee authorized under a general permit requesting termination of coverage.

Operator - The person or persons associated with a large or small construction activity that meets either of the following two criteria:

(a) the person or persons have operational control over construction plans and specifications to the extent necessary to meet the requirements and conditions of this general permit; or

(b) the person or persons have day-to-day operational control of those activities at a construction site which are necessary to ensure compliance with a storm water pollution prevention plan for the site or other permit conditions (e.g. they are authorized to direct workers at a site to carry out activities required by the Storm Water Pollution Prevention Plan or comply with other permit conditions).

Permittee - An operator authorized under this general permit. The authorization may be gained through submission of a notice of intent, by waiver, or by meeting the requirements for automatic coverage to discharge storm water runoff and certain non-storm water discharges.

Point Source - Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are, or may be, discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Pollutant - (from the Texas Water Code, Chapter 26) Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, filter backwash, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into any surface water in the state. The term "pollutant" does not include tail water or runoff water from irrigation or rainwater runoff from cultivated or uncultivated rangeland, pastureland, and farmland.

Pollution - (from the Texas Water Code, Chapter 26) The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any surface water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Runoff Coefficient - The fraction of total rainfall that will appear at the conveyance as runoff.

Separate Storm Sewer System - A conveyance or system of conveyances (including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains), designed or used for collecting or conveying storm water; that is not a combined sewer, and that is not part of a publicly owned treatment works (POTW).

Small Construction Activity - Construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one (1) acre and less than five (5) acres of land. Small construction activity also includes the disturbance of less than one (1) acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one (1) and less than five (5) acres of land. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance. Small construction activity does not include the routine grading of existing dirt roads, asphalt overlays of existing roads, the routine clearing of existing right-of-ways, and similar maintenance activities.

Storm Water - Storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm Water Associated with Construction Activity - Storm water runoff from a construction activity where soil disturbing activities (including clearing, grading, excavating) result in the disturbance of one (1) or more acres of total land area, or are part of a larger common plan of development or sale that will result in disturbance of one (1) or more acres of total land area.

Structural Control (or Practice) - A pollution prevention practice that requires the construction of a device, or the use of a device, to capture or prevent pollution in storm water runoff. Structural controls and practices may include but are not limited to: silt fences, earthen dikes, drainage swales, sediment traps, check dams, subsurface drains, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins.

Surface Water in the State - Lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, wetlands, marshes, inlets, canals, the Gulf of Mexico inside the territorial limits

of the state (from the mean high water mark (MHWM) out 10.36 miles into the Gulf), and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or nonnavigable, and including the beds and banks of all water-courses and bodies of surface water, that are wholly or partially inside or bordering the state or subject to the jurisdiction of the state; except that waters in treatment systems which are authorized by state or federal law, regulation, or permit, and which are created for the purpose of waste treatment are not considered to be water in the state.

Temporary Stabilization - A condition where exposed soils or disturbed areas are provided a protective cover, which may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place.

Waters of the United States - (from title 40, part122, section 2 of the Code of Federal Regulations) Waters of the United States or waters of the U.S. means:

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

(b) all interstate waters, including interstate wetlands;

(c) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds that the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

  (1) which are or could be used by interstate or foreign travelers for recreational or other purposes;

  (2) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

  (3) which are used or could be used for industrial purposes by industries in interstate commerce;

(d) all impoundments of waters otherwise defined as waters of the United States under this definition;

(e) tributaries of waters identified in paragraphs (a) through (d) of this definition;

(f) the territorial sea; and

(g) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR § 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

Part II. Permit Applicability and Coverage

Section A. Discharges Eligible for Authorization

1. Storm Water Associated with Construction Activity

   Discharges of storm water runoff from small and large construction activities may be authorized under this general permit.

2. Discharges of Storm Water Associated with Construction Support Activities

   Discharges of storm water runoff from construction support activities, including concrete batch plants, asphalt batch plants, equipment staging areas, material storage yards, material borrow areas, and excavated material disposal areas may be authorized under this general permit provided:

   (a) the activity is located within a 1-mile distance from the boundary of the permitted construction site and directly supports the construction activity;

   (b) the storm water pollution prevention plan is developed according to the provisions of this general permit and includes appropriate controls and measures to reduce erosion and discharge of pollutants in storm water runoff from the supporting industrial activity site; and

   (c) the industrial activity either does not operate beyond the completion date of the construction activity or obtains separate TPDES authorization for discharges.

3. Non-storm Water Discharges

   The following non-storm water discharges from sites authorized under this general permit are also eligible for authorization under this general permit:

   (a) discharges from fire fighting activities;

(b) fire hydrant flushings;

(c) vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless spilled materials have been removed; and if local state, or federal regulations are applicable, the materials are removed according to those regulations), and where the purpose is to remove mud, dirt, an dust;

(d) water used to control dust;

(e) potable water sources including waterline flushings;

(f) air conditioning condensate;

(g) uncontaminated ground water or spring water, including foundation or footing drains where flows are not contaminated with industrial materials such as solvents.

4. Other Permitted Discharges

Any discharge authorized under a separate NPDES, TPDES, or TCEQ permit may be combined with discharges authorized by this permit.

Section B. Limitations on Permit Coverage

1. Post Construction Discharges.

Discharges that occur after construction activities have been completed, and after the construction site and any supporting activity site have undergone final stabilization, are not eligible for coverage under this general permit. Discharges originating from the sites are not authorized under this general permit following the submission of the notice of termination (NOT) for the construction activity.

2. Prohibition of Non-Storm Water Discharges

Except as provided in Part II. A.2., A3., and A4., all discharges authorized by this general permit must be composed entirely of storm water associated with construction activity.

3. Compliance With Water Quality Standards

Discharges to surface water in the state that would cause or contribute to a violation of water quality standards or that would fail to protect and maintain existing designated uses are not eligible for coverage under this general permit. The executive director may require an application for an individual permit or alternative

general permit (see Part II.G.3) to authorize discharges to surface water in the state from any activity that is determined to cause a violation of water quality standards or is found to cause, or contribute to, the loss of a designated use. The executive director may also require an application for an individual permit considering factors described in Part II. G.2.

4. Discharges to Water Quality-Impaired Receiving Waters.

New sources or new discharges of the constituents of concern to impaired waters are not authorized by this permit unless otherwise allowable under 30 TAC Chapter 305 and applicable state law. Impaired waters are those that do not meet applicable water quality standards and are listed on the EPA approved Clean Water Act Section 303(d) list. Constituents of concern are those for which the water body is listed as impaired.

Discharges of the constituents of concern to impaired water bodies for which there is a total maximum daily load (TMDL) implementation plan are not eligible for this permit unless they are consistent with the approved TMDL and the implementation plan. Permittees must incorporate the limitations, conditions, and requirements applicable to their discharges, including monitoring frequency and reporting required by TCEQ rules, into their storm water pollution prevention plan in order to be eligible for coverage under this general permit.

