
CHAPTER 3

Erosion and Sediment Control Practices

3.1 CONSTRUCTION PHASE EROSION AND SEDIMENT CONTROL PLANNING

The development of and adherence to a TCEQ Stormwater Pollution Prevention Plan (SWPPP) per the TXR150000 General Permit is an important first step in meeting the State requirements for erosion and sediment control. A SWPPP is required by the State when site disturbance exceeds one acre and notification to the TCEQ is necessary when the disturbance exceeds five acres.

There are three permit categories:

- **Construction Activities that Disturb Less than One Acre:** Not part of a larger common plan of development that would disturb less than 1 acre are not required to obtain coverage under the general permit.
- **Small Construction Activities:** Disturb at least 1 but less than 5 acres and is not part of a larger common plan of development
- **Large Construction Activities:** Disturb 5 or more acres or are part of a larger common plan of development that will disturb 5 or more acres

The most effective erosion control is the minimization of disturbed area. When this practice is combined with rapid re-vegetation of disturbed areas, receiving water bodies can be protected from sedimentation. Final stabilization of soil disturbing activities is considered complete when perennial vegetative cover reaches 70% density of the native background vegetative cover for the area. Permanent best management practices (BMPs) must achieve a density of 80% vegetative cover to be considered complete.

HOW TO CREATE AN EFFECTIVE EROSION AND SEDIMENT CONTROL PLAN

The following outlines the necessary steps for creating an effective erosion and sediment control plan. Details for individual erosion and sediment control BMPs can be found in this Chapter.

- 1. Assess the drainage characteristics and construction phasing of a site. This process should identify:**
 - Patterns of stormwater flowing over the site including off-site sources, sub-drainage areas, sheet-flow areas, concentrated flow areas and exit points;
 - Location of proposed cuts and fills, grading, curbing, buildings, and impacts on drainage/sequence of construction relating to initial, interim and final drainage;
 - Necessary access points;
 - Limits of construction and non-disturbance area;
 - Construction equipment storage areas.
- 2. Determine the location of the temporary erosion controls by:**
 - Locating controls as close to disturbed areas as possible allowing room for construction activities and maintenance of controls;
 - Assuring there are no breaks or points where runoff can bypass or short-circuit the temporary erosion controls;
 - Locating controls so as not to create off-site flooding of adjacent properties.
- 3. Based on steps 1 and 2, the category or function of controls and their phasing should be determined to reflect construction sequence and changing drainage patterns.**

4. The designer must now determine specific controls to be shown at the locations chosen in step 3.

5. Perform an adequacy check to determine compliance with the following items:

- Controls used are within the allowable drainage area limits;
- Controls are located perpendicular to the runoff flow;
- Detention controls are shaped to create adequate areas for ponding and sediment accumulation;
- Detention/filtration controls are installed along contours to promote spreading of runoff;
- Controls located in low traffic areas are easily accessible for maintenance;
- Controls phased as necessary to reflect changes in drainage patterns to remain effective throughout the construction period;
- Controls are located in areas that will not cause flooding of adjacent properties.

In order to recognize sites that have more erosion potential than others, the designer will rank the erosion potential based on the site characteristics in Table 3-1.

EROSION POTENTIAL – RANKING CATEGORIES

- **High Erosion Potential:** Key factors that impact erosion potential are steep slopes, soils conducive to erosion, construction disturbance covering a large area extending over a significant duration, and roadways planned to cross creeks.
- **Low Erosion Potential:** Minimal disturbance area, short construction period, relatively flat slopes, and non-erosion prone soils are common traits of sites that have a low potential for erosion problems.

If a development project is within different drainage areas or has more than one discharge point, then the above rating is applied to each drainage area/discharge point.

A project has a High Erosion Potential if four or more items are checked in Table 3-1.

Table 3-1: Site Characteristics for High Erosion Potential Checklist

___ Disturbed area > Five (5) acres

___ More than 25% of development area has slopes > 2 %

___ Soils – silts/clays from SCS Soil Surveys and field observation

___ Existing vegetative cover < 50 % coverage (groundcover)

___ Off-site drainage area > Five (5) acres (discharges to site)

___ Construction duration > Six (6) months

___ Utility and road crossing(s) of drainage ways/buffer zones

___ Distance of soil disturbance from creek centerline or tidal water is less than 100 feet

Sites that rank as having a high potential for erosion will require special attention in the design, implementation, and maintenance of construction activities and temporary erosion and sediment controls.

To aid in the proper selection of erosion control and stabilization techniques, Table 3-2 presents typical erosion site characteristics and the accompanying BMPs.

Table 3-2: Erosion Control Selection Guidance - Suggested Techniques to Minimize Soil Erosion

Site Characteristics	Management Approach	BMP Tools	Comments
Disturbed Area > 5 acres	Limit disturbance, control access to non-construction areas and buffers	Silt fence Rock berms Brush berms	Identify disturbed and protected areas on the construction plans
Slopes > 2%	Limit construction on steep slopes, stabilize immediately	Silt Fencing Rock berms Compost/mulch/seed	Seed and vegetate as soon as possible, use soil protection blankets or compost-seed mixes
Soils – Clay/Silt	Minimize excavation, cover/vegetate immediately	Silt Fence Blankets & Matting Compost/mulch/seed/ Sod	Difficult to settle soil particles, minimize disturbed area
Vegetative Cover < 50%	Minimize disturbance in this area, enhance vegetation	Seed Sod Compost/mulch/seed	Promote rapid vegetation growth
Off-site Drainage Area > 5 acres	By-pass runoff around site, or convey in stable manner	Diversion Dikes Interceptor Dikes Pipe/slope/Drain	Maintain diversion BMPs during construction to prevent sedimentation of devices
Construction Duration > 6 months	Phase construction disturbance, stabilize disturbed areas	Vegetation Blankets & Matting	Develop construction disturbance and re-vegetation plan as part of construction sequence
Road Crossings of Drainage Ways	Minimize crossings, stabilize road cuts as soon as possible	Temporary Sediment Basins that intercept runoff before reaching the drainageway	Basin size – 8,000 cubic feet per disturbed acre drainage to basin
Distance < 100 feet from Drainage	Relocate disturbed areas beyond the buffer zone limits	Silt Fence Rock Berms Sediment Basins	Identify buffer zones, use temporary fencing around buffer zones, perform work and maintain stockpiles outside of this zone

Temporary Erosion Controls should be considered the first line of defense for the prevention of water pollution during construction activities. It is much simpler to maintain soil cover than to attempt to trap sediment once it has been mobilized. In addition, effective erosion prevention can result in cost savings, since repair of erosion damage can be minimized.

Permanent Erosion Controls are used to reduce the potential of erosion after construction activities are complete to ensure proper stabilization of areas disturbed by construction.

Primary erosion control strategies are to divert runoff away from unstable areas or to provide a stable surface that will resist the effects of rain and runoff. The Principle measures for diverting runoff during construction include building perimeter swales, dikes, and slope drains. Existing trees and vegetation should be protected to help maintain a stable ground surface and prevent loss of valuable topsoil. Forms of temporary vegetation, such as blankets, matting, and mulches, can stabilize an area until vegetation is established.

Final stabilization is achieved when all soil disturbing activities at site have been completed and a uniform vegetation cover with a density of 70 percent of the native background vegetative cover for the area has been established.

Contractors are encouraged to install and maintain practices carefully and minor adjustments should be anticipated to assure proper performance. Intensive maintenance and extensive use of vegetation, mulch, and other ground covers may be required to achieve optimum performance. The erosion and sediment control practices should be specified in the [Stormwater Pollution Prevention Plan](#) and in the general construction contract so that any unexpected expenses can be approved before they are incurred. When these controls are removed after final stabilization of the site, it is important to also remove or stabilize any accumulated sediment.

Periodic inspection and maintenance is vital to the performance of erosion and sedimentation control measures. It is recommended that all temporary erosion controls be inspected weekly and after every rainfall; however, daily inspections may be warranted when environmentally sensitive features are located on or immediately adjacent to the site. If not properly maintained, some practices may cause more damage than they prevent.

Always evaluate the consequences of a measure failing when considering which control measure to use, since failure of a practice may be hazardous or damaging to both people and property. For example, a large sediment basin failure can have disastrous results; low points in dikes can cause major gullies to form on a fill slope. It is essential to inspect all practices to determine that they are working properly and to ensure that problems are corrected as soon as they develop. The project owner should assign an individual to be responsible for routine checks of erosion and sedimentation control practices.

3.2 TEMPORARY EROSION AND SEDIMENT CONTROL DETAILS

The Texas Department of Transportation (TXDOT) provides design and construction details for many practices to manage construction erosion and sedimentation. [This website](#), dated September 18, 2018 can be referenced for plan details that designers and engineers can include in their construction plans. Details from the website are found below:

- [Silt fence and vertical tracking](#)
- [Rock filter dams](#)
- [Construction exits](#)
- [Dikes and earthwork](#)
- [Swales and earthwork](#)
- [Sediment basins and traps](#)
- [Temporary pipe slope drains](#)
- [Temporary paved flumes](#)
- [Erosion control log](#)

3.3 SPILL PREVENTION AND CONTROL

The objective of this section is to describe measures to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

The following steps will help reduce the stormwater impacts of leaks and spills:

EDUCATION

1. Be aware that different materials pollute in different amounts. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills. Employees should also be aware of when spills must be reported to the TCEQ. Information available in 30 TAC 327.4 and 40 CFR 302.4.
2. Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
3. Hold regular meetings to discuss and reinforce appropriate disposal procedures (these may be incorporated into regular safety meetings).
4. Establish a continuing education program to indoctrinate new employees.
5. Have contractor’s superintendent or representative oversee and enforce proper spill prevention and control measures.

GENERAL MEASURES

1. To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
2. Store hazardous materials and wastes in covered containers and protect from vandalism.
3. Place a stockpile of spill cleanup materials where it will be readily accessible.
4. Train employees in spill prevention and cleanup.
5. Designate responsible individuals to oversee and enforce control measures.
6. Spills should be covered and protected from stormwater run-on during rainfall to the extent that it does not compromise clean-up activities.
7. Do not bury or wash spills with water.
8. Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
9. Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with applicable regulations.
10. Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
11. Place Material Safety Data Sheets (MSDS), as well as proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
12. Keep waste storage areas clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

CLEANUP

1. Clean up leaks and spills immediately.
2. Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be disposed of as hazardous waste.
3. Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

MINOR SPILLS

1. Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
2. Use absorbent materials on small spills rather than hosing down or burying the spill.
3. Absorbent materials should be promptly removed and disposed of properly.
4. Follow the practice below for a minor spill:
 - Contain the spread of the spill.
 - Recover spilled materials.
 - Clean the contaminated area and properly dispose of contaminated materials.

SEMI-SIGNIFICANT SPILLS

Semi-significant spills can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Spills should be cleaned up immediately:

1. Contain spread of the spill.
2. Notify the project foreman immediately.
3. If the spill occurs on paved or impermeable surfaces, clean up using “dry” methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

SIGNIFICANT/HAZARDOUS SPILLS

For significant or hazardous spills that are in reportable quantities:

1. Notify the TCEQ by telephone as soon as possible and within 24 hours. It is the contractor’s responsibility to have all emergency phone numbers at the construction site.
2. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110, 119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
3. Notification should first be made by telephone and followed up with a written report.
4. The services of a spill management contractor or a Haz-Mat team should be obtained immediately.

Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.

5. Other agencies which may need to be notified/consulted include, but are not limited to, the City Police Department, County Sheriff Office, Fire Departments, etc.

VEHICLE AND EQUIPMENT MAINTENANCE

1. If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the run-on of stormwater and the runoff of spills.
2. Regularly inspect onsite vehicles and equipment for leaks and repair immediately
3. Check incoming vehicles and equipment (including delivery trucks, as well as employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
4. Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
5. Place drip pans or absorbent materials under paving equipment when not in use.
6. Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
7. Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
8. Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
9. Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

VEHICLE AND EQUIPMENT FUELING

1. If fueling must occur on site, use designated areas, located away from drainage courses, to prevent the run-on of stormwater and the runoff of spills.
2. Discourage "topping off" of fuel tanks.
3. Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

3.4 CREEK CROSSINGS

Creek crossings represent particularly important areas to employ effective erosion and sedimentation control. Creek crossings may require compliance with [Section 404 of the Clean Water Act](#). The designer should verify the need for compliance. Guidance on [Nationwide Permits](#) should be reviewed as well as facilitate appropriate design and compliance. Underground utility construction across creeks requires special measures, as detailed below.

1. Unless prior approval is received from the jurisdictional stormwater authority, utility line creek crossings should be made perpendicular to the creek flowline.
2. Every effort should be made to keep the zone of immediate construction free of surface water. For construction in the creek channel, a pipe of adequate size to divert normal stream flow should be provided around the construction area. Diversion may be by pumping or gravity flow using temporary dams.
3. Where water must be pumped from the construction zone, discharges should be in a manner that will not cause scouring or erosion. All discharges shall be on the upstream or upslope side of emplaced erosion control structures. If discharges are necessary in easily erodible areas, a stabilized, energy-dissipating discharge apron shall be constructed of riprap with minimum stone diameter of 6 inches and minimum depth of 12 inches. Size of the apron in linear dimensions shall be approximately 10 times the diameter of the discharge pipe.
4. Before any trenching, install two high service rock berms at 100-ft spacing across the channel (perpendicular to the flowline) downstream of the proposed trench. These berms should be located between 100 and 300 feet downstream of the proposed trench. Lay pipe or other utility line and bury as soon as possible after trenching.
5. After installation is complete (or at the end of work day, if installation cannot be completed by end of day), install silt fencing along trench line on either side of creek at 25-ft intervals, as shown in Figure 3-1.
6. Material excavated from the trench in the creek channel should not be deposited on the channel banks. Excavation should be hauled out of the channel or used in backfill of open trench. No loose excavated material should be left in the channel at the end of a work day.
7. A concrete cap should be placed over any buried pipe within the creek, and streambed should be restored to proper grade.
8. Revegetate disturbed areas using appropriate native or adapted grass species applied either with hydromulch at twice the normal application rate or incorporated with erosion protection matting.

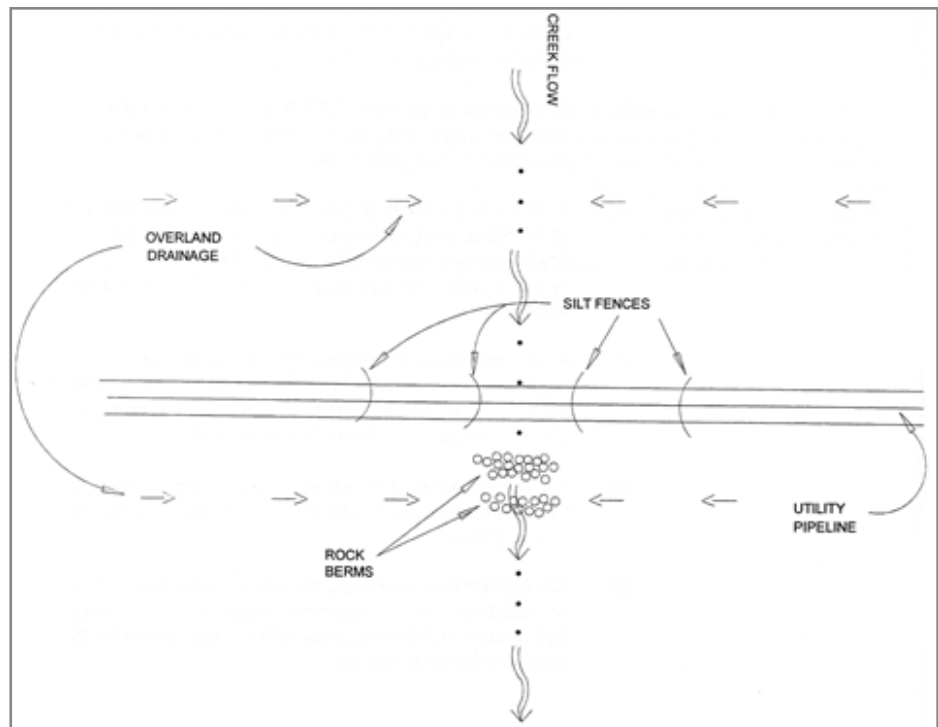


Figure 3-1: Utility Line Creek Crossing