INSPECTION MANUAL

STORM WATER POLLUTION PREVENTION ORDINANCE

CITY OF WICHITA

Prepared by

DEPARTMENT OF PUBLIC WORKS
STORM WATER MANAGEMENT OFFICE

DECEMBER 1998

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Ordinance

See current 16.32 stormwater Ordinance at

WWW.wichita.gov

Pages 3-31 contained an out dated version of chapter 16.32

Therefore they have been removed from updated manual.

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Introduction

The Storm Water Pollution Prevention Ordinance defines permissible and illegal discharges into rivers, lakes, and storm drain systems according to the City of Wichita's storm water discharge permit as issued by the Kansas Department of Health & Environment. A copy of the Ordinance can be found beginning on page three (3). The purpose of this manual is to provide guidance to inspectors who will be responsible for enforcing the various provisions of Wichita's storm water management program.

Several Departments in the City will be responsible for enforcing the various ordinance provisions. Those responsibilities are outlined in more detail in the following sections of this manual. The principal Departments involved will be the Storm Water Management Office, the Storm Water Utility Field Office, the Office of Central Inspection, City-County Health Department, and the Storm Water Specialist in the Department of Water and Sewer. The City of Wichita Storm Water Pollution Prevention Ordinance establishes the following as violations:

1. Illegal dumping or discharging.
2. Illegal connections.
3. Failure to get a State NPDES permit.
4. Failure to prepare a storm water pollution prevention plan .
5. Failure to install Best Management Practice (BMP) devices.
6. Failure to maintain BMP devices.
7. Failure to comply with any order or directive issued under the Ordinance

Listed below are the telephone numbers of the key Departments or individuals that will be involved in the enforcement effort:

Jim Hardesty	Mark Hall
Stormwater Specialist	Stromwater Compliance Officer
316-268-8317 (office)	316-268-8337 (office)
316-312-5464 (cell)	316-393-1492 (cell)

Storm Water Management
8th Floor, City Hall
268-4498

Storm Water Utility Field Office
Central Maintenance Facility
268-4090

Office of Central Inspection
7th floor, City Hall
268-4461

City-County Health Department
1900 E. 9th Street
268-8351

City Engineer's Office
7th Floor, City Hall
268-4501

Best Management Practices (BMP)

Current storm water rules and regulations do not require that storm water be treated to improve its quality. Instead, the E.P.A. has taken the approach that "Best Management Practices" should be employed in an effort to improve water quality. As those practices are implemented, the City is required to continue water quality testing. Hopefully, as more BMP's are installed, water quality will improve.

What are B.M.P.'s? Simply put, they are any practice that will reduce the potential for storm water pollution, and, in a general sense, can be broken down into the following categories:

1. Good housekeeping.
2. Preventative maintenance.
3. Visual inspections.
4. Spill prevention and response.
5. Sediment and erosion control.
6. Management of runoff.
7. Employee training.
8. Record keeping and reporting.

Although we will have the occasion to be involved with all of the above BMP's at one time or another, in most cases we will be dealing with runoff management, good housekeeping, and sediment control. The following pages show some typical BMP devices and their uses for sediment and erosion control.

Other good housekeeping practices to look at will include: Litter Control, fuel storage areas, construction material storage areas, and any practices on a site that could result in storm water pollution.

Temporary Seeding

What Is It

Temporary seeding means growing a short-term vegetative cover (plants) on disturbed site areas that may be in danger of erosion. The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that will not be stabilized for long periods of time or where permanent plant growth is not necessary or appropriate. This practice uses fast-growing grasses whose root systems hold down the soils so that they are less apt to be carried offsite by storm water runoff or wind. Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

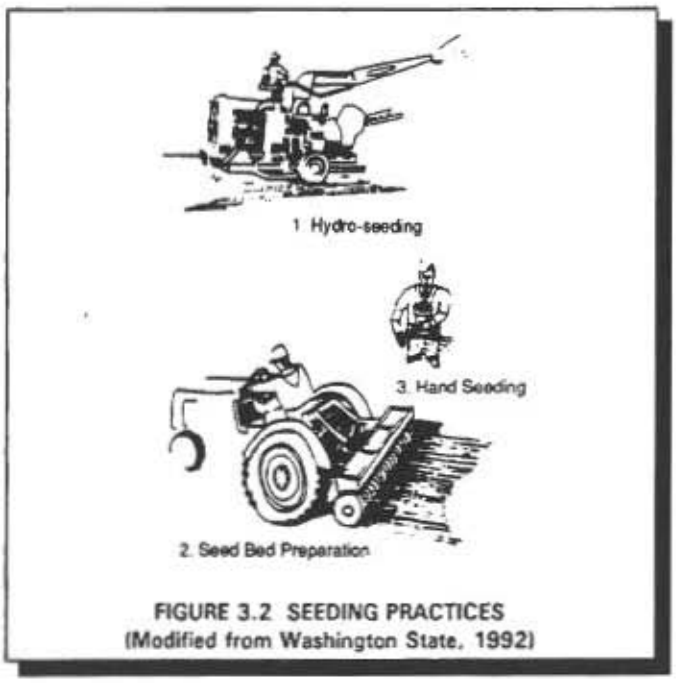

FIGURE 3.2 SEEDING PRACTICES
(Modified from Washington State, 1992)

When and Where to Use It

Temporary seeding should be performed on areas which have been disturbed by construction and which are likely to be redisturbed, but not for several weeks or more. Typical areas might include denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, and temporary roadbanks. Temporary seeding should take place as soon as practicable after the

last land disturbing activity in an area. Check the requirements of your permit for the maximum amount of time allowed between the last disturbance of an area and temporary stabilization. Temporary seeding may not be an effective practice in arid and semi-arid regions where the climate prevents fast plant growth, particularly during the dry seasons. In those areas, mulching or chemical stabilization may be better for the short-term (see sections on Mulching, Geotextiles, and Chemical Stabilization).

What to Consider

Proper seed bed 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. Successful growth usually requires that the soil be tilled before the seed is applied. Topsoiling is not necessary for temporary seeding; however, it may improve the chances of establishing temporary vegetation in an area. Seed bed preparation may also require applying fertilizer and/or lime to the soil to make conditions more suitable for plant growth. Proper fertilizer, seeding mixtures, and seeding rates vary depending on the location of the site, soil types, slopes, and season. Local suppliers, State and local regulatory agencies, and the USDA Soil Conservation Service will supply information on the best seed mixes and soil conditioning methods.

Seeded areas should be covered with mulch to provide protection from the weather. Seeding on slopes of 2:1 or more, in adverse soil conditions, during excessively hot or dry weather, or where heavy rain is expected should be followed by spreading mulch (see section on Mulching). Frequent inspections are necessary to check 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 enough, mulching, matting, and controlled watering should be done. If seeded areas are watered, watering rates should be watched so that over-irrigation (which can cause erosion itself) does not occur.

Advantages of Temporary Seeding
• Is generally inexpensive and easy to do • Established plant cover fast when conditions are good • Stabilizes soils well, is aesthetic, and can provide sedimentation controls for other site areas • May help reduce costs of maintenance on other erosion controls (e.g., sediment basins may need to be cleaned out less often)
Disadvantages of Temporary Seeding
• Depends heavily on the season and rainfall rate for success • May require extensive fertilizing of plants grown on some soils, which can cause problems with local water quality • Requires protection from heavy use, once seeded • May produce vegetation that requires irrigation and maintenance

Mulching

What Is It

Mulching is a temporary soil stabilization or erosion control practice where materials such as grass, hay, woodchips, wood fibers, straw, or gravel are placed on the soil surface. In addition to stabilizing soils, mulching can reduce the speed of storm water runoff over an area. When used together with seeding or planting, mulching can aid in plant growth by holding the seeds, fertilizers, and topsoil in place, by helping to retain moisture, and by insulating against extreme temperatures.

When and Where to Use it

Mulching is often used alone in areas where temporary seeding cannot be used because of the season or climate. Mulching can provide immediate, effective, and inexpensive erosion control. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place.

Mulch seeded and planted areas where slopes are steeper than 2:1, where runoff is flowing across the area, or when seedlings need protection from bad weather.

What to Consider

Use of mulch may or may not require a binder, netting, or the tacking of mulch to the ground. Final grading is not necessary before mulching. Mulched areas should be inspected often to find where mulched material has been loosened or removed. Such areas should be reseeded (if necessary) and the mulch cover replaced immediately. Mulch binders should be applied at rates recommended by the manufacturer.

Advantages of Mulching
• Provides immediate protection to soils that are exposed and that are subject to heavy erosion
• Retains moisture, which may minimize the need for watering
• Requires no removal because of natural deterioration of mulching and matting
Disadvantages of Mulching
• May delay germination of some seeds because cover reduces the soil surface temperature
• Mulch can be easily blown or washed away by runoff if not secured
• Some mulch materials such as wood chips may absorb nutrients necessary for plant growth

Geotextiles

What are They

Geotextiles are porous fabrics known in the construction industry as filter fabrics, road rugs, synthetic fabrics, construction fabrics, or simply fabrics. Geotextiles are manufactured by weaving or bonding fibers made from synthetic materials such as polypropelene, polyester, polyethylene, nylon, polyvinyl chloride, glass and various mixtures of these. As a synthetic construction material, geotextiles are used for a variety of purposes in the United States and foreign countries. The uses of geotextiles include separators, reinforcement, filtration and drainage, and erosion control. We will discuss the use of geotextiles in preventing erosion at construction sites in this section.

Some geotextiles are also biodegradable materials such as mulch matting and netting. Mulch mattings are materials (jute or other wood fibers) that have been formed into sheets of mulch that are more stable than normal mulch. Nettings is typically made from jute, other wood fiber, plastic, paper, or cotton and can be used to hold the mulching and matting to the ground. Netting can also be used alone to stabilize soils while the plants are growing; however, it does not retain moisture or temperature well. Mulch binders (either asphalt or synthetic) are sometimes used instead of netting to hold loose mulches together.

When and Where to Use Them

Geotextiles can be used for erosion control by using it alone. Geotextiles, when used alone, can be used as matting. Mattings are used to stabilize the flow on channels and swales. Also, matting is used on recently planted slopes to protect seedlings until they become established. Also, matting may be used on tidal or stream banks where moving water is likely to wash out new plantings.

Geotextiles are also used as separators. An example of such a use is geotextile as a separator between riprap and soil. This "sandwiching" prevents the soil from being eroded from beneath the riprap and maintaining the riprap's base.

What to Consider

As stated above, the types of geotextiles available are vast, therefore, the selected fabric should match its purpose. Also, State or local requirements, design procedures, and any other applicable requirements should also be consulted. In the field, important concerns include regular inspections to determine if cracks, tears, or breaches are present in the fabric and appropriate repairs should be made.

Effective netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

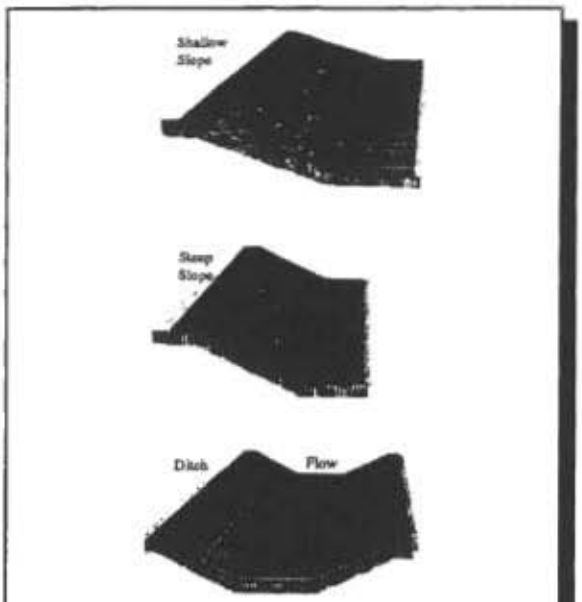

FIGURE 3.3 ORIENTATION OF MULCH NETTING AND MATTING
(Modified from County of Fairfax, 1987)

Advantages of Geotextiles
• Fabrics are relatively inexpensive for certain applications
• Offer convenience to the installer
• Design methodologies for the use of geotextiles are available
• A wide variety of geotextiles to match specific needs are available
• Mulch matting and netting are biodegradable
Disadvantages of Geotextiles
• If the fabric is not properly selected, design, or installed, the effectiveness may be reduced drastically
• Many synthetic geotextiles are sensitive to light and must be protected prior to installation

Chemical Stabilization

What Is It

Chemical stabilization practices, often referred to as a chemical mulch, soil binder, or soil palliative, are temporary erosion control practices. Materials made of vinyl, asphalt, or rubber are sprayed onto the surface of the soil to hold the soil in place and protect against erosion from storm water runoff and wind. Many of the products used for chemical stabilization are human-made, and many different products are on the market.

When and Where to Use It

Chemical stabilization can be used as an alternative in areas where temporary seeding practices cannot be used because of the season or climate. It can provide immediate, effective, and inexpensive erosion control anywhere erosion is occurring on a site.

What to Consider

The application rates and procedures recommended by the manufacturer of a chemical stabilization product should be followed as closely as possible to prevent the products from forming ponds and from creating large areas where moisture cannot get through.

Advantages of Chemical Stabilization
• Is easily applied to the surface of the soil
• Is effective in stabilizing areas where plants will not grow
• Provides immediate protection to soils that are in danger of erosion
Disadvantages of Chemical Stabilization
• Can create impervious surfaces (where water cannot get through), which may in turn increase the amount and speed of storm water runoff
• May cause harmful effects on water quality if not used correctly
• Is usually more expensive that vegetative cover

Permanent Seeding and Planting

What Is It

Permanent seeding of grass and planting trees and brush provides stabilization to the soil by holding soil particles in place. Vegetation reduces sediments and runoff to downstream areas by slowing the velocity of runoff and permitting greater infiltration of the runoff. Vegetation also filters sediments, helps the soil absorb water, improves wildlife habitats, and enhances the aesthetics of a site.

SIX WEEKS AFTER SEEDING

ONE YEAR AFTER SEEDING

FIGURE 3.4 ESTABLISHING PERMANENT COVER WITH VEGETATION
(Modified from State of North Carolina, 1988)

When and Where to Use It

Permanent seeding and planting is appropriate for any graded or cleared area where long-lived plant cover is desired. Some areas where permanent seeding is especially important are filter strips, buffer areas, vegetated swales, steep slopes, and stream banks. This practice is effective on areas where soils are unstable because of their texture, structure, a high water table, high winds, or high slope.

What to Consider

For this practice to work, it is important to select appropriate vegetation, prepare a good seedbed, properly time planting, and to condition the soil. Planting local plants during their

regular growing season will increase the chances for success and may lessen the need for watering. Check seeded areas frequently for proper watering and growth conditions.

When seeding in cold climates during fall or winter, cover the area with mulch to provide a protective barrier against cold weather (see Mulching). Seeding should also be mulched if the seeded area slopes 4:1 or more, if soil is sandy or clayey, or if weather is excessively hot or dry.

Plant when conditions are most favorable for growth. When possible, use low-maintenance local plant species.

Topsoil should be used on areas where topsoils have been removed, where the soils are dense or impermeable, or where mulching and fertilizers alone cannot improve soil quality. Topsoiling should be coordinated with the seeding and planting practices and should not be planned while the ground is frozen or too wet. Topsoil layers should be at least 2 inches deep (or similar to the existing topsoil depth).

To minimize erosion and sedimentation, remove as little existing topsoil as possible. All site controls should be in place before the topsoil is removed. If topsoils are brought in from another site, it is important that its texture is compatible with the subsoils onsite; for example, sandy topsoils are not compatible with clay subsoils.