5. Discharges to the Edwards Aquifer Recharge Zone

Discharges cannot be authorized by this general permit where prohibited by 30 Texas Administrative Code (TAC) Chapter 213 (relating to Edwards Aquifer).

(a) For new discharges located within the Edwards Aquifer Recharge Zone, or within that area upstream from the recharge zone and defined as the Contributing Zone, operators must meet all applicable requirements of, and operate according to, 30 TAC Chapter 213 (Edwards Aquifer Rule) in addition to the provisions and requirements of this general permit.

(b) For existing discharges, the requirements of the agency-approved Water Pollution Abatement Plan under the Edwards Aquifer Rules are in addition to the requirements of this general permit. BMPs and maintenance schedules for structural storm water controls, for example, may be required as a provision of the rule. All applicable requirements of the Edwards Aquifer Rule for reductions of suspended solids in storm water runoff are in addition to the requirements in this general permit for this pollutant. For discharges from large construction activities located on the Edwards Aquifer contributing zone, applicants must also submit a copy of the NOI to the appropriate TCEQ regional office."

Counties:	Contact:
Comal, Bexar, Medina, Uvalde, and Kinney	TCEQ Water Program Manager San Antonio Regional Office 14250 Judson Rd. San Antonio, Texas (210) 490-3096
Williamson, Travis, and Hays	TCEQ Water Program Manager Austin Regional Office 1921 Cedar Bend Dr., Ste. 150 Austin, Texas (512) 339-2929.

6. Discharges to Specific Watersheds and Water Quality Areas

Discharges otherwise eligible for coverage cannot be authorized by this general permit where prohibited by 30 TAC Chapter 311 (relating to Watershed Protection) for water quality areas and watersheds.

7. Protection of Streams and Watersheds by Other Governmental Entities

This general permit does not limit the authority or ability of federal, other state, or local governmental entities from placing additional or more stringent requirements on construction activities or discharges from construction activities. For example, this permit does not limit the authority of a home-rule municipality provided by Section 401.002 of the Texas Local Government Code.

8. Indian Country Lands

Storm water runoff from construction activities occurring on Indian Country lands are not under the authority of the TCEQ and are not eligible for coverage under this general permit. If discharges of storm water require authorization under federal National Pollutant Discharge Elimination System (NPDES) regulations, authority for these discharges must be obtained from the U.S. Environmental Protection Agency (EPA).

9. Oil and Gas Production

Storm water runoff from construction activities associated with the exploration, development, or production of oil or gas or geothermal resources, including transportation of crude oil or natural gas by pipeline, are not under the authority of the TCEQ and are not eligible for coverage under this general permit. If discharges

of storm water require authorization under federal NPDES regulations, authority for these discharges must be obtained from the EPA.

10. Storm Water Discharges from Agricultural Activities

Storm water discharges from agricultural activities that are not point source discharges of storm water are not subject to TPDES permit requirements. These activities may include clearing and cultivating ground for crops, construction of fences to contain livestock, construction of stock ponds, and other similar agricultural activities.

Section C. Deadlines for Obtaining Authorization to Discharge

1. Large Construction Activities

(a) New Construction - Discharges from sites where the commencement of construction occurs on or after the issuance date of this general permit must be authorized, either under this general permit or a separate TPDES permit, prior to the commencement of those construction activities.

(b) Ongoing Construction - Operators of large construction activities continuing to operate after the issuance date of this permit, and authorized under NPDES general permit TXR100000 (issued July 6, 1998, FR 36490), must submit an NOI to obtain authorization under this general permit within 90 days of the issuance date of this general permit. During this interim period, as a requirement of this TPDES permit, the operator must continue to meet the conditions and requirements of the federal NPDES permit. If the construction activity is completed prior to this 90-day deadline, and the site would otherwise qualify for termination of coverage under that federal NPDES permit, the operator must notify the executive director of the TCEQ in writing within 30 days of that condition.

2. Small Construction Activities

(a) New Construction - Discharges from sites where the commencement of construction occurs on or after the issuance date of this general permit must be authorized, either under this general permit or a separate TPDES permit, prior to the commencement of those construction activities.

(b) Ongoing Construction - Discharges from ongoing small construction activities that commenced prior to March 10, 2003, and that would not meet the conditions to qualify for termination of this permit as described in Part II.E. of this general permit, must be authorized, either under this general permit or a separate TPDES permit, prior to March 10, 2003.

Section D. Obtaining Authorization to Discharge

1. Small construction activities are determined to occur during periods of low potential for erosion, and operators of these sites may be automatically authorized under this general permit and not required to develop a storm water pollution prevention plan or submit a notice of intent (NOI), provided:

   (a) the construction activity occurs in a county listed in Appendix A;

   (b) the construction activity is initiated and completed, including either final or temporary stabilization of all disturbed areas, within the time frame identified in Appendix A for the location of the construction site;

   (c) all temporary stabilization is adequately maintained to effectively reduce or prohibit erosion, final stabilization activities have been initiated and a condition, of final stabilization is completed no later than 30 days following the end date of the time frame identified in Appendix A for the location of the construction site;

   (d) the permittee signs a completed construction site notice (Attachment 1 of this general permit), including the certification statement;

   (e) a signed copy of the construction site notice is posted at the construction site in a location where it is readily available for viewing by the general public, local, state, and federal authorities prior to commencing construction activities, and maintained in that location until completion of the construction activity;

   (f) a copy of the signed and certified construction site notice is provided to the operator of any municipal separate storm sewer system receiving the discharge at least two days prior to commencement of construction activities; and

   (g) any supporting concrete batch plant or asphalt batch plant is separately authorized for discharges of storm water runoff or other non-storm water discharges under an individual TPDES permit, another TPDES general permit or under an individual TCEQ permit where storm water and non-storm water is disposed of by evaporation or irrigation (discharges are adjacent to water in the state).

2. Operators of small construction activities not described in Part II.D.1. above may be automatically authorized under this general permit, and operators of these sites are not required to submit an NOI provided they:

   (a) develop a SWP3 according to the provisions of this general permit, that covers either the entire site or all portions of the site for which the applicant

is the operator, and implement that plan prior to commencing construction activities;

(b) sign a completed construction site notice (Attachment 2 of this general permit);

(c) post a signed copy of the construction site notice at the construction site in a location where it is readily available for viewing by the general public, local, state, and federal authorities, prior to commencing construction activities, and maintain the notice in that location until completion of the construction activity; and

(d) provide a copy of the signed and certified construction site notice to the operator of any municipal separate storm sewer system receiving the discharge at least two days prior to commencement of construction activities.

