TENNESSEE

EROSION & SEDIMENT CONTROL HANDBOOK

A Guide for Protection of State Waters
through the use of Best Management Practices
during Land Disturbing Activities

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Second Edition

MARCH 2002

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**A Guide for Protection of State Waters
through the use of Best Management Practices
during Land Disturbing Activities**

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PREFACE

Construction activities near streams, rivers and lakes have the potential to cause water pollution and stream degradation if erosion and sediment controls are not properly installed and maintained. In order to effectively reduce erosion and sedimentation impacts, Best Management Practices (BMP's) must be designed, installed, and maintained on construction sites.

The Tennessee Department of Environment and Conservation, Division of Water Pollution Control has determined that siltation is the leading cause of impairment of streams, rivers and lakes in Tennessee. While certainly not the only source, construction and development activities continue throughout Tennessee, and have been shown to contribute large quantities of sediment to water bodies during precipitation events, if BMP's are not used. Pollution due to siltation can have physical, chemical, biological, and economic impacts to waters. Siltation causes changes in flow patterns, increased water treatment costs, hindrances to navigation, and the increased possibility of flooding. Sediment can also restrict light penetration, transport other pollutants into the water body, smother eggs and nests of fish, and cover stream substrates that provide habitat for fish and aquatic life.

The proper use of BMP's can be effective in preventing erosion and controlling sediment on construction sites. This Erosion and Sediment Control Handbook is designed to provide information to planners, developers, engineers, and contractors on the proper selection, installation, and maintenance of BMP's. The handbook is intended for use during the design and construction of projects that require erosion and sediment controls to protect waters of the state. It also aids in the development of Storm Water Pollution Prevention Plans (SWPPP's) and other reports, plans, or specifications required for participation in Tennessee's water quality regulations.

The use of the words 'shall', 'will', and 'must' within the standards in this handbook is meant to emphasize the guidelines that ensure that the BMP will serve its intended purpose.

This handbook is printed in a loose-leaf format with the intention of allowing periodic updates as technological advancements are made, or errors are corrected. The handbook is available by attending one of the ***Fundamentals of Erosion Prevention and Sediment Control*** or ***Design of Vegetative and Structural Measures for Erosion and Sediment Control*** courses offered by the State of Tennessee. It is also available for download from the Department's web page located at:

www.state.tn.us/environment

or for a fee at one of the Environmental Assistance Centers throughout the state. As updates are developed, they also will be available online at the web page address above.

TDEC's goals in producing the Second Edition of the Erosion and Sediment Control Handbook include:

- Updating the aging first edition;
- Providing current information on erosion and sediment control technology;
- Providing information that will help with the creation of effective Storm Water Pollution Prevention Plans for construction sites;
- Providing information that will assist the site worker in correctly installing and maintaining erosion and sediment controls;
- Providing course material for use in the training and certification courses.

ACKNOWLEDGEMENTS

This handbook is prepared by the Division of Water Pollution Control of the Tennessee Department of Environment and Conservation. Many sources were consulted during the development of this handbook. Various resources are cited, and a references section is provided for the reader. Any omission of a reference in this handbook is unintentional. Permission has been granted to reproduce the information taken from other sources when possible. Any omissions or suggestions should be brought to the attention of the Division.

We are grateful to the Georgia Soil and Water Conservation Commission and the Virginia Division of Soil and Water Conservation for the use of content, layout, and other material from their handbooks.

Numerous other agencies also provided information used in compiling this handbook. These agencies include the Chattanooga Storm Water Management Office, Knoxville Storm Water Management Office, Memphis Storm Water Management Office, Nashville Storm Water Quality Management Program, Tennessee Department of Transportation, Tennessee Division of Natural Heritage, University of Tennessee Agriculture Extension Service, University of Tennessee Water Resources Research Center, and the University of Tennessee Department of Civil and Environmental Engineering. Division of Water Pollution Control personnel provided much assistance with review of drafts of the handbook.

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INTRODUCTION

Soil is formed when chemical, physical, and biological weathering processes break down underlying bedrock. It may take hundreds or thousands of years for one foot of soil to develop. Soils have properties like texture, structure, porosity, and chemistry that are determined by the parent bedrock material, but may also be influenced by the actions we take to alter the soil profile. Soil fertility, or the ability of soil to sustain life, is the product of a combination of those properties. The alteration or destruction of one or more of these properties may have serious adverse effect on the soil's ability to grow stabilizing vegetative cover.

Erosion is the detachment of a portion of the soil profile or soil surface. This can occur by either the impact of raindrops, or by the shear forces of water flowing across the soil surface. Soil particles can be transported a short distance (like the splash from a raindrop impact), or may be transported a longer distance (to the bottom of the slope, or into a water conveyance) before being deposited. The transport and deposition process is called sedimentation.

Erosion and sedimentation are natural processes. These processes occur daily, on all land, as the result of wind, water, ice, and gravity. However, the effect of natural erosion is usually only noticeable on a geologic time scale. The global average, natural geologic rate of soil erosion is about 0.2 tons per acre per year. This is approximately equal to the rate that soil is being created by the weathering of bedrock and parent material. Disturbance of the soil surface, including activities like construction, farming, or logging, greatly increases the amount of sediment loss from the site due to erosion. Soil loss from pastureland averages 1.5 tons per acre per year. Cultivated cropland can lose 20 tons per acre per year. Major land disturbances, such as mines or construction sites, can experience annual soil loss from 150 to 200 tons per acre. Erosion may occur unnoticed on exposed soil even though large amounts of soil are being lost. One millimeter of soil removed from an area of one acre weighs about five tons. Five tons of silty clay loam equates to about 4.5 cubic yards of soil. Lost soil is a lost resource of the property. Lost soil may carry off important nutrients needed for reestablishing effective, attractive vegetation after the site development is complete. If erosion is severe enough, soil might have to be brought in from other locations to regrade eroded areas, or to provide a suitably fertile growing medium for vegetation establishment.

Sediments that escape the site will eventually enter a stream or wetland. Solids suspended in the water column will interfere with the photosynthesis of plant life that form the base of the aquatic system food web. Sediments may carry other pollutants, in the form of metals, pesticides, or nutrients, into streams, or cause organic enrichment of streams, which also disrupts the food web. Suspended sediments increase the costs of drinking-water treatment for municipalities.

Sediment deposition changes the flow characteristics of a water body. These changes may result in physical hindrances to navigation or increased possibility of flooding. Deposits may actually cause further erosion within a water body if the deposit occurs at a critical spot. Sedimentation in wetlands can alter the hydrology or destroy hydric vegetation. Sedimentation that occurs in streams can cover up habitat that certain integral parts of the food web rely on. Certain types of soil particles actually bind to the gills of aquatic insects or fish. Sediment may also smother nesting sites for fish or amphibians, or cover mussel beds that filter significant quantities of pollutants from water that ultimately becomes our drinking water.

The average erosion from a designated area over a designated time may be computed by using the Revised Universal Soil Loss Equation (RUSLE). RUSLE is an erosion model developed by the U. S. Department of Agriculture to help make good

decisions in soil conservation planning. It is a set of mathematical equations used to determine what conservation practices might be applied to a landscape to reduce or limit the amount of erosion and sediment loss. The original application for RUSLE was agriculture, primarily cropland production. Subsequent revisions have widened the program's applicability to be useful to other land-disturbing activities like mining, forest management, and construction sites.

The four major factors that RUSLE uses to compute the amount of soil loss from a site are: climate, soil erodibility, topography, and land use. The important climatic variables are the amount of rainfall and the intensity of the rainfall. Soils differ in their inherent erodibility, which is based on the previously mentioned properties: texture, structure, porosity, and chemistry. Climate and soil information are obtained from regionally mapped or surveyed data. Climatic and soil variables are independent of the activities we undertake at a worksite, however, the length of time that a bare area is exposed to precipitation is considered within the climate factor of RUSLE and may considerably affect the soil loss from the worksite. In this way, phasing and sequencing the surface disturbing activities at a worksite reduces the total erosion and reduces the amount of sediment that must be controlled by other means.

Site topography, ground cover, and best management practice (BMP) use are the most variable factors in determining erosion. These three factors are also what we have control over. Slope length, slope steepness, and slope shape are the important components of topography. Much of the work done at construction sites is to change the slope length, steepness, or shape to make the property better suited for development. Obviously, the original vegetation must be disturbed to accomplish this work, however, ground cover is the single most influential variable in determining soil loss. The soil loss from a site that has been graded bare and has no BMP's in use may be 100 times the soil loss from the same site with an average stand of grass present. BMP's can reduce the amount of sediment leaving the site, but no single practice is 100% effective.

There are two types of BMP's. One type, **erosion prevention practices** are ground covers that prevent any of the types of erosion from occurring. Ground covers include vegetation, riprap, mulch, and blankets that absorb the energy of a raindrop's impact and reduce the amount of sheet erosion. Diversions, check dams, slope drains, and storm drain protection, while they may also trap sediment, are primarily used to prevent rill and gully erosion from starting. Rill and gully erosion are more difficult and expensive to repair, and result in greater volumes of sediment to control.

The second type, **sediment control practices** attempt to prevent soil particles that are already being carried in storm waters from leaving the site and entering streams or rivers. Silt fence, sediment traps, sediment basins, check dams, and even vegetative cover are sediment control practices. Of course, all BMP's must be chosen carefully, located and installed correctly, and maintained well to be effective at keeping sediment on a site.

It is important to note that a particular BMP may be an erosion prevention practice, or a sediment control practice, or it may serve both purposes at the same time.

Using RUSLE as our model, we can see that a combination of erosion prevention, consisting of leaving original vegetation whenever possible and reestablishing vegetative cover as quickly as conditions allow, as well as sediment controls, like clean water diversions, silt fences, and sediment basins can prevent sediment loss from a construction site (or any other site) during most storm events. We also see that leaving original vegetation in place for as much of the construction period as possible reduces the opportunity for a precipitation event that occurs to cause significant erosion and soil loss on a worksite.

VEGETATIVE PRACTICES

Buffer Zone – BF

DEFINITION

A strip of undisturbed, original vegetation, enhanced or restored existing vegetation, or the re-establishment of vegetation surrounding an area of disturbance or bordering streams, ponds, wetlands, or lakes.

PURPOSE

To provide a buffer zone which can filter and infiltrate runoff, reduce storm runoff velocities, protect channel banks from scour and erosion, provide flood protection, cool rivers and streams by creating shade, provide food and cover for wildlife and aquatic organisms, reduce construction noise, and improve aesthetics on the disturbed land. See Figure 1 and Table 1.

CONDITIONS

A natural strip of vegetation should be preserved and, if needed, supplemented to form the buffer zone. There are two types of buffer zones.

General Buffers: A strip of undisturbed, original land adjacent to the disturbed site provides a general buffer. It is useful to filter and infiltrate runoff, and also to reduce construction noise. General buffers may be enhanced to achieve desired goals.

Vegetated Riparian Buffers: Buffers bordering streams are critical due to their protection of streams from sedimentation through filtration and bank stabilization. Riparian buffers are also useful in cooling rivers and providing food and cover for wildlife. In most cases, the buffer zone will be incorporated into the permanent

Riparian Buffer Zone

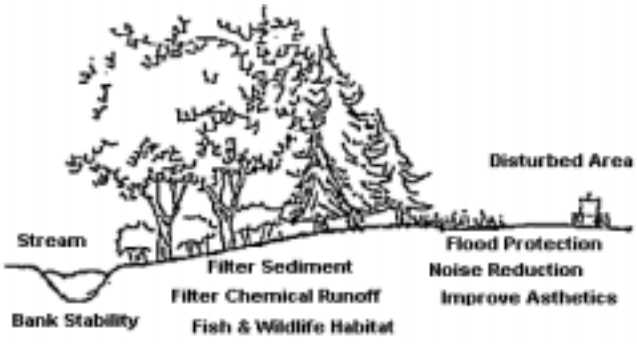


Figure 1

vegetative stabilization. Refer to specification **Disturbed Area Stabilization (With Permanent Vegetation) - PS.**

Effectiveness of Vegetative Buffer Strips

Purpose	Grass	Shrub	Tree
Filter Sediment	High	Low	Low
Filter Chemicals	Medium	Low	Low
Stabilize Stream Banks	Low	High	High
Improve Aesthetics	Medium	Medium	High
Improve Habitat	Medium	Medium	High
Reduce Noise	Low	Medium	High
Intercept Rainfall	High	High	High
Infiltrate Runoff	High	Medium	Medium

Table 1

DESIGN SPECIFICATIONS

Important design factors such as slope, hydrology, width and structure shall be considered.

General Buffers: A width should be selected to permit the zone to serve the purpose(s) stated above. Supplemental plantings may be used to increase the effectiveness of the buffer zone.

Vegetated Riparian Buffers: The structure of vegetated riparian buffers should be considered to determine if the buffer must be enhanced to achieve the necessary goals. The size of the stream as well as the topography of the area must be considered to determine the appropriate width of the vegetated stream buffer. A vegetated stream buffer of 50 feet is suggested for flat lying areas. The buffer should be increased 2 feet in width for every 1% of slope (measured along a line perpendicular to the stream bank).

Unless undisturbed vegetation is left in place and used as the buffer, a constructed, multipurpose riparian buffer should be created consisting of three zones:

- Zone 1 The first 20 feet nearest the stream should consist of trees and shrubs spaced 6-10 feet apart to provide stabilization of the bank deep into the soil.
- Zone 2 The next 10 feet should consist of managed forest for chemical absorption and wildlife habitat.
- Zone 3 The upper 20 feet should be comprised of grasses for sediment and chemical capture.

This general multipurpose design contains trees and shrubs that help to stabilize stream banks and grasses which spread and reduce the flow from adjacent areas as well as increase settling and infiltration. If the ideal vegetated buffer width cannot be achieved; narrower buffers can still be used to obtain the goals of bank stabilization and riparian habitat. If this is the case, several design principals should be considered:

- Sheet flow should be encouraged at the disturbed edge of the vegetated stream buffer.
- The structure of the buffer should consist of understory and canopy species.
- The width should be proportional to the watershed area and slope.
- Native and non-invasive plant species should be used.
- Density must be considered to determine if the existing buffer must be enhanced to achieve the necessary goals. Vegetation must be dense enough to filter sediment and provide detrital nutrients for aquatic organisms.

Stream bank stabilization techniques may be required if steep slopes and/or hydrologic patterns deem it necessary. Refer to specification **Bioengineered Stream Bank Stabilization - SBS.** Vegetated stream buffers on steep slopes may need to be wider to effectively filter overland flow. Corridors subject to intense flooding may require additional stream bank stabilization measures.

PLANTING TECHNIQUES

Plantings for buffer reestablishment and enhancement can consist of bare root seedlings, container grown seedlings, container grown plants, and balled and burlapped plants. Standard permanent erosion control grasses and legumes may be used in denuded areas for quick stabilization. Refer to specification **Disturbed Area Stabilization (With Permanent Vegetation) - PS.**

Soil preparation and maintenance are essential for the establishment of planted vegetation.

MAINTENANCE

Areas closest to the stream should be maintained with minimal impact.

Watering: During periods of drought as well as during the initial year, watering may be necessary in all buffer areas planted or seeded for enhancement.

Replanting: It is imperative that the structure of the vegetated stream buffer be maintained. If the buffer has been planted, it is suggested that the area be monitored to determine if plant material must be replaced. Provisions for the protection of new plantings from destruction or damage from beavers or other damaging pests should be incorporated into the plan.

Disturbed Area Stabilization (With Mulch) – MU

DEFINITION

Applying hay, straw, mulch, plant residues, or other suitable materials, produced on the site if possible, to the soil surface.

PURPOSE

- To reduce runoff and erosion
- To conserve moisture
- To promote germination of seed
- To prevent surface compaction or crusting
- To protect seed from birds
- To modify soil temperature
- To increase biological activity in the soil

CONDITIONS

Mulch may be used to promote vegetation germination and growth during a vegetative stabilization practice, or may be used as a temporary stabilization measure on its own where seed may not germinate due to temporary conditions.

CONSTRUCTION SPECIFICATIONS

Mulching Without Seeding: This standard applies to cleared areas where seed may not have a suitable growing season to produce an erosion-retardant cover, but can be stabilized with a mulch cover. Mulch can be used as an erosion control device for up to six months, but it shall be applied at the appropriate depth (depending on the material used), anchored, and have a continuous 95% cover or greater of the soil surface. Maintenance is required to maintain 95% cover.

Mulching With Seeding: Mulch should be applied when seeding for vegetation stabilization. It significantly assists germination by protecting the seed from birds, by holding moisture at the surface of the soil, and by reducing soil surface temperature. Mulch applied to seeded areas shall achieve 75% soil cover.

Site Preparation: Consider these factors when preparing to use mulch:

1. Grade to enable the use of equipment for applying and anchoring mulch.

2. Install best management practices as required such as diversions, terraces, and/or sediment barriers.

3. Loosen compacted soil to a minimum depth of 4 inches if using mulch while seeding.

Mulching Materials: Select one of the following materials and apply at the rate indicated:

1. Dry straw or hay shall be applied at a rate that provides 95% or greater soil coverage.
2. Wood waste (chips, sawdust or bark) shall be applied at a rate that provides 95% or greater soil coverage. **Organic material from the clearing stage of development should remain on site, be chipped, and applied as mulch.** This method of mulching can greatly reduce erosion control costs. This method should not, however, be used in conjunction with seeding due to soil acidification and nitrogen reduction problems that the decomposition of the "green" material will produce.

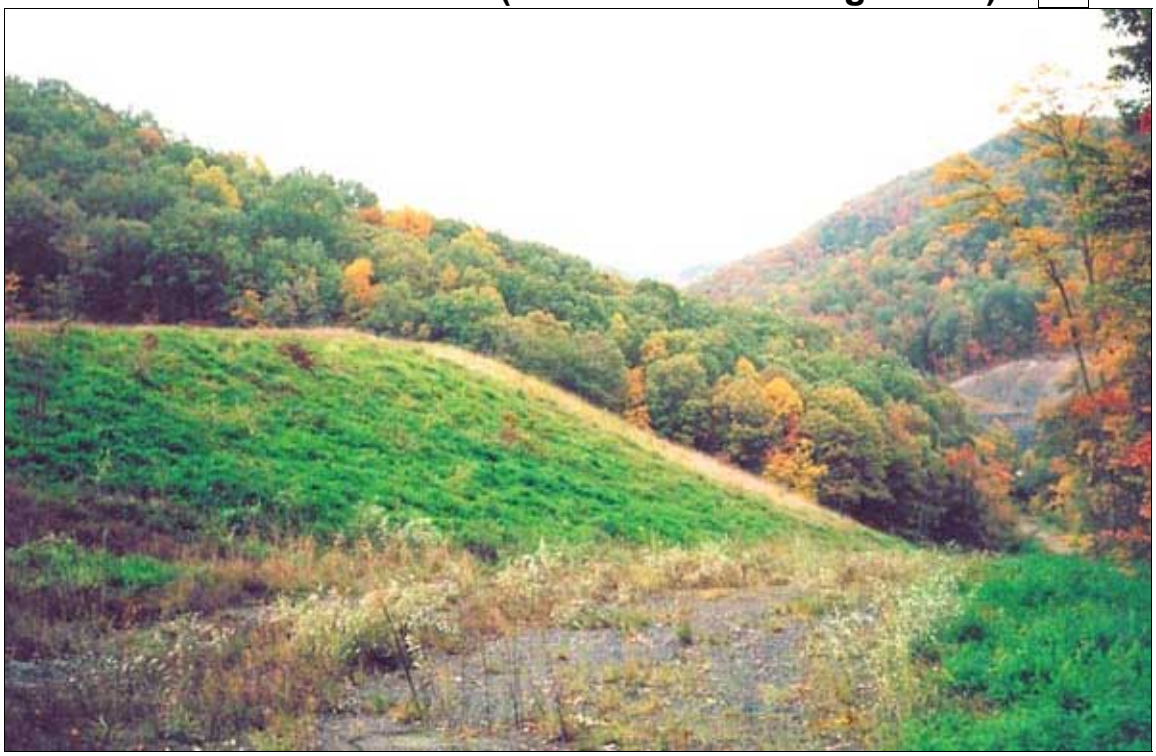
Anchoring Mulch: Anchor straw or hay mulch immediately after application by one of the following methods:

1. Emulsified asphalt can be (a) sprayed uniformly onto the mulch as it is ejected from the blower machine or (b) sprayed on the mulch immediately following mulch application when straw or hay is spread by methods other than special blower equipment. The combination of asphalt emulsion and water shall consist of a homogeneous mixture satisfactory for spraying. The mixture shall consist of 100 gallons of emulsified asphalt and 100 gallons of water per ton of mulch. Care shall be taken at all times to protect state waters, the public, adjacent property, pavements, curbs, sidewalks, and all other structures from asphalt discoloration.
2. Hay and straw mulch may be pressed into the soil immediately after the mulch is spread. A special "crimper" or disk harrow with the disks set straight may be used. Serrated discs are preferred and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the disks shall be dull enough to press the mulch into the ground without cutting it, leaving much of it in an erect position. Mulch should not be plowed into the soil.
3. Synthetic tackifiers or binders may be applied in conjunction with or immediately after the mulch is spread. Synthetic tackifiers should be mixed and applied according to manufacturer's specifications. Refer to specification **Tackifiers and Binders - TB.**

MAINTENANCE

Inspection of the application should be performed along with other regularly scheduled erosion and sediment control inspections. Any areas that have washed out due to high storm water flows should be reconsidered for different BMP use, or at least retreated. Areas that have been disturbed by blowing wind should be retreated. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Disturbed Area Stabilization (With Permanent Vegetation) – PS



DEFINITION

The planting of perennial vegetation such as trees, shrubs, vines, grasses, or legumes on exposed areas for final permanent stabilization. Permanent perennial vegetation shall be used to achieve final stabilization.