Stockpiling of topsoils onsite requires good planning so soils will not obstruct other operations. If soil is to be stockpiled, consider using temporary seeding, mulching, or silt fencing to prevent or control erosion. Inspect the stockpiles frequently for erosion. After topsoil has been spread, inspect it regularly, and reseed or replace areas that have eroded.

Advantages of Permanent Seeding and Planting
• Improves the aesthetics of a site
• Provides excellent stabilization
• Provides filtering of sediments
• Provides wildlife habitat
• Is relatively inexpensive
Disadvantages of Permanent Seeding and Planting
• May require irrigation to establish vegetation
• Depends initially on climate and weather for success

Buffer Zones

What are They

Buffer zones are vegetated strips of land used for temporary or permanent water quality benefits. Buffer zones are used to decrease the velocity of storm water runoff, which in turn helps to prevent soil erosion. Buffer zones are different from vegetated filter strips (see section on Vegetated Filter Strips) because buffer zone effectiveness is not measured by its ability to improve infiltration (allow water to go into the ground). The buffer zone can be an area of vegetation that is left undisturbed during construction, or it can be newly planted.

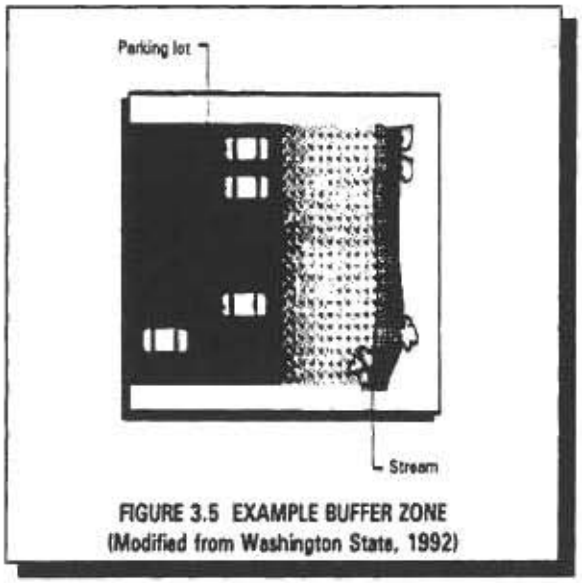

FIGURE 3.5 EXAMPLE BUFFER ZONE
(Modified from Washington State, 1992)

When and Where to Use Them

Buffer zones technique can be used at any site that can support vegetation. Buffer zones are particularly effective on floodplains, next to wetlands, along stream banks, and on steep, unstable slopes.

What to Consider

If buffer zones are preserved, existing vegetation, good planning, and site management are needed to protect against disturbances such as grade changes, excavation, damage from equipment, and other activities. Establishing new buffer strips requires the establishment of a good dense turf, trees, and shrubs (see Permanent Seeding and Planting). Careful maintenance is important to ensure healthy vegetation. The need for routine maintenance such as mowing, fertilizing, liming, irrigating, pruning, and weed and pest control will depend on the species of plants and trees involved, soil types and climatic conditions. Maintaining planted areas may require debris removal and protection against unintended uses or traffic.

Advantages of Buffer Zones
• Provide aesthetic as well as water quality benefits
• Provide areas for infiltration, which reduces amount and speed of storm water runoff
• Provide areas for wildlife habitat
• Provide areas for recreation
• Provide buffers and screens for onsite noise if trees or large bushes are used
• Low maintenance requirements
• Low cost when using existing vegetation
Disadvantages of Buffer Zones
• May not be cost effective to use if the cost of land is high
• Are not feasible if land is not available
• Require plant growth before they are effective

Preservation of Natural Vegetation

What Is It

The preservation of natural vegetation (existing trees, vines, brushes, and grasses) provides natural buffer zones. By preserving stabilized areas, it minimizes erosion potential, protects water quality, and provides aesthetic benefits. This practice is used as a permanent control measure.

When and Where to Use It

This technique is applicable to all types of sites. Areas where preserving vegetation can be particularly beneficial are floodplains, wetlands, stream banks, steep slopes, and other areas where erosion controls would be difficult to establish, install, or maintain.

What to Consider

Preservation of vegetation on a site should be planned before any site disturbance begins. Preservation requires good site management to minimize the impact of construction activities on existing vegetation. Clearly mark the trees to be preserved and protect them from ground disturbances around the base of the tree. Proper maintenance is important to ensure healthy vegetation that can control erosion. Different species, soil types, and climatic conditions will require different maintenance activities such as mowing, fertilizing, liming, irrigation, pruning, and weed and pest control. Some State/local regulations require natural vegetation to be preserved in sensitive areas; consult the appropriate State/local agencies for more information on their regulations. Maintenance should be performed regularly, especially during construction.

Advantages of Preservation of Natural Vegetation
• Can handle higher quantities of storm water runoff than newly seeded areas
• Does not require time to establish (i.e., effective immediately)
• Increases the filtering capacity because the vegetation and root structure are usually denser in preserved natural vegetation than in newly seeded or base areas
• Enhances aesthetics
• Provides areas for infiltration, reducing the quantity and velocity of storm water runoff
• Allows areas where wildlife can remain undisturbed
• Provides noise buffers and screens for onsite operations.
• Usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation
Disadvantages of Preservation of Natural Vegetation
• Requires planning to preserve and maintain the existing vegetation
• May not be cost effective with high land costs
• May constrict area available for construction activities

FIGURE 3.6 BENEFITS OF PRESERVING NATURAL VEGETATION
(Modified from Washington State, 1992)

Sod Stabilization

What Is It

Sodding stabilizes an area by immediately covering the surface with vegetation and providing areas where storm water can infiltrate into the ground.

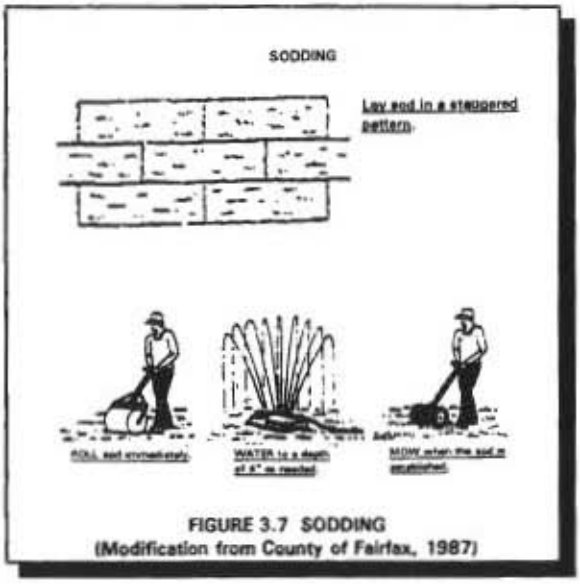

FIGURE 3.7 SODDING
(Modification from County of Fairfax, 1987)

When and Where to Use It

Sodding is appropriate for any graded or cleared area that might erode and where a permanent, long-lived plant cover is needed immediately. Examples of where sodding can be used are buffer zones, stream banks, dikes, swales, slopes, outlets, level spreaders, and filter strips.

What to Consider

The soil surface should be fine-graded before laying down the sod. Topsoil may be needed in areas where the soil textures are inadequate (see topsoil discussion in section on Permanent Seeding and Planting). Lime and fertilizers should be added to the soil to promote good growth conditions. Sodding can be applied in alternating strips or other patterns, or alternate areas can be seeded to reduce expense. Sod should not be planted

during very hot or wet weather. Sod should not be placed on slopes that are greater than 3:1 if they are to be mowed. If placed on steep slopes, sod should be laid with staggered joints and/or be pegged. In areas such as steep slopes or next to running waterways, chicken wire, jute, or other netting can be placed over the sod for extra protection against lifting (see Mulching and Geotextiles). Roll or compact immediately after installation to ensure firm contact with the underlying topsoil. Inspect the sod frequently after it is first installed, especially after large storm events, until it is established as permanent cover. Remove and replace dead sod. Watering may be necessary after planting and during periods of intense heat and/or lack of rain (drought).

Advantages of Sod Stabilization
• Can provide immediate vegetative cover and erosion control
• Provides more stabilizing protection than initial seeding through dense cover formed by sod
• Produces lower weed growth than seeded vegetation
• Can be used for site activities within a shorter time than can seeded vegetation
• Can be placed at any time of the year as long as moisture conditions in the soil are favorable
Disadvantage of Sod Stabilization
• Purchase and installation costs are higher than for seedings
• May require continued irrigation if the sod is place during dry seasons or on sandy soils

Stream Bank Stabilization

What Is It

Stream bank stabilization is used to prevent stream bank erosion from high velocities and quantities of storm water runoff. Typical methods include the following:

- **Riprap**—Large angular stones placed along the stream bank or lake
- **Gabion**—Rock-filled wire cages that are used to create a new stream bank
- **Reinforced Concrete**—Concrete bulkheads and retaining walls that replace natural stream banks and create a nonerosive surface
- **Log Cribbing**—Retaining walls built of logs to anchor the soils against erosive forces. Usually built on the outside of stream bends
- **Grid Pavers**—Precast or poured-in-place concrete units that are placed along stream banks to stabilize the stream bank and create open spaces where vegetation can be established

When and Where to Use It

Steam bank stabilization is used where vegetative stabilization practices are not practical and where the stream banks are subject to heavy erosion from increased flows or disturbance during construction. Stabilization should occur before any land development in the watershed area. Stabilization can also be retrofitted when erosion of a stream bank occurs.

What to Consider

Stream bank stabilization structures should be planned and designed by a professional engineer licensed in the State where the site is located. Applicable Federal, State and local requirements should be followed, including Clean Water Act Section 404 regulations. An important design feature of stream bank stabilization methods is the foundation of the structure; the potential for the stream to erode the sides and bottom of the channel should be considered to make sure the stabilization measure will be supported properly. Structures can be designed to protect and improve natural wildlife habitats; for example, log structures and grid pavers can be designed to keep vegetation. Only pressure-treated wood should be used

in log structures. Permanent structures should be designed to handle expected flood conditions. A well-designed layer of stone can be used in many ways and in many locations to control erosion and sedimentation. Riprap protects soil from erosion and is often used on steep slopes built with fill materials that are subject to harsh weather or seepage. Riprap can also be used for flow channel liners, inlet and outlet protection at culverts, stream bank protection, and protection of shore lines subject to wave action. It is used where water is turbulent and fast flowing and where soil may erode under the design flow conditions. It is used to expose the water to air as well as to reduce water energy. Riprap and gabion (wire mesh cages filled with rock) are usually placed over a filter blanket (i.e., a gravel layer or filter cloth). Riprap is either a uniform size or graded (different sizes) and is usually applied in an even layer throughout the stream. Reinforced concrete structures may require positive drainage behind the bulkhead or retaining wall to prevent erosion around the structure. Gabion and grid pavers should be installed according to manufacturers' recommendations.

Stream bank stabilization structures should be inspected regularly and after each large storm event. Structures should be maintained as installed. Structural damage should be repaired as soon as possible to prevent further damage or erosion to the stream bank.

Advantages of Stream Bank Stabilization
• Can provide control against erosive forces caused by the increase in storm water flows created during land development
• Usually will not require as much maintenance as vegetative erosion controls
• May provide wildlife habitats
• Forms a dense, flexible, self-healing cover that will adapt well to uneven surfaces (riprap)
Disadvantages of Steam Bank Stabilization
• Does not provide the provide the water quality or aesthetic benefits that vegetative practices could
• Should be designed by qualified professional engineers, which may increase project costs
• May be expensive (materials costs)
• May require additional permits for structure
• May alter stream dynamics which cause changes in the channel downstream
• May cause negative impacts to wildlife habitats

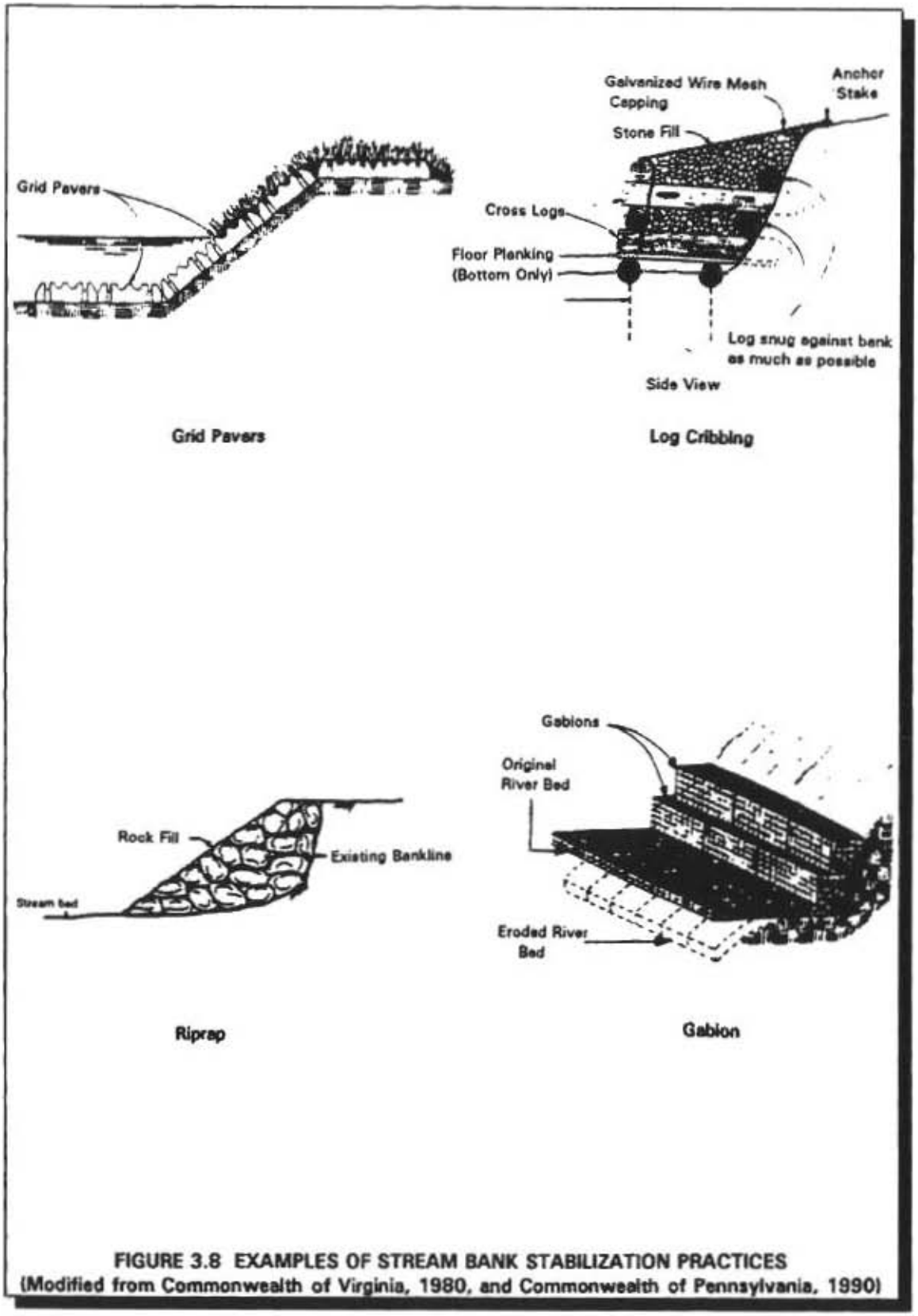

FIGURE 3.8 EXAMPLES OF STREAM BANK STABILIZATION PRACTICES
(Modified from Commonwealth of Virginia, 1980, and Commonwealth of Pennsylvania, 1990)

Soil Retaining Measures

What Are They

Soil retaining measures refer to structures or vegetative stabilization practices used to hold the soil firmly to its original place or to confine as much as possible within the site boundary. There are many different methods for retaining soil; some are used to control erosion while others are used to protect the safety of the workers (i.e., during excavations). Examples of soil retaining measures include reinforced soil retaining systems, wind breaks, and stream bank protection using shrubs and reeds.