3. Operators of all other construction activities that qualify for coverage under this general permit must:

(a) develop a SWP3 according to the provisions of this general permit, that covers either the entire site or all portions of the site for which the applicant is the operator, and implement that plan prior to commencing construction activities;

(b) submit a Notice of Intent (NOI), using a form provided by the executive director, at least 2 days prior to commencing construction activities; or

(c) if the operator changes, or an additional operator is added after the initial NOI is submitted, the new operator must submit an NOI at least two (2) days before assuming operational control;

(d) post a copy of the NOI at the construction site in a location where it is readily available for viewing prior to commencing construction activities, and maintain the notice in that location until completion of the construction activity;

(e) provide a copy of the signed NOI to the operator of any municipal separate storm sewer system receiving the discharge, at least two (2) days prior to commencing construction activities; and

(f) implement the SWP3 prior to beginning construction activities.

4. Effective Date of Coverage

(a) Operators of construction activities described in either Part II. D.1. or D.2. are authorized immediately following compliance with the conditions of Part II. D.1. or D.2. that are applicable to the construction activity.

(b) Operators of all other construction activities eligible for coverage under this general permit, unless otherwise notified by the executive director, are provisionally authorized two (2) days from the date that a completed NOI is postmarked for delivery to the TCEQ. If electronic submission of the NOI is provided, and unless otherwise notified by the executive director, operators are provisionally authorized 24 hours following confirmation of receipt of the NOI by the TCEQ. Authorization is non-provisional when the executive director finds the NOI is administratively complete and an authorization number is issued for the activity.

(c) Operators are not prohibited from submitting late NOIs or posting late notices to obtain authorization under this general permit. The TCEQ reserves the right to take appropriate enforcement actions for any unpermitted activities that may have occurred between the time construction commenced and authorization is obtained.

5. Notice of Change (NOC) Letter

If the operator becomes aware that it failed to submit any relevant facts, or submitted incorrect information in an NOI, the correct information must be provided to the executive director in a NOC letter within 14 days after discovery. If relevant information provided in the NOI changes, a NOC letter must be submitted within 14 days of the change. A copy of the NOC must be provided to the operator of any MS4 receiving the discharge.

6. Signatory Requirement for NOI Forms, Notice of Termination (NOT) Forms, NOC Letters, and Construction Site Notices

NOI forms, NOT forms, NOC letters, and Construction Site Notices must be signed according to 30 TAC § 305.44 (relating to Application for Permit).

7. Contents of the NOI

The NOI form shall require, at a minimum, the following information:

(a) the name, address, and telephone number of the operator filing the NOI for permit coverage;

(b) the name (or other identifier), address, county, and latitude/longitude of the construction project or site;

(c) number of acres that will be disturbed (estimated to the largest whole number);

(d) whether the project or site is located on Indian Country lands;

(e) confirmation that a SWP3 has been developed and that the SWP3 will be compliant with any applicable local sediment and erosion control plans; and

(f) name of the receiving water(s).

Section E. Application to Terminate Coverage

Each operator that has submitted an NOI for authorization under this general permit must apply to terminate that authorization following the conditions described in this section of the general permit. Authorization must be terminated by submitting a Notice of Termination (NOT) on a form supplied by the executive director. Authorization to discharge under this permit terminates at midnight on the day the NOT is postmarked for delivery to the TCEQ. If electronic submission of the NOT is provided, authorization to discharge under this permit terminates immediately following confirmation of receipt of the NOT by the TCEQ. Compliance with the conditions and requirements of this permit is required until an NOT is submitted.

1. Notice of Termination Required

The NOT must be submitted to TCEQ, and a copy of the NOT provided to the operator of any MS4 receiving the discharge, within thirty (30) days, after:

(a) final stabilization has been achieved on all portions of the site that is the responsibility of the permittee: or

(b) another permitted operator has assumed control over all areas of the site that have not been finally stabilized; and

(c) all silt fences and other temporary erosion controls have either been removed, scheduled for removal as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage. Erosion controls that are designed to remain in place for an indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal.

2. Minimum Contents of the NOT

The NOT form shall require, at a minimum, the following information:

(a) if authorization was granted following submission of a NOI, the permittees site-specific TPDES general permit number for the construction site;

(b) an indication of whether the construction activity is completed or if the permittee is simply no longer an operator at the site;

(c) the name, address and telephone number of the permittee submitting the NOT;

(d) the name (or other identifier), address, county, and latitude/longitude of the construction project or site; and

(e) a signed certification that either all storm water discharges requiring authorization under this general permit will no longer occur, or that the applicant to terminate coverage is no longer the operator of the facility or construction site, and that all temporary structural erosion controls have either been removed, will be removed on a schedule defined in the SWP3, or transferred to a new operator if the new operator has applied for permit coverage. Erosion controls that are designed to remain in place for an indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal.

Section F. Waivers from Coverage

The executive director may waive the otherwise applicable requirements of this general permit for storm water discharges from small construction activities under the terms and conditions described in this section.

1. Waiver Applicability and Coverage

Operators of small construction activities may apply for and receive a waiver from the requirements to obtain authorization under this general permit where:

(a) the calculated rainfall erosivity R factor for the entire period of the construction project is less than five (5);

(b) the operator submits a signed waiver certification form, supplied by the executive director, certifying that the construction activity will commence and be completed within a period when the value of the calculated rainfall erosivity R factor is less than five (5); and

(c) the waiver certification form is submitted to the TCEQ at least two (2) days before construction activity begins.

2. Effective Date of Waiver

Operators of small construction activities are provisionally waived from the otherwise applicable requirements of this general permit two (2) days from the date that a completed waiver certification form is postmarked for delivery to TCEQ.

3. Activities Extending Beyond the Waiver Period

If a construction activity extends beyond the approved waiver period due to circumstances beyond the control of the operator, the operator must either:

(a) recalculate the rainfall erosivity factor R factor using the original start date and a new projected ending date, and if the R factor is still under five (5), submit a new waiver certification form at least two (2) days before the end of the original waiver period; or

(b) obtain authorization under this general permit according to the requirements delineated in either Part II.D.2. or Part II.D.3. at least two (2) days before the end of the approved waiver period.

Section G. Alternative TPDES Permit Coverage

1. Individual Permit Alternative

Any discharge eligible for coverage under this general permit may alternatively be authorized under an individual TPDES permit according to 30 TAC Chapter 305 (relating to Consolidated Permits). Applications for individual permit coverage should be submitted at least three hundred and thirty (330) days prior to commencement of construction activities to ensure timely issuance.

2. Individual Permit Required

The executive director may suspend an authorization or NOI in accordance with the procedures set forth in 30 TAC Chapter 205, including the requirement that the executive director provide written notice to the permittee. The executive director may require an operator of a construction site, otherwise eligible for authorization under this general permit, to apply for an individual TPDES permit because of:

(a) the conditions of an approved TMDL or TMDL implementation plan;

(b) the activity is determined to cause a violation of water quality standards or is found to cause, or contribute to, the loss of a designated use of surface water in the state: and

(c) any other considerations defined in 30 TAC Chapter 205 would include the provision at 30 TAC § 205.4(c)(3)(D), which allows TCEQ to deny authorization under the general permit and require an individual permit if a discharger "has been determined by the executive director to have been out of compliance with any rule, order, or permit of the commission, including non-payment of fees assessed by the executive director."