PURPOSE

- To reduce storm water runoff velocity
- To maintain sheet flow
- To protect the soil surface from erosion
- To promote infiltration of runoff into the soil
- To improve wildlife habitat
- To improve aesthetics

CONDITIONS

Permanent perennial vegetation is used to provide a protective cover for exposed areas including cuts, fills, and other denuded areas that will not be regraded. Permanent stabilization should be applied where topsoil was never stripped, or has been returned and incorporated into the soil surface.

PLANNING CONSIDERATIONS

1. When stripping a site, topsoil should be stockpiled for later use.
2. Stockpiled topsoil should be stabilized using temporary vegetation. Refer to specification **Disturbed Area Stabilization (With Temporary Vegetation) - TS.**
3. Where a suitable planting medium is not present, topsoil shall be imported and incorporated into the site.
4. Block sod provides immediate cover. It is especially effective in controlling erosion adjacent to concrete flumes and other structures. Refer to specification **Disturbed Area Stabilization (With Sod) - SO.**
5. When mixed plantings are done during marginal planting periods, companion crops shall be used.
6. No-till planting can be effective when planting is done following a summer or winter annual cover crop.
7. Irrigation should be used when the soil is dry or when summer plantings are done.

8. Low maintenance plants, as well as native species, should be used to ensure long-lasting erosion control.
9. Wildlife plantings should be included when applicable.

Wildlife Plantings: Commercially available plants beneficial to wildlife species include the following:

Mast Bearing Trees: Beech, Black Cherry, Blackgum, Chestnut, Oak, Hackberry, Hickory, Locust, and Persimmon.

Trees that produce nuts or fruits are favored by many game species.

Shrubs and Small Trees: Bayberry, Bicolor Lespedeza, Crabapple, Dogwood, Huckleberry or Native Blueberry, Mountain Laurel, Rhododendron, Native Holly, Red Cedar, Red Mulberry, Sumac, Wax Myrtle, Wild Plum and Blackberry. Plant shrubs in patches without tall trees to develop stable shrub communities. All produce fruits used by many kinds of wildlife, except for lespedeza, which produces seeds used by quail and songbirds.

CONSTRUCTION SPECIFICATIONS

Grading and Shaping: Grading and shaping may not be required where hydraulic seeding and fertilizing equipment is to be used. Vertical banks shall be sloped to enable plant establishment.

When conventional seeding and fertilizing are to be done, grade and shape the slope, where feasible and practical, so that equipment can be used safely and efficiently during seedbed preparation, seeding, mulching and maintenance of the vegetation.

Concentrations of water that could cause excessive soil erosion should be diverted to a safe outlet. Diversions and other treatment practices must conform to the appropriate standards and specifications set out in this handbook.

Plant Selection: Refer to Table 1 for suggested species. Plants should be selected on the basis of species characteristics, site and soil conditions, planned use and maintenance of the area; time of year of planting, method of planting; and the needs and desires of the land user.

Plant selection may also include annual companion crops. Annual companion crops should be used only when the perennial species are not planted during their optimum planting period. Care should be taken in selecting companion crop species and seeding rates because annual crops will compete with perennial species for water, nutrients, and growing space. A high seeding rate of the companion crop may prevent the establishment of perennial species.

Ryegrass shall not be used in any seeding mixtures containing permanent, perennial species due to its ability to out-compete desired species chosen for permanent perennial cover.

Seed Quality: The term “pure live seed” is used to express the quality of seed and is not shown on the label. Pure live seed (PLS) is expressed as a percentage of the seeds that are pure and will germinate. Information on percent germination and purity can be found on seed tags. PLS is determined by multiplying the percent of pure seed with the percent of germination; i.e.,

(PLS = % germination x % purity)

EXAMPLE: Common bermuda seed

70% germination, *80%* purity
PLS = *70%* germination x 80% purity
PLS = 56%

The percent of PLS determines the amount of seed needed. If the seeding rate is 10 pounds PLS and the bulk seed is 56 % PLS, the bulk seeding rate is:

$$\frac{\text{10 lbs PLS/acre}}{\text{56\% PLS}} = 17.9 \text{ lbs/acre}$$

An application of 17.9 lbs/acre will provide 10 lbs/acre of pure live seed.

Permanent Cover Seeding Mixtures

Seeding Dates	Grass Seed	Percentages
February 1 to July 1	Kentucky 31 Fescue	80%
	Korean Lespedeza	15%
	English Rye	5%
June 1 to August 15	Kentucky 31 Fescue	55%
	English Rye	20%
	Korean Lespedeza	15%
	German Millet	10%
April 15 to August 15	Bermudagrass (hulled)	70%
	Annual Lespedeza	30%
August 1 to December 1	Kentucky 31 Fescue	70%
	English Rye	20%
	White Clover	10%
February 1 to December 1	Kentucky 31 Fescue	70%
	Crown Vetch	25%
	English Rye	5%

Source: TDOT Standard Specifications

Table 1

Topsoil: Topsoil should be friable and loamy, free of debris, objectionable weeds and stones, and contain no toxic substances that may be harmful to plant growth. When replacing topsoil on disturbed areas, maintain needed erosion and sediment control practices such as diversions, berms, sediment basins, etc. Grades containing these structures should be maintained after the topsoil is applied.

Topsoil should be handled only when it is dry enough to work without damaging soil structure. A uniform application of 5 inches (unsettled) is recommended, but may be adjusted at the discretion of the engineer or landscape architect. See Table 2 for additional information about the volume of topsoil to achieve various depths.

Seedbed Preparation: When conventional seeding is to be used, topsoil should be applied to any area where the disturbance results in subsoil being the final grade surface.

Broadcast plantings

1. Seedbed preparation may not be required where hydraulic seeding equipment is to be used.
2. Tillage, at a minimum, shall adequately loosen the soil to a depth of 4 to 6 inches; alleviate compaction; incorporate topsoil, lime, and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of straw or hay mulch if a crimper is to be used.
3. Tillage may be done with any suitable equipment.
4. Tillage should be done parallel to the contour where feasible.
5. On slopes too steep for the safe operation of tillage equipment, the soil surface shall be pitted or trenched across the slope with appropriate hand tools to provide consecutive beds, 6 to 8 inches apart, in which seed may

lodge and germinate. Hydraulic seeding may also be used.

Individual Plants

1. Where individual plants are to be set, the soil shall be prepared by excavating holes, opening furrows, or dibble planting.
2. For nursery stock plants, holes shall be large enough to accommodate roots without crowding.
3. Where pine seedlings are to be planted, use a subsoiler under the row to a depth of 36 inches on the contour four to six months prior to planting. Subsoiling should be done when the soil is dry, preferably in August or September.
4. Trees should not be planted in power line right-of-ways or under power lines.

Inoculants: All legume seed shall be inoculated with appropriate nitrogen fixing bacteria. The inoculants shall be pure culture prepared specifically for the seed species and used within the dates on the container.

A mixing medium recommended by the manufacturer shall be used to bond the inoculants to the seed. For conventional seeding, use twice the amount of inoculants recommended by the manufacturer. For hydraulic seeding, four times the amount of innoculant recommended by the manufacturer shall be used.

All inoculated seed shall be protected from the sun and high temperatures and shall be planted the same day inoculated. No inoculated seed shall remain in the hydroseeder longer than one hour.

Cubic Yards of Topsoil Required to Attain Various Soil Depths

Depth (Inches)	Per 1,000 Square Feet	Per Acre
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

Table 2

PLANTING

Hydraulic Seeding: Mix the seed (innoculated if needed), fertilizer, and wood cellulose or wood pulp fiber mulch with water and apply in a slurry uniformly over the area to be treated. Apply within one hour after the mixture is made.

Conventional Seeding: Seeding will be done on a freshly prepared seedbed. For broadcast planting, use a cultipacker seeder, drill, rotary seeder, other mechanical seeder, or hand seeding to distribute the seed uniformly over the area to be treated. Cover the seed lightly with l/8 to l/4 inch of soil for small seed and l/2 to 1 inch for large seed when using a cultipacker or other suitable equipment.

No-Till Seeding: No-till seeding is permissible into annual cover crops when planting is done following maturity of the cover crop or if the temporary cover stand is sparse enough to allow adequate growth of the permanent (perennial) species. No-till seeding shall be done with appropriate no-till seeding equipment. The seed must be uniformly distributed and planted at the proper depth.

Individual Plants: Shrubs, vines and sprigs may be planted with appropriate planters or hand tools. Pine trees shall be planted manually in the subsoil furrow. Each plant shall be set in a manner that will avoid crowding the roots.

Nursery stock plants shall be planted at the same depth or slightly deeper than they grew at

the nursery. The tips of vines and sprigs must be at or slightly above the ground surface.

Where individual holes are dug, an appropriate amount of fertilizer shall be placed in the bottom of the hole, two inches of soil shall be added, and the plant shall be set in the hole and the hole filled in.

APPLYING MULCH

Mulch is required for all permanent vegetation applications. Mulch applied to seeded areas shall achieve 75% soil cover. Select the mulching material from the following and apply as indicated:

1. When using temporary erosion control blankets or block sod, mulch is not required.
2. Dry straw or dry hay of good quality and free of weed seeds can be used. Dry straw shall be applied at the rate of 2 tons per acre. Dry hay shall be applied at a rate of 2 l/2 tons per acre. *Sericea lespedeza* hay containing mature seed shall be applied at a rate of three tons per acre.
3. Straw or hay mulch will be spread uniformly within 24 hours after seeding and/or planting. The mulch may be spread by blower type spreading equipment, other spreading equipment or by hand.
4. Wood cellulose mulch or wood pulp fiber shall be used with hydraulic seeding. It shall be applied at the rate of 500 pounds per acre. Dry straw or dry hay shall be applied (at the rate indicated above) after hydraulic seeding.
5. One thousand pounds per acre of wood cellulose or wood pulp fiber, which includes a tackifier, shall be used with hydraulic seeding on slopes ¾:1 or steeper.
6. Wood cellulose and wood pulp fibers shall not contain germination or growth inhibiting factors. They shall be evenly dispersed when agitated in water. The fibers shall contain a dye to aid in uniform application during seeding.

ANCHORING MULCH

Anchor straw or hay mulch immediately after application by one of the following methods:

1. Emulsified asphalt can be (a) sprayed uniformly onto the mulch as it is ejected from the blower machine or (b) sprayed on the mulch immediately following mulch application when straw or hay is spread by methods other than special blower equipment. The combination of asphalt emulsion and water shall consist of a homogeneous mixture satisfactory for spraying. The mixture shall consist of 100 gallons of emulsified asphalt and 100 gallons of water per ton of mulch. Care shall be taken at all times to protect state waters, the public, adjacent property, pavements, curbs, sidewalks, and all other structures from asphalt discoloration.
2. Hay and straw mulch may be pressed into the soil immediately after the mulch is spread. A special “crimper” or disk harrow with the disks set straight may be used. Serrated disks are preferred, and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the disks shall be dull enough to press the mulch into the ground without cutting it, leaving much of it in an erect position. Mulch shall not be plowed into the soil.
3. Synthetic tackifiers or binders may be applied in conjunction with or immediately after the mulch is spread. Synthetic tackifiers should be mixed and applied according to manufacturer’s specifications. Refer to specification **Tackifiers and Binders - TB.**

BEDDING MATERIAL

Mulch is used as a bedding material to conserve moisture and control weeds in nurseries, ornamental beds, around shrubs, and on bare areas.

Material	Depth
Grain straw	4” to 6”
Grass Hay	4” to 6”

Pine needles	3” to 5”
Wood waste	4” to 6”

IRRIGATION

Irrigation will be applied at a rate that will not cause runoff.

MAINTENANCE

Inspection of the seeding and mulch application should be performed along with other regularly scheduled erosion and sediment control inspections. Any areas that have washed out due to high storm water flows, areas that have been disturbed by blowing wind, and areas that do not show good germination should be retreated. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Disturbed Area Stabilization (With Sod) – SO

DEFINITION

A permanent vegetative cover using sod brought from locations off site.

PURPOSE

- To establish immediate ground cover
- To reduce storm water runoff
- To protect the soil surface from erosion
- To reduce damage from sediment and runoff to downstream areas
- To improve aesthetics

CONDITIONS

This application is appropriate for areas that require immediate vegetative covers, such as drop inlets, grass swales, and waterways with intermittent flow.

PLANNING CONSIDERATIONS

Sod can initially be more costly than seeding, but the advantages often justify the increased initial costs.

- Immediate erosion control and green surface
- Reduced failure as compared to seed as well as the lack of weeds
- Can be established nearly year-round

Sod is preferable to seed in waterways and swales because of the immediate protection of the channel after application. Sod must be staked in concentrated flow areas (See Figure 1).

CONSTRUCTION SPECIFICATIONS

Soil Preparation: Bring soil surface to final grade. Clear surface of trash, woody debris, stones and clods larger than 1". Apply sod to soil surfaces only and not frozen surfaces, or gravel type soils.

Properly applied topsoil will help guarantee a stand of grass. Don't use topsoil recently treated with herbicides.

Mix fertilizer and/or lime into soil surface. Fertilize and/or lime based on soil tests and/or contact with NRCS.

Installation: Lay sod with tight joints and in straight lines. Don't overlap joints. Stagger joints and do not stretch sod (See Figure 2).

On slopes steeper than 3:1, sod should be anchored with pins or other approved methods. Installed sod should be rolled or tamped to provide good contact between sod and soil.

Irrigate sod and the top 4" of soil immediately after installation.

Sod should not be cut or spread in extremely wet or dry weather. Irrigation should be used to supplement rainfall for a minimum of 2 - 3 weeks.

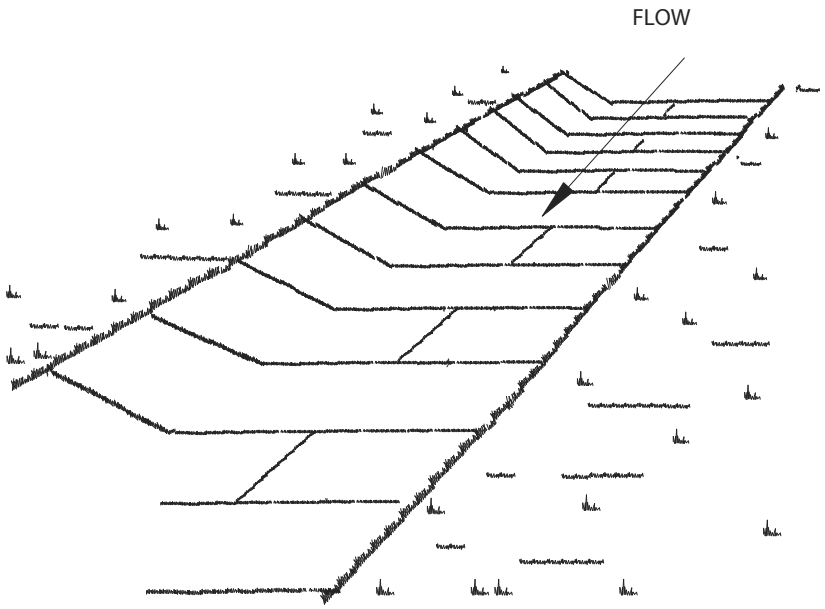
Materials: Sod selected should be certified. Sod grown in the general area of the project is desirable.

1. Sod should be machine cut and contain ¾" (+ or – ¼") of soil, not including shoots or thatch.
2. Sod should be cut to the desired size. Torn or uneven pads should be rejected.
3. Sod should be cut and installed within 36 hours of digging.
4. Avoid planting when subject to frost heave or hot weather if irrigation is not available.

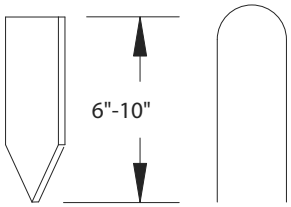
MAINTENANCE

Re-sod areas where an adequate stand of sod is not obtained. New sod should be mowed sparingly. Grass height should not be cut to less than 2"-3".

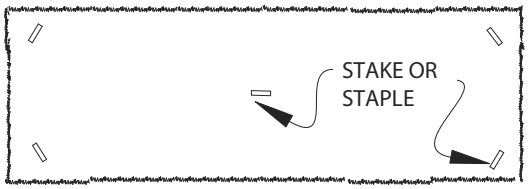
SODDED WATERWAYS

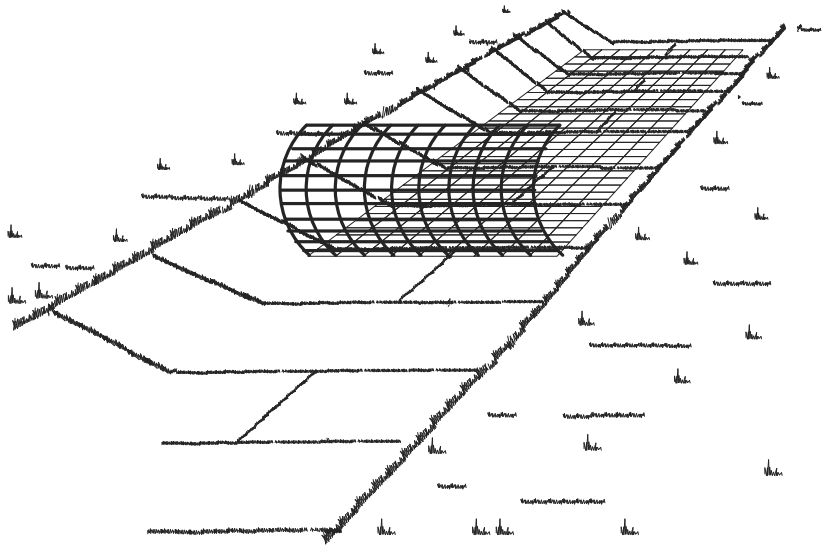


LAY SOD ACROSS THE DIRECTION OF FLOW.



USE STAKES OR STAPLES TO FASTEN SOD FIRMLY AT THE ENDS OF STRIPS AND IN THE CENTER, OR EVERY 3-4 FEET IF THE STRIPS ARE LONG. WHEN READY TO MOW, DRIVE STAKES OR STAPLES FLUSH WITH THE GROUND.



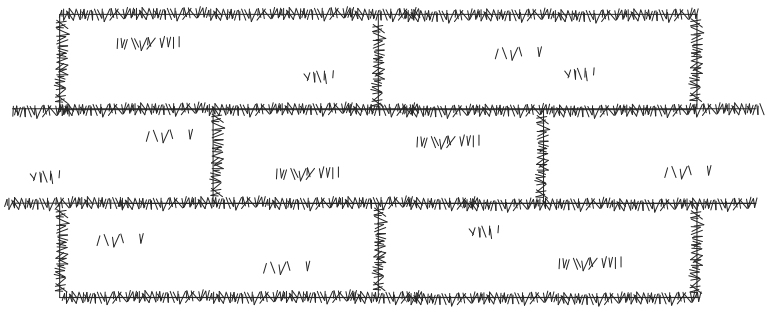


IN CRITICAL AREAS, SECURE SOD WITH NETTING. USE STAPLES.

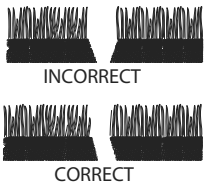
Source: VA DSWC

Figure 1

SODDING



LAY SOD IN A STAGGERED PATTERN. BUTT THE STRIPS TIGHTLY AGAINST EACH OTHER. DO NOT LEAVE SPACES AND DO NOT OVERLAP. A SHARPENED MASON'S TROWEL IS A HANDY TOOL FOR TUCKING DOWN THE ENDS AND TRIMMING PIECES.