Reinforced soil retaining measures refer to using structural measures to hold in place loose or unstable soil. During excavation, for example, soil tiebacks and retaining walls are used to prevent cave-ins and accidents. But these same methods can be used to retain soils and prevent them from moving. While detailed discussion of soil retaining methods is beyond the scope of this manual, several are briefly described.

- **Skeleton Sheeting**—Skeleton sheeting, the least expensive soil bracing system, requires the soil to be cohesive (i.e., like clay). Construction grade lumber is used to brace the excavated face of the slope.

- **Continuous Sheeting**—Continuous sheeting involves using a material that covers the face of the slope in a continuous manner. Struts and boards are placed along the slope which provide continuous support to the slope face. The material used can be steel, concrete, or wood.

- **Permanent Retaining Walls**—Permanent construction walls may be necessary to provide support to the slope well after the construction is complete. In this instance, concrete masonry or wood (railroad tie) retaining walls can be constructed and left in place.

When and Where to Use Them

Use reinforced soil retaining methods where using other methods of soil retention (e.g., vegetation) is not practical. Some sites may have slopes or soils that do not lend themselves to ordinary practices of soil retention. In these instances, a reinforced soil retaining measure should be considered.

What to Consider

As emphasized earlier, the use of reinforced soil retaining practices serve both safety and erosion control purposes. Since safety is the first concern, the design should be performed by qualified and certified engineers. Such design normally involves understanding the nature of soil, location of the ground water table, the expected loads, and other important design considerations.

FIGURE 3.9 USE OF RETAINING WALLS
(Modification from Washington State, 1992)

Advantages of Soil Retaining Measures
• Provide safety to workers, and some types of reinforced retention can be left as permanent structures
• Prevent erosion of soil difficult to stabilize using conventional methods
Disadvantages of Soil Retaining Measures
• Require the expertise of a professional engineer and may be expensive to design and install

Dust Control

What Is It

Wind is capable of causing erosion, particularly in dry climates or during the dry season. Wind erosion can occur wherever the surface soil is loose and dry, vegetation is sparse or absent, and the wind is sufficiently strong. Wind erodes soils and transports the sediments offsite, where they may be washed into the receiving water by the next rainstorm. Therefore, various methods of dust control may need to be employed to prevent dust from being carried away from the construction site. There are many ways to accomplish this and some are described below:

- **Vegetative Cover**—For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Temporary Seeding and Permanent Seeding and Planting).

- **Mulch (Including Gravel Mulch)**—When properly applied, mulch offers a fast, effective means of controlling dust (see Mulching).

- **Spray-on Adhesive**—Asphalt emulsions, latex emulsions, or resin in water can be sprayed onto mineral soil to prevent their blowing away (see Chemical Stabilization).

- **Calcium Chloride**—Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.

- **Sprinkling**—The site may be sprinkled until the surface is wet. Sprinkling is especially effective for dust control on haul roads and other traffic routes.

- **Stone**—Used to stabilize construction roads; can also be effective for dust control.

- **Barriers**—A board fence, wind fence, sediment fence, or similar barrier can control air currents and blowing soil. All of these fences are normally constructed of wood and they prevent erosion by obstructing the wind near the ground and preventing the soil from blowing offsite.

  Barriers can be part of long-term dust control strategy in arid and semiarid areas; however, they are not a substitute for permanent stabilization. A wind barrier generally protects soil downward for a distance of 10 times the height of the

barrier. Perennial grass and stands of existing trees may also serve as wind barriers.

When and Where to Use It

The above measures for dust control should be used when open dry areas of soil are anticipated on the site. Clearing and grading activities create the opportunity for large amounts of dust to be blown, therefore, one or several dust control measures should be considered prior to clearing and grading. One should also note that many of the water erosion control measures indirectly prevent wind erosion.

As the distance across bare soil increases, wind erosion becomes more and more severe. In arid and semiarid regions where rainfall is insufficient to establish vegetative cover, mulching may be used to conserve moisture, prevent surface crusting, reduce runoff and erosion, and help establish vegetation. It is a critical treatment on sites with erosive slopes.

What to Consider

The direction of the prevailing winds and careful planning of clearing activities are important considerations. As a standard practice, any exposed area should be stabilized using vegetation to prevent both wind and water erosion. If your site is located in an arid or semiarid area, you may wish to contact the USDA Soil Conservation Service representative in your area or the appropriate State/local government agency for additional information.

Advantages of Dust Control
• Reduces movement of soil to offsite areas
Disadvantages of Dust Control
• Excessive sprinkling may result in non-storm water discharges from the site

Earth Dike

What Is It

An earth dike is a ridge or ridge and channel combination used to protect work areas from upslope runoff and to divert sediment-laden water to appropriate traps or stable outlets. The dike consists of compacted soil and stone, riprap, or vegetation to stabilize the channel.

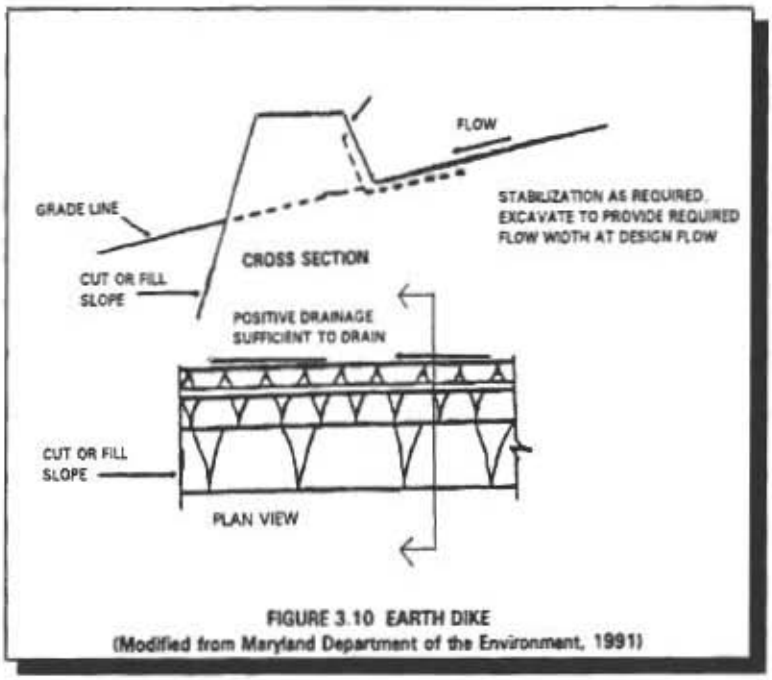

FIGURE 3.10 EARTH DIKE
(Modified from Maryland Department of the Environment, 1991)

When and Where to Use It

Earth dikes are used in construction areas to control erosion, sedimentation, or flood damage. Earth dikes can be used in the following situations:

- Above disturbed existing slopes and above cut or fill slopes to prevent runoff over the slope
- Across unprotected slopes, as slope breaks, to reduce slope length
- Below slopes to divert excess runoff to stabilized outlets
- To divert sediment laden water to sediment traps

- At or near the perimeter of the construction area to keep sediment from leaving the site

- Above disturbed areas before stabilization to prevent erosion and maintain acceptable working conditions

- Temporary diversions may also serve as sediment traps when the site has been overexcavated on a flat grade or in conjunction with a sediment fence.

What to Consider

Despite an earth dike's simplicity, improper design can limit its effectiveness; therefore, the State or local requirements should be consulted. Some general considerations include proper compaction of the earth dike, appropriate location to divert the intercepted runoff, and properly design ridge height and thicknesses. Earth dikes should be constructed along a positive grade. There should be no dips or low points in an earth dike where the storm water will collect (other than the discharge point). Also, the intercepted runoff from disturbed areas should be diverted to a sediment-trapping device. Runoff from undisturbed areas can be channeled to an existing swale or to a level spreader. Stabilization for the dike and flow channel of the drainage swale should be accomplished as soon as possible. Stabilization materials can include vegetation or stone/riprap.

Advantages of an Earth Dike
• Can be constructed from materials and equipment which are typically already present on a construction site
Disadvantages of an Earth Dike
• Frequent inspection and maintenance required

Drainage Swale

What Is It

A drainage swale is a channel with a lining of vegetation, riprap, concrete, or other material. It is constructed by excavating a channel and applying the appropriate stabilization.

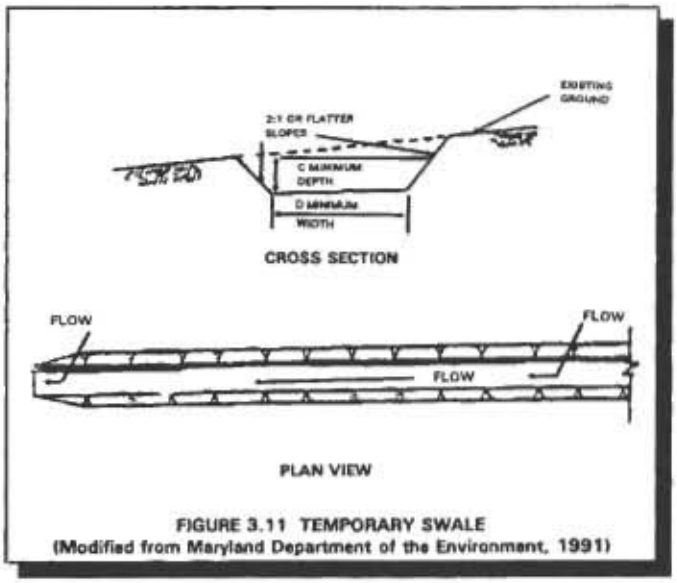

FIGURE 3.11 TEMPORARY SWALE
(Modified from Maryland Department of the Environment, 1991)

When and Where to Use It

A drainage swale applies when runoff is to be conveyed without causing erosion. Drainage swales can be used to convey runoff from the bottom or top of a slope. Drainage swales accomplish this by intercepting and diverting the flow to a suitable outlet. For swales draining a disturbed area, the outlet can be to a sediment trapping device prior to its release.

What to Consider

Since design flows, channel linings, and appropriate outlet devices will need to be considered, consult your State's requirements on such erosion control measures prior to constructing a drainage swale. General considerations include:

- Divert the intercepted runoff to an appropriate outlet.

- The swale should be lined using geotextiles, grass, sod, riprap, asphalt, or concrete. The selection of the liner is dependent upon the volume and the velocity of the anticipated runoff.

- The swale should have a positive grade. There should be no dips or low points in the swale where the storm water will collect.

Advantages of a Drainage Swale
• Excavation of swale can be easily performed with earth moving equipment • Can transport large volumes of runoff
Disadvantages of a Drainage Swale
• Stabilization and design costs can make construction expensive • Use is restricted to areas with relatively flat slopes

Interceptor Dikes and Swales

What Are They

Interceptor dikes (ridges of compacted soil) and swales (excavated depressions) are used to keep upslope runoff from crossing areas where there is a high risk of erosion. They reduce the amount and speed of flow and then guide it to a stabilized outfall (point of discharge) or sediment trapping area (see sections on Sediment Traps and Temporary Sediment Basins). Interceptor dikes and swales divert runoff using a combination of earth dike and vegetated swale. Runoff is channeled away from locations where there is a high risk of erosion by placing a diversion dike or swale at the top of a sloping disturbed area. Dikes and swales also collect overland flow, changing it into concentrated flows. Interceptor dikes and swales can be either temporary or permanent storm water control structures.

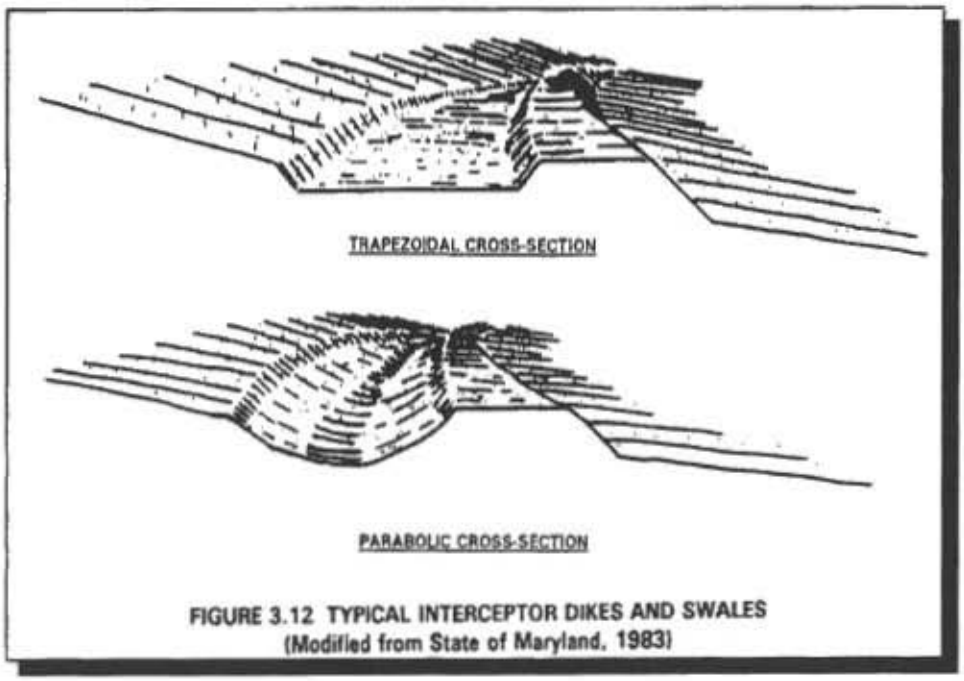

FIGURE 3.12 TYPICAL INTERCEPTOR DIKES AND SWALES
(Modified from State of Maryland, 1983)

When and Where to Use Them

Interceptor dikes and swales are generally built around the perimeter of a construction site before any major soil disturbing activity takes place. Temporary dikes or swales may also be used to protect existing buildings; areas, such as stockpiles; or other small areas that have

not yet been fully stabilized. When constructed along the upslope perimeter of a disturbed or high-risk area (though not necessarily all the way around it), dikes or swales prevent runoff from uphill areas from crossing the unprotected slope. Temporary dikes or swales constructed on the down slope side of the disturbed or high-risk area will prevent runoff that contains sediment from leaving the site before sediment is removed. For short slopes, a dike or swale at the top of the slope reduces the amount of runoff reaching the disturbed area. For longer slopes, several dikes or swales are placed across the slope at intervals. This practice reduces the amount of runoff that accumulates on the face of the slope and carries the runoff safely down the slope. In all cases, runoff is guided to a sediment trapping area or a stabilized outfall before release.

What to Consider

Temporary dikes and swales are used in areas of overland flow; if they remain in place longer than 15 days, they should be stabilized. Runoff channeled by a dike or swale should be directed to an adequate sediment trapping area or stabilized outfall. Care should be taken to provide enough slope for drainage but not too much slope to cause erosion due to high runoff flow speed. Temporary interceptor dikes and swales may remain in place as long as 12 to 18 months (with proper stabilization) or be rebuilt at the end of each day's activities. Dikes or swales should remain in place until the area they were built to protect is permanently stabilized. Interceptor dikes and swales can be permanent controls. However, permanent controls: should be designed to handle runoff after construction is complete; should be permanently stabilized; and should be inspected and maintained on a regular basis. Temporary and permanent control measures should be inspected once each week on a regular schedule and after every storm. Repairs necessary to the dike and flow channel should be made promptly.