3. Any discharge eligible for authorization under this general permit may alternatively be authorized under a separate, applicable general permit according to 30 TAC Chapter 205 (relating to General Permits for Waste Discharges).

Section H. Permit Expiration

This general permit shall be issued for a term not to exceed five (5) years. Following public notice and comment, as provided by 30 TAC § 205.3 (relating to Public Notice, Public Meetings, and Public Comment), the commission may amend, revoke, cancel, or renew this general permit. If the TCEQ publishes a notice of its intent to renew or amend this general permit before the expiration date, the permit will remain in effect for existing, authorized, discharges until the commission takes final action on the permit. Upon issuance of a renewed or amended permit, permittees may be required to submit an NOI within 90 days following the effective date of the renewed or amended permit, unless that permit provides for an alternative method for obtaining authorization.

In the event that the general permit is not renewed, discharges that are authorized under the general permit must obtain either a TPDES individual permit or coverage under an alternative general permit.

Part III. Storm Water Pollution Prevention Plans (SWP3)

Storm water pollution prevention plans must be prepared for storm water discharges that will reach Waters of the United States, including discharges to MS4 systems and privately owned separate storm sewer systems that drain to Waters of the United States, to identify and address potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project. The SWP3 must describe and ensure the implementation of practices that will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and assure compliance with the terms and conditions of this permit.

Individual operators at a site may develop separate SWP3s that cover only their portion of the project provided reference is made to the other operators at the site. Where there is more than one SWP3 for a site, permittees must coordinate to ensure that BMPs and controls are consistent, and do not negate or impair the effectiveness of each other. Regardless of whether a single comprehensive SWP3 is developed, or separate SWP3s are developed for each operator, it is the responsibility of each operator to ensure that compliance with the terms and conditions of this general permit is met in the areas of the construction site where that operator has operational control over construction plans and specifications or day-to-day operational control.

Section A. Shared SWP3 Development

For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site is encouraged. Operators must independently submit an NOI and obtain authorization, but may work together to prepare and implement a single comprehensive SWP3 for the entire construction site.

1. The SWP3 must clearly list the name and, for large construction activities, the general permit authorization numbers, for each operator that participates in the shared SWP3. Until the TCEQ responds to receipt of the NOI with a general permit authorization number, the SWP3 must specify the date that the NOI was submitted to TCEQ by each operator. Each participant in the shared plan must also sign the SWP3.

2. The SWP3 must clearly indicate which operator is responsible for satisfying each shared requirement of the SWP3. If the responsibility for satisfying a requirement is not described in the plan, then each permittee is entirely responsible for meeting the requirement within the boundaries of the construction site where they perform construction activities. The SWP3 must clearly describe responsibilities for meeting each requirement in shared or common areas.

Section B. Responsibilities of Operators

1. Operators with Control Over Construction Plans and Specifications

   All operators with operational control over construction plans and specifications to the extent necessary to meet the requirements and conditions of this general permit must:

   (a) ensure the project specifications allow or provide that adequate BMPs may be developed to meet the requirements of Part III of this general permit;

   (b) ensure that the SWP3 indicates the areas of the project where they have operational control over project specifications (including the ability to make modifications in specifications);

   (c) ensure all other operators affected by modifications in project specifications are notified in a timely manner such that those operators may modify best management practices as are necessary to remain compliant with the conditions of this general permit; and

   (d) ensure that the SWP3 for portions of the project where they are operators indicates the name and TPDES permit numbers for permittees with the day-to-day operational control over those activities necessary to ensure compliance with the SWP3 and other permit conditions. In the case that responsible parties have not been identified, the permittee with operational control over project specifications must be considered to be the responsible party until such time as the authority is transferred to another party and the plan is updated.

2. Operators with Day-to-Day Operational Control

Operators with day-to-day operational control of those activities at a project that are necessary to ensure compliance with a SWP3 and other permit conditions must:

(a) ensure that the SWP3 for portions of the project where they are operators meets the requirements of this general permit;

(b) ensure that the SWP3 identifies the parties responsible for implementation of best management practices described in the plan;

(c) ensure that the SWP3 indicates areas of the project where they have operational control over day-to-day activities;

(d) ensure that the SWP3 indicates, for areas where they have operational control over day-to-day activities, the name and TPDES permit number of the parties with operational control over project specifications (including the ability to make modifications in specifications).

Section C. Deadlines for SWP3 Preparation and Compliance

1. The SWP3 must be:

(a) completed prior to obtaining authorization under this general permit;

(b) implemented prior to commencing construction activities that result in soil disturbance;

(c) updated as necessary to reflect the changing conditions of new operators, new areas of responsibility, and changes in best management practices; and

(d) prepared so that it provides for compliance with the terms and conditions of this general permit.

Section D. Plan Review and Making Plans Available

1. The SWP3 must be retained on-site at the construction site or, if the site is inactive or does not have an on-site location to store the plan, a notice must be posted describing the location of the SWP3. The SWP3 must be made readily available at the time of an on-site inspection to: the executive director; a federal, state, or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; and the operator of a municipal separate storm sewer receiving discharges from the site.

2. Operators of a large construction activity obtaining authorization to discharge through submission of a NOI must post a notice near the main entrance of the

construction site. If the construction project is a linear construction project (e.g. pipeline, highway, etc.), the notice must be placed in a publicly accessible location near where construction is actively underway. Notice for these linear sites may be relocated, as necessary, along the length of the project. The notice must be readily available for viewing by the general public, local, state, and federal authorities, and contain the following information:

(a) the TPDES general permit number for the project (or a copy of the NOI that was submitted to the TCEQ if a permit number has not yet been assigned);

(b) the name and telephone number of a representative for the operator;

(c) a brief description of the project; and

(d) the location of the SWP3.

3. This permit does not provide the general public with any right to trespass on a construction site for any reason, including inspection of a site; nor does this permit require that permittees allow members of the general public access to a construction site.

Section E. Keeping Plans Current

The permittee must revise or update the storm water pollution prevention plan whenever:

1. there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants and that has not been previously addressed in the SWP3; or

2. results of inspections or investigations by site operators, operators of a municipal separate storm sewer system receiving the discharge, authorized TCEQ personnel, or a federal, state or local agency approving sediment and erosion plans indicate the SWP3 is proving ineffective in eliminating or significantly minimizing pollutants in discharges authorized under this general permit.

Section F. Contents of SWP3

The SWP3 must include, at a minimum, the information described in this section.