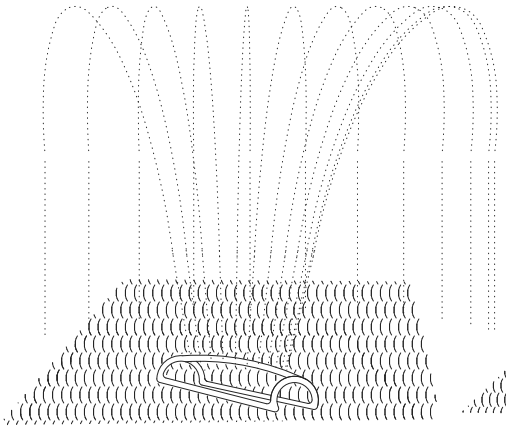


INCORRECT

CORRECT

BUTTING - ANGLED ENDS CAUSED BY THE AUTO-MATIC SOD CUTTER MUST BE MATCHED CORRECTLY.

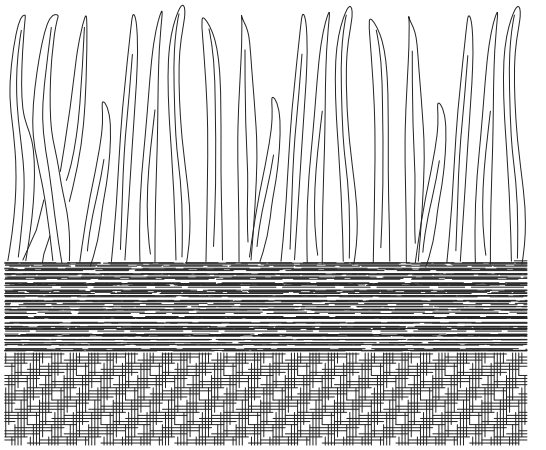
ROLL SOD IMMEDIATELY TO ACHIEVE FIRM CONTACT WITH THE SOIL.



WATER TO A DEPTH OF 4" AS NEEDED. WATER WELL AS SOON AS THE SOD IS LAID.

MOW WHEN THE SOD IS ESTABLISHED - IN 2-3 WEEKS. SET THE MOWER HIGH (2"-3").

APPEARANCE OF GOOD SOD



SHOOTS OR GRASS BLADES. GRASS SHOULD BE GREEN AND HEALTHY, MOWED AT A 2"-3" CUTTING HEIGHT.

THATCH - GRASS CLIPPINGS AND DEAD LEAVES, UP TO 1/2" THICK.

ROOT ZONE - SOIL AND ROOTS. SHOULD BE 1/2"-3/4" THICK, WITH DENSE ROOT MAT FOR STRENGTH.

Source: VA DSWC

Figure 2

Disturbed Area Stabilization (With Temporary Vegetation) – TS

DEFINITION

The establishment of temporary vegetative cover with fast growing species for seasonal protection on disturbed or denuded areas.

PURPOSE

- To reduce storm water runoff velocity
- To maintain sheet flow
- To protect the soil surface from erosion
- To promote infiltration of runoff into the soil
- To improve wildlife habitat
- To improve aesthetics
- To improve the soil condition for permanent plantings

CONDITIONS

Temporary vegetative measures should be coordinated with permanent measures to assure economical and effective stabilization. Most types of temporary vegetation are ideal to use as companion crops until the permanent vegetation is established. Note: *Some species of temporary vegetation are not appropriate for companion crop plantings because of their potential to out compete the desired species (e.g. annual ryegrass).*

CONSTRUCTION SPECIFICATIONS

Grading and Shaping: Excessive water runoff shall be reduced by properly designed and installed erosion control practices such as ditches, dikes, diversions, sediment barriers, etc.

No shaping or grading is required if slopes can be stabilized by hand-seeded vegetation or if hydraulic seeding equipment is to be used.

Seedbed Preparation: When a hydraulic seeder is used, seedbed preparation may not be required. When using conventional or hand-seeding, seedbed preparation may not be required when the soil material is loose and not compacted by equipment or rainfall.

When soil has been compacted by equipment or rainfall, or consists of smooth cut slopes, the soil shall be disked, plowed, tilled, or otherwise scarified to provide a place for seed to lodge and germinate.

Seeding: Select a grass or grass-legume mixture suitable to the area and season of the year. See Table 1 for suggestions of temporary seeding species. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder, or hydraulic seeder (slurry including seed and mulch). Drill or cultipacker seeders should normally place seed one quarter to one half inch deep. Appropriate depth of planting is ten times the seed diameter. Soil should be "raked" lightly to cover seed with soil if seeded by hand.

Mulching: Temporary vegetation may be established without the use of mulch. Mulch without seeding may be considered for short-term protection. Refer to **Disturbed Area Stabilization (With Mulch) - MU.**

Irrigation: During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to a depth that will insure germination of the seed. Subsequent applications should be made as needed. Newly seeded areas require more water than more mature plants.

MAINTENANCE

Inspections of temporarily seeded areas should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Inspections should identify any areas that need reseeding or need additional BMP's. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Temporary Cover Seeding Mixtures

Seeding Dates	Grass Seed	Percentages
January 1 to May 1	Italian Rye	33%
	Korean Lespedeza	33%
	Summer Oats	34%
May 1 to July 15	Sudan - Sorghum	100%
May 1 to July 15	Starr Millet	100%
July 15 to January 1	Balboa Rye	67%
	Italian Rye	33%

Table 1

Source: TDOT Standard Specifications

Erosion Control Blanket/Matting – MA

DEFINITION

A protective blanket or soil stabilization mat used to assist in establishment of temporary or permanent vegetation on steep slopes, channels, or stream banks.

PURPOSE

- To prevent erosion of the soil surface
- To promote seed germination
- To protect young vegetation
- To prevent erosion of seed
- To prevent wind dispersal of seed or mulch
- To allow for easy installation of seed and/or mulch

CONDITIONS

Matting and blankets can be applied to steep slopes where erosion hazards are high and conventional seeding is likely to be too slow in providing adequate protective cover. **Concentrated flow areas, all slopes steeper than 2.5:1, with a height of ten feet or greater, and cuts and fills within stream buffers, should be stabilized with the appropriate erosion control matting or blanket.** Maintenance of the final vegetative cover must be considered when choosing blankets versus matting.

PLANNING CONSIDERATIONS

Care must be taken to choose the type of blanket or matting which is most appropriate for the specific needs of a project. Manufacturer's recommendations should be followed when choosing products.

Temporary Erosion Control Blankets

This includes rolled erosion control blankets consisting of a plastic netting which covers and is intertwined with a natural organic or manmade mulch; or, a jute mesh which is typically homogenous in design and can act alone as a soil stabilization blanket. Temporary blankets as a minimum should be used to stabilize concentrated flow areas with a velocity less than 5 ft/sec and slopes 2.5:1 or steeper with a height of 10 feet or greater. Because temporary blankets will deteriorate in a short

period of time, they provide no long-term erosion prevention protection when used alone.

Benefits of using temporary erosion control blankets include the following:

- Protection of the seed and soil from raindrop impact and subsequent displacement
- Thermal consistency and moisture retention for seedbed area
- More complete and faster germination of grasses and legumes

Permanent Erosion Control Matting

Consists of a permanent, non-degradable, three-dimensional plastic structure that is filled with soil prior to planting. These mats are also known as turf reinforcing mats. Roots penetrate the matrix, forming a continuous anchorage for vegetation. Matting should be used when a vegetative lining is desired in storm water conveyance channels where the projected or designed velocity is between about five and ten feet per second. These velocities are suggestions only. Concentrated flow channel linings should be designed by a professional experienced in the use of these materials, and according to the manufacturer's recommendations.

Benefits of using erosion control matting include the following:

- All of the benefits gained from using erosion control blankets
- Provides erosion protection from flows of high capacity storm water conveyance channels
- Acts as a filter for fine sediment during lower flow storm water events

CONSTRUCTION SPECIFICATIONS

All blanket and matting materials should be nontoxic to vegetation and to the germination of seed. Netting should be intertwined with the mulching material/fiber to maximize strength and provide for ease of handling.

Temporary Blankets

Machine produced temporary blankets should have a consistent thickness with the organic material evenly distributed over the entire blanket area. All blankets should have a minimum width of 48 inches. Machine produced temporary blankets include the following:

1. Straw blankets are temporary blankets that consist of weed-free straw from agricultural crops formed into a blanket. Blankets with a top side of photodegradable plastic mesh size of 5/16 x 5/16 inch and sewn to the straw with biodegradable thread are appropriate for slopes. The blanket should have a minimum thickness of 3/8 inch and minimum dry weight of 0.5 pounds per square yard.
2. Excelsior blankets are temporary blankets that consist of curled wood excelsior (80% of fibers are six inches or longer) formed into a blanket. The blanket should have clear markings indicating the top side of the blanket and be smolder resistant. Blankets should have photodegradable plastic mesh having a maximum mesh size of 1 ½ x 3 inches. The blanket should have a minimum thickness of ¼ of an inch and a minimum dry weight of 0.8 pounds per square yard. Slopes require excelsior matting with the top side of the blanket covered in the plastic mesh, and for waterways, both sides of the blanket require plastic mesh.
3. Coconut fiber blankets are temporary blankets that consist of 100% coconut fiber formed into a blanket. The minimum thickness of the blanket should be ¼ of an inch with a minimum dry weight of 0.5 pounds per square yard. Blankets should have photodegradable plastic mesh, with a maximum mesh size of 5/8 x 5/8 inch and be sewn to the fiber with a breakdown resistant synthetic yarn. Plastic mesh is required on both sides of the blanket if used in waterways. A maximum of two inches is allowable for the stitch pattern and row spacing.
4. Wood fiber blankets are temporary blankets that consist of reprocessed wood fibers that do not possess or contain any growth or germination inhibiting factors. The blanket should have a photodegradable plastic mesh; with a maximum mesh size of 5/8 x ¾ inch, securely bonded to the top of the

mat. The blanket should have a minimum dry weight of 0.35 pounds per square yard. A maximum of two inches is allowable for the stitch pattern and row spacing. This practice should be applied only to slopes.

5. Jute mesh consists of woven root fiber or yarn, with regularly spaced openings between strands. A typical jute mesh will weigh approximately 1.0 pounds per square yard for basic slope applications.

Permanent Matting

Permanent matting consists of a web of nettings, monofilaments or fibers that are entangled to form a strong and dimensionally stable matrix. Mats should maintain their shape before, during, and after installation, under dry or water saturated conditions. Mats must be stabilized against ultraviolet degradation and shall be inert to chemicals normally encountered in a natural soil environment.

INSTALLATION

Always follow the manufacturer's recommendations for orienting, overlapping, entrenching, and securing blankets or mats. The following are basic guidelines that may vary by manufacturer or application.

Site Preparation: After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch in diameter, and any foreign material that will prevent contact of the blanket or mat with the soil surface.

Temporary Blankets: Erosion control blankets should generally be installed vertically from the top of the slope to the bottom (See Figure 1). Trim blankets as necessary to fit the area to be covered. For slopes shallower than 2:1, and with a height of twice the width of the blanket roll or less, up to a maximum height of 16 feet, the blanket may be applied horizontally across the slope. For use in concentrated flow areas, place the blanket in the direction of the water flow.

Always entrench the blanket beyond the top and bottom of the slope and at any horizontal joint a minimum of 6 inches, or per manufacturer's recommendation. Overlap vertical joints at least 3 inches, or per manufacturer's recommendation (See Figure 2).

Permanent Matting: When installing permanent matting in a storm water conveyance channel, begin at the bottom of the slope and progress upstream, centering the mat in the middle of the channel. Shingle upstream layer over downstream layer, overlapping 3 feet. Overlap 3 inches minimum along longitudinal seams. Entrench the upper and lower edges beyond the slope (See Figure 3).

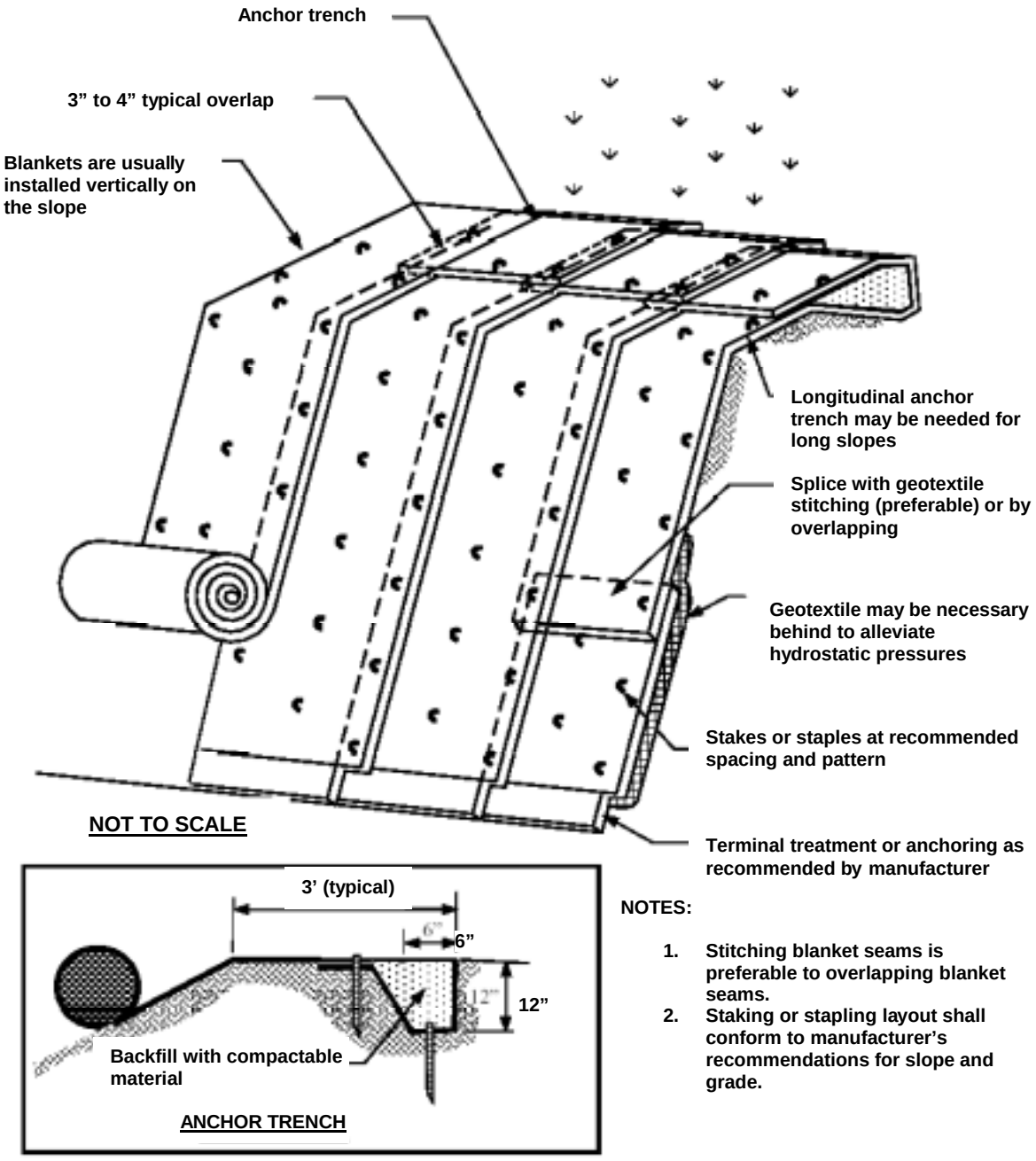
Staples: Staples should be used to anchor temporary blankets, and either staples or stakes should be used to anchor permanent matting. Follow manufacturer's recommendations for stapling or staking pattern and frequency.

Planting: Seed and any necessary soil amendments should be applied prior to installation of temporary blankets. For permanent mats, the area should be brought to final grade, and any soil amendments tilled or plowed into the soil surface. After the permanent mat has been installed and backfilled with topsoil, the area should be seeded and mulched. Refer to specifications **Disturbed Area Stabilization (With Permanent Vegetation) – PS** and **Disturbed Area Stabilization (With Mulch) – MU**.

MAINTENANCE

Inspections of blankets and matting should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Blanket and matting inspections should identify washed out areas, areas needing additional staples, and/or additional areas needing blankets or matting. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Erosion Control Blanket - Slope Installation



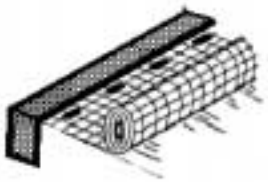
NOTES:

1. Stitching blanket seams is preferable to overlapping blanket seams.
2. Staking or stapling layout shall conform to manufacturer's recommendations for slope and grade.

Figure 1

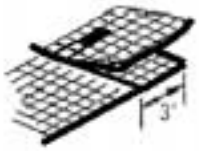
Source: Knoxville Engineering Department

Anchoring Details For Erosion Control Blanket



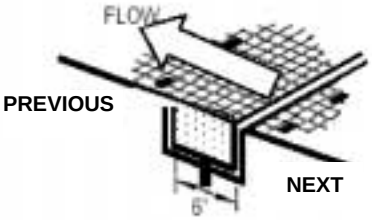
UPHILL ANCHOR SLOT:

Bury the uphill end of the mat within a trench at least 6” deep (12” deep for longer slopes). Tamp the soil firmly. Staple or stake at 12” intervals across the mat.



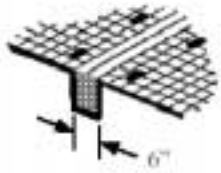
OVERLAP:

Overlap edges of the strips at least 3” (and preferably more for channels). Stake or staple every 12” down the center of the overlap.



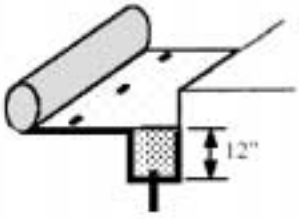
ANCHOR SLOT (WITHIN A CHANNEL):

Dig a slot 6” deep and 6” wide at end of the PREVIOUS roll, and insert NEXT roll on bottom and sides of anchor slot. Insert the PREVIOUS roll on bottom and sides of anchor slot, and then install stakes or staples through both rolls at the bottom of the anchor slot. Fill anchor slot with soil, tamp firmly, and then install NEXT roll in the upstream direction.



CHECK SLOTS:

Check slots should be made every 50 feet on slopes and intermittent drainage channels. Insert a fold of the mat into a 6” deep trench and tamp firmly. Staple or stake at 12” intervals across the mat. Lay mat smoothly on the surface of the soil. Do not stretch the mat and do not allow wrinkles.



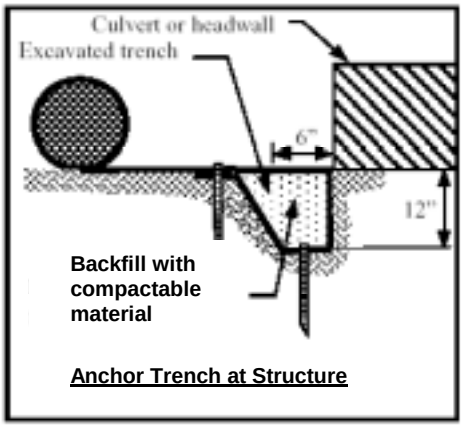
ANCHORING ENDS AT STRUCTURES:

Place end of mat in a 12” deep slot at the side of structure. Place stakes or staples at 12” intervals within slot. Fill trench and tamp firmly. Roll mat up the channel or downhill as necessary.