Advantages of Interceptor Dikes and Swales
• Are simple and effective for channeling runoff away from areas subject to erosion
• Can handle flows from large drainage areas
• Are inexpensive because they use materials and equipment normally found onsite
Disadvantages of Interceptor Dikes and Swales
• If constructed improperly, can cause erosion and sediment transport since flows are concentrated
• May cause problems to vegetation growth if water flow is too fast
• Require additional maintenance, inspections, and repairs

Temporary Stream Crossing

What Is It

A temporary stream crossing is a bridge or culvert across a stream or watercourse for short-term use by construction vehicles or heavy equipment. Vehicles moving over unprotected stream banks will damage the bank, thereby releasing sediments and degrading the stream bank. A stream crossing provides a means for construction vehicles to cross streams or watercourses without moving sediment to streams, damaging the streambed or channel, or causing flooding.

When and Where to Use It

A temporary stream crossing is used when heavy equipment should be moved from one side of a stream channel to another, or where light-duty construction vehicles have to cross the stream channel frequently for a short period of time. Temporary stream crossings should be constructed only when it is necessary to cross a stream and a permanent crossing is not yet constructed.

- **Bridges**—Where available materials and designs are adequate to bear the expected loadings, bridges are preferred as a temporary stream crossing.

- **Culverts**—Culverts are the most common type of stream crossings and are relatively easy to construct. A pipe, which is to carry the flow, is laid into the channel and covered by gravel.

What to Consider

When feasible, one should always attempt to minimize or eliminate the need to cross streams. Temporary stream crossings are a direct source of pollution; therefore, every effort should be made to use an alternate method (e.g., longer detour), when feasible. When it becomes necessary to cross a stream, a well planned approach will minimize the damage to the stream bank and reduce erosion. The design of temporary stream crossings requires knowledge of the design flows and other information; therefore, a professional engineer and specific State and local requirements should be consulted. State/local jurisdictions may require a separate permit for temporary stream crossings; contact them directly to learn about their exact requirements.

The specific loads and the stream conditions will dictate what type of stream crossing to employ. Bridges are the preferred method to cross a stream as they provide the least obstruction to flows and fish migration.

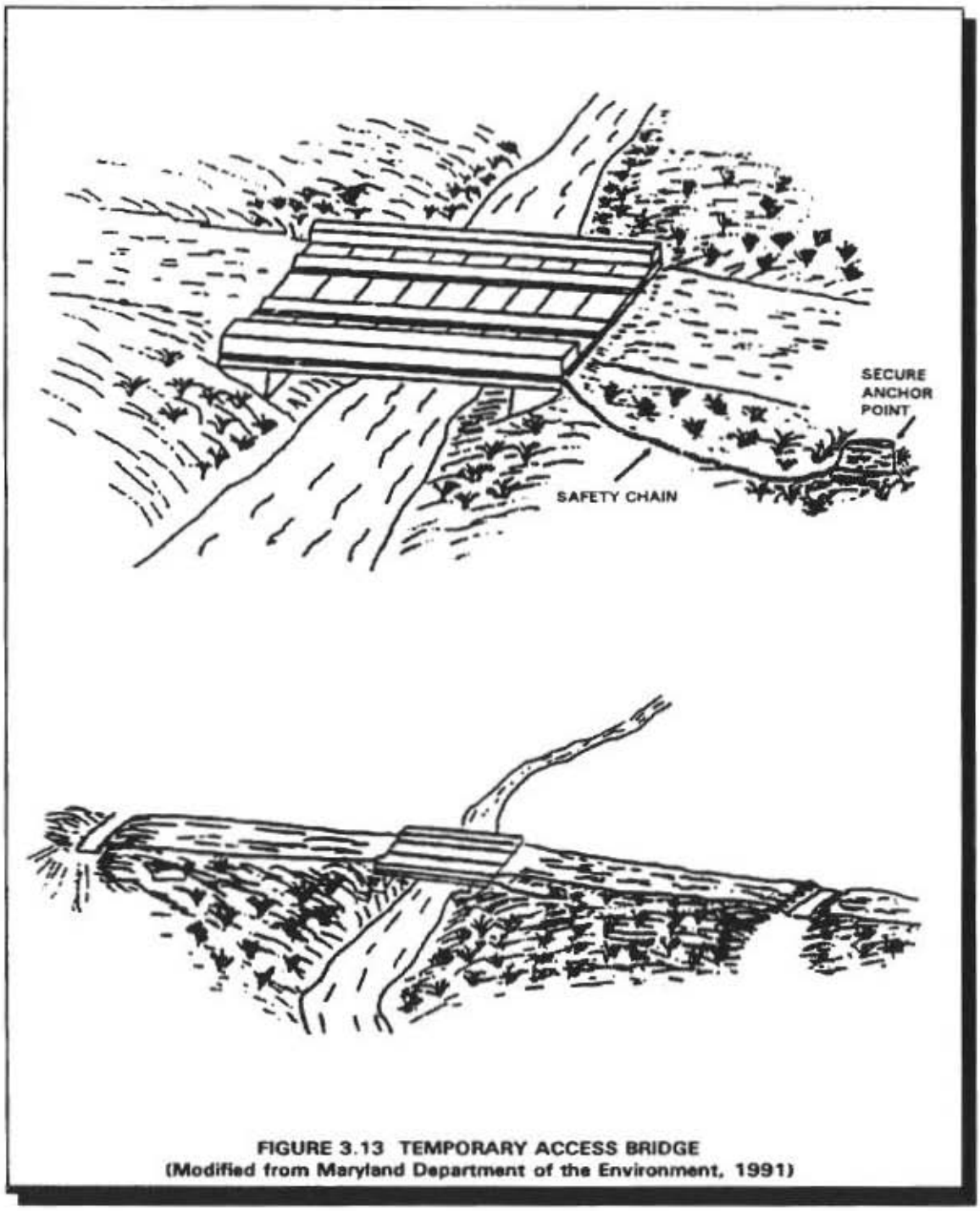

FIGURE 3.13 TEMPORARY ACCESS BRIDGE
(Modified from Maryland Department of the Environment, 1991)

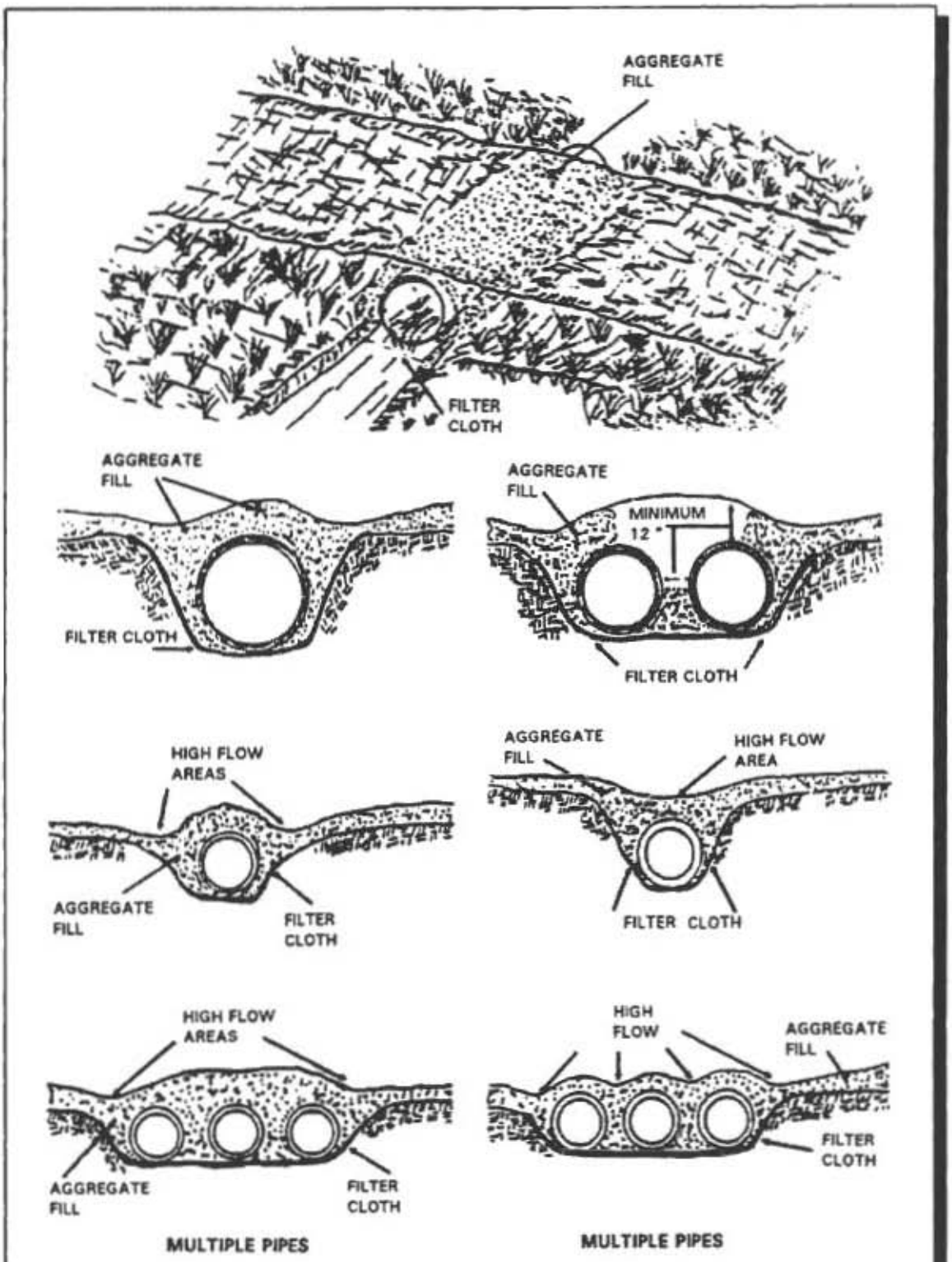

FIGURE 3.14 TEMPORARY ACCESS CULVERT
(Modified from Maryland Department of the Environment, 1991)

Advantages of a Temporary Stream Crossing
• Bridges provide the least obstruction to flow and fish migration and the construction material can be salvaged
• Culverts are inexpensive and easily installed structures
Disadvantages of a Temporary Stream Crossing
• Bridges are expensive to design and install
• Culverts cause greater disturbances during installation and removal

Temporary Storm Drain Diversion

What Is It

A temporary storm drain is a pipe which redirects an existing storm drain system or outfall channel to discharge into a sediment trap or basin.

When and Where to Use It

Use storm drain diversions to temporarily divert flow going to a permanent outfall. This diverted flow should be directed to a sediment-trapping device. A temporary storm drain diversion should remain in place as long as the area draining to the storm sewer remains disturbed. Another method is to delay completion of the permanent outfall and instead using temporary diversions to a sediment trapping device before discharge. Finally, a sediment trap or basin can be constructed below a permanent storm drain outfall. The basin would be designed to trap any sediment before final discharge.

What to Consider

Since the existing storm draining systems will be modified, careful consideration to piping configuration and resulting impact of installing a temporary storm drain diversion should be given. The temporary diversions will also need to be moved, once the construction has ceased and it is necessary to restore the original storm drainage systems. Therefore, appropriate restoration measures such as flushing the storm drain prior to removal of the sediment trap or basin, stabilizing the outfall, restoration of grade areas, etc. should be taken. And finally, the State or local requirements should be consulted for detailed requirements.

Advantages of a Temporary Storm Drain Diversion
• Requires little maintenance once installed
Disadvantages of a Temporary Storm Drain Diversion
• Disturbs existing storm drainage patterns

Pipe Slope Drains

What Are They

Pipe slope drains reduce the risk of erosion by discharging runoff to stabilized areas. Made of flexible or rigid pipe, they carry concentrated runoff from the top to the bottom of a slope that has already been damaged by erosion or is at high risk for erosion. They are also used to drain saturated slopes that have the potential for soil slides. Pipe slope drains can be either temporary or permanent depending on the method of installation and material used.

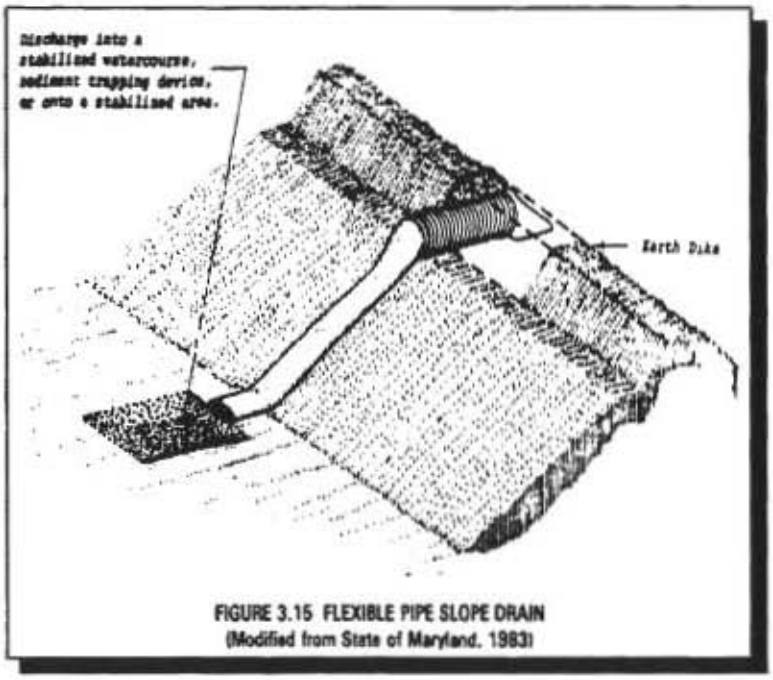

FIGURE 3.15 FLEXIBLE PIPE SLOPE DRAIN
(Modified from State of Maryland, 1983)

When and Where to Use Them

Pipe slope drains are used whenever it is necessary to convey water down a slope without causing erosion. They are especially effective before a slope has been stabilized or before permanent drainage structures are ready for use. Pipe slope drains may be used with other devices, including diversion dikes or swales, sediment traps, and level spreaders (used to spread out storm water runoff uniformly over the surface of the ground). Temporary pipe slope drains, usually flexible tubing or conduit, may be installed prior to the construction of

permanent drainage structures. Permanent slope drains may be placed on or beneath the ground surface; pipes, sectional downdrains, paved chutes, or clay tiles may be used.

Paved chutes may be covered with a surface of concrete or other impenetrable material. Subsurface drains can be constructed of concrete, PVC, clay tile, corrugated metal, or other permanent material.

What to Consider

The drain design should be able to handle the volume of flow. The inlets and outlets of a pipe slope drain should be stabilized. This means that a flared end section should be used at the entrance of the pipe. The soil around the pipe entrance should be fully compacted. The soil at the discharge end of the pipe should be stabilized with riprap (a combination of large stones, cobbles, and boulders). The riprap should be placed along the bottom of a swale which leads to a sediment trapping structure or another stabilized area.

Pipe slope drains should be inspected on a regular schedule and after any major storm. Be sure that the inlet from the pipe is properly installed to prevent bypassing the inlet and undercutting the structure. If necessary, install a headwall, riprap, or sandbags around the inlet. Check the outlet point for erosion and check the pipe for breaks or clogs. Install outlet protection if needed and promptly clear breaks and clogs.

Advantages of Pipe Slope Drains
• Can reduce or eliminate erosion by transporting runoff down steep slopes or by draining saturated soils
• Are easy to install and require little maintenance
Disadvantages of Pipe Slope Drains
• Require that the area disturbed by the installation of the drain should be stabilized or it, too, will be subject to erosion
• May clog during a large storm

Subsurface Drains

What Are They

A subsurface drain is a perforated pipe or conduit placed beneath the surface of the ground at a designed depth and grade. It is used to drain an area by lowering the water table. A high water table can saturate soils and prevent the growth of certain types of vegetation. Saturated soils on slopes will sometimes "slip" down the hill. Installing subsurface drains can help prevent these problems.