1. A site description, or project description must be developed to include:

(a) a description of the nature of the construction activity, potential pollutants and sources;

(b) a description of the intended schedule or sequence of major activities that will disturb soils for major portions of the site;

(c) the total number of acres of the entire property and the total number of acres where construction activities will occur, including off-site material storage areas, overburden and stockpiles of dirt, and borrow areas;

(d) data describing the soil or the quality of any discharge from the site;

(e) a map showing the general location of the site (e.g. a portion of a city or county map);

(f) a detailed site map (or maps) indicating the following:

(i) drainage patterns and approximate slopes anticipated after major grading activities;

(ii) areas where soil disturbance will occur;

(iii) locations of all major structural controls either planned or in place;

(iv) locations where stabilization practices are expected to be used;

(v) locations of off-site material, waste, borrow, fill, or equipment storage areas;

(vi) surface waters (including wetlands) either adjacent or in close proximity; and

(vii) locations where storm water discharges from the site directly to a surface water body.

(g) the location and description of asphalt plants and concrete plants providing support to the construction site and authorized under this general permit;

(h) the name of receiving waters at or near the site that will be disturbed or that will receive discharges from disturbed areas of the project; and

(i) a copy of this TPDES general permit.

2. The SWP3 must describe the best management practices that will be used to minimize pollution in runoff. The description must identify the general timing or sequence for implementation. At a minimum, the description must include the following components:

(a) Erosion and Sediment Controls

(i) Erosion and sediment controls must be designed to retain sediment on-site to the extent practicable with consideration for local

topography, soil type, and rainfall. Controls must also be designed and utilized to reduce the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water from the site.

(ii) Control measures must be properly selected, installed, and maintained according to the manufacturer's or designer's specifications. If periodic inspections or other information indicates a control has been used incorrectly, or that the control is performing inadequately, the operator must replace or modify the control as soon as practicable after discovery that the control has been used incorrectly, is performing inadequately, or is damaged.

(iii) Sediment must be removed from sediment traps and sedimentation ponds no later than the time that design capacity has been reduced by 50%.

(iv) If sediment escapes the site, accumulations must be removed at a frequency to minimize further negative effects, and whenever feasible, prior to the next rain event.

(v) Controls must be developed to limit, to the extent practicable, offsite transport of litter, construction debris, and construction materials.

(b) Stabilization Practices

The SWP3 must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where it is possible.

(i) Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing trees and vegetation, and other similar measures.

(ii) The following records must be maintained and either attached to or referenced in the SWP3, and made readily available upon request to the parties in Part III.D.1 of this general permit:

(a) the dates when major grading activities occur;

(b) the dates when construction activities temporarily or permanently cease on a portion of the site; and

(c) the dates when stabilization measures are initiated.

(iii) Stabilization measures must be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, and except as provided in (a) through (c) below, must be initiated no more than fourteen (14) days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a) Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.

(b) Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within twenty-one (21) days, temporary stabilization measures do not have to be initiated on that portion of site.

(c) In arid areas (areas with an average rainfall of 0 to 10 inches), semiarid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonably arid conditions, stabilization measures must be initiated as soon as practicable.

3. Structural Control Practices

The SWP3 must include a description of any structural control practices used to divert flows away from exposed soils, to limit the contact of runoff with disturbed areas, or to lessen the off-site transport of eroded soils.

(a) Sediment basins are required, where feasible for common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2-year, 24-hour storm from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where rainfall data is not available or a calculation cannot be performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained is required where attainable until final stabilization of the site. When calculating the volume of runoff from a 2-year, 24-hour storm event, it is not required to include the flows from offsite areas and flow from onsite areas that are either undisturbed or have already undergone final stabilization, if

these flows are diverted around both the disturbed areas of the site and the sediment basin. In determining whether installing a sediment basin is feasible, the permittee may consider factors such as site soils, slope, available area on site, public safety, precipitation patterns, site geometry, site vegetation, infiltration capacity, geotechnical factors, depth to groundwater and other similar considerations. Where sediment basins are not feasible, equivalent control measures , which may include a series of smaller sediment basins, must be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area.

(b) Sediment traps and sediment basins may also be used to control solids in storm water runoff for drainage locations serving less than ten (10) acres. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction. Alternatively, a sediment basin that provides storage for a calculated volume of runoff from a 2-year, 24-hour storm from each disturbed acre drained, or equivalent control measures, may be provided or where rainfall data is not available or a calculation cannot be performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained may be provided.

4. Permanent Storm Water Controls

A description of any measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWP3. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site or prior to submission of an NOT.

5. Other Controls

(a) Off-site vehicle tracking of sediments and the generation of dust must be minimized.

(b) The SWP3 must include a description of construction and waste materials expected to be stored on-site and a description of controls to reduce pollutants from these materials.

(c) The SWP3 must include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

(d) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

6. Approved State and Local Plans

(a) Permittees must ensure the SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or site permits approved by federal, state, or local officials.

(b) SWP3s must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment erosion site plans or site permits, or storm water management site plans or site permits approved by state or local official for which the permittee receives written notice.

7. Maintenance

All erosion and sediment control measures and other protective measures identified in the SWP3 must be maintained in effective operating condition. If through inspections the permittee determines that BMPs 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. Erosion and sediment controls that have been intentionally disabled, run-over, removed, or otherwise rendered ineffective must be replaced or corrected immediately upon discovery.

8. Inspections of Controls

In the event of flooding or other uncontrollable situations which prohibit access to the inspection sites, inspections must be conducted as soon as access is practicable

(a) Personnel provided by the permittee and familiar with the SWP3 must inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWP3 must be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking. Inspections must be conducted at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm event of 0.5 inches or greater.

Where sites have been finally or temporarily stabilized, where runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or frozen ground exists), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches), inspections must be conducted at least once every month.

As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm event of 0.5 inches or greater, the SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

(b) Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may provide inspection personnel with limited access to the areas described in Part III.F.8.(a) above. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls must be inspected at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm event of 0.5 inches, but representative inspections may be performed. For representative inspections, personnel must inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described in Part III.F.8.(a) above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm event of 0.5 inches or greater, the SWP3 may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

(c) The SWP3 must be modified based on the results of inspections, as necessary, to better control pollutants in runoff. Revisions to the SWP3 must be completed within seven (7) calendar days following the inspection. If existing BMPs are modified or if additional BMPs are necessary, an implementation schedule must be described in the SWP3 and wherever

possible those changes implemented before the next storm event. If implementation before the next anticipated storm event is impracticable, these changes must be implemented as soon as practicable.

(d) A report summarizing the scope of the inspection, names and qualifications of personnel making the inspection, the dates of the inspection, and major observations relating to the implementation of the SWP3 must be made and retained as part of the SWP3. Major observations should include: The locations of discharges of sediment or other pollutants from the site; locations of BMPs that need to be maintained; locations of BMPs that failed to operate as designed or proved inadequate for a particular location; and locations where additional BMPs are needed.

Actions taken as a result of inspections must be described within, and retained as a part of, the SWP3. Reports must identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the facility or site is in compliance with the SWP3 and this permit. The report must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports)

9. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for all eligible non-storm water components of the discharge.