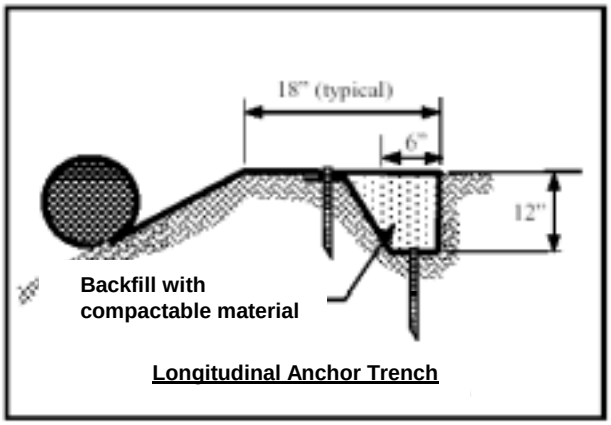
Figure 2

Source: Knoxville Engineering Department

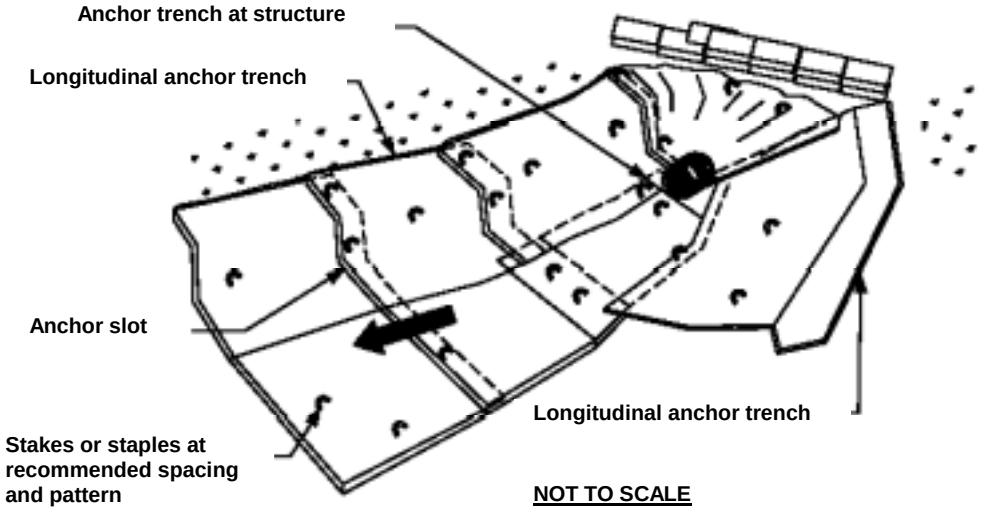
Erosion Control Matting - Channel Installation



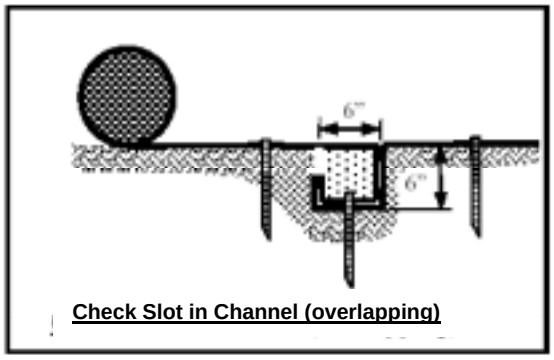
Anchor Trench at Structure



Longitudinal Anchor Trench



NOT TO SCALE



Check Slot in Channel (overlapping)

NOTES:

1. **Stitching blanket seams is preferable to overlapping blanket seams.**
2. **Staking or stapling layout shall conform to manufacturer's recommendations for slope and grade.**

Figure 3

Source: Knoxville Engineering Department

Polyacrylamide – PAM

DEFINITION

The land application or storm water application of product containing anionic polyacrylamide (PAM).

PURPOSE

Land application of PAM is performed to reduce soil surface erosion due to wind and/or water forces. Storm water applications of PAM promote settling of fine soil particles in sediment basins.

CONDITIONS

Polyacrylamides have two general erosion and sediment control applications. One temporary practice is direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. Such areas may include construction sites where land-disturbing activities prevent the establishment or maintenance of a vegetative cover. The product may also be applied to storm water as it enters sediment basins. This will cause soil particles to bind together and settle within the pond.

This temporary practice is not intended for application to surface waters of the state. It is intended for application within construction storm water drainages that feed into pre-constructed sediment ponds or basins.

PLANNING CONSIDERATIONS

Anionic PAM is available in emulsions, powders, and gel bars or logs. It is required that other Best Management Practices be used in combination with anionic PAM. The use of seed and mulch for additional erosion protection beyond the life of the anionic PAM is recommended. Repeat application if disturbance occurs to target area.

The following recommendations relating to design may enhance the use of, or avoid problems with the practice:

1. **Use 25-foot setbacks when applying anionic PAM near natural water bodies.**

2. Consider that performance of PAM decreases with time and exposure to ultraviolet light.
3. In concentrated flow channels, the effectiveness of PAM decreases.
4. Mulch to protect seed, if seed is applied with anionic PAM.
5. Never add water to PAM, add PAM slowly to water. If water is added to PAM, clumping can form which can clog dispensers. This signifies incomplete dissolving of the PAM and therefore increases the risk of under-application.
6. NOT ALL POLYMERS ARE PAM.

DESIGN CRITERIA

Application rates should conform to manufacturer's guidelines for application. **Only the anionic form of PAM should be used. Cationic PAM is toxic and should NOT be used.** PAM and PAM mixtures should be environmentally benign, harmless to fish, wildlife, and plants. PAM and PAM mixtures should be noncombustible.

Anionic PAM, in pure form, should have less than or equal to 0.05% acrylamide monomer by weight, as established by the Food and Drug Administration and the Environmental Protection Agency. To maintain less than or equal to 0.05% of acrylamide monomer, the maximum application rate of PAM, in pure form, should not exceed 200 pounds/acre/year. Do not over apply PAM. Excessive application of PAM can lower infiltration rate or suspend solids in water, rather than promoting settling.

Users of anionic PAM should obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations. Additives to PAM such as fertilizers, solubility promoters or inhibitors, should be nontoxic. The manufacturer or supplier should provide written application methods for PAM and PAM mixtures. The application method should ensure uniform coverage to the target and avoid drift to non-target areas including waters of the state. The manufacturer or supplier should also provide written instructions to ensure proper safety, storage, and mixing of the product.

Gel bars or logs of anionic PAM mixtures may be used in ditch systems. This application should meet the same testing requirement as anionic PAM emulsions and powders.

To prevent exceeding the acrylamide monomer limit in the event of a spill, the anionic PAM in pure form should not exceed 200 pounds/batch at 0.05% acrylamide monomer (AMD) or 400 pounds/batch at 0.025% AMD.

MAINTENANCE

Inspections should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified. Maintenance will consist of reapplying anionic PAM to disturbed areas including high use traffic areas that interfere in the performance of this practice.

STRUCTURAL PRACTICES

Check Dam - CD

DEFINITION

Small temporary barrier, grade control structure, or dam constructed across a swale, drainage ditch, or area of concentrated flow.

PURPOSE

To minimize the erosion rate by reducing the velocity of storm water in areas of concentrated flow, and to capture larger soil particles.

CONDITIONS

This practice is applicable for use in small open channels and **is not to be used in a stream**. Specific applications include:

- Temporary or permanent swales or ditches in need of protection during establishment of grass linings.
- Temporary or permanent swales or ditches that, due to their short length of service or for other reasons, cannot receive a permanent non-erodible lining for an extended period of time.
- Other locations where small localized erosion and sedimentation problems exist.

DESIGN CRITERIA

Formal design is not required. The following standards should be used:

Drainage Area: For stone check dams, the drainage area should not exceed one acre. For rock check dams, the drainage area should not exceed five acres.

Spacing: Two or more check dams in series should be used for drainage areas greater than one acre. Maximum spacing between dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. (See Figure 1)

Height: The center of the check dam should be at least 9 inches lower than outer edges. Dam height should be 2 feet maximum measured to the center of the check dam. (See Figure 2)

Side Slopes: Side slopes should be 2:l or less.

Geotextiles: A geotextile should be used as a separator between the graded stone and the soil base and abutments. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. Geotextiles should be "set" into the subgrade soils. The geotextile should be placed immediately adjacent to the subgrade without any voids and extend five feet beyond the down stream toe of the dam to prevent scour. Refer to specification **Geotextile – GE**.

CONSTRUCTION SPECIFICATIONS

The following types of check dams are used for this standard:

Stone Check Dams - CD-S: Stone check dams are constructed from large aggregate (clean of fines) such as TDOT #1 or #2 with a minimum stone size of 1.5 inch. These structures are used **for small drainage areas up to 1 acre**.

Rock Check Dam - CD-R: Rock check dams are constructed from small riprap such as TDOT Class A-1 (clean of fines) with stone sizes from 2 to 15 inches. These structures are used **for drainage areas up to 5 acres**. An upstream layer of smaller aggregate may be used for filtering. Rock can be placed by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage. Refer to **Riprap - RR** for riprap and aggregate specifications.

Rock check dams should be keyed into the swale or channel bottom at, typically, a depth of 6 inches. Advantages of keying into the swale or channel bottom are that the check dam will be more stable and less likely to wash out. A disadvantage of keying into the swale or channel bottom is that the channel will have to be repaired and reshaped whenever the rock check dam is removed.

Sandbag Check Dam - CD-SB: Sandbags filled with either aggregate or sand may also be used as a check dam. Sandbags should be staked and tied together, after being placed in a staggered fashion. Provide an overflow weir in the center of the channel similar to the check dam in Figure 2.

INSPECTION

Inspections of erosion control measures should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

MAINTENANCE

Sediment should be removed before it reaches a depth of one-half the original dam height. Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

If the area is to be mowed, check dams should be removed once final stabilization has occurred. Otherwise, check dams may remain in place permanently. After removal, the disturbed area should be seeded and mulched immediately.

Spacing Between Check Dams

L = The distance such that points A and B are of equal elevation

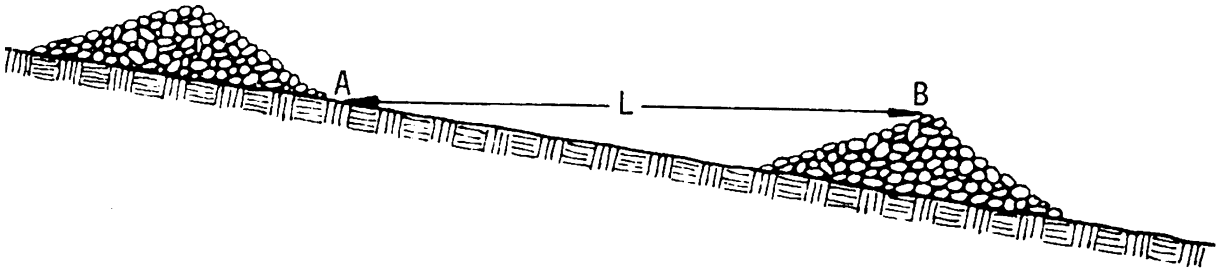
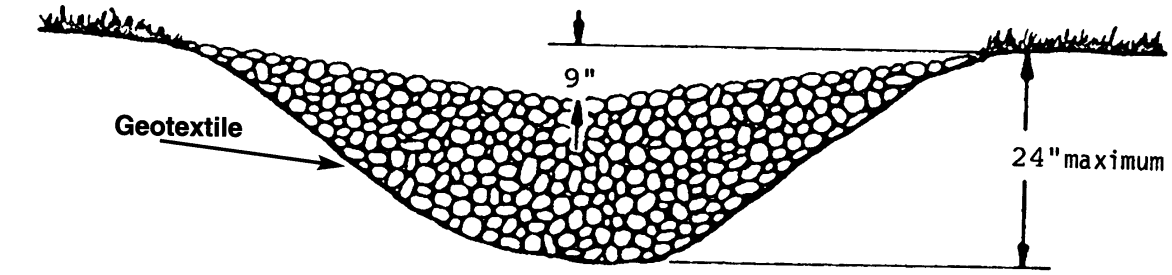
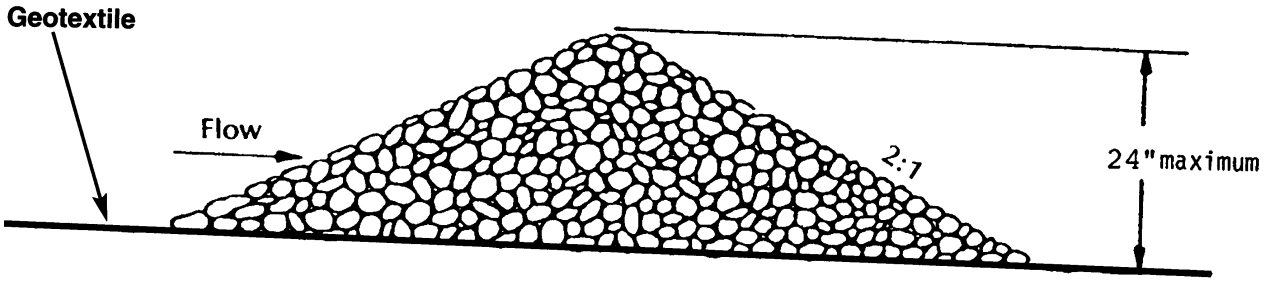


Figure 1

Height Of Check Dams





Source: GA SWCCC

Figure 2

Construction Exit - CE

DEFINITION

A stone-stabilized pad located at any point where traffic will be leaving a construction site to a public roadway.

PURPOSE

To reduce or eliminate the transport of material from the construction area onto a public roadway.

CONDITIONS

This practice is applied at appropriate points of construction egress. Geotextile under-liners are required to stabilize and support the pad aggregates.

DESIGN CRITERIA

Formal design is not required. A typical construction exit is shown in Figure 1. The following standards should be used:

Aggregate Size: Stone should be in accordance with TDOT #1 or #2 stone specifications (1.5 to 3.5 inch stone), washed, and well graded. Refer to specification **Riprap – RR** for aggregate size tables.

Pad Thickness: The gravel pad should have a minimum thickness of 6 inches.

Pad Length and Width: At a minimum, the width should equal full width of all points of vehicular egress, but not less than 20 feet wide. Pad length should be no less than 50 feet.

Washing: If the action of the vehicle traveling over the gravel pad does not sufficiently remove the material, the tires should be washed prior to exit onto public roadways. When washing is required, the wash rack should be designed for the anticipated traffic loads and placed on level ground, on a pad of coarse aggregate (such as TDOT #57). A typical wash rack is shown in Figure 2. The wash rack design may consist of other materials suitable for truck traffic that remove mud and dirt. The wash rack should have provisions that intercept the sediment-laden runoff and direct it into a sediment trap or sediment basin.

Location: The exit should be located wherever traffic will be leaving a construction site directly onto a public roadway.

CONSTRUCTION SPECIFICATIONS

It is recommended that the exit area be excavated to a depth of 3 inches and be cleared of all vegetation and roots.

Waterbar Diversion: On sites where the grade toward the public roadway is greater than 2%, a waterbar diversion 6 to 8 inches high with 3:l side slopes should be constructed across the foundation of the construction exit to prevent storm water runoff from leaving the site. Refer to specification **Diversion – DI.** Diverted runoff should be directed into a sediment trap or sediment basin. Refer to specification **Sediment Trap – ST** or **Sediment Basin – SB.**

Geotextile: The geotextile under-liner must be placed the full length and width of the exit. Refer to specification **Geotextile – GE.**

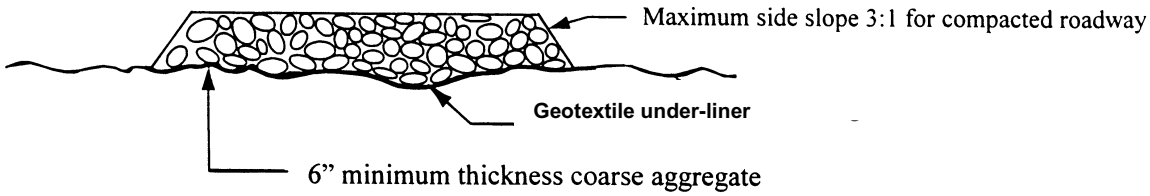
INSPECTIONS

Inspections of construction exit should be made at the end of each shift or workday.

MAINTENANCE

The exit should be maintained in a condition that will prevent tracking or flow of material onto public rights-of-way. This may require periodic top dressing with fresh stone, as conditions demand, and repair and/or cleanout of any structures to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.

Construction Exit



SECTION A-A

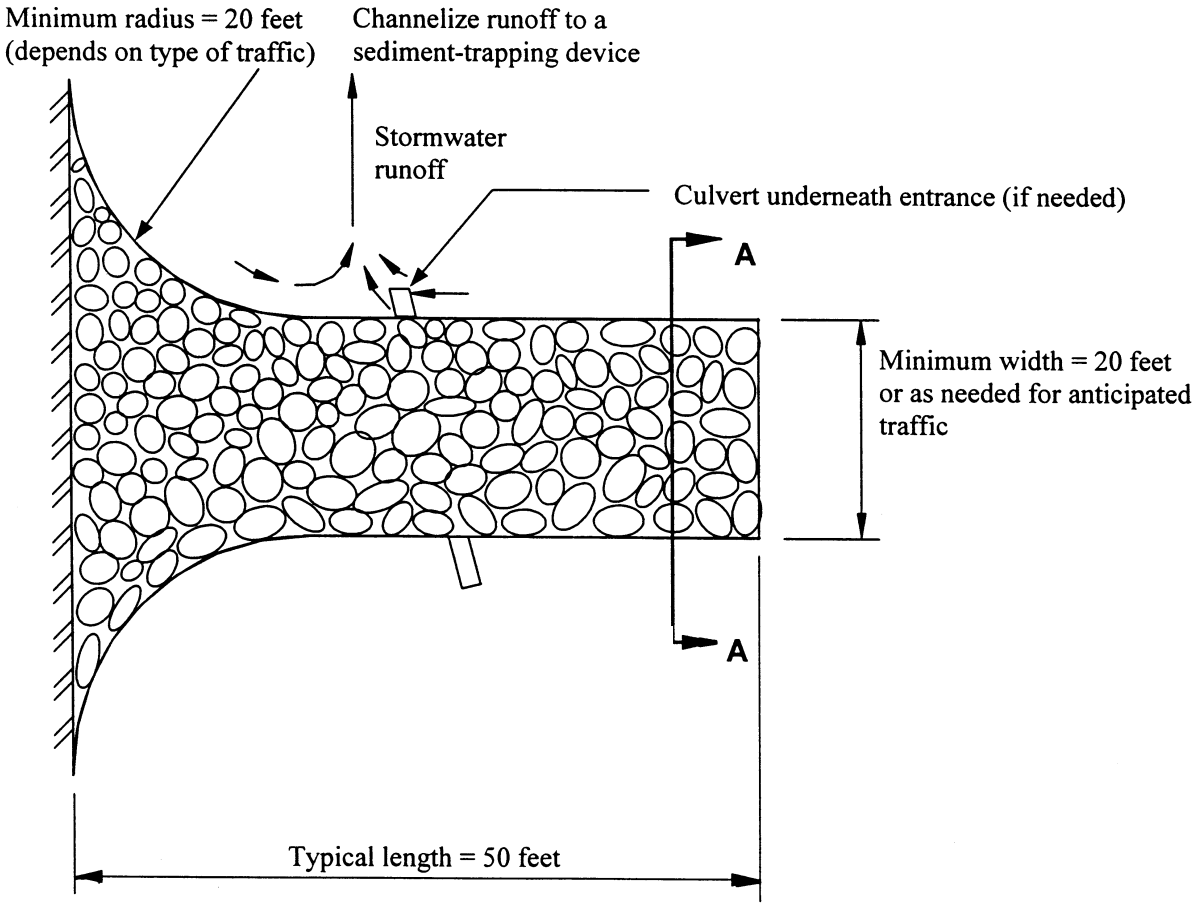
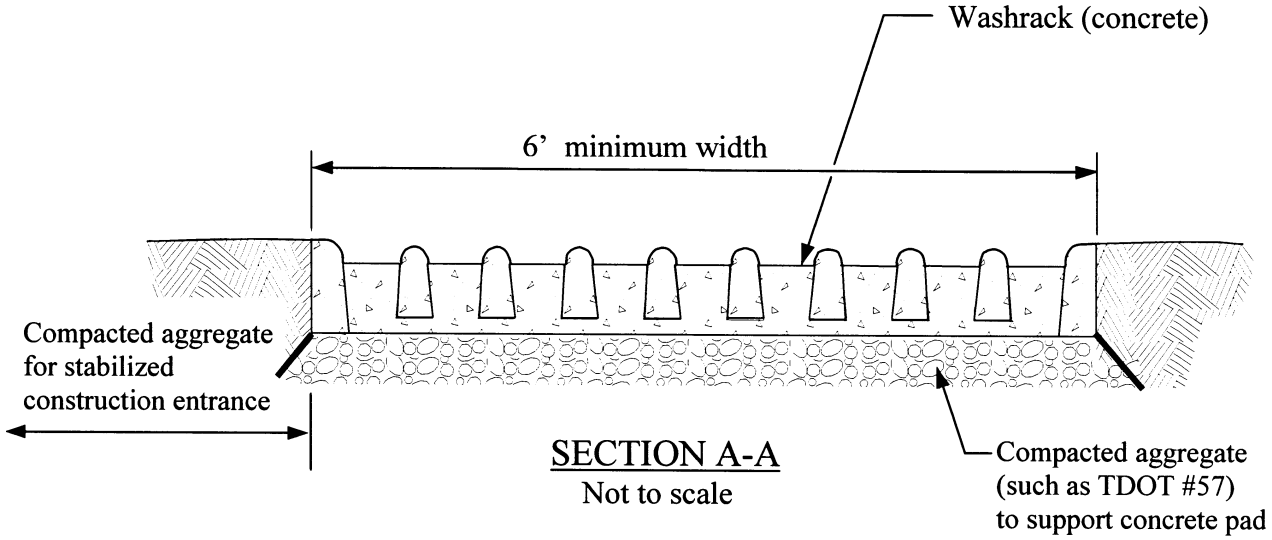
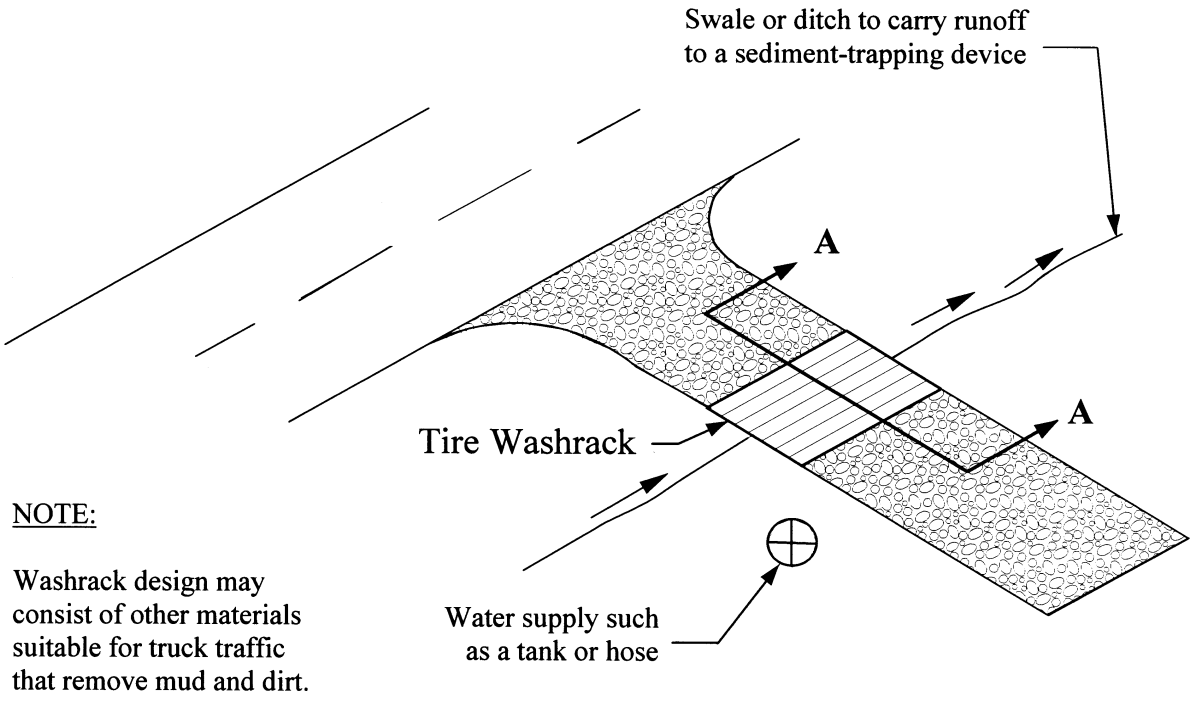