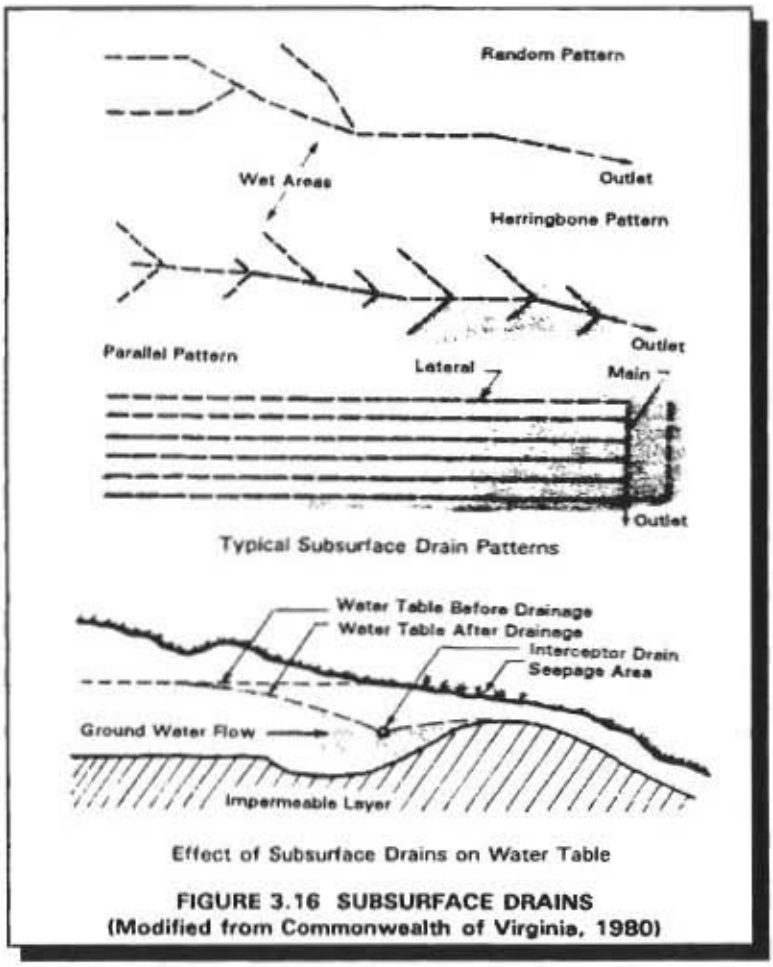

FIGURE 3.16 SUBSURFACE DRAINS
(Modified from Commonwealth of Virginia, 1980)

When and Where to Use Them

There are two types of subsurface drains: relief drains and interceptor drains. Relief drains are used to dewater an area where the water table is high. They may be placed in a gridiron, herringbone, or random pattern. Interceptor drains are used to remove water where sloping soils are excessively wet or subject to slippage. They are usually placed as single pipes instead of in patterns. Generally, subsurface drains are suitable only in areas where the soil is deep enough for proper installation. They are not recommended where they pass under heavy vehicle crossings.

What to Consider

Drains should be place so that tree roots will not interfere with drainage pipes. The drain design should be adequate to handle the volume of flow. Areas disturbed by the installation of a drain should be stabilized or they, too, will be subject to erosion. The soil layer must be deep enough to allow proper installation.

Backfill immediately after the pipe is place. Material used for backfill should be open granular soil that is highly permeable. The outlet should be stabilized and should direct sediment-laden storm water runoff to a sediment trapping structure or another stabilized area.

Inspect subsurface drains on a regular schedule and check for evidence of pipe breaks or clogging by sediment, debris, or tree roots. Remove blockage immediately, replace any broken sections, and restabilize the surface. If the blockage is from tree roots, it may be necessary to relocate the drain. Check inlets and outlets for sediment or debris. Remove and dispose of these materials properly.

Advantages of Subsurface Drains
• Provide an effective method for stabilizing wet sloping soils
• Are an effective way to lower the water table
Disadvantages of Subsurface Drains
• May be pierced and clogged by tree roots
• Should not be installed under heavy vehicle crossings
• Cost more than surface drains because of the expenses of excavation for installation

Silt Fence

What Is It

A silt fence, also called a "filter fence," is a temporary measure for sedimentation control. It usually consists of posts with filter fabric stretched across the posts and sometimes with a wire support fence. The lower edge of the fence is vertically trenched and covered by backfill. A silt fence is used in small drainage areas to detain sediment. These fences are most effective where there is overland flow (runoff that flows over the surface of the ground as a thin, even layer) or in minor swales or drainageways. They prevent sediment from entering receiving waters. Silt fences are also used to catch wind blown sand and to create an anchor for sand dune creation. Aside from the traditional wooden post and filter fabric method, there are several variations of silt fence installation including silt fence which can be purchased with pockets presewn to accept use of steel fence posts.

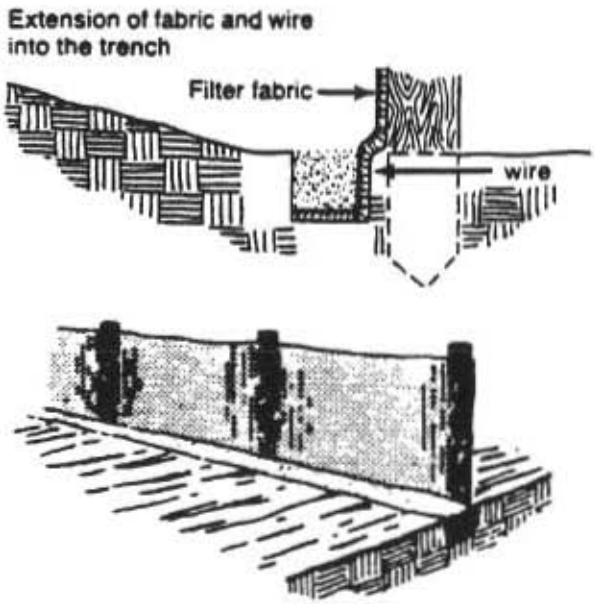

FIGURE 3.17 SILT FENCE DETAILS
(Modified from State of North Carolina, 1988; and State of Wisconsin, 1988)

When and Where to Use It

A silt fence should be installed prior to major soil disturbance in the drainage area. The fence should be placed across the bottom of a slope along a line of uniform elevation (perpendicular to the direction of flow). It can be used at the outer boundary of the work area. However, the fence does not have to surround the work area completely. In addition, a silt fence is effective where sheet and rill erosion may be a problem. Silt fences should not be constructed in streams or swales.

What to Consider

A silt fence is not appropriate for controlling runoff from a large area. This type of fence can be more effective than a straw bale barrier if properly installed and maintained. It may be used in combination with other erosion and sediment practices.

The effective life span for a silt fence depends upon the material of construction and maintenance. The fence requires frequent inspection and prompt maintenance to maintain its effectiveness. Inspect the fence after each rainfall. Check for areas where runoff eroded a channel beneath the fence, or where the fence was caused to sag or collapse by runoff flowing over the top. Remove and properly dispose of sediment when it is one-third to one-half the height of the fence or after each storm.

Advantages of a Silt Fence
• Removes sediments and prevents downstream damage from sediment deposits
• Reduces the speed of runoff flow
• Minimal clearing and grubbing required for installation
• Inexpensive
Disadvantages of a Silt Fence
• May result in failure from improper choice of pore size in the filter fabric or improper installation
• Should not be used in streams
• Is only appropriate for small drainage areas with overland flow
• Frequent inspection and maintenance is necessary to ensure effectiveness

Gravel or Stone Filter Berm

What Is It

A gravel or stone filter berm is a temporary ridge constructed of loose gravel, stone, or crushed rock. It slows and filters flow, diverting it from an exposed traffic area. Diversions constructed of compacted soil may be used where there will be little or no construction traffic within the right-of-way. They are also used for directing runoff from the right-of-way to a stabilized outlet.

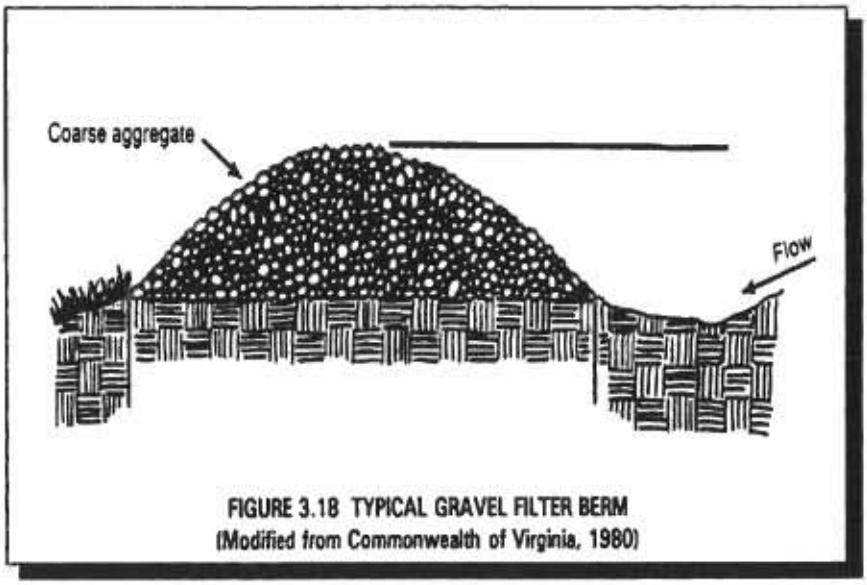

FIGURE 3.18 TYPICAL GRAVEL FILTER BERM
(Modified from Commonwealth of Virginia, 1980)

When and Where to Use It

This method is appropriate where roads and other rights-of-way under construction should accommodate vehicular traffic. Berms are meant for use in areas with gentle slopes. They may also be used at traffic areas within the construction site.

What to Consider

Berm material should be well graded gravel or crushed rock. The spacing of the berms will depend on the steepness of the slope: berms should be placed closer together as the slope increases. The diversion should be inspected regularly after each rainfall, or if breached by

construction or other vehicles. All needed repairs should be performed immediately. Accumulated sediment should be removed and properly disposed of and the filter material replaced, as necessary.

Advantages of a Gravel or Stone Filter Berm
• Is a very efficient method of sediment control
• Reduces the speed of runoff flow
Disadvantages of a Gravel or Stone Filter Berm
• Is more expensive than methods that use onsite materials
• Has a very limited life span
• Can be difficult to maintain because of clogging from mud and soil on vehicle tires

Storm Drain Inlet Protection

What Is It

Storm drain inlet protection is a filtering measure placed around any inlet or drain to trap sediment. This mechanism prevents the sediment from entering inlet structures. Additionally, it serves to prevent the silting-in of inlets, storm drainage systems, or receiving channels. Inlet protection may be composed of gravel and stone with a wire mesh filter, block and gravel, filter fabric, or sod.

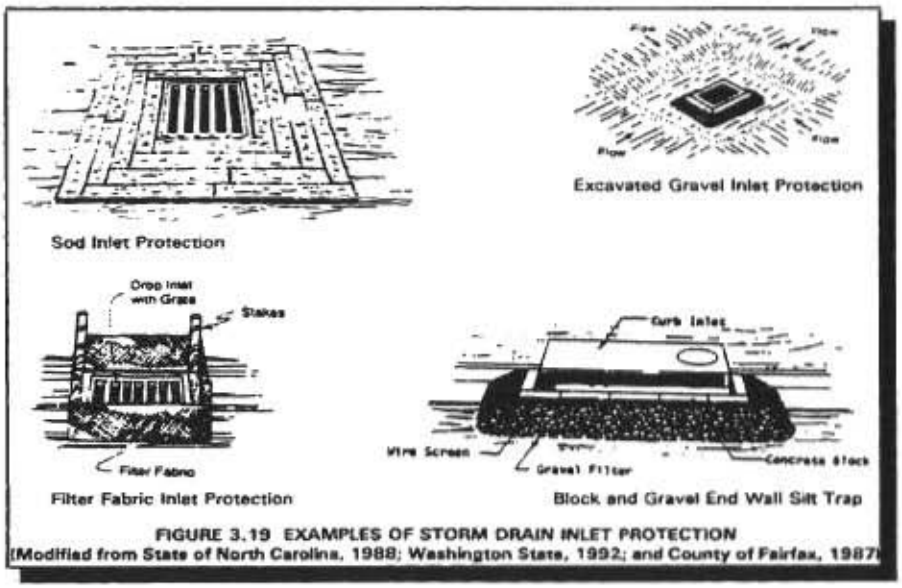

FIGURE 3.19 EXAMPLES OF STORM DRAIN INLET PROTECTION
(Modified from State of North Carolina, 1988; Washington State, 1992; and County of Fairfax, 1987)

When and Where to Use It

This type of protection is appropriate for small drainage areas where storm drain inlets will be ready for use before final stabilization. Storm drain inlet protection is also used where a permanent storm drain structure is being constructed onsite. Straw bales are not recommended for this purpose. Filter fabric is used for inlet protection when storm water flows are relatively small with low velocities. This practice cannot be used where inlets are paved because the filter fabric should be staked. Block and gravel filters can be used where velocities are higher. Gravel and mesh filters can be used where flows are higher and subject to disturbance by site traffic. Sod inlet filters are generally used where sediments in the storm water runoff are low.

What to Consider

Storm drain inlet protection is not meant for use in drainage areas exceeding 1 acre or for large concentrated storm water flows. Installation of this measure should take place before any soil disturbance in the drainage area. The type of material used will depend on site conditions and the size of the drainage area. Inlet protection should be used in combination with other measures, such as small impoundments or sediments traps, to provide more effective sediment removal. Inlet protection structures should be inspected regularly, especially after a rainstorm. Repairs and silt removal should be performed as necessary. Storm drain inlet protection structures should be removed only after the disturbed areas are completely stabilized.

Advantages of Storm Drain Inlet Protection
• Prevents clogging of existing storm drainage systems and the siltation of receiving waters
• Reduces the amount of sediment leaving the site
Disadvantages of Storm Drain Inlet Protection
• May be difficult to remove collected sediment
• May cause erosion elsewhere if clogging occurs
• Is practical only for low sediment, low volume flows (disturbed areas less than one acre)

Sediment Trap

What Is It

A sediment trap is formed by excavating a pond or by placing an earthen embankment across a low area or drainage swale. An outlet or spillway is constructed using large stones or aggregate to slow the release of runoff. The trap retains the runoff long enough to allow most of the silt to settle out.

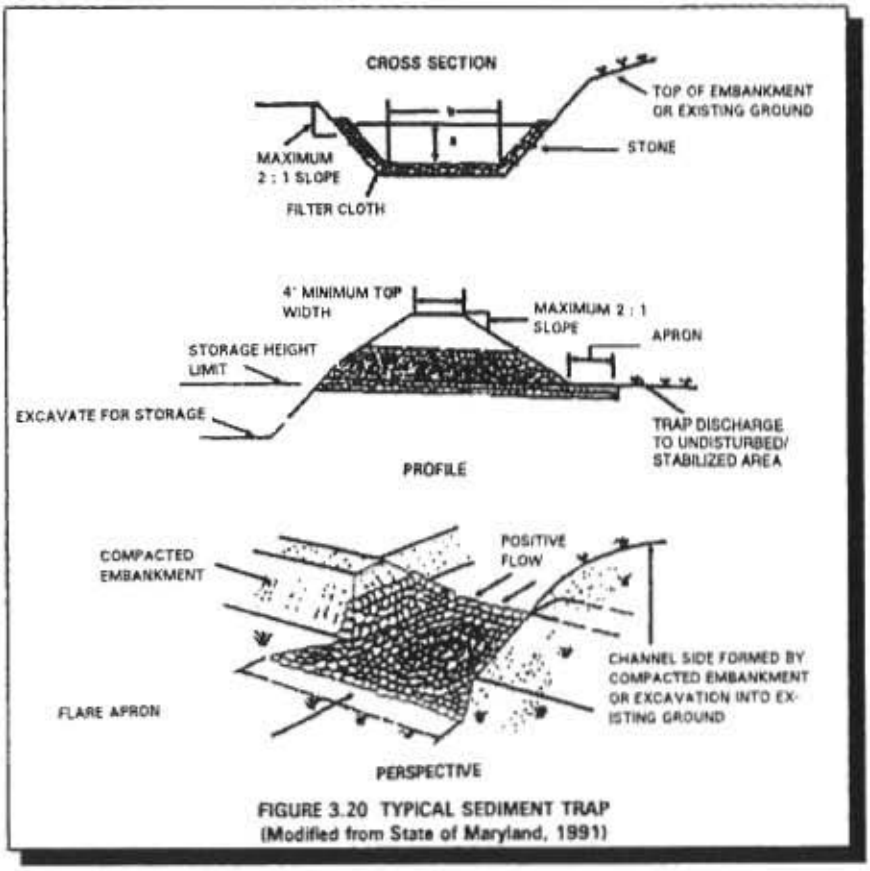

FIGURE 3.20 TYPICAL SEDIMENT TRAP
(Modified from State of Maryland, 1991)

When and Where to Use It

A temporary sediment trap may be used in conjunction with other temporary measures, such as gravel construction entrances, vehicle wash areas, slope drains, diversion dikes and swales, or diversion channels.