Part IV. Numeric Effluent Limitations

Section A. Limitations

All discharges of storm water runoff from concrete batch plants that qualify for coverage, and that are authorized to discharge storm water under the provisions of this general permit must be monitored at the following monitoring frequency and comply with the following numeric effluent limitations:

	Limitations	Monitoring
Parameter	Daily Maximum	Frequency
Total Suspended Solids	65 mg/l	1/Year*
Oil and Grease	15 mg/l	1/Year*
pH	between 6 and 9 standard units	1/Year*

* If discharge occurs.

Section B. Reporting Requirements

Results of monitoring for determining compliance with numeric effluent limitations must be recorded on a discharge monitoring report (DMR). The DMR must either be an original EPA No. 3320-1 form (Attachment 3 of this general permit), a duplicate of the form, or as otherwise provided by the executive director. Monitoring must be conducted prior to December 31st for each annual

monitoring period. A copy of the DMR must either be retained at the facility or shall be made readily available for review by authorized TCEQ personnel upon request, by March 31st following the end of each annual monitoring period. If the results indicate the violation of one or more of these numeric limitations, the permittee must also submit the DMR to the TCEQ's Information Resources Center (MC 212) by March 31st of each annual monitoring period.

Part V. Retention of Records

The permittee must retain the following records for a minimum period of three (3) years from the date that a NOT is submitted as required by Part II.D. For activities that are not required to submit an NOT, records shall be retained for a minimum period of three (3) years from the date that either: final stabilization has been achieved on all portions of the site that is the responsibility of the permittee; or another permitted operator has assumed control according to over all areas of the site that have not been finally stabilized. Records include:

1. A copy of the SWP3 plan.
2. All reports and actions required by this permit, including a copy of the construction site notice.
3. All data used to complete the NOI, if an NOI is required for coverage under this general permit.

Part VI. Standard Permit Conditions

1. The permittee has a duty to comply with all permit conditions. Failure to comply with any permit condition is a violation of the permit and statutes under which it was issued, and is grounds for enforcement action, for terminating coverage under this general permit, or for requiring a discharger to apply for and obtain an individual TPDES permit.

2. Authorization under this general permit may be suspended or revoked for cause. Filing a notice of planned changes or anticipated non-compliance by the permittee does not stay any permit condition. The permittee must furnish to the executive director, upon request and within a reasonable time, any information necessary for the executive director to determine whether cause exists for revoking, suspending, or terminating authorization under this permit. Additionally, the permittee must provide to the executive director, upon request, copies of all records that the permittee is required to maintain as a condition of this general permit.

3. It is not a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity to maintain compliance with the permit conditions.

4. Inspection and entry shall be allowed under Texas Water Code Chapters 26-28, Health and Safety Code §§ 361.032-361.033 and 361.037, and 40 Code of Federal Regulations (CFR) §122.41(i). The statement in Texas Water Code § 26.014 that commission entry of a facility shall occur according to an establishment's rules and regulations concerning safety, internal security, and fire protection is not grounds for denial or restriction of entry to any part of the

facility or site, but merely describes the commission's duty to observe appropriate rules and regulations during an inspection.

5. The discharger is subject to administrative, civil, and criminal penalties, as applicable, under Texas Water Code §§ 26.136, 26.212, and 26.213 for violations including but not limited to the following:

   a. negligently or knowingly violating CWA, §§ 301, 302, 306, 307, 308, 318, or 405, or any condition or limitation implementing any sections in a permit issued under CWA, § 402, or any requirement imposed in a pretreatment program approved under CWA, §§ 402(a)(3) or 402(b)(8);

   b. knowingly making any false statement, representation, or certification in any record or other document submitted or required to be maintained under a permit, including monitoring reports or reports of compliance or noncompliance.

6. All reports and other information requested by the executive director must be signed by the person and in the manner required by 30 TAC § 305.128 (relating to Signatories to Reports).

7. Authorization under this general permit does not convey property or water rights of any sort and does not grant any exclusive privilege.

Part VII. Fees

Section A. Application Fees

An application fee of $100 must be submitted with each NOI for coverage of a large construction activity. A fee is not required for submission of an NOT or NOC letter.

Section B. Water Quality Fees

Large construction activities authorized under this general permit must pay an annual Water Quality Fee of $100 under Texas Water Code 26.0291 and according to TAC Chapter 205 (relating to General Permits for Waste Discharges).

Appendix A.
Periods of Low Erosion Potential by County

Start Date - End Date
Dec. 15 - Feb. 14
Archer
Baylor
Brown
Callahan
Childress
Coke
Coleman
Concho
Cottle
Dimmit
Eastland
Edwards
Fisher
Foard
Hardeman
Haskell
Irion
Jones
Kerr
Kimble
King
Kinney
Knox
Mason
Maverick
McCulloch
Menard
Nolan
Real
Runnels
Schleicher
Shackelford
Stephens
Stonewall
Sutton
Taylor
Throckmorton
Tom Green
Uvalde
Wichita
Wilbarger
Young
Zavala

Start Date - End Date
Nov. 15 - Apr. 30
Andrews
Armstrong
Borden
Brewster
Briscoe
Carson
Castro
Crane
Crosby
Dawson
Deaf Smith
Ector
Floyd
Gaines
Garza
Glasscock
Hale
Hansford
Hartley
Howard
Hutchinson
Lubbock
Lynn
Martin
Midland
Mitchell
Moore
Oldham
Pecos
Potter
Randall
Reagan
Scurry
Sherman
Sterling
Swisher
Terrell
Terry
Upton

Start Date - End Date
Feb. 1 - Mar. 30
Hall

Start Date - End Date
Nov. 15 - Jan. 14 or **Feb. 1 - Mar. 30**
Crockett
Dickens
Kent
Motley
Val Verde

Start Date - End Date
Nov. 1 - Apr. 14 or **Nov. 15 - Apr. 30**
Dallam
Hockley
Lamb
Parmer
Ward

Start Date - End Date
Nov. 1 - Apr. 30 or **Nov. 15 - May. 14**
Bailey
Cochran
Jeff Davis
Loving
Presidio
Reeves
Winkler
Yoakum

Start Date - End Date
Nov. 1 - May. 14
Culberson
Hudspeth

Start Date - End Date
Jan. 1 - Jul. 14 or **May. 15 - Jul. 31** or
Jun. 1 - Aug. 14 or **Jun. 15 - Sept. 14** or
Jul. 1 - Oct. 14 or **Jul. 15 - Oct. 31** or
Aug. 1 - Apr. 30 or **Aug. 15 - May. 14** or
Sept. 1 - May. 30 or **Oct. 1 - Jun. 14** or
Nov. 1 - Jun. 30 or **Nov. 15 - Jul. 14**
El Paso