Figure 1

Source: Knoxville Engineering Department

Typical Washrack for Construction Exit





NOTE:

Washrack design may consist of other materials suitable for truck traffic that remove mud and dirt.

Figure 2

Source: Knoxville Engineering Department

Construction Road Stabilization - CRS

DEFINITION

The use of construction specifications, techniques, and materials to stabilize soils on which a travel way is constructed as part of a construction plan. A travel way may include access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes not accessible to public traffic.

PURPOSE

To provide a fixed route for construction traffic, and to reduce erosion and subsequent re-grading of permanent roadbeds between the time of initial grading and final stabilization.

CONDITIONS

This practice is applicable where travel ways are needed in a planned land use area or wherever stone-base roads or parking areas are constructed, whether permanent or temporary, for use by construction traffic.

PLANNING CONSIDERATIONS

Areas graded for construction vehicle transport and parking purposes are especially susceptible to erosion. The exposed soil is continually disturbed, eliminating the possibility of stabilization with vegetation. The prolonged exposure of the roads and parking areas to surface runoff can create severe rill erosion and/or sedimentation, requiring regrading before paving. The soil removed during this process may enter streams and other waters of the state, compromising water quality. Additionally, because unfinished roads become so unstable during wet weather, they are virtually unusable, limiting access, and causing delays in construction

DESIGN CRITERIA

The application of this practice does not require formal design. The following standards should be used:

Temporary Roads and Parking Areas

Location: Temporary roads should be located to serve the purpose intended; facilitate the control and disposal of water; control or reduce erosion; and make the best use of topographic features. Temporary parking areas should be located on naturally flat areas to minimize grading.

Temporary roads should follow the contour of the natural terrain to minimize disturbance of drainage patterns. If a temporary road must cross a stream, the crossing must be designed, installed, and maintained according to specification **Temporary Stream Crossing - TSC.**

All stream crossings require authorization from the Tennessee Division of Water Pollution Control and United States Army Corps of Engineers prior to construction.
For more information, see Appendix C and:
http://www.state.tn.us/environment/permits/arap.htm

Grade and Alignment: The gradient and vertical and horizontal alignment should be adapted to the intensity of use, mode of travel, and level of development. Grades for temporary roads should not exceed ten percent except for very short lengths (200 feet or less), but maximum grades of 20 percent or more may be used if necessary for special uses. Frequent grade changes generally cause fewer erosion problems than long continuous gradients. Grades for temporary parking areas should be sufficient to provide drainage but should not exceed four percent.

Curves and switchbacks must be of sufficient radius for trucks and other large vehicles to negotiate easily. On temporary roads, the radius should be no less than 35 feet for standard vehicles and 50 feet for tractor-trailers.

Width: Temporary roadbeds should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic. The width for two-way traffic should be increased approximately four feet for trailer traffic. A minimum shoulder width should be two feet on each side. Where turnouts are used, road width should be increased to a minimum of 20 feet for a distance of 30 feet.

Side Slopes: All cuts and/or fills should have side slopes designed to be stable for the particular site conditions and soil materials involved. All cuts and/or fills should be 2:I or less, to the extent possible. When maintenance by machine mowing is planned, side slopes should be no steeper than 3:I.

Drainage: The type of drainage structure used will depend on the type of activity and runoff conditions. The capacity and design should be consistent with sound engineering principles and should be adequate for the class of vehicle, type of road, development, or use. Structures should be designed to withstand flows from a 25-year, 24-hour frequency storm. Ditches should be designed to be on stable grades and/or protected with structures or linings for stability.

Water breaks or bars may be used to control surface runoff on low-intensity use roads. Refer to specification **Diversion – DI.**

Stabilization: A 6-inch layer of coarse aggregate, such as TDOT #57, should be applied immediately after grading or the completion of utility installation within the right-of-way. In areas experiencing heavy traffic, stone should be placed at an 8 to I0 inch depth to avoid excessive dissipation or maintenance needs.

Geotextile should be applied beneath the stone for additional stability. Refer to specification **Geotextile – GE**.

All roadside ditches, cuts, fills, and disturbed areas adjacent to parking areas and roads should be stabilized with appropriate temporary or permanent seeding according to specification in **Disturbed Area Stabilization (With Temporary Vegetation) - TS** and **Disturbed Area Stabilization (With Permanent Vegetation) – PS,** or with rock armoring according to specification in **Riprap – RR.**

Permanent Roads and Parking Areas

Permanent roads and parking areas should be designed and constructed according to

criteria established by the local authority and TDOT. Permanent roads and parking areas should be stabilized in accordance with this specification, applying an initial base course of gravel immediately following grading.

CONSTRUCTION SPECIFICATIONS

1. Trees, stumps, brush, roots, weeds, and other objectionable materials should be removed from the work area.

2. Unsuitable material should be removed from the roadbed and parking areas.

3. Grading, subgrade preparation, and compaction should be done as needed. Fill material should be deposited in layers not to exceed 9 inches and compacted with the controlled movement of compacting and earth moving equipment.

4. The roadbed and parking area should be graded to the required elevation. Subgrade preparation and placement of the surface layer should be in accordance with sound highway construction practice.

5. Structures such as culverts, pipe drops, or bridges should be installed to the lines and grades shown on the plans or as staked in the field. Culverts should be placed on a firm foundation. Selected backfill material should be placed around the culvert in layers not to exceed 6 inches. Each layer should be properly compacted.

6. Roads should be planned and laid out with storm water flow paths in mind.

INSPECTIONS

Inspections of erosion control measures should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

MAINTENANCE

Add top dressing of stone to roads and parking areas to maintain a gravel depth of 6 inches.

Remove any silt or other debris causing clogging of roadside ditches or other drainage structure.

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Dewatering Structure - DW

DEFINITION

A temporary structure for settling and/or filtering sediment-laden water that is discharged from dewatering activities.

PURPOSE

To settle and filter sediment-laden water prior to the water being discharged off-site.

CONDITIONS

Wherever sediment-laden water must be removed from a construction activity by means of pumping.

PLANNING CONSIDERATIONS

Water that is pumped from a construction site usually contains a large amount of sediment. A dewatering structure is typically needed to remove the sediment before water is released off-site.

One of several types of dewatering structures may be constructed depending upon site conditions and type of operation. A well stabilized, onsite, vegetated area may serve as a dewatering device if the area is stabilized so that it can filter sediment and at the same time withstand the velocity of the discharged water without eroding. The discharge of sediment-laden water onto a vegetated area should not pose a threat to the survival of the existing vegetative stand through smothering by sedimentation. A minimum filtering length of **75 feet** must be available in order for such a method to be feasible.

DESIGN CRITERIA

Formal design is not required. The following information should be considered:

A dewatering structure must be sized (and operated) to allow pumped water to flow through the filtering device **without overtopping** the structure. An excavated basin may be lined with geotextile to help reduce scour and to prevent the inclusion of

soil from within the structure. Types of dewatering devices are shown in Figures 1 and 2.

CONSTRUCTION SPECIFICATIONS

Portable Sediment Tank (see Figure 1)

Materials: The sediment tank may be constructed with steel drums, sturdy wood or other material suitable for handling the pressure exerted by the volume of water. The structure should have a minimum depth of two feet.

Location: The location for the sediment tank should be chosen for easy clean-out and disposal of the trapped sediment, and to minimize the interference with construction activities.

Storage Volume: The following formula should be used to determine the storage volume of the sediment tank:

Pump discharge (gpm) x 16 = cubic feet of storage required

Operation: Once the water level nears the top of the tank, **the pump must be shut off** while the tank drains and additional capacity is made available. The tank should be designed to allow for emergency flow over the top of the tank. Clean-out of the tank is required once one-third of the original capacity is depleted due to sediment accumulation. The tank should be clearly marked showing the clean-out point.

Straw Bale /Silt Fence Pit (see Figure 2)

Materials: The straw bale/silt fence pit should consist of straw bales, silt fence, a stone outlet (a combination of TDOT Class A-1 Riprap and TDOT #1 Aggregate) and an excavated wet storage pit.

Storage Volume: The following formula should be used to determine the storage volume of the straw bale/silt fence pit:

Pump discharge (gpm) x 16 = cubic feet of storage required

In calculating the capacity, one should include the volume available from the floor of the excavation to the crest of the stone weir. In any case, the excavated area should be a minimum of 3 feet below the base of the perimeter measures (straw bales or silt fence). The perimeter measures must be installed according to the specification **Silt Fence- SF**.

Operation: Once the water level nears the crest of the stone weir (emergency overflow), **the pump must be shut off** while the structure drains down to the elevation of the excavated area. The remaining water may be removed only after a minimum of 6 hours of sediment settling time. This effluent should be pumped across an area with established vegetation or through a silt fence prior to entering a watercourse. When the excavated area becomes filled to one-half of the excavated depth, accumulated sediment should be removed and properly disposed of.

Sediment Filter Bag (see Photograph)

Materials: The filter bag should be constructed of non-woven geotextile material that will provide adequate filtering ability to capture the larger soil particles from the pumped water. The bag should be constructed so that there is an inlet neck that may be clamped around the dewatering pump discharge hose so that all of the pumped water passes through the bag.

Location: The filter bag should be used in combination with a straw bale/silt fence pit when located within 50 feet of a stream. When the distance to a stream is greater than 50 feet, the bag may be placed on well-established grass, or on an aggregate pad constructed of TDOT # 57 stone at a minimum depth of 6 inches. The bag should never be placed on bare soil.

Storage Volume: The capacity of the sediment filter bag should be adequate to handle the dewatering pump discharge, and should be based on the bag manufacturer's recommendation.

Operation: When used in conjunction with a straw bale/silt fence pit, a filter bag may be operated until the water in the pit reaches the crest of the emergency overflow. **The pump must be shut off** at this point.

When placed on either a stone pad or well-established grass, the pad may be operated until such time the discharge from the bag reaches a stream. Unless the discharge is at least as clear as the receiving water, **the pump must be shut off** at this point.

Disposal: When the bag has been completely filled with sediment it should be cut open, regraded in place, and immediately stabilized with either sod or erosion control blanket. Refer to specifications **Disturbed Area Stabilization (with Sod) – SO**, or **Erosion Control Blanket/Matting – MA**, respectively.

MAINTENANCE

The filtering devices must be inspected frequently and repaired or replaced once the sediment build-up prevents the structure from functioning as designed.

The accumulated sediment which is removed from a dewatering device must be spread on-site and stabilized or disposed of at an approved disposal site as per the SWPPP.

Portable Sediment Tank

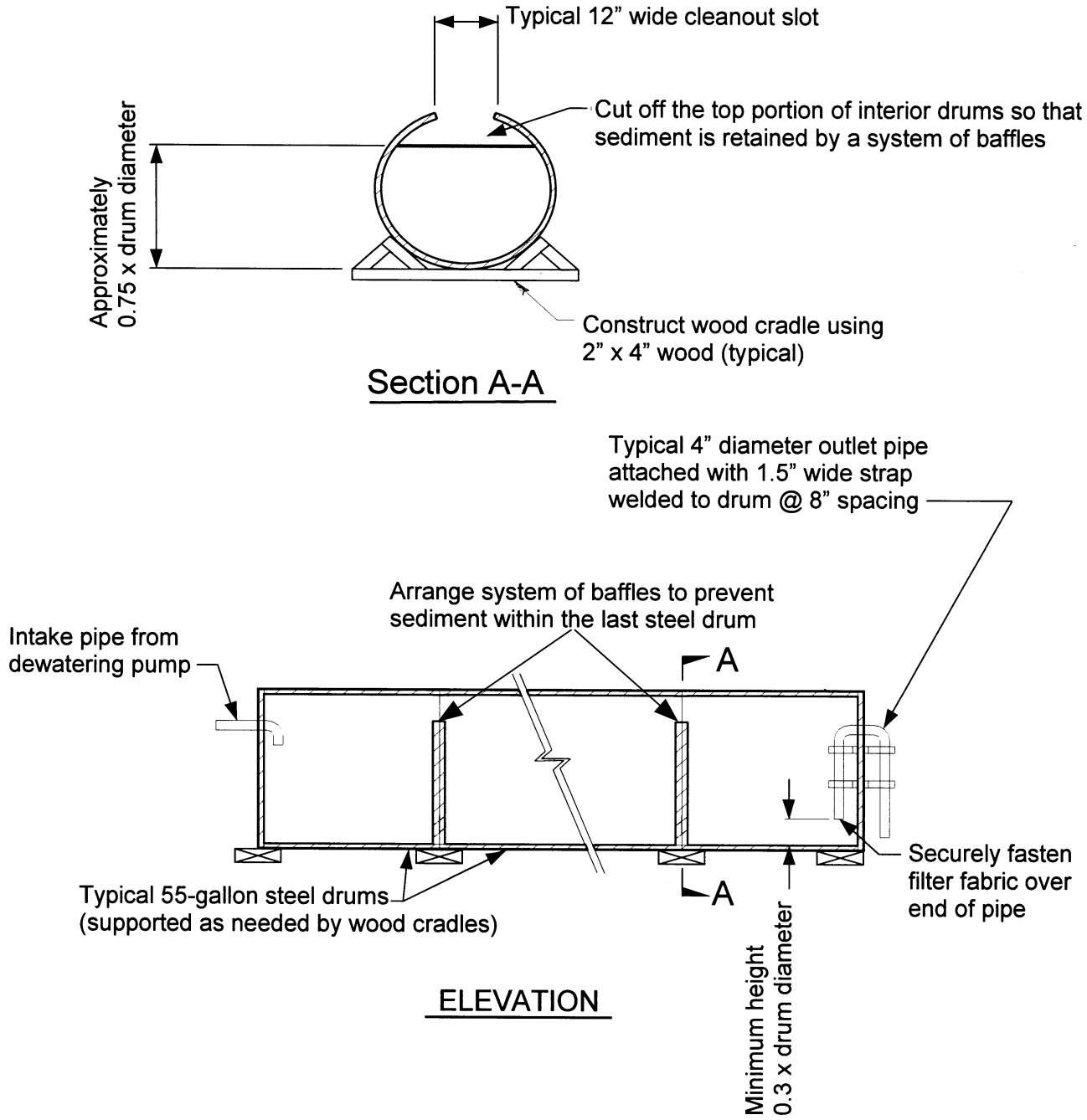
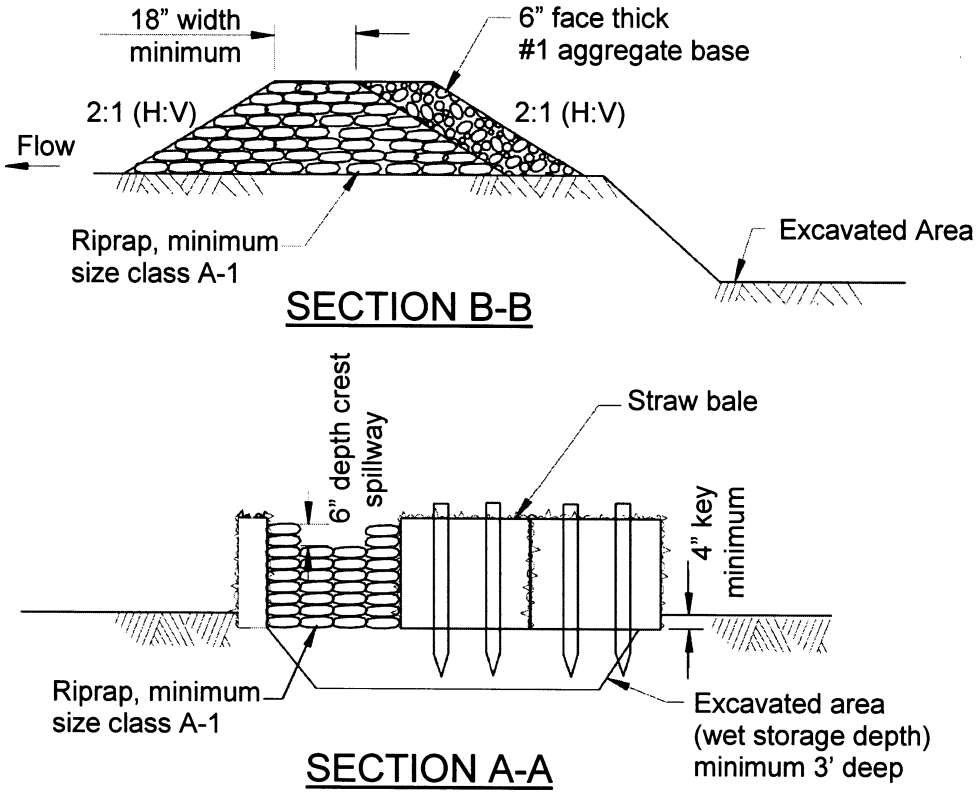


Figure 1

Source: Knoxville Engineering Department

Straw Bale/Silt Fence Pit



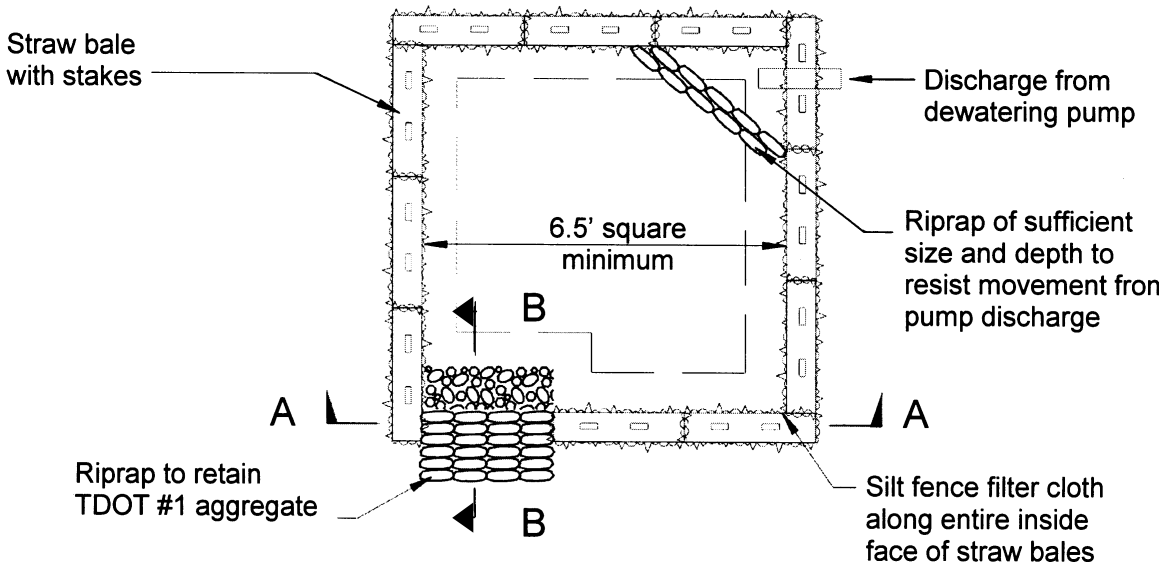


Figure 2

Source: Knoxville Engineering Department

Diversion - DI

DEFINITION

A channel of compacted soil constructed above, across, or below a slope, with a supporting earthen ridge on the lower side.