What to Consider

Sediment traps are suitable for small drainage areas, usually no more than 10 acres. The trap should be large enough to allow the sediments to settle and should have a capacity to store the collected sediment until it is removed. The volume of storage required depends upon the amount and intensity of expected rainfall and on estimated quantities of sediment in the storm water runoff. Check your Permit to see if it specifies a minimum storage volume for sediment traps.

The effective life of a sediment trap depends upon adequate maintenance. The trap should be readily accessible for periodic maintenance and sediment removal. Traps should be inspected after each rainfall and cleaned when no more than half the design volume has been filled with collected sediment. The trap should remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place.

Advantages of a Temporary Sediment Trap
• Protects downstream areas from clogging or damage due to sediment deposits
• Is inexpensive and simple to install
• Can simplify the design process by trapping sediment at specific spots onsite
Disadvantages of a Temporary Sediment Trap
• Is suitable only for a limited area
• Is effective only if properly maintained
• Will not remove very fine silts and clays

Temporary Sediment Basin

What Is It

A temporary sediment basin is a setting pond with a controlled storm water release structure used to collect and store sediment produced by construction activities. A sediment basin can be constructed by excavation and/or by placing an earthen embankment across a low area or drainage swale. Sediment basins can be designed to maintain a permanent pool or to drain completely dry. The basin detains sediment-laden runoff from larger drainage areas long enough to allow most of the sediment to settle out.

The pond has a riser and pipe outlet with a gravel outlet or spillway to slow the release of runoff and provide some sediment filtration. By removing sediment, the basin helps prevent clogging of offsite conveyance systems and sediment-loading of receiving waterways. In this way, the basin helps prevent destruction of waterway habitats.

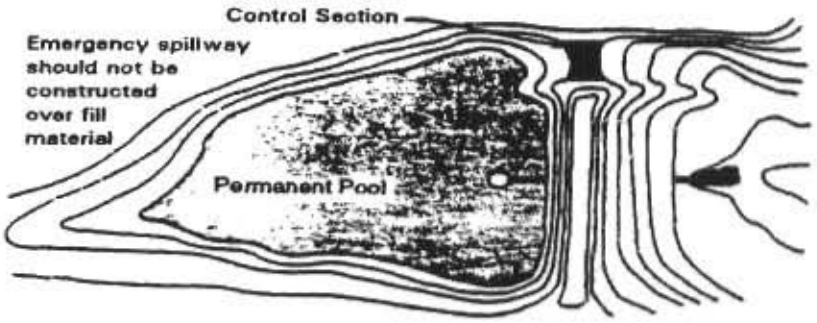

FIGURE 3.21 TEMPORARY SEDIMENT BASIN
(Modified from Commonwealth of Virginia, 1980)

When and Where to Use It

A temporary sediment basin should be installed before clearing and grading is undertaken. It should not be built on an embankment in an active stream. The creation of a dam in such a site may result in the destruction of aquatic habitats. Dam failure can also result in flooding. A temporary sediment basin should be located only if there is sufficient space and appropriate topography. The basin should be made large enough to handle the maximum expected amount of site drainage. Fencing around the basin may be necessary for safety or vandalism reasons.

A temporary sediment basin used in combination with other control measures, such as seeding or mulching, is especially effective for removing sediments.

What to Consider

Temporary sediment basins are usually designed for disturbed areas larger that 5 acres. The pond should be large enough to hold runoff long enough for sediment to settle. Sufficient space should be allowed for collected sediments. Check the requirements of your permit to see if there is a minimum storage requirement for sediment basins. The useful life of a temporary sediment basin is dependent upon adequate maintenance.

Sediment trapping efficiency is improved by providing the maximum surface area possible. Because finer silts may not settle out completely, additional erosion control measures should be used to minimize release of fine silt. Runoff should enter the basin as far from the outlet as possible to provide maximum retention time.

Sediment basins should be readily accessible for maintenance and sediment removal. They should be inspected after each rainfall and be cleaned out when about half the volume has been filled with sediment. The sediment basin should remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place. The embankment forming the sedimentation pool should be well compacted and stabilized with vegetation. If the pond is located near a residential area, it is recommended for safety reasons that a sign be posted and that the area be secured by a fence. A well built temporary sediment basin that is large enough to handle the post construction runoff volume may later be converted to use as a permanent storm water management structure.

The sediment basins outlet pipe and spill way should be designed by an engineer based upon an analysis of the expected runoff flow rates from the site. Consult your state/local requirements to determine the frequency of the storm for which the outlet must be designed.

EPA BASELINE GENERAL PERMIT REQUIREMENTS
Sediment Basin Requirements Part IV.D.2.a.(2).(a). For common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. The 3,600 cubic feet of storage area per acre drained does not apply to flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around the sediment basin. For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent controls is not attainable, sediment traps, silt fences, or equivalent sediment controls are required for all sideslope and downslope boundaries of the construction area.

Advantages of a Temporary Sediment Basin
• Protects downstream areas from clogging or damage due to sediment deposits generated during construction activities
• Can trap smaller sediment particles than sediment traps can because of the longer detention time
• Can be converted to a permanent storm water detention structure, once construction is complete
Disadvantages of a Temporary Sediment Basin
• Is generally suitable for small areas
• Requires regular maintenance and cleaning
• Will not remove very fine silts and clays unless used in conjunction with other measures
• Is a more expensive way to remove sediment than several other methods
• Requires careful adherence to safety practices since ponds are attractive to children

Outlet Protection

What Is It

Outlet protection reduces the speed of concentrated storm water flows and therefore it reduces erosion or scouring at storm water outlets and paved channel sections. In addition, outlet protection lowers the potential for downstream erosion. This type of protection can be achieved through a variety of techniques, including stone or riprap, concrete aprons, paved sections and settling basins installed below the storm drain outlet.

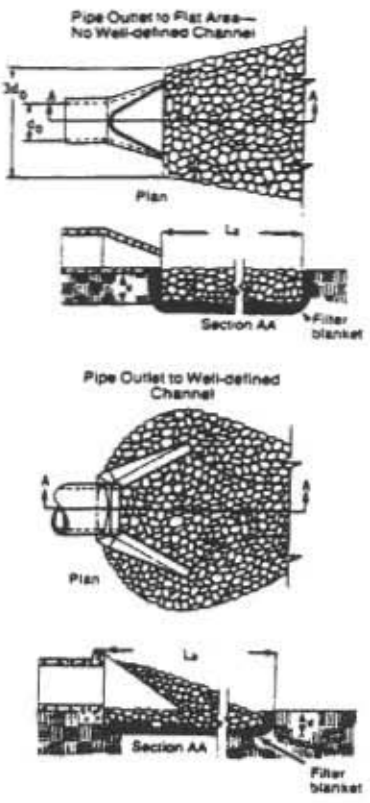

FIGURE 3.22 TYPICAL DETAILS FOR ROCK OUTLET PROTECTION
(Modified from State of North Carolina, 1988)

When and Where to Use It

Outlet protection should be installed at all pipe, interceptor dike, swale, or channel section outlets where the velocity of flow may cause erosion at the pipe outlet and in the receiving channel. Outlet protection should also be used at outlets where the velocity of flow at the design capacity may result in plunge pools (small permanent pools located at the inlet to or the outfall from B.M.P.'s). Outlet protection should be installed early during construction activities, but may be added at any time, as necessary.

What to Consider

The exit velocity of the runoff as it leaves the outlet protection structure should be reduced to levels that minimize erosion. Outlet protection should be inspected on a regular schedule to look for erosion and scouring. Repairs should be made promptly.

Advantages of Outlet Protection
• Provides, with riprap-line apron (the most common outlet protection), a relatively low cost method that can be installed easily on most sites
• Removes sediment in addition to reducing flow speed
• Can be used at most outlets where the flow speed is high
• Is an inexpensive but effective measure
• Requires less maintenance than many other measures
Disadvantages of Outlet Protection
• May be unsightly
• May cause problems in removing sediment (without removing and replacing the outlet protection structure itself)
• May require frequent maintenance for rock outlets with high velocity flows

Check Dams

What Are They

A check dam is a small, temporary or permanent dam constructed across a drainage ditch, swale, or channel to lower the speed of concentrated flows. Reduced runoff speed reduces erosion and gullying in the channel and allows sediments to settle out.

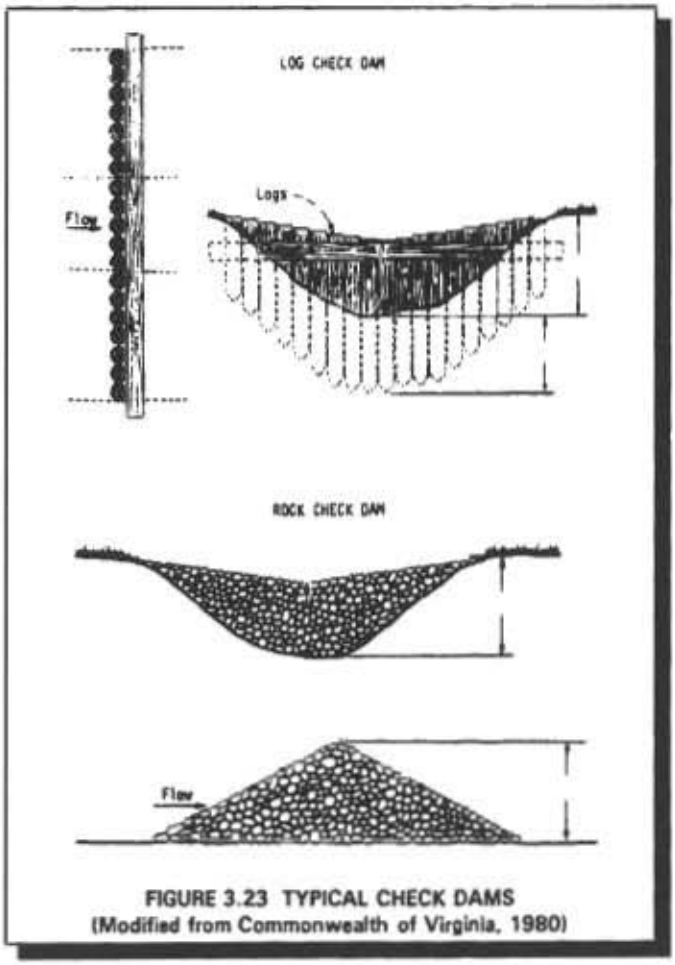

FIGURE 3.23 TYPICAL CHECK DAMS
(Modified from Commonwealth of Virginia, 1980)

When and Where to Use Them

A check dam should be installed in steeply sloped swales, or in swales where adequate vegetation cannot be established. A check dam may be built from logs, stone, or pea gravel-filled sandbags.

What to Consider

Check dams should be used only in small open channels which will not be overtopped by flow once the dams are considered. The dams should not be placed in streams (unless approved by appropriate State authorities). The center section of the check dam should be lower than the edges. Dams should be spaced so that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

After each significant rainfall, check dams should be inspected for sediment and debris accumulation. Sediment should be removed when it reaches one half the original dam height. Check for erosion at edges and repair promptly as required. After construction is complete, all stone and riprap should be removed if vegetative erosion controls will be used as a permanent erosion control measure. It will be important to know the expected erosion rates and runoff flow rate for the swale in which this measure is to be installed. Contact the State/local storm water program agency or a licensed engineer for assistance in designing this measure.

Advantages of Check Dams
• Are inexpensive and easy to install
• May be used permanently if designed properly
• Allow a high proportion of sediment in the runoff to settle out
• Reduce velocity and may provide aeration of the water
• May be used where it is not possible to divert the flow or otherwise stabilize the channel
Disadvantages of Check Dams
• May kill grass linings in channels if the water level remains high after it rains or if there is significant sedimentation
• Reduce the hydraulic capacity of the channel
• May create turbulence which erodes the channel banks

Surface Roughening

What Is It

Surface roughening is a temporary erosion control practice. The soil surface is roughened by the creation of horizontal grooves, depressions, or steps that run parallel to the contour of the land. Slopes that are not fine-graded and that are left in a roughened condition can also control erosion. Surface roughening reduces the speed of runoff, increase infiltration, and traps sediment. Surface roughening also helps establish vegetative cover by reducing runoff velocity and giving seed an opportunity to take hold and grow.

FIGURE 3.24 SURFACE ROUGHENING
(Modified from Washington State, 1992)

When and Where to Use It

Surface roughening is appropriate for all slopes. To slow erosion, roughening should be done as soon as possible after the vegetation has been removed from the slope. Roughening can be used with both seeding and planting and temporary mulching to stabilize an area. For steeper slopes and slopes that will be left roughened for longer periods of time, a combination of surface roughening and vegetation is appropriate. Surface roughening should be performed immediately after grading activities have ceased (temporarily or permanently) in an area.

What to Consider

Different methods can be used to roughen the soil surface on slopes. They include stair-step grading, grooving (using disks, spring harrows, or teeth on a front-end loader), and tracking (driving a crawler tractor up and down a slope, leaving the cleat imprints parallel to the slope contour). The selection of an appropriate method depends on the grade of the slope, mowing requirements after vegetative cover is established, whether the slope was formed by cutting or filling, and type of equipment available.

Cut slopes with a gradient steeper than 3:1 but less than 2:1 should be stair-step graded or groove cut. Stair-step grading works well with soils containing large amounts of small rock. Each step catches material discarded from above and provides a level site where vegetation can grow. Stairs should be wide enough to work with standard earth moving equipment. Grooving can be done by any implement that can be safely operated on the slope, including those described above. Grooves should not be less than 3 inches deep nor more than 15 inches apart. Fill slopes with a gradient steeper than 3:1 but less than 2:1 should be compacted every 9 inches of depth. The face of the slope should consist of loose, uncompacted fill 4 to 6 inches deep that can be left rough or can be grooved as described above, if necessary.

Any cut or filled slope that will be mowed should have a gradient less than 3:1. Such a slope can be roughened with shallow grooves parallel to the slope contour by using normal tilling. Grooves should be close together (less than 10 inches) and not less than 1 inch deep. Any gradient with a slope greater than 2:1 should be stair-stepped.

It is important to avoid excessive compacting of the soil surface, especially when tracking, because soil compaction inhibits vegetation growth and causes higher runoff speed. Therefore, it is best to limit roughening with tracked machinery to sandy soils that do not compact easily and to avoid tracking on clay soils. Surface roughened areas should be seeded as quickly as possible. Also, regular inspections should be made of all surface roughened areas, especially after storms. If rills, (small watercourses that have steep sides

and are usually only a few inches deep) appear, they should be filled, graded again, and reseeded immediately. Proper dust control procedures should be followed when surface roughening.