Start Date - End Date
Jan. 1 - Mar. 30 or **Dec. 1 - Feb. 28**
Collingsworth
Donley
Gray
Hemphill
Lipscomb
Ochiltree
Roberts
Wheeler

CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program

TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.1.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: (Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	

For Construction Sites Authorized Under Part II.D.1. the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization by waiver under Part II.D.1. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. Construction activities at this site shall occur within a time period listed in Appendix A of the TPDES general permit for this county, that period beginning on _____and ending on _____. I understand that if construction activities continue past this period, all storm water runoff must be authorized under a separate provision of this general permit. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

_____ _____
Signature and Title Date

CONSTRUCTION SITE NOTICE

FOR THE
Texas Commission on Environmental Quality (TCEQ)
Storm Water Program

TPDES GENERAL PERMIT TXR150000

The following information is posted in compliance with **Part II.D.2.** of the TCEQ General Permit Number TXR150000 for discharges of storm water runoff from construction sites. Additional information regarding the TCEQ storm water permit program may be found on the internet at:
www.tnrcc.state.tx.us/permitting/waterperm/wwperm/tpdestorm

Contact Name and Phone Number:	
Project Description: ((Physical address or description of the site's location, estimated start date and projected end date, or date that disturbed soils will be stabilized)	
Location of Storm Water Pollution Prevention Plan :	

For Construction Sites Authorized Under Part II.D.2. (Obtaining Authorization to Discharge) the following certification must be completed:

I _____ (Typed or Printed Name Person Completing This Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part II.D.2. of TPDES General Permit TXR150000 and agree to comply with the terms of this permit. A storm water pollution prevention plan has been developed and implemented according to permit requirements. A copy of this signed notice is supplied to the operator of the MS4 if discharges enter an MS4 system. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

_____ _____
Signature and Title Date

CONCRETE BATCH FACILITIES

STW/ TXR15_____/ CO

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)

NAME

ADDRESS

FACILITY LOCATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER

NOTE: Enter your permit number in the underlined space in the upper right hand corner of this page. Example: STW/TXR15 00123/ CO

Mail to: TCEQ (MC 212)
P.O. Box 13087
Austin, TX 78711-3087

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
	01	01		12	31
(20-21)	(22-23)	(24-25)	(26-27)	(28-29)	(30-31)

☐

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(46-53) MAXIMUM	(54-61) UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Total Suspended Solids	SAMPLE MEASUREMENT	*******	*******	*******	*******	*******					
	SAMPLE REQUIREMENT	*******	*******	*******	*******	*******	65 Daily Max	mg/l		1/Year	Grab
Oil & Grease	SAMPLE MEASUREMENT	*******	*******	*******	*******	*******					
	SAMPLE REQUIREMENT	*******	*******	*******	*******	*******	15 Daily Max	mg/l		1/Year	Grab
pH	SAMPLE MEASUREMENT	*******	*******	*******	*******	*******					
	SAMPLE REQUIREMENT	*******	*******	*******	*******	*******	6.0 - 9.0 Range	S.U.		1/Year	Grab
	SAMPLE MEASUREMENT										
	SAMPLE REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
	I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.						
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

EPA Form 3320-1 (3-99) (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED) PAGE OF
Form Approved OMB No. 2040-004

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

For help completing this application, read the TXR150000 NOI Instructions (TCEQ-20022-Instructions).

TCEQ Office Use Only
TPDES Permit Number: TXR15 __ __ __ __ - NO
GIN Number: __ __ __ __ __ __ __

A. Construction Site Operator ■ New ☐ No Change Customer Reference Number: CN NA
Name: Texas Department of Transportation (District name)
Mailing Address: (District or Area office) City: State: Zip Code:
Country Mailing Information (*if outside USA*) Territory: NA Country Code: NA Postal Code: NA
Phone Number: Extension: Fax Number:
E-mail Address:
Type of Operator: ☐ Individual ☐ Sole Proprietorship - D.B.A. ☐ Partnership ☐ Corporation ☐ Federal Government
■ State Government ☐ County Government ☐ City Government ☐ Other:
Independent Operator? ■ Yes ☐ No Number of Employees: ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ■ 501 or higher
Federal Tax ID: 746000170 State Franchise Tax ID Number: NA DUNS Number: NA

B. Billing Address
Name: TxDOT (Project responsible engineer)
Mailing Address: (District or Area office) City: State: Zip Code:
Country Mailing Information (*if outside USA*) Territory: NA Country Code: NA Postal Code: NA

C. Project / Site Information ■ New ☐ No Change Regulated Entity Reference Number: RN NA
Name: FM 1054 Widen existing lanes (CSJ# XXXX-XX-XXX)
Mailing Address: (Same as A and B above) City: State: Zip Code:
Physical Address: FM 1054 City: NA County: BORDEN Zip Code:
Location Access Description: FM 1054 at the Lynn and Borden County line to 8.6 miles south
Latitude: 36 ° 45 ' 56 " N Longitude: 100 ° 45 ' 32 " W Degrees (°), Minutes ('), and Seconds (")
Latitude: NA Longitude: – NA Decimal Form
Standard Industrial Classification (SIC) code: 9621 Also, describe the construction activity at this site *(do not repeat the SIC code)*:
widen lanes from 9 feet to 12 feet and add shoulders
Has a storm water pollution prevention plan been prepared as specified in the general permit (TXR150000)? ■ Yes ☐ No
Estimated area of land disturbed (to the nearest acre): 6 Is the project / site located on Indian Country Lands? ☐ Yes ■ No
Does this project / site discharge storm water into a municipal separate storm sewer system (MS4)? ■ Yes ☐ No
If yes, provide the name of the MS4 operator: TxDOT (or City if applicable)
Provide the name or segment number of the water body that receives storm water from this project / site: Bear Creek

D. Contact - If the TCEQ needs additional information regarding this application, who should be contacted?
Name: (Project responsible engineer) Title:
Phone Number: Extension: Fax Number:
E-mail Address:

E. Payment Information - Check / Money Order Number: Name on Check / Money Order: TxDOT RTI#330380

F. Certification
I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Construction Site Operator Representative:

Prefix: First: Middle:
Last: Suffix: Title:

Signature: Date:

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671.
Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed NOI must be mailed to the following address. Use the attached document to submit the $100 application fee. Please note that the NOI and application fee are submitted separately to different addresses.

Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087

Form 2118
11-07-2003

CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN
FIELD INSPECTION AND MAINTENANCE REPORT

Project Information:

Controlling CSJ: _____
Controlling Project: _____
Controlling Highway: _____
Controlling County: _____

Inspection Cycle Option:

☐ 1. At least every 14 calendar days or within 24 hours after 0.5 inches or more of rainfall.
☐ 2. At least every 7 calendar days.
☐ 3. At least monthly [Engineer approved revision to SWP3 required.]