PURPOSE

To reduce the erosion of steep, or otherwise highly erodible areas by reducing slope lengths, intercepting storm runoff and diverting it to a stable outlet at a non-erosive velocity, or to convey storm water through a construction site.

CONDITIONS

This standard applies to temporary and permanent diversions in land-disturbing activities. Diversions are applicable where:

- The slope length needs to be reduced to minimize erosion.
- Runoff from upslope areas is, or has the potential for, damaging property, flooding, or preventing the establishment of vegetation on lower areas.
- Clean storm water is coming onto the site and needs to be conveyed across or around the disturbed area to prevent contamination.

DESIGN CRITERIA

Professionals familiar with the design of storm water conveyance systems should prepare construction plans and drawings for diversion designs. A diversion consists of two components: the ridge and the channel.

Ridge Design: The ridge should be compacted and designed to have stable side slopes, which should not be steeper than 2:l. When maintenance by machine mowing is planned, side slopes should be no steeper than 3:1. The ridge should be a minimum width of four feet at the design water elevation after settlement. Its design should allow for ten percent settlement.

Channel Design: Land slope must be taken into consideration when choosing channel dimensions. On the steeper slopes, narrow and deep channels may be required. On the more gentle slopes, broad, shallow channels

usually are applicable. The wide, shallow section will be easier to maintain. Since sediment deposition is often a problem in diversions, the designed flow velocity should be kept as high as the channel lining will permit. Unless the purpose of the diversion is to convey clean water around the disturbed area, a diversion should lead to a sediment-trapping device.

Table 1 lists minimum design criteria for diversions. The storm frequency is used to determine the required channel capacity (peak rate of runoff).

The channel portion of the diversion may have a parabolic, trapezoidal, or vee-shaped cross-section, as shown in Figure 1. Professional design following sound engineering practice must be used to compute the capacity and dimension of the channel.

Location: Diversion location should be determined by considering outlet conditions, topography, land use, soil type, length of slope, seep planes (when seepage is a problem), and the development layout. Diversions should be tailored to fit the conditions for particular location and soil type(s).

Outlets: Each diversion must have an adequate outlet. The outlet may be a constructed or natural waterway, a stabilized vegetated area or another energy dissipation device. Refer to specification **Storm Drain Outlet Protection – OP**. In all cases, the outlet must discharge in such a manner as to not cause erosion or sedimentation problems. Protected outlets should be constructed and stabilized prior to construction of the diversion.

Stabilization: Channels should be stabilized in accordance with sound engineering practice to provide adequate stability for expected water velocities.

WATERBAR DIVERSIONS FOR ROADS

A detailed design is not required for this type of diversion. Diversions installed to divert water off a road or right-of-way should consist of a series of compacted ridges of soil running diagonally across the road at a 30º angle. Ridges are constructed by excavating a channel up-slope, and using the excavated material for the compacted ridge.

The compacted ridge height should be 8-12" above the original road surface; the channel depth should be 8- 12" below the original road surface. Channel bottoms and ridge tops should be smooth enough to be crossed by vehicular traffic. The maximum spacing between diversions is shown in Table 2. Waterbars should discharge to a stabilized conveyance that carries the storm water to an approved outlet or treatment structure.

CONSTRUCTION SPECIFICATIONS

1. All trees, brush, stumps, obstructions, and other objectionable material should be removed and disposed of so as not to interfere with the proper functioning of the diversion.

2. The diversion should be excavated or shaped to line, grade, and cross section as designed to meet the criteria specified herein and be free of irregularities that will impede normal flow.

3. All fills should be machine compacted as needed to prevent unequal settlement that would cause damage in the completed diversion.

4. All earth removed and not needed in construction should be spread or disposed of so that it will not interfere with the functioning of the diversion.

5. Diversion channels should be stabilized in accordance with designed plans and specifications.

INSPECTION

Inspections of erosion control measures should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily

stabilized, such inspection may be conducted only once per month.

MAINTENANCE

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Diversion Design Criteria

Diversion Type	Land or Improvement Protected	Storm Frequency	Freeboard	Minimum Ridge Width
Temporary	Construction Areas	2yr / 24 hr	0.3	4 feet
Permanent	Landscaped, recreation and similar areas	25yr / 24hr	0.3	4 feet
Permanent	Dwellings, schools, commercial bldgs., and similar installations	50yr / 24hr	0.5	4 feet

Table 1

Source: GA SWCC

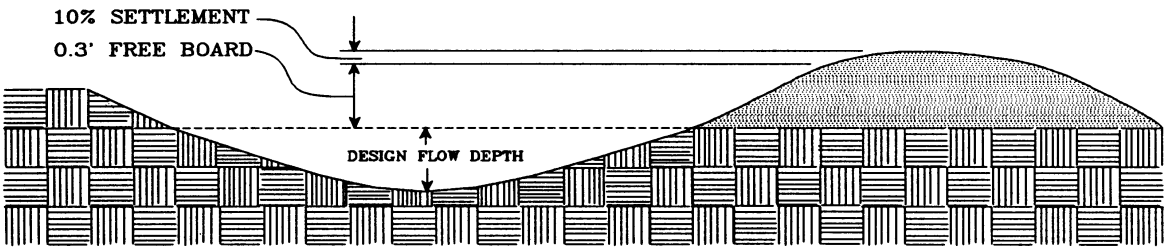
Maximum Spacing Between Waterbar Diversions

Road Grade (Percent)	Distance Between Diversions (Feet)
1	400
2	250
5	125
10	80
15	60
20	50

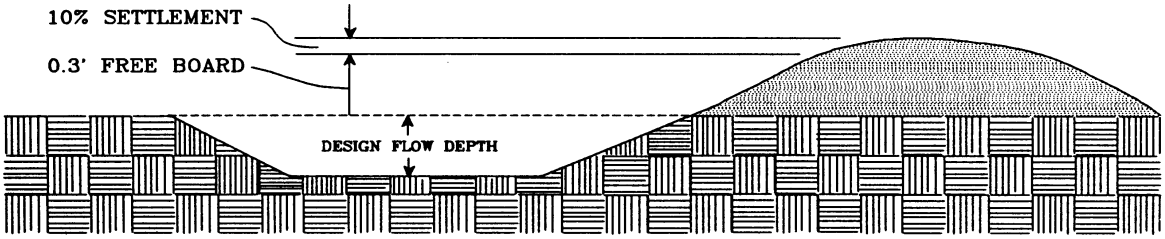
Table 2

Source: GA SWCC

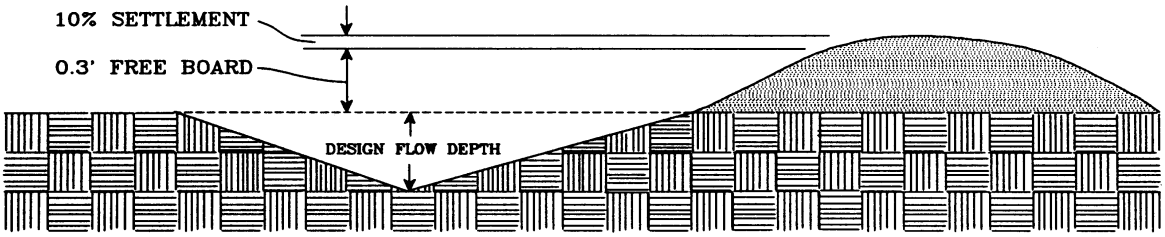
Typical Diversion Cross-Sections



Typical Parabolic Diversion



Typical Trapezoidal Diversion



Typical Vee-Shaped Diversion

Figure 1

Source: VA DSWC

Filter Ring - FR

DEFINITION

A temporary stone barrier constructed at storm drain inlets.

PURPOSE

This structure is used to reduce flow velocities and prevent the failure of other sediment control devices. It also prevents sediment from leaving the site or entering drainage systems, prior to permanent stabilization of the disturbed area.

CONDITIONS

Filter rings should be used in combination with other sediment control measures. They can be installed at or around devices such as storm drain inlets or slope drain inlets.

DESIGN CRITERIA

Formal design is not required. The following standards should be used:

Location: The filter ring should surround all sides of the structure receiving runoff from disturbed areas. See Figure 1 for a typical stone filter ring. It should be placed a minimum of four feet from the structure. The ring should be constructed so that it does not substantially impound water, causing flooding or damage to adjacent areas.

Stone Size: When utilized at inlets/outlets with diameters less than 12 inches, the filter ring should be constructed of small riprap such as TDOT Class A-3 (clean from fines) with stone sizes from 2 to 6 inches. Refer to **Riprap - RR** for riprap and aggregate specifications.

When utilized at inlets with diameters greater than 12 inches, the filter ring should be constructed of small riprap such as TDOT Class A-1 (clean from fines) with stone sizes from 2 to 15 inches.

For added sediment filtering capabilities, the upstream side of the riprap can be faced with smaller coarse aggregate, such as TDOT #57 (clean of fines) with a minimum stone size of ¾ inch.

Geotextiles: A geotextile should be used as a separator between the graded stone and the soil base and abutments. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. Geotextiles should be "set" into the subgrade soils. The geotextile should be placed immediately adjacent to the subgrade without any voids and extend to beneath the inlet to prevent scour within the filter ring. Refer to specification **Geotextile** – **GE.**

Height: The filter ring should be constructed at a height no less than two feet from grade.

CONSTRUCTION SPECIFICATIONS

Mechanical or hand placement of stone should be utilized to uniformly surround the structure to be supplemented. The filter ring may be constructed on natural ground surface, on an excavated surface, or on machine compacted fill. A common failure of filter rings is caused by their placement too close or too high above the structure to be enhanced.

INSPECTION

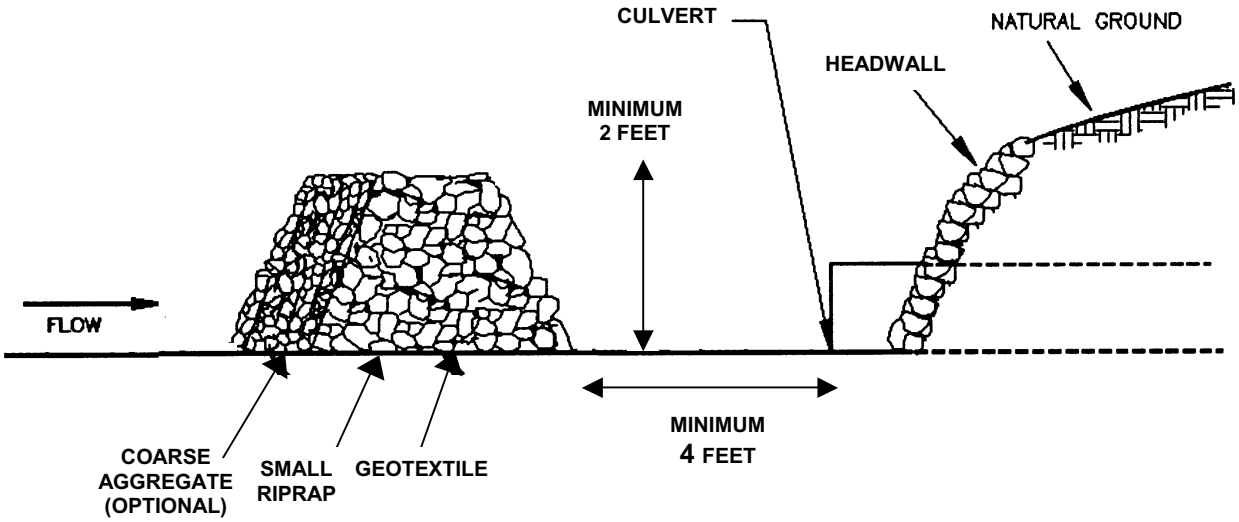
Inspections of the filter ring should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

MAINTENANCE

The filter ring must be kept clear of trash and debris. Sediment should be removed when the level reaches one-half the height of the filter ring. These structures are temporary and should be removed when the land-disturbing project has been stabilized.

Stone Filter Ring

Cross-Section



Perspective View

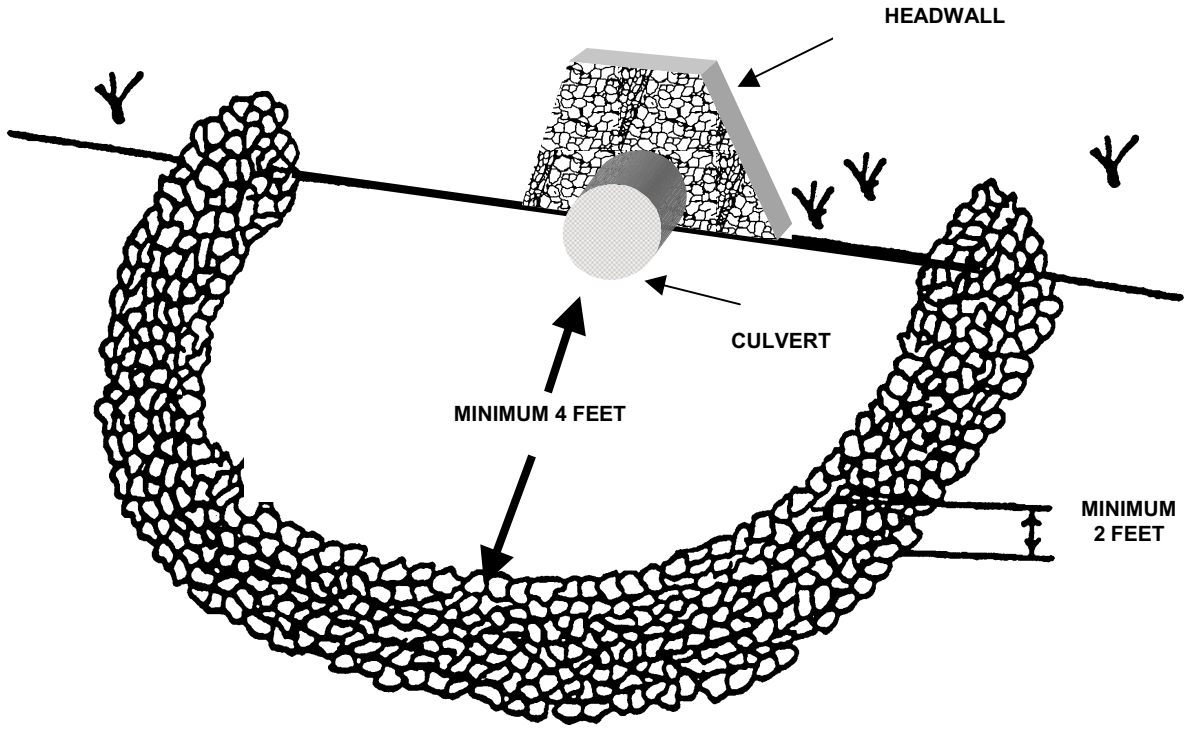


Figure 1

Source: GA SWCC

Gabion - GA

DEFINITION

Large, multi-celled, welded wire or rectangular wire mesh boxes, used as channel revetments, retaining walls, abutments, check dams, etc.

PURPOSE

Rock-filled baskets, properly wired together, to form flexible monolithic building blocks used for construction of erosion control structures and to stabilize steep slopes or highly erosive materials.

CONDITIONS

The practice is applicable wherever slope steepness or erosion potential exceeds the management capacity of less complicated applications. Gabions are typically a permanent or semi-permanent slope and/or soil stabilization application. Typical installations include:

- Retaining walls
- Bridge abutments and wing walls
- Culvert headwalls and outlet aprons
- Shore and beach protection
- Check dams

DESIGN CRITERIA

Professionals familiar with the use of gabions should prepare construction plans and drawings. Erosion and sediment control construction plans should ensure that foundations are properly prepared to receive gabions; that the gabion structure is securely "keyed" into the foundations and abutment surfaces; and that the rock used is durable and adequately sized to be retained in the baskets. See Figure 1 for a typical gabion installation.

CONSTRUCTION SPECIFICATIONS

Filling: The gabion is usually filled with 4 - 8 inch pieces of stone (clean; without fines), preferably placed by hand, but sometimes dumped mechanically, into the basket. Hand packing allows the complete filling of the basket; allowing the basket to gain strength and maintain its integrity. The filled gabion then becomes a large, flexible, and

permeable building block from which a broad range of structures may be built. This is done by setting and wiring individual, empty baskets together in courses and filling them in place. The manufacturer should provide installation details.

Geotextiles: It is recommended that geotextiles be used behind all gabion structures. If there is seepage from the excavated soil face, the appropriate geotextile should be selected to prevent the build-up of hydrostatic pressure behind the geotextile. Improper geotextile selection may result in failure of the structure or piping and erosion around the structure. Refer to specification **Geotextile** – **GE**.

Corrosion Resistance of Gabions: The wire mesh or welded wire used in gabions is heavily galvanized. For highly corrosive conditions, a PVC (polyvinyl chloride) coating must be used over the galvanizing. Such treatment is an economical solution to deterioration of the wire near the ocean; in some industrial areas; and/or in polluted streams. However, extra care should be taken during construction and installation because the corrosion resistance of the baskets is compromised if the PVC coating is chipped off. Baskets manufactured completely of plastic are also available. However, estimated required wire strength should be considered in the selection of wire versus plastic.

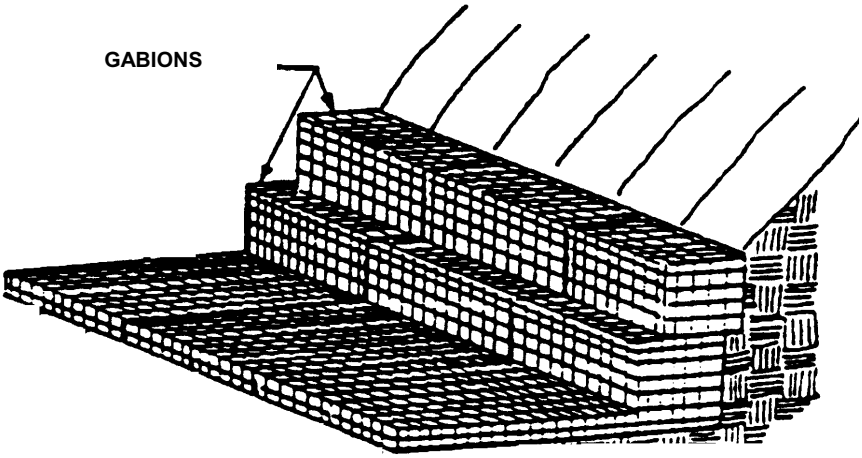
Permeability: If properly designed and constructed, hydrostatic pressure does not develop behind a gabion wall. The wall is pervious to water and stabilizes a slope by the combined action of draining and retaining. Drainage is accomplished by gravity and by evaporation as the porous structure permits active air circulation through it. Moreover, as plant growth invades the structure, transpiration further assists in removing moisture from the backfill.