Advantages of Surface Roughening
• Provides a degree of instant erosion protection for bare soil while vegetative cover is being established
• Is inexpensive and simple for short-term erosion control
Disadvantages of Surface Roughening
• Is of limited effectiveness in anything more than a gentle rain
• Is only temporary; if roughening is washed away in a heavy storm, the surface will have to be re-roughened and new seed laid

Gradient Terraces

What Are They

Gradient terraces are earth embankments or ridge-and-channels constructed along the face of a slope at regular intervals. Gradient terraces are constructed at a positive grade. They reduce erosion damage by capturing surface runoff and directing it to a stable outlet at a speed that minimizes erosion.

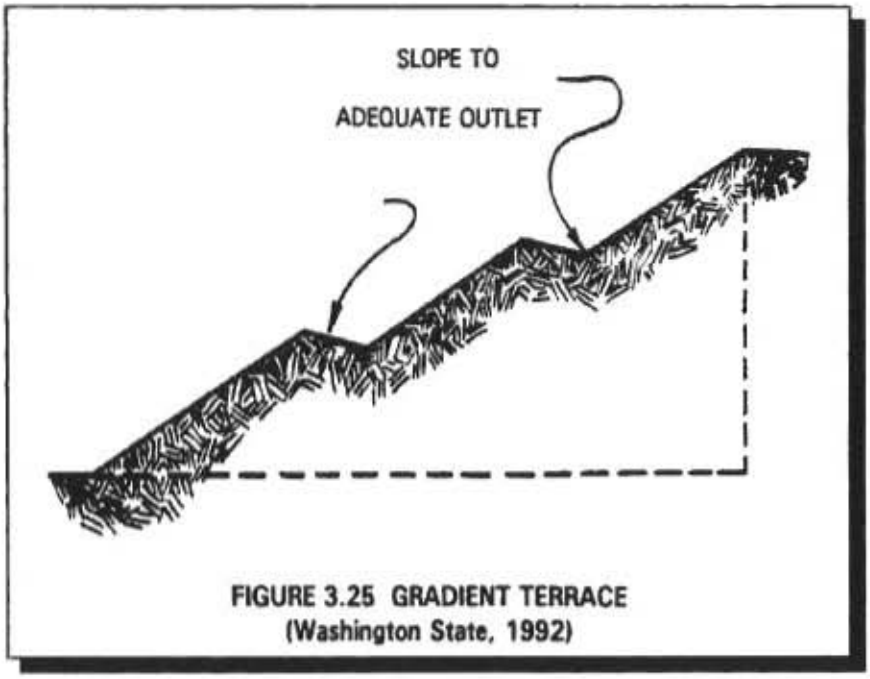

FIGURE 3.25 GRADIENT TERRACE
(Washington State, 1992)

When and Where to Use Them

Gradient terraces are usually limited to use on long, steep slopes with a water erosion problem, or where it is anticipated that water erosion will be a problem. Gradient terraces should not be constructed on slopes with sandy or rocky soils. They will be effective only where suitable runoff outlets are or will be made available.

What to be Consider

Gradient terraces should be designed and installed according to a plan determined by an engineering survey and layout. It is important that gradient terraces are designed with

adequate outlets, such as a grassed waterway, vegetated area, or tile outlet. In all cases, the outlet should direct the runoff from the terrace system to a point where the outflow will not cause erosion or other damage. Vegetative cover should be used in the outlet where possible. The design elevation of the water surface of the terrace should not be lower than the design elevation of the water surface in the outlet at their junction, when both are operating at design flow. Terraces should be inspected regularly at least once a year and after major storms. Proper vegetation/stabilization practices should be followed while constructing these features.

Advantages of Gradient Terraces
• Reduce runoff speed and increase the distance of overland runoff flow
• Hold moisture better than do smooth slopes and minimize sediment loading of surface runoff
Disadvantages of Gradient Terraces
• May significantly increase cut and fill costs and cause sloughing if excessive water infiltrates the soil
• Are not practical for sandy, steep, or shallow soils

Right-of-Entry Provisions

A. Treat each and every citizen/property owner with respect and decency.

B. When a citizen requests the name and/or identification number of any inspector, he/she is required to tell the citizen his/her first name, last name, and ID number.

C. Be attentive to complaints and/or requests by citizens, and take action on them, or refer the person(s) to the proper agencies or individuals.

D. Before entering onto any private property for the purpose of inspection, your City ID badge should be clearly displayed by being pinned or clipped to exterior clothing in a clearly visible manner.

E. Introduction Speech:

Hello, my name is _____. I am an inspector with the _____ Department of the City of Wichita. I am performing inspections regarding the discharge of storm water from your property. I would like permission to inspect your storm water drainage facilities (or sample storm water).

F. Clearly identify yourself by name, position and employer. Show the occupant or owner your City Identification.

G. Attempt to ascertain whether the resident, builder, developer, owner/manager or other individual in charge of the property is present prior to beginning any inspection.

H. Ascertain the relationship of the individual to the structure. If the person is anyone other than the owner, manager, builder, developer, job foreman or adult tenant, do not enter the structure for an inspection. Leave your card and attempt to find out when the person in charge might return to the premises.

I. Clearly state the purpose of your visit:

1. Why are you there?
   To discover and verify storm water drainage or compliance with Best Management Practice standards

J. Explain to the individual the inspection procedures.

1. What are you going to be doing?

K. If the person is the appropriate person in charge, ask for permission to inspect. Permission must be given before entering the structure or private portion of a business.

L. If the individual refuses permission to enter the premises for inspection or testing, the inspector will politely thank the resident and leave the premises. Do not attempt entry or argue with any uncooperative occupant. The inspector may inform the occupant of the inspector's right to enter to inspect, and examine records. Additionally, the inspector may inform the occupant of his/her right to request an administrative search warrant, if access is denied. If there is a refusal to permit entry, however, the inspector must leave the private portion of the premises.

M. Once entry has been denied, you may request that an administrative search warrant be prepared. You may make an exterior inspection of the premises which are in plain view and can be noted from public property.

N. If the property is unoccupied, and if the property or structure is clearly marked with "No Trespassing" signs, you may proceed to make an exterior inspection of the premises which are in plain view and can be noted from public property.

O. If the property is vacant and is not posted with a "No Trespassing" sign, you may proceed to make an exterior inspection by walking around the property. If however, there is a locked fence, or gate, you should not attempt to open the gate or fence and should not climb the fence. You may make whatever exterior inspection from areas outside the fence, on public property, or on adjoining private properties where proper permission has been obtained.

P. Protection of Private Property:

> Damage to private property must be avoided at all times. Great care should be exercised to avoid damage to yard, trees, bushes, flowers, etc.

Q. Unless specifically allowed by the Code of the City of Wichita or emergency circumstances exist, all inspections are to be made during regular and usual business hours.

R. All inspections shall be conducted in a reasonable manner and be concluded with a reasonable period of time.

S. Inspections should be conducted only as are necessary to enforce the provisions of the City codes regarding the discharge of storm water.

Enforcement Mechanisms

The Ordinance generally provides for the following enforcement mechanisms:

1. Criminal Penalty
2. Stop Work Order
3. Administrative Penalty

These will generally apply as follows:

1. Criminal Penalty:
   - A. Illegal Dumping
   - B. Individual Building Sites
   - C. Illegal Connections
   - D. Subdivision developers on sites disturbing less than five acres
   - E. City contractors and Utility Companies on sites disturbing less than five acres

2. Stop Work Orders:
   - A. Individual Building Sites
   - B. Subdivision developers on sites disturbing less than five acres

3. Administrative Penalty:
   - A. Subdivision developers on sites disturbing five acres or more
   - B. Subdivision developers and contractors with multiple Criminal Penalties
   - C. Industrial Violations
   - D. Individual building sites disturbing five (5) acres or more
   - E. Illegal Connections
   - F. City contractors and Utility Companies on sites disturbing five acres or more

The Ordinance also provides for some additional enforcement mechanisms that are implemented at the discretion of the Public Works Director, including performance bonds and insurance requirements.

The Criminal Penalty and Stop Work Order mechanisms will generally be the same as what City Inspectors currently use. Separate "Notice of Violation" and "Citation" forms will be provided by the Storm Water Management Office, for use with this Ordinance.

Illegal Dumping

The Storm Water Pollution Prevention Ordinance defines permissible and illegal discharges. Illegal dumping occurs any time a substance is dumped or discharged into a lake, drain, or storm sewer that is not a permitted discharge. These violations will generally be found by citizen complaint or by field crews.

The procedures to be used in dealing with illegal dumping situations are as follows:

1. Fill out a "Incident Report" form to document the occurrence.

2. Determine what the substance is. Call the Storm Water Specialist, if necessary, for an analysis. Take pictures of the violation for later court documentation, if possible.

3. Determine the responsible party, if possible. Should this not be possible, it may be necessary to do additional site monitoring in an effort to determine who is responsible. If the party responsible cannot be determined, the situation should be called into the Storm Water Utility Field Office so that it can be cleaned up.

4. If the responsible party can be determined, issue a "Notice of Violation" and send a copy to the Storm Water Management Office. On the "Notice of Violation", inform the responsible party that it is their duty to clean up the situation. Use judgement on the amount of time you give them to complete this. A minimum time of 24 hours and possibly three to four days for larger infractions is recommended. Reinspect violation for compliance within five days of remediation date in the "Notice of Violation".

5. If the responsible party cleans up the situation, this would end the enforcement activity but the site should be monitored periodically for any additional reoccurrences. A citation is not issued at this point.

6. If the site is not cleaned up or the responsible party fails to bring the property into compliance, a citation should be issued. Send Storm Water Management a copy of the citation.

7. If necessary, call the Storm Water Utility Field Office to have the situation cleaned up. Storm Water Utility will bill the responsible party.

8. Complete the "Incident Report" form. Send to the Storm Water Management Office.

9. Monitor the site periodically to watch for any reoccurrences. If a reoccurrence occurs, issue a citation immediately.

Illegal Connections

An illegal connection is defined as any connection to a storm sewer or outfall to a ditch or pond that discharges any prohibited substance. These connections can be reported by citizens or found by field employees. Typically, the work dealing with illegal connections will be done by the Storm Water Management Office, the Storm Water Utility Field Office, the City-County Health Department, and the Storm Water Specialist.

The process to use on illegal connections is generally as follows:

1. Report all illegal connections to the Storm Water Specialist.

2. The Storm Water Specialist will fill out the appropriate "Incident Report" and determine the nature of the substance being discharged as well as the responsible party. Pictures shall be taken for court documentation, if possible.

3. If the substance is not a prohibited discharge, the investigation will end. Submit a completed "Incident Report" to the Storm Water Management Office.

4. If the substance is determined to be a prohibited discharge, the Storm Water Specialist will notify the Storm Water Management Office. If the substance is found to be a hazardous substance, the Storm Water Specialist will also notify the City-County Health Department immediately.

5. The Storm Water Specialist will contact the owner, issue a "Notice of Violation", explain the problem, and set a date by which we expect the connection to be eliminated. If any subsequent clean up is warranted, the time frame for that to be completed should be established in the "Notice of Violation". Use your judgement on the amount of time you give them. A minimum time of 24 hours and possibly several weeks for longer infractions is recommended. If deadlines are established in the "Notice of Violation", a reinspection must be made within 5 days of said deadline.

6. Follow the procedure as outlined for Industrial Violations on page 98. Take photographs of the violation for later use in Court, if necessary.

7. If the clean up of the substance is not completed upon reinspection, call the Storm Water Utility Field Office to make arrangements to have the substance cleaned up. The Storm Water Utility will bill the responsible party for the cost of the clean up.

8. When the situation is resolved, complete the "Incident Report" and file it with the Storm Water Management Office.

Industrial Violations

These violations will occur at industrial sites and will usually involve illegal connections or discharges. Enforcement in this area will be the responsibility of the Storm Water Management Office and the Storm Water Specialist, although either the Health Department, O.C.I., or the Storm Water Utility Office could receive the complaint or find the violation.

The procedures to follow in dealing with industrial violations is as follows:

1. Report all possible violations to the Storm Water Specialist.

2. The Storm Water Specialist will determine the responsible party and the nature of the substance being discharged. Fill out the "Incident Report". Take photos of the violation for court documentation, if possible.

3. If the substance is a permissible discharge, terminate the investigation and complete the "Incident Report". Send the "Incident Report" to the Storm Water Management Office.

4. If the discharge constitutes an Ordinance violation, report it to the Storm Water Management Office. If the discharge is a hazardous material, also notify the City-County Health Department immediately for assistance.

5. The Storm Water Management Office will follow the process in the Ordinance for industrial violations. A "Notice of Violation" will be issued to the owner stating whether or not a clean up will be required and establishing deadlines for same. Reinspect within five days of deadline.

6. If a clean-up is required but the owner refuses to do so, contact the Storm Water Utility Field Office to have the situation cleaned up. The Storm Water Utility Office will bill the responsible party for the cost of the clean up.

7. When the situation is resolved, the Storm Water Management Office will complete the "Incident Report".

Individual Building Sites

Individual building sites must also comply with the Storm Water Management provisions. On these sites, the Office of Central Inspection personnel will be the front line inspectors. Remember that ALL construction sites are required to use BMP devices to prevent pollutants from entering storm sewers, drains, and streets. In addition, for construction that disturbs five acres or more, the site must have its own State NPDES permit and storm water pollution prevention plan, in which case all BMP devices must be as specified in said plan.

Inspection procedures at individual building sites should be as follows:

1. Do not conduct NPDES inspections for 24 hours following a rain of 0.25 inches or more.

2. Examine the perimeter of the construction site. Determine if eroded soil or any other pollutant has entered into any storm sewer, drain, or street. If it has not, look to see if any BMP devices are present at the site. If these devices are present and there is no evidence of any pollutant being discharged, no violation has occurred, document and end the inspection. If pollutants have been discharged and/or if BMP devices are not being used, a violation has occurred.

3. Issue a "Notice of Violation" to the owner and contractor immediately, with a copy to the Storm Water Management Office. Give them 48 hours to come into compliance. Compliance will be realized when effective BMP devices are installed to solve the problem. Reinspect the site within five days of any deadline established in the "Notice of Violation" to determine compliance.

4. If, using your judgement, the pollutants need to be cleaned up, the "Notice of Violation" shall also state a specific deadline for that to occur. Reinspect in accordance with paragraph 3., above.

5. If a contractor or utility company fails to comply with the stipulation in any "Notice of Violation", a citation will be issued. A copy of the citation shall be sent to the Storm Water Management Office. Photographs should be taken of all violations for later court documentation.

6. Notify the Storm Water Utility Field Office if a clean up is needed. The Storm Water Utility will bill the contractor or utility company for the cost of the clean up.

7. If any particular contractor or utility company continues to violate the terms and condition of the Ordinance and receives multiple citations (3 or more per

year), the administrative penalty process shall also apply. Contact the Storm Water Management Office if that occurs.

8. On individual building sites that disturb five acres or more, the owner/contractor is also subject to the administrative penalty clause in the Ordinance. In all likelihood, this would be invoked only in cases of repeated violations by the same owner/contractor. Also, on those sites, the site is required to have a State NPDES permit and a Storm Water Pollution Prevention Plan(SWP3). When violations occur on these larger sites, the inspector should ask to see the pollution prevention plan and self-inspection reports. If these do not exist, additional violations have occurred for which a citations can be issued, after issuing the appropriate "Notice of Violation".