Inspection Date: _____
TCEQ Authorization Number: (If Applicable) _____
Date of Last Rainfall: _____
Amount of Last Rainfall: _____

Areas Inspected:

Area:	Inspected? (Y/NA)	Area:	Inspected? (Y/NA)	Area:	Inspected? (Y/NA)
Disturbed Soil Areas		Structural Controls		Entrance(s) & Exit(s)	
Material Storage Areas		Sediment & Erosion Controls		Other _____	

Describe how the inspection was conducted.

Best Management Practices (BMPs) Inspected:

Except those listed below, all BMPs have been inspected and found to be in functioning as intended and do not require maintenance, upgrading or additional controls? (If multiple highways or project locations are involved, identify the highway or project location for the BMP requiring maintenance or improvement.)

BMP Type	Approximate Station		Lt or Rt of Centerline	BMP Required Maintenance or Improvement (Describe required corrective actions needed and taken or directions given to the contractor.)
	From:	To:		

Additional BMPs Needed (Any BMPs not shown on the SWP3 must be approved by the Engineer. If multiple highways or project locations are involved, identify the highway or project location for the additional BMP.):

Approximate Station		Lt or Rt of Centerline	BMP to be Installed (Describe required corrective actions needed and taken or directions given to the contractor.)
From:	To:		

Temporarily or Permanently Ceased Construction Activities: Where construction activities (grading, excavating, embankment, or other land disturbing activities) have temporarily or permanently ceased, describe why stabilization measures were not initiated within 14 days of when the construction activities ceased or if additional construction activities will not occur within 21 days of when construction activities were temporarily ceased. (Include the general location of the area involved if it is only part of the site.)

Actions to be taken as a result of this inspection.

Furnish a copy of this inspection report to the contractor so necessary maintenance or improvement actions can be taken. Document all changes to the SWP3 after the Engineer has approved them.

Contractor's Representative Name:	Title:	Date:

Compliance Certification *(Check only one)* **:**

☐ With the maintenance and improvements actions noted, the site is in compliance with the SWP3 and the CGP regulations.

☐ The site is in potential non-compliance with the SWP3 or the CGP regulations. Complete the following "Potential Non-Compliance Issues" section of this inspection report.

TxDOT's Representative Name:	Title:	Date:

TxDOT's Representative Signature:

Potential Non-Compliance Issues:

Describe potential non-compliance issues (repeated failure of a BMP, failure to install a required BMP, off-site discharges [silt, gravel, sand, oily water, other pollutant], potential off-site discharges, etc.)	Location on-site where discharge occurred

Forward this inspection report to your Supervisor immediately if any potential non-compliance issues are listed.

Inspection Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

TxDOT's Certifying Representative Name:	Title:	Date:

Signature:

1. Temporary Seeding	8. Hay Bales	15. Rock Bed at Construction Exit	22. Curbs and gutters
2. Permanent Plant, Sod or Seed	9. Rock Berm	16. Timber Mat at Construction Exit	23. Storm Sewers
3. Mulch	10.Diversion Dike	17. Channel Liner	24. Velocity Control Devices
4. Soil Retention Blanket	11. Diversion Swale	18. Sediment Trap	25. Excess Dirt removed from Rdwy Daily
5. Buffer Zone	12. Diversion Dike/Swale	19. Sediment Basin	26. Haul Roads Dampened for Dust Control
6. Preserve Natural Resource	13. Pipe Slope Drain	20. Storm Inlet Sediment Trap	27. Cleanup of Possible Contaminants
7. Silt Fence	14. Paved Flume	21. Stone Outlet Structure	28. _____

Low Rainfall Erosivity Waiver for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR150000)

TCEQ Office Use Only
TPDES Waiver Number: TXRCW*__*__*__*__*-NO
GIN Number: *__*__*__*__*__*__*__*__*

For help completing this application, read the Low Rainfall Erosivity Waiver Instructions (TCEQ-20064-Instructions).

A. Construction Site Operator ☐ New ☐ No Change Customer Reference Number: CN_____

Name: _____

Mailing Address: _____ City: _____ State: ____ Zip Code: _____

Country Mailing Information (*if outside USA*) Territory: _____ Country Code: _____ Postal Code: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

Type of Operator: ☐ Individual ☐ Sole Proprietorship - D.B.A. ☐ Partnership ☐ Corporation ☐ Federal Government
☐ State Government ☐ County Government ☐ City Government ☐ Other: _____

Independent Operator? ☐ Yes ☐ No Number of Employees: ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 or higher

Federal Tax ID: _____ State Franchise Tax ID Number: _____ DUNS Number: _____

B. Project / Site Information ☐ New ☐ No Change Regulated Entity Reference Number: RN_____

Name: _____

Mailing Address: _____ City: _____ State: ____ Zip Code: _____

Physical Address: _____ City: _____ County: -- _____ Zip Code: _____

Location Access Description: _____

Latitude: ___ ° ___ ' ___ " N Longitude: ___ ° ___ ' ___ " W Degrees (°), Minutes ('), and Seconds (")

Latitude: _____ Longitude: – _____ Decimal Form

Standard Industrial Classification (SIC) code: _____ Also, describe the construction activity at this site *(do not repeat SIC code)*:

_____

Estimated start date: ____ / ____ / _____ Estimated end date: ____ / ____ / _____

Does the construction site, based on its location and time frame for completion, have an R Factor < 5? ☐ Yes ☐ No
If no, this waiver can not be obtained.

Will the construction site disturb an area greater than or equal to 5 acres, or is the construction site part of a larger common plan of development or sale that would disturb an area greater than or equal to 5 acres? ☐ Yes ☐ No If yes, this waiver can not be obtained.

Does this project / site discharge storm water into a municipal separate storm sewer system (MS4)? ☐ Yes ☐ No

If yes, provide the name of the MS4 operator: _____

Provide the name or segment number of the water body that receives storm water from this project / site: _____

C. Contact - If the TCEQ needs additional information regarding this waiver, who should be contacted?

Name: _____ Title: _____

Phone Number: _____ Extension: _____ Fax Number: _____

E-mail Address: _____

D. Certification

I certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization by waiver under the TPDES General Permit TXR150000. Construction activities at this site shall occur within a time period in which the erosivity factor (R Factor) is less than 5. I understand that if construction activities continue past the end date provided in this form, a new R factor must be calculated based on the initial start date and a new end date. If the R Factor is greater than or equal to 5, all applicable sections of the general permit (TXR150000) must be followed. I am aware there are significant penalties for providing false information or for conducting unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

Construction Site Operator Representative:

Prefix: _____ First: _____ Middle: _____

Last: _____ Suffix: _____ Title: _____

Signature: _____ Date: _____

If you have questions on how to fill out this form or about the storm water program, please contact us at (512) 239-4671.
Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at (512) 239-3282.

The completed waiver must be mailed to the following address:

Texas Commission on Environmental Quality
Storm Water & General Permits Team; MC - 228
P.O. Box 13087
Austin, Texas 78711-3087