INSPECTION

Inspect for signs of undercutting or excessive erosion at transition areas, and around or under the structure. Inspections should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

Gabion Installation

Gabion Toe Wall



Gabion Revetment

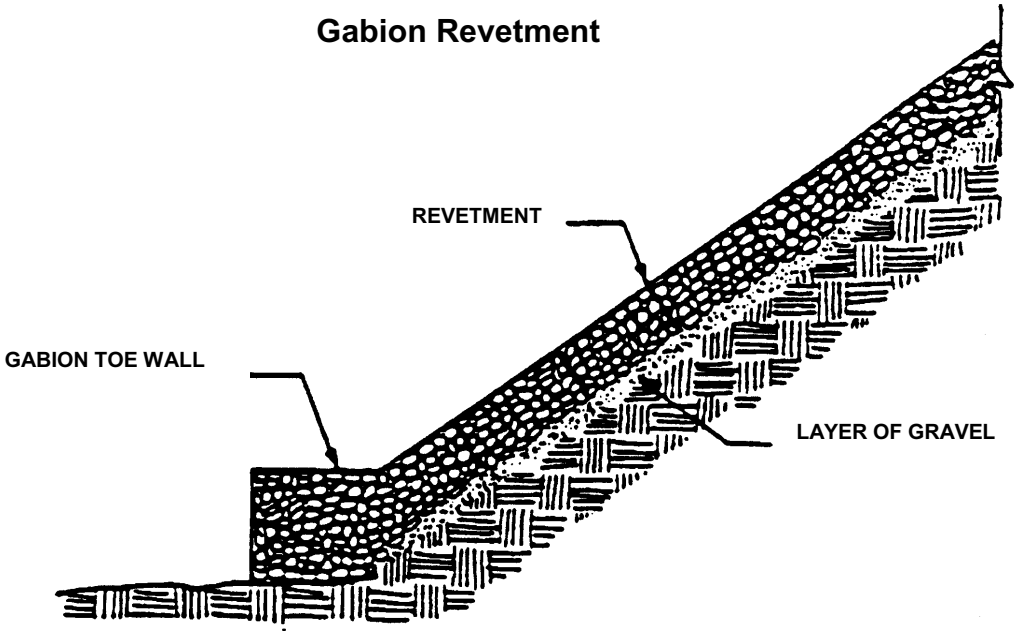


Figure 1

Source: Chattanooga Public Works Department

Geotextile – GE

DEFINITION

A geosynthetic fabric, either woven or non-woven, applied to either the soil surface or between materials.

PURPOSE

To reduce erosion by, and sediment found in, storm generated water by providing filtration, separation, or stabilization properties.

CONDITIONS

Geotextiles provide stabilization, filtration, and separation properties. This standard may be used when there is a need for separation between two materials that are likely to otherwise interfere with one another. Examples of this situation include:

- Separating subsoil from aggregate within a subsurface drain
- Separating subsoil from aggregate placed at the soil surface
- Stabilization of soil surface during temporary stream diversion
- To prevent the buildup of hydrostatic pressure behind gabion, decorative, or retaining walls

DESIGN CRITERIA

The application of geotextile does not require professional design for most uses. If hydrostatic pressure is a concern for stability of a retaining wall, consult a professional experienced in the selection of geotextile fabric.

Geotextile selection should be based on guidelines within AASHTO M288 Standard Specification.

CONSTRUCTION SPECIFICATIONS

Geotextiles should be non-toxic to vegetation, be inert to common chemicals, and be mildew and rot resistant. Materials should meet or exceed the strength, elongation, permittivity, apparent opening size, and ultraviolet stability properties of the requirements outlined in AASHTO M288 for the respective use.

INSTALLATION

Geotextiles should be installed according to manufacturer's specifications. The installation site should be prepared without voids, and without rocks, clods, or debris greater than 1 inch in size. The geotextile should be placed loosely, with no wrinkles or folds, in direct contact with the soil surface.

Overlap of successive sheets should place the upstream or upslope sheet on top of the downslope sheet. Field joining of sheets should be accomplished by sewing or thermal welding for critical applications such as stream diversions or steep slopes. Field joining for regular applications may also be accomplished by overlapping and then using stakes or staples in the overlapped portion. The amount of overlap depends on the size and positioning of the stakes or staples.

Aggregate should be placed carefully onto geotextile to prevent damage. It should never be dumped from a height greater than five feet. Damaged portions may be patched with fabric overlapping on all sides a minimum of one foot, or the specified seam overlap, whichever is greater. Construction vehicles should not be driven directly onto the geotextile.

MAINTENANCE

Geotextiles are generally installed in conjunction with some other practice. Inspections should be conducted simultaneously, and should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Gradient Treatment - GT

DEFINITION

Step or terrace features created along the contour of steep or long slopes.

PURPOSE

Stepped slopes prevent slope erosion and the formation of rills or washes by:

- Decreasing runoff velocities.
- Trapping sediment.
- Increasing infiltration of water into the soil.
- Supporting the establishment of vegetative cover.

CONDITIONS

Stepped or terraced slopes, as well as any permanent slopes which are steeper than 3:1 (H:V), should be designed by a professional based upon actual site conditions. A stepped slope is not practical for sandy soils or other soils with low cohesiveness.

There are several ways to create a gradient terrace that will meet slope stability requirements. Factors to be considered are the steepness of slope, mowing requirements, and whether the slope is formed by fill or by excavation. If terraced slopes become unstable due to diverted flow, alternative measures should be considered. Alternative measures can include flow diversion, drains, and slope stabilization practices.

DESIGN CRITERIA

Contour Furrow – GT-CO: Contour furrows (Figure 1) may be used for slopes which are 3:1 (H:V) or less. Diversion berms or channels may be necessary at the top of slope and along the edges of the slope in order to prevent concentrated storm water runoff from eroding the slope. The maximum distance between furrows should be 40 feet, and the maximum slope length should be 200 feet.

Serrated Slope – GT-SE: A serrated slope (Figure 2) may be used for slopes which are

2:1 (H:V) or less. This type of gradient terrace is labor-intensive in that bladed equipment will be needed to make numerous passes along a slope, beginning at the top and working downward. The maximum slope length should be 100 feet.

Stepped Slope – GT-ST: Graded areas steeper than 3:1 (H:V), which will not be mowed, should preferably have a stepped slope as in Figure 3. The stair-stepping effect will help vegetation become attached and also trap soil eroded from the slopes above. Stepped slopes are particularly appropriate in soils containing rock. Each step catches rocky material, which sloughs from above, and provides a level site where vegetation can become established.

Steps should be wide enough to work with standard earth moving equipment. Preferably the horizontal distance should be at least 1.5 times the vertical cut distance. Slightly grade the horizontal bench inwards (e.g. back towards the top of slope). Do not make individual vertical cuts more than 24 inches high in soft materials or more than 36 inches high in rocky materials.

Terraced Slope – GT-TE: Terraced slopes (Figure 3) should be used on most slopes which are longer than those allowed for other methods. Designed drainage channels are located in the slope at regular intervals. The designed drainage channel has a regular cross-section including slope and depth requirements. It may be necessary to locate intersecting channels to convey storm water to the bottom of the slope. The maximum slope height between terraces shall be 30 feet for cut slopes and 25 feet for fill slopes. Terrace widths should be at least 6 feet wide.

INSPECTION

Inspections of the stepped slope treatment should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

MAINTENANCE

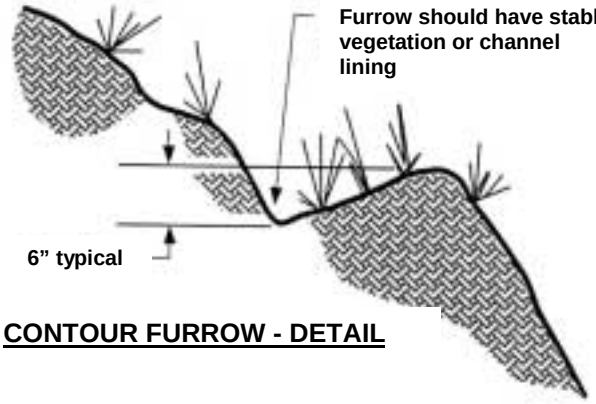
Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Contour Furrow – GT-CO

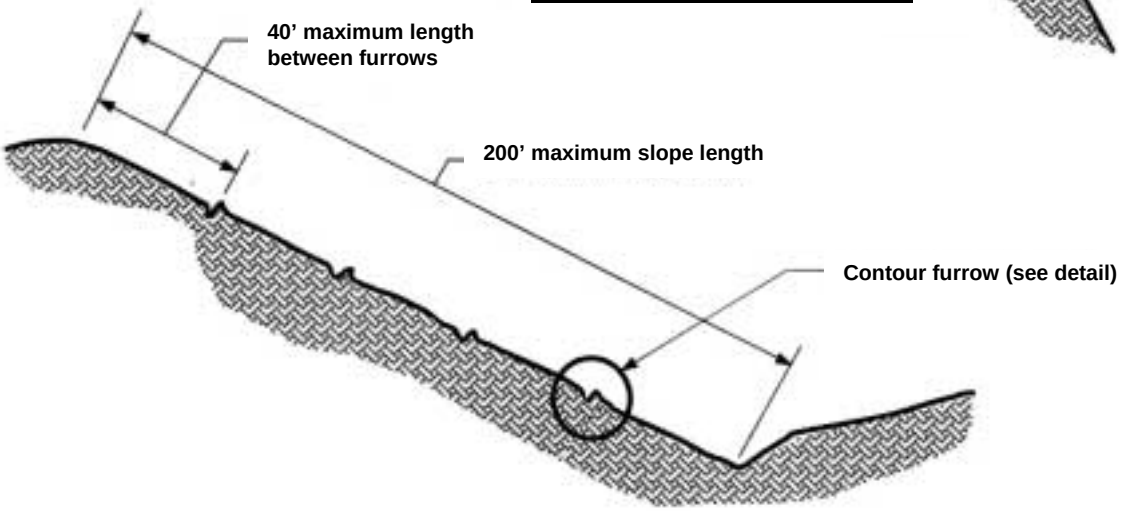
Notes:

1. **Contour furrows will catch fertilizer, seed, mulch, and rainfall to reduce storm water runoff.**

2. **Contour furrows should be designed with appropriate channel slope to safely convey storm water without excessive velocity.**



CONTOUR FURROW - DETAIL



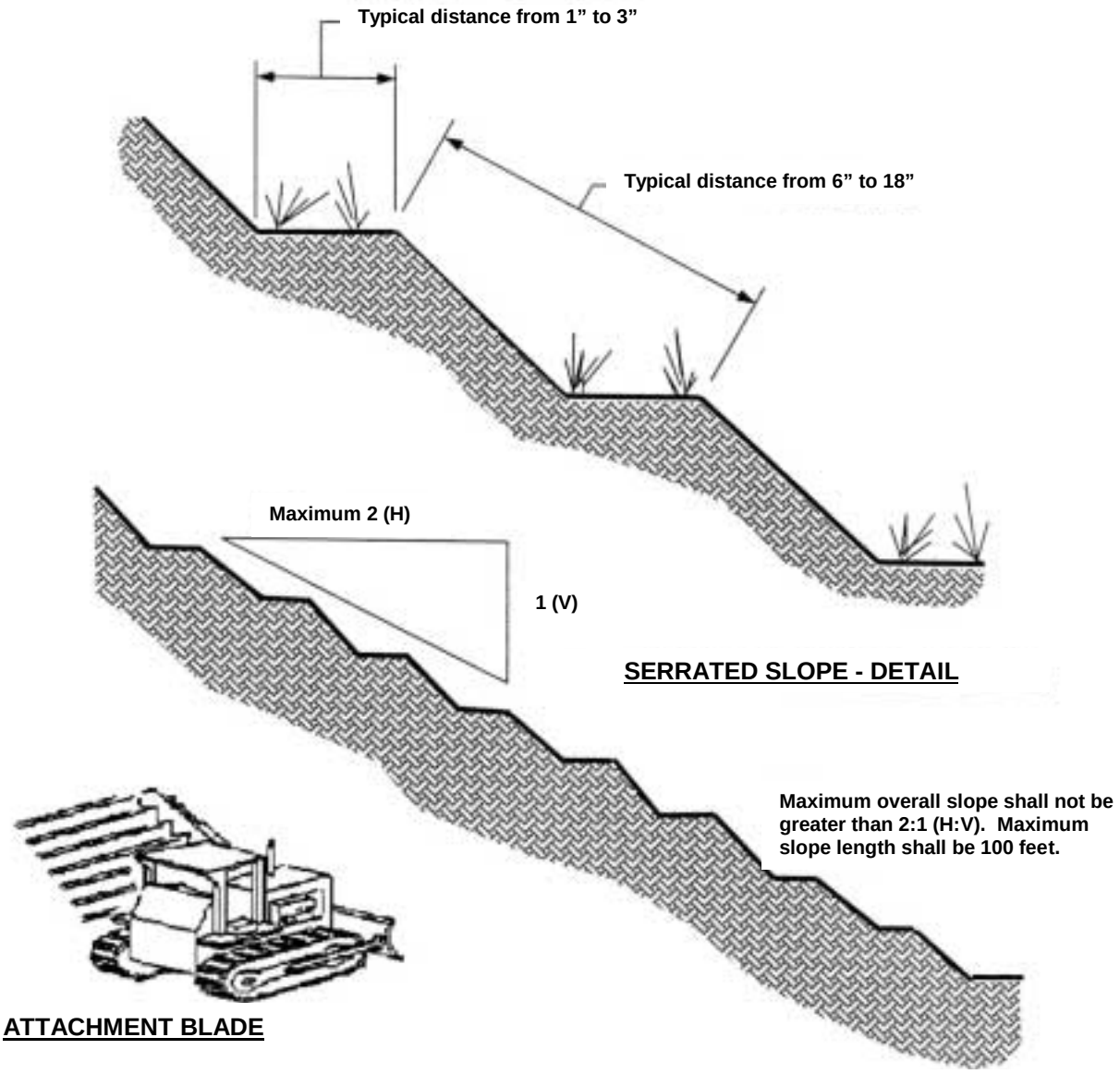
CONTOUR FURROW - SPACING

NOT TO SCALE

Figure 1

Source: Knoxville Engineering Department

Serrated Slope – GT-SE



Note:

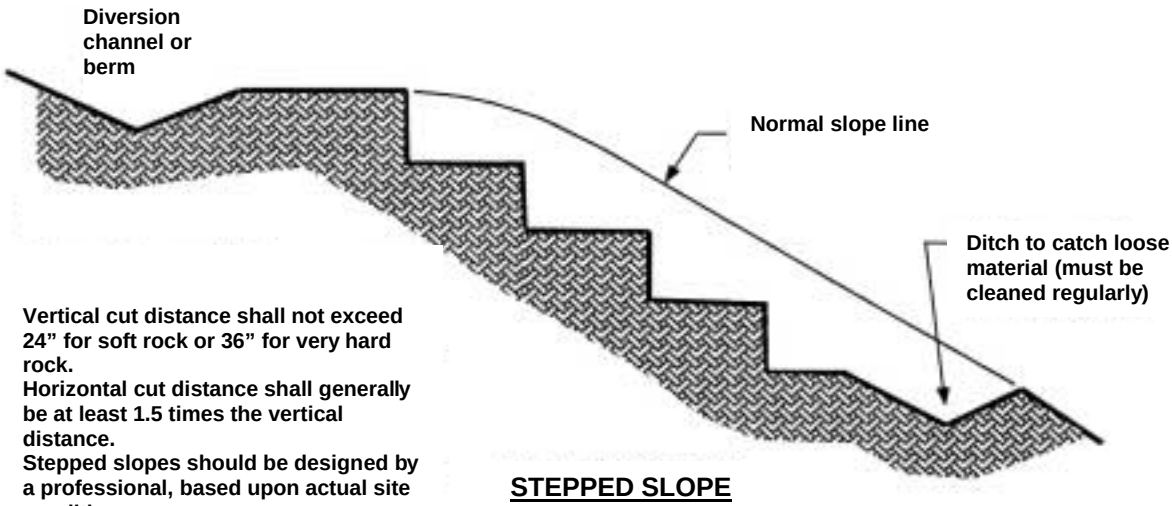
Serrated slopes will catch fertilizer, seed, mulch, and rainfall to reduce storm water runoff.

NOT TO SCALE

Figure 2

Source: Knoxville Engineering Department

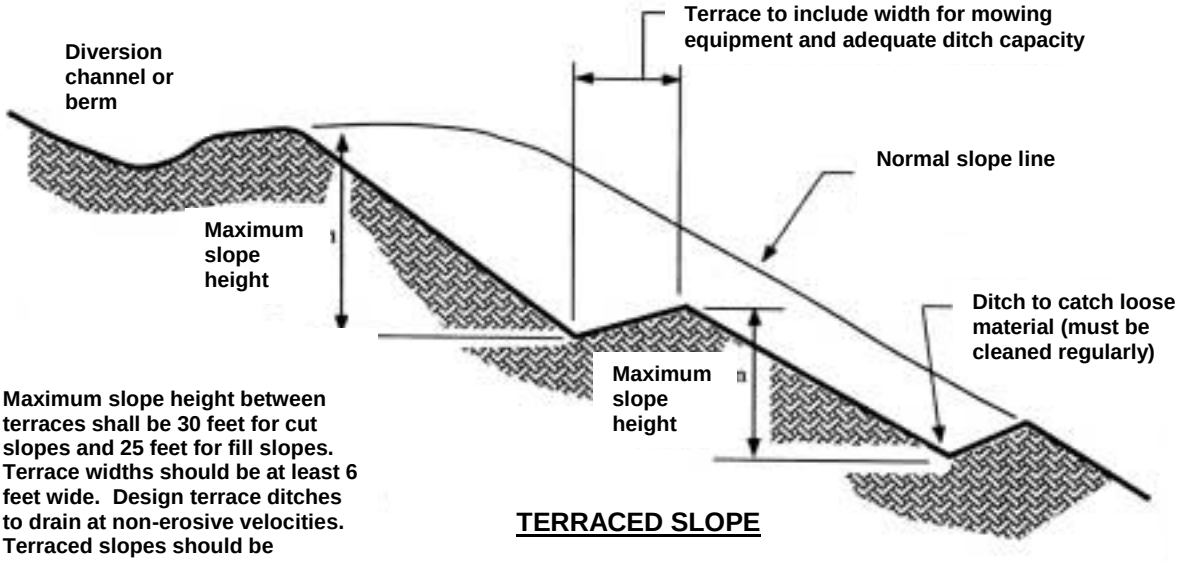
Stepped Slope – GT-ST and Terraced Slope – GT-TE



Notes:

1. Vertical cut distance shall not exceed 24" for soft rock or 36" for very hard rock.
2. Horizontal cut distance shall generally be at least 1.5 times the vertical distance.
3. Stepped slopes should be designed by a professional, based upon actual site conditions.

STEPPED SLOPE



Notes:

1. Maximum slope height between terraces shall be 30 feet for cut slopes and 25 feet for fill slopes.
2. Terrace widths should be at least 6 feet wide. Design terrace ditches to drain at non-erosive velocities.
3. Terraced slopes should be designed by a professional, based upon actual site conditions.

TERRACED SLOPE

NOT TO SCALE

Figure 3

Source: Knoxville Engineering Department

Riprap – RR

DEFINITION

A permanent, erosion-resistant ground cover of large, loose, angular stone with a geotextile or granular underlining.

PURPOSE

Riprap is used to protect culvert inlets and outlets, stabilize stream banks, stabilize drainage channels, and protect slopes and other areas subject to erosion by storm water, where vegetative or geotextile measures are not adequate or appropriate. This practice significantly reduces erosion and sediment movement.

CONDITIONS

Riprap may be used in many different locations and many different ways:

- Along a stream or within drainage channels, as a stable lining resistant to erosion.
- On lakefronts and riverfronts, or other areas subject to wave action.
- Around culvert outlets and inlets to prevent scour and undercutting.
- In channels where infiltration is desirable, but velocities are too excessive for vegetative or geotextile lining.
- On slopes and areas where conditions may not allow vegetation to grow.

Riprap protection of banks and channels of streams, rivers, and lakes requires authorization from the Tennessee Division of Water Pollution Control and United States Army Corps of Engineers.
For more information, see Appendix C and:
http://www.state.tn.us/environment/permits/arap.htm

DESIGN CRITERIA

Riprap applications for channel or slope stabilization should be designed by a professional familiar with the design of storm water conveyance structures.

Stone riprap can either be placed as machine-graded riprap (layers that can be placed by machine and then compacted) or as rubble (large pieces of rock that are placed by hand). Graded riprap is often used for channel linings because it is flexible and

can be compacted to a dense structure without manual sorting or placement.

Rubble-stone riprap can be used for an attractive landscaped appearance but lacks flexibility to adapt to settlement, washing out of material, burrowing animals, etc. Hand placed riprap is typically two-dimensional. Each piece is “keyed” into each other and the displacement of one piece may lead to the failure of surrounding pieces. Machine placed riprap layers are typically thicker, providing more structural integrity.

Riprap should be used only when other methods of protection or stabilization are not appropriate. Erosion control matting, geotextiles, and flexible mattresses are examples of geosynthetics that provide an alternative to channels lined with riprap or concrete. Some alternatives to riprap for slopes include surface roughening, vegetation, terracing, and mulching as found elsewhere in this manual.

As a rough guideline, riprap can be specified for a channel design flow velocity that is over 5 feet per second (approximate upper limit of most vegetative channel linings). The upper limit for design flow velocity of a riprap channel lining depends primarily on the size of riprap specified and methods used for securing riprap material in place. Sound engineering practice should be used when considering flow velocity in the design of channels. Graded machined riprap is usually less expensive to install than hand-placed riprap and tends to be more flexible in case of settlement or movement.

CONSTRUCTION SPECIFICATIONS

Quality of Stone: Riprap should generally consist of machined shot rock that is angular and clean. Do not use rounded stones or cobbles for riprap (although cobble stones may be used in grouted channels for architectural appearances). Riprap should not contain sand, dust, organic material, excessive cracks, mineral lenses and intrusions, or other impurities.
Riprap is usually solid durable limestone rock, which is generally resistant to erosion and to normal stream chemistry. Riprap material that is of questionable origin should be given a sodium sulfate soundness test to determine its durability. Riprap material should have a specific gravity of at least 2.5.

Gradation: Different classes of machined riprap are shown in Table 1 taken from the TDOT Standard Specifications for Road and Bridge Construction. Gradations are commonly specified in terms of a specified percentage by weight being smaller than a diameter. For example, TDOT calls for Class B riprap to have a D_{20} of at least 6 inches. This means that for Class B riprap, 20% of the stones, by weight, would be 6 inches in diameter or larger. D_0 would be the smallest allowable size and D_{100} would be the largest allowable size for any specified gradation.

Other types of riprap materials are shown in Table 2. Rubble-stone riprap can be very attractive as well as functional, but requires a great deal of hand labor and time. Manufactured concrete products such as interlocking blocks, articulated blocks, and revetment mattresses can resist very high flow velocities and are usually designed to be flexible for handling settlement and subgrade irregularities. Sacked riprap (essentially a concrete lining) is also labor-intensive and expensive to install. Concrete linings are discouraged because they do not allow for wildlife habitats and may contribute to downstream drainage problems such as high storm water velocities.

For smaller aggregates (less than 2 inches across), gradation is normally determined by mechanically shaking several pounds of material through a set of progressively smaller sieves. Then it can be stated that a certain percentage (by weight) is finer than a particular sieve with a defined opening size, which is then equated with an average diameter. However, riprap material cannot be mechanically shaken through sieves and thus it is more difficult to quantify the average size. The different classes of aggregates are shown in Table 3 and are taken directly from the TDOT Standard Specifications for Road and Bridge Construction.

Machined Riprap Specifications

Class A-1	Class A-3	Class B	Class C
2" to 15" diameter (0.5 to 169 lbs) Dumped	2" to 6" diameter (0.5 to 11 lbs) Dumped	3" to 27" diameter (1.5 to 985 lbs) Dumped	5" to 36" diameter (6 to 2335 lbs) Dumped
20% by weight shall be at least 4" size (3 lbs) Typical thickness is 18" with surface tolerance of 3"	20% by weight shall be at least 4" size (3 lbs) Typical thickness is 12" with surface tolerance of 2"	20% by weight shall be at least 6" size (11 lbs) Typical thickness is 30" with a surface tolerance of 4"	20% by weight shall beat least 9" size (36 lbs) Typical thickness is 42" with a surface tolerance of 6"

Table 1

Non-Machined Riprap Specifications

Rubble-stone (plain)	Rubble-stone (grouted)	Concrete blocks	Sacked riprap (sand-cement)
Min 2" diameter (min 0.5 lbs) Placed by hand	Min 2" diameter (min 0.5 lbs) Placed by hand	Rectangular shapes Placed by hand	Approx 1 cubic ft (approx. 100 lbs) Placed by hand
80% by weight shall be at least 10" in any dimension (prefer rectangular) Remainder is 2" to 4" size for chinking	80% by weight shall be at least 10" in any dimension (prefer rectangular) Remainder is 2" to 4" size for chinking	Class A concrete with 3000 psi 28-day strength Various thickness from 4" upwards	Sacks should be cotton or jute cloth that retains sand and dry cement mix Mix 1 bag cement (94 lbs) with 5 cubic feet of sand
Typical thickness is 12" with surface tolerance of 2"	Typical thickness is 12" with surface tolerance of 2"	Design and install per manufacturer's recommendations	Typical thickness is 10" with a surface tolerance of 2"

Table 2

Source: TDOT Standard Specifications for Road and Bridge Construction

Machined Aggregate Specifications

Size number	1	2	24	3	357
Nominal size square openings	90 to 37.5 mm (3 1/2" to 1 1/2")	63 to 37.5 mm (2 1/2" to 1 1/2")	63 to 19 mm (3 1/2" to 3/4")	50 to 25 mm (2" to 1")	50 to 4.75 mm (2" to No. 4)
Size number	4	467	5	56	57
Nominal size square openings	37.5 to 19 mm (1 1/2" to 3/4")	37.5 to 4.75 mm (1 1/2" to No. 4)	25 to 12.5 mm (1" to 1/2")	25 to 9.5 mm (1" to 3/8")	25 to 4.75 mm (1" to No. 4)
Size number	6	67	68	7	78
Nominal size square openings	19 to 9.5 mm (3/4" to 3/8")	19 to 4.75 mm (3/4" to No. 4)	19 to 2.36 mm (3/4" to No. 8)	12.5 to 2.36 mm (1/2" to No. 4)	9.5 to 2.36 mm (1/2" to No. 8)
Size number	8	89	9	10	
Nominal size square openings	9.5 to 1.18 mm (3/8" to No. 8)	4.75 to 1.18 mm (3/8" to No. 16)	4.75 to 1.18 mm (No. 4 to No. 16)	4.75 mm (No.4 to No.100)	

Table 3

Source: TDOT Standard Specifications for Road and Bridge Construction

Geotextile: A geotextile should be placed beneath riprap to maintain separation from underlying soils. It is also necessary within stream channels to avoid migration of fine-grained soils from the subgrade into the riprap. In particular, use geotextile at the inlet and outlet of culverts, where turbulence is normally expected. Refer to the specification **Geotextiles - GE**

Granular Filter: A layer of aggregate or sand can also be placed beneath riprap to maintain separation from underlying soils, either in addition to geotextile or in place of geotextile. The layer of aggregate or sand acts as a smooth bed to allow easier placement of riprap, and it can be used as a granular filter. The granular filter permits water to drain out or seep through it without allowing the adjacent soil or aggregate to migrate through. In general, a geotextile will perform this function more reliably and with lower installation costs.

A granular filter (Figure 1) should have the following properties with relation to the base soil underneath:

1. D_{15} of filter must not be more than five times D_{85} of base.
2. D_{15} of filter must not be less than five times D_{15} of base.
3. D_{15} of filter must not be more than forty times D_{15} of base.
4. D_{50} of filter must not be more than forty times D_{50} of base.

The relationship of the riprap to an underlying granular filter layer should follow the same filter criteria as between the granular filter and the base soil. In other words, the term "filter" refers to the larger-grained material and the term "base" refers to the smaller-grained material. Due to the many problems associated with carefully placing 6" layers of graded aggregate or sand, the use of geotextile is greatly preferred.

There are many methods available for choosing riprap size, particularly for riprap channel linings. There are methods that make use of only one equation, which can only account for 3 or 4 factors using assumptions and various rule-of-thumb guidelines. There are many methods which try to account for forces and momentum more exactly, with several equations and nomographs being used for factors such as

rock specific gravity, stream tractive force, drag force, etc.

Riprap design should be performed by a professional using drainage computations, which consider field conditions, quality of materials, and construction placement. If possible, it is recommended that a few design methods should be used to verify reasonable results.

Riprap for River Shorelines: Riprap for use on river or lake shorelines should be designed to conform to standards by Tennessee Valley Authority (TVA) or the US Army Corps of Engineers.

Riprap for Slopes: Riprap applications for slope stabilization, where wave action or flowing water is not a concern, should be sized for stability. The natural angle of repose is defined as the angle at which material can be placed without sliding downhill due to gravity. Angular riprap or crushed rock typically has an angle of repose in the neighborhood of 40°, so that a slope of 1.5 to 1 is reasonable for most slopes when not subject to flowing water. Rounded stones such as river gravel have a lower angle of repose. See Figure 2 for angle of repose based on average stone size, D_{50}.

The angle of repose does not take into account any external forces (such as vehicles, people, storms, groundwater, earthquakes, or other ground vibrations). Failure will often occur at the interface between two layers, such as on a geotextile filter fabric that is not sufficiently anchored or where hydraulic forces exceed the sheer strength of the base and/or filter layer. A professional engineer should perform slope stability analyses for all sloped areas that are critical or potentially hazardous. See Figure 3 for base of riprap slope protection.

Riprap at Outlets: Design criteria for sizing stone and determining the dimensions and installation of riprap pads used at the outlet of drainage structures are contained in the specification **Storm Drain Outlet Protection - OP**

Typical Granular Filter

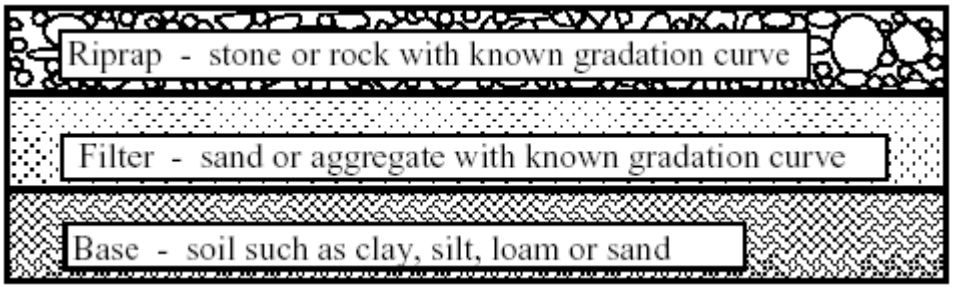


Figure 1

Source: Knoxville Engineering Department

Angle of Repose for Riprap Based on Average Stone Size

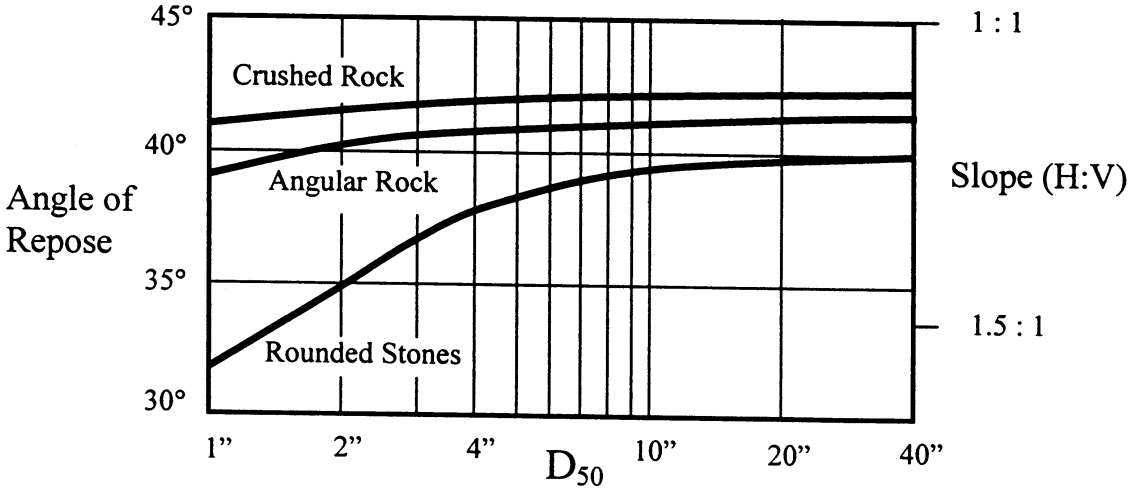


Figure 2

Source: Knoxville Engineering Department

Base of Riprap Slope Protection

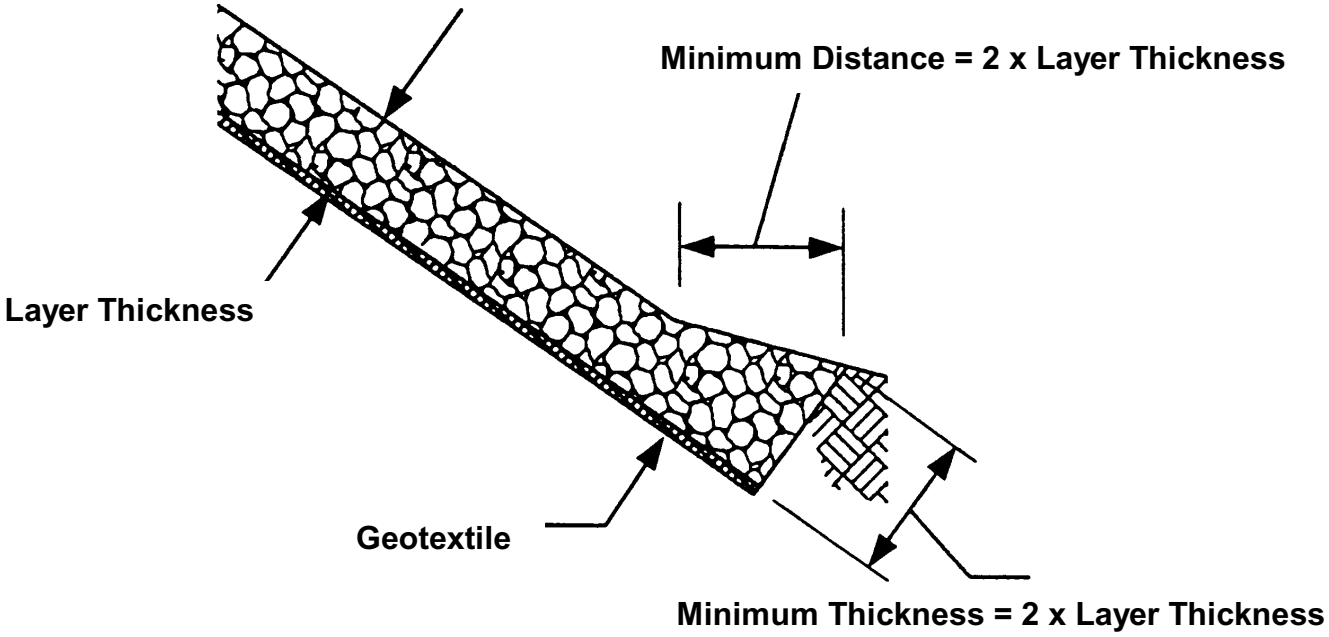


Figure 3

Source: Knoxville Engineering Department

Riprap for Channel Stabilization (HEC-15 design method): The following design method for sizing riprap is taken from Hydraulic Engineering Circular 15, Design of Stable Channels With Flexible Linings, by the Federal Highway Administration (1975). The mean riprap size is computed for tangent sections and curved sections of trapezoidal channels. Drainage computations are used to determine channel shape, channel slope, surface width, and design flow depth by using the Manning's n roughness coefficient equal to:

$$n = 0.0395 \times (D_{50})^{1/6}$$

1. Compute the channel bottom D_{50} riprap size based on the following equation where D_{50} and the maximum design flow depth have the same units (inches or feet) and channel slope is expressed in feet per foot (H:V):

Bottom D_{50} = 12.5 X depth X Channel Slope

2. If the channel side slopes are steeper than 3:1, then the side slope D_{50} riprap size will be adjusted using the following equation where K_1 is obtained from Figure 4 and K_2 is obtained from an equation:

$$\text{Bottom } D_{50} \times K_1 / K_2 = \text{side slope } D_{50}$$

$$K_2 = (1 - \sin^2(\varphi)/\sin^2(\theta))^{0.5}$$

The side slope D_{50} is the riprap size necessary for the side slopes of tangent sections where side slope is steeper than 3:1 (18.5°), φ is the angle of the side slope in degrees, and θ is the angle of repose in degrees

3. For curved sections of channel, compute the ratio $\triangle_c$ that is the internal angle that differentiates between a short bend and a long bend. The value R_O is the radius of the channel centerline bend, and the value R_D is the average radius of the channel outside bend as computed by the following equation using T (top width of the channel) and B (bottom width of trapezoidal channel):

$$R_D = R_O + 0.25\,(T+B)$$
$$\triangle_C = \cos^{-1}(R_O / R_D).$$

Distribution of Boundary Shear For Trapezoidal Channels

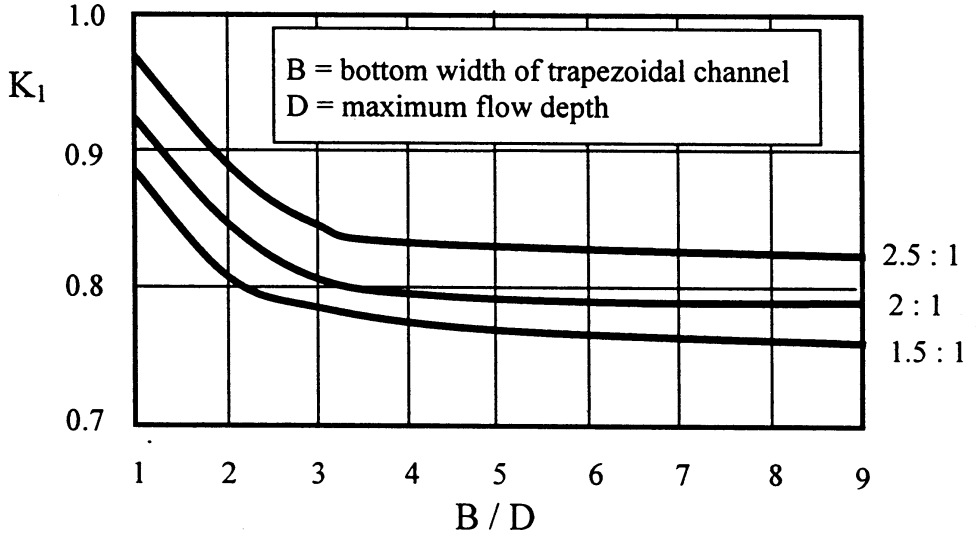


Figure 4

Source: Knoxville Engineering Department

4. Long bend (bend angle $\triangle$ is more than $\triangle_c$): The tangent D_{50} riprap size (from step 1 if side slopes are not steeper than 3:1, or Step 2 if side slopes are steeper than 3:1) will be adjusted using the coefficient K_3 that is obtained from an equation with V being the average velocity (using Manning's flow equation):

$$\text{Curved } D_{50} = K_3 \times \text{tangent } D_{50}$$
$$K_3 = 4 \times V^2 / R_D$$

5. Short bend (bend angle $\triangle$ is less than $\triangle_c$): The tangent D_{50} riprap size (from Step I if side slopes are not steeper than 3:1, or Step 2 if side slopes are steeper than 3:1) will be adjusted using the coefficient K_4 that is obtained from an equation using K_3 as computed above:

$$\text{Curved } D_{50} = K_4 \times \text{tangent } D_{50}$$
$$K_4 = I + (K_3 - 1)\ (\triangle / \triangle_c)$$

The selection of a mean riprap size D_{50} will basically specify a gradation curve. The maximum riprap size should be 1.5 times the D_{50} riprap size. The riprap layer thickness should be approximately 1.7 to 2.0 times the D_{50} riprap size, in accordance with the TDOT riprap classifications in Table 1.

The minimum freeboard for a riprap channel should generally be at least 6 inches, depending upon the type of computations and potential for damage. Always provide additional freeboard at culvert inlets and outlets, areas of potential turbulence, changes in slope or direction, etc. Superelevation of the flow surface may occur on the outside bank of a channel bend. The amount of superelevation, $\triangle_Y$, can be estimated using the following equation where g is equal to 32.2 feet per second per second and the other terms have already been defined:

$$\triangle_Y = (V^2\ T) / (g\ R_O)$$

INSTALLATION

Installation of riprap should be accomplished within a short time frame (1 or 2 days) to minimize potential for damage from storm water runoff.

General Subgrade Preparation

1. The area should be cleared of trees, brush, vegetation, unsuitable soils, and graded. Access for equipment that will be necessary for earthwork and handling of large rocks should be provided.

2. The subgrade should be prepared to the specified depth necessary for installation of riprap. Compact subgrade firmly to prevent slumping or undercutting. Excavate anchor trenches as necessary for installation of geotextile filter fabric.

3. Install geotextile to