SUBDIVISIONS

Inspection in subdivisions can be quite complicated due to the number of people involved. The Storm Water Pollution Prevention Ordinance generally outlines the various responsibilities as follows:

1. Owner (Subdivider or Developer): The owner is required to get a State NPDES permit if the project will disturb five acres or more, and must prepare and implement a storm water pollution prevention plan that would address overall construction in the subdivision as well as construction on individual lots. The owner is also responsible to insure that all those working in the subdivision are familiar with the BMP requirements, the SWP3, and that they use BMP devices where called for. All contractors working on a permitted site are required to sign a certification statement agreeing to comply with the owners plan.

2. General Contractors - Individual Building Sites: Any contractor working on a building site must always comply with the owner's storm water pollution prevention plan, if one was prepared, and install minimum BMP devices on site. Best management practice (BMP) devices must be effective. If the construction disturbs five acres or more, the owner must obtain a State NPDES permit and prepare an individual storm water pollution prevention plan for that particular site.

3. City Contractors: Often times, contractors working for the City will be involved in installing public infrastructure at the site. They must agree to comply with the owner's storm water pollution prevention plan and, where applicable, utilize BMP's. City contractors may be required to obtain an individual State NPDES permit and prepare a separate storm water pollution prevention plan if the construction will disturb five acres or more.

4. Utility Companies: Utility companies are often times involved in installing public infrastructure at the site. They must also agree to comply with the owners storm water pollution prevention plan, where applicable, and always utilize best management practices. They may also be required to obtain a State NPDES permit and prepare a storm water pollution prevention plan if the project will disturb five acres or more.

Different people in the City's organizational structure will be involved in the enforcement work at the subdivision. Usually, the first stage in subdivision development is the installation of streets and public utilities. Since the Office of Central Inspection is not involved at this point, primary enforcement will be through the Public Works personnel

(Inspectors and Storm Water Management Staff). The developer also has a responsibility to insure that the work at this point complies with his NPDES permit and storm water pollution prevention plan.

SUBDIVISION STREET AND UTILITY CONSTRUCTION

Inspection procedures for street and utility construction will be a follows:

1. Do not conduct NPDES inspections for 24 hours following a rain of 0.25 inches or more.

2. Examine the perimeter of the construction site. Determine if eroded soil or any other pollutant has entered into any storm sewer, drain, or street. Determine if BMP devices are present at the site. If BMP devices are not present or if the discharge of a pollutant has occurred, a violation exists. Photos of the violation should be taken for later court documentation.

3. Issue a "Notice of Violation" to the contractor or utility company immediately, with a copy to the Storm Water Management Office. Give them 48 hours to come into compliance. Compliance will be realized when BMP devices are installed to solve the problem.

4. If, using your judgement, the pollutants needs to be cleaned up, the "Notice of Violation" shall also state a specific deadline for that to occur. This deadline should be 24 hours to 3 days from the inspection date. If any deadlines are established in said "Notice", reinspect the site within five days of the deadline to determine compliance.

5. If a contractor or utility company fails to comply with the conditions of the "Notice of Violation", a citation should be issued. A copy of the citation shall be sent to the Storm Water Management Office.

6. Notify the Storm Water Utility Field Office if a clean-up is needed. The Storm Water Utility Office will bill the contractor or utility company for the cost of the clean up.

7. If any particular contractor or utility company continues to violate the terms and condition of the Ordinance and receives multiple citations (3 or more per year), and on construction sites disturbing five acres or more, the administrative penalty process shall also apply. Contact the Storm Water Management Office if that occurs.

Once streets and public utilities are installed, building construction begins. During the building phase, the Office of Central Inspection personnel will become the principal inspectors. Each individual building site is to be looked at separately. ALL building sites

in Wichita are required to use BMP devices to prevent pollutants from entering storm sewers, drains, and streets. In addition, for construction that disturbs five acres or more, the site must have its own State NPDES permit and storm water pollution prevention plan, in which case all BMP devices would be as specified in said plan. In all cases, work in subdivisions must comply with owners State NPDES permit and storm water pollution prevention plan, as applicable.

SUBDIVISION BUILDING SITES

Inspection procedures for building sites in subdivisions should be as follows:

1. Do not conduct NPDES inspections for 24 hours following a rain of 0.25 inches or more.

2. Inspect individual construction sites periodically as other building code inspections are made.

3. Examine the perimeter of the site. Determine if eroded soil or any other pollutant has entered into any storm sewer, ditch, pond, or street. Determine if BMP devices are being used. If no BMP devices are present or if pollutants have been discharged, a violation has occurred. Get photos of the violation for later court documentation.

4. Issue the "Notice of Violation" to the builder immediately sending a copy to the Storm Water Management Office. Allow the builder 24 to 48 hours to come into compliance. Compliance will be achieved when BMP devices are installed that will solve the problem. Reinspect site within five days of any deadline established in the "Notice".

5. If, using your judgement, the pollutants need to be cleaned up, the "Notice of Violation" shall so state and specify a deadline for that to occur.

6. If the builder fails to comply with any condition of the "Notice of Violation", issue a citation. A copy of the citation must be sent to the Storm Water Management Office.

7. Notify the Storm Water Utility Field Office if a clean-up is needed. The Storm Water Utility Office will bill the builder for the cost of the clean-up.

8. If any particular builder or contractor continues to violate the terms of the Ordinance and receives multiple citations (3 or more per year), administrative penalties shall also apply. Contact the Storm Water Management Office if this occurs.

9. Each owner/developer is responsible for all construction that occurs in the subdivision and we expect him/her to be active in this process by ensuring that people working in the subdivision are aware of the NPDES requirements and are complying with them. Should this not occur, the owner or developer is also subject to administrative penalties. If, in any given subdivision, you notice less than 70% of the construction sites thereon are utilizing BMP's and, in fact, pollution has resulted, contact the Storm Water Management Office immediately. The administrative penalty process will be started by the Storm Water Management Office against the developer.

10. Do not forget that, in any subdivision in which five acres or more of land is disturbed, a State NPDES permit and a SWP3 is required. In subdivisions where there are a large number of violations, ask the owner to see a copy of his pollution prevention plan and self-inspection reports. If they do not exist, notify the Storm Water Management Office and the administrative penalty process will be started.

Sites of Earthwork Activity

Earthwork activities can often occur at sites not involving building construction. Since building permits may not be required in these cases, all inspection employees should watch for these sites. The enforcement procedures will be as follows:

1. Notify Storm Water Management Office of the location of work.

2. Storm Water Management will determine responsible party and whether or not the activity has been permitted.

3. If unpermitted, Storm Water Management will issue a "Stop Work Order" to responsible party demanding that all work cease until the proper permit is obtained. If work is not stopped, a citation will be issued.

4. If the site has been permitted, Storm Water Management will conduct periodic inspections of the site perimeter to determine whether or not BMP devices are installed and/or pollutants have entered any drain, storm sewer, or street. If BMP devices are present and no pollutants have been discharged, no violation has occurred and the inspection will end. If no BMP devices are being used or pollutants have been discharged, a violation has occurred. Get photos of the violation for later court documentation.

5. If a violation has occurred, ask the owner to see a copy of the site pollution prevention plan and self inspection documentation. If these do not exist, issue a citation for failure to prepare and implement a pollution prevention plan. Require that the responsible party clean up the pollutants and install BMP devices within a specified time frame. The deadline should be 24 hours to 3 days from the inspection date. Re-inspect the site at the end of said period. If not cleaned up, notify the Storm Water Utility Field Office that a clean up is needed. The field office will bill the responsible party for the clean-up.

6. If a violation has occurred and a pollution prevention plan exists, issue a "Notice of Violation" for failure to implement the plan or failure to maintain BMP devices, whichever is the case. Provide a certain amount of time for the responsible party to clean-up the problem. Reinspect. If the clean-up has been done and effective BMP devices installed, end inspection. If the clean-up has not been done or if BMP devices have not been installed, issue a citation and report to the Storm Water Utility Field Office that a clean up is needed. The field office will bill the responsible party for the clean-up cost.

7. If continued violations occur at the site, issue citations immediately.

Courtroom Procedures for Storm Water Investigations

Court Considerations:

I. File Documentation:

File documentation is very important, especially if you are ever required to testify regarding your inspection and the handling of a case.

A. In addition to information about each scheduled re-inspection, entries should also be made to document the following:

1. Any verbal or written acknowledgments by the owner or person in control of the property that they are the owner or person in control, and that the Notice was received.

2. Names, dates, and places concerning individuals spoken to concerning the case, both over the phone and out in the field.

3. The date of any time extensions, and the reason for any extensions.

4. Any progress in bringing the property into compliance and the extent of the progress made.

5. Any other significant events surrounding the case.

6. Always avoid any prejudicial or irrelevant remarks.

7. Entries in cryptic shorthand are not acceptable and should be avoided.

II. Pre-Court Preparation:

If you receive a subpoena, your case has been scheduled for a trial. These cases will be scheduled at one of the police substations. The location of the trail will be determined by the location of the citation. Below is an outline of the current locations.

East:	Thursday
West:	Tuesday
South:	Monday
North:	Wednesday

All trial dockets begin at 6:00 p.m..

Prior to court, an additional inspection should be completed to determine the status of the property. If not in compliance, additional photographs should be taken. These should be completed as closely to the trial date as possible.

After court, the inspector should enter the results of each of their cases in their files. If court action taken requires a follow-up inspection by the inspector in order to continue court activity, the inspector should enter a re-inspection date for approximately 30 days from the date of the court hearing.

III. Trial Date and Court Procedure:

A. Preparation for testimony:

1. The following is testimony that will be required of the inspector in court at the time of trial:

   a. Name of inspector and position and department;
   b. Address of property;
   c. Initial date violations were observed;
   d. Relationship of person charged to property; contractor, sub, developer;
   e. Owner of property and how ownership determined;
   f. Date notice of violation served;
   g. Time stated in the order for compliance with the violations;
   h. Dates of re-inspections after time of compliance with the violations remaining;
   i. General description of violations;
   j. Statements (admissions) by owner or responsible party as to ownership or control, or agreement that violations exists;
   k. Agreement for Compliance;

2. Review your file and photographs so that you can testify as much as possible without reference to documents.

3. Always inspect the location to get pictures and current status of improvements, if any, on the day of or a few days before trial.

4. Be prepared to discuss case with the prosecutor. You will be asked about the status of the property and what actions you want the court to take regarding the property.

B. Testimony:

1. Outside the courtroom:

   a. Do not discuss the case with the defendant or the defense attorney outside the presence or without the permission of the City Attorney.

   b. Observe the proper rules of decorum.

2. Direct examination by the City Attorney:

   a. Speak distinctly.
   b. Answer questions precisely and to the point.
   c. If you do not understand the question or know the answer, say so.
   d. Be impartial and fair.
   e. Do not volunteer information or opinions.
   f. Avoid hearsay testimony (out of court statements made by someone who is not in court).
   g. Do not testify in a conclusionary manner.

3. Cross examination:

   a. Do not argue or get angry.
   b. Do not volunteer information.
   c. Try to answer questions precisely; if you can answer by "yes" or " no", do so. If you don't know, say so.
   d. Listen to the questions carefully before answering; don't let the attorney or defendant misstate your testimony as part of a question.
   e. If the City Attorney objects to a question, do not answer until the judge rules on the objection.
   f. Do not make objections to the questions, let the City Attorney make any appropriate objections.

IV. Sample Questions:

1. What is your name:
2. What is your occupation and how long have you been so employed?
3. In your official capacity, did you inspect a property at (address)?
4. What was the date of that inspection?
5. Is this property in the corporate city limits of the City of Wichita?
6. What type of property/structure is at location?
7. Size of property i.e. less than five acres?

7. Size of property i.e. less than five acres?
8. What was the purpose of the initial inspection (citizen's complaint/routine inspection)?
9. Was there a written notice of violation issued to correct the condition? Date of notice? Compliance Date?
10. Was a determination made as to the ownership of the property in questions? How was this done? (Personal check of County tax records, city building records, or personal admission of defendant to you.)
11. Who was the notice of violation issued to: owner, contractor, developer?
12. How and when was the notice served?
13. Any conversations with defendant regarding responsibility for the property in question?
14. Can you identify the defendant?
15. What was the time in the notice in which to correct the violation?
16. Were any further extensions of time granted? (Yes or No)
17. Any conversation with defendant or representative regarding compliance?
18. Did you make a re-inspection of the property prior to issuing criminal complaint? What was the date?
19. Describe the condition of the property? Photographs?
20. How many inspections were made of the property in question in regard to this notice prior to filing UCC?
21. Any conversation with defendant regarding the violations?
22. Any attempts/efforts to bring property into compliance?

STORM WATER MANAGEMENT
INCIDENT REPORT

Location

Name of Caller	Address	Telephone

Complaint	Date:	Time:

How Received:
Mail: ☐
Phone: ☐
Personal: ☐

Received By:

Referred To:

Investigation Remarks:

Signature: Date:

Disposition:

Signature: Date

Notice of Violation
Storm Water Pollution Prevention
City Code Chapter 16.32

To: _____ Date: _____
Address: _____ Zip Code: _____

An inspection of property located at _____ detected the following violations of Chapter 16.32 of the Code of the City of Wichita, Kansas:

A. General Violations:
- ☐ Section 16.32.020 (A) Illegal Discharge/Illegal Dumping into storm sewer system

B. Construction Site Violations:
- ☐ Section 16.32.050 B(2) Failure to prepare or implement a Pollution Prevention Plan
- ☐ Section 16.32.050 A(1) Failure to use Best Management Practices (owner)
- ☐ Section 16.32.050 A(6) Failure to use Best Management Practices (contractor)
- ☐ Section 16.32.050 A(7) Malicious destruction of Best Management Practice devices
- ☐ Section 16.32.050 A(7) Failure to repair Best Management Practice devices

C. Industrial Sites:
- ☐ Section 16.32.060 A(2) Failure to prepare or implement a Pollution Prevention Plan
- ☐ Section 16.32.060 A(12) Failure to implement a sampling or testing program as required by N.P.D.E.S. Permit

D. Private Ditches or Ponds:
- ☐ Section 16.32.070 (A) Failure to use Best Management Practice devices to minimize pollutant levels down stream

E. Other Violations:
- ☐ Section _____

Violation Details: _____

You must take corrective action to bring this property into compliance before _____.

Clean-up: ☐ If this box is checked, you are hereby directed to cleanup the pollution which has resulted from this violation by _____.

Additional Remarks: _____

Failure to comply with any requirements of this Notice can result in the issuance of a criminal citation to you or subject you to administrative penalties pursuant to Section 16.32.100 of The Code of the City of Wichita.

Please contact me at _____ between the hours of _____, should you have any further questions.

This Notice of Violation issued this _____ day of _____, _____ at _____ A.M./P.M..

By: _____ _____ _____
Signature I.D. Number Telephone Number

_____
Certified Mail Receipt Number

Order for Compliance
City of Wichita, Kansas
Department of Public Works

Date: _____

To: _____ Address: _____

Whereas, on _____, you were issued a "**Notice of Violation**" for violating certain sections of Chapter 16.32 of the Code of the City of Wichita, Kansas, dealing with storm water pollution at _____, to wit:

Section	Violation

The time period specified in said Notice for corrective action and/or cleanup has now expired. Further inspection of the property indicates that:

- ☐ No action has been taken to correct the violation, and/or
- ☐ Cleanup has not been accomplished as directed.

Now, therefore, the following order is hereby issued relative to the above noted violation(s):

Should you fail to comply with this Order, you will be subject to administrative penalties in the amount of $1000 to $2,500 per day for each continuing violation. Should you wish to appeal this Order, you must submit a written appeal to the Director of Public Works, within 7 days of the date of this order, at City Hall, 455 North Main, 8th Floor, Wichita, Kansas 67202.

_____ _____

Steve Lackey P.E., Director of Public Works Certified Mail Receipt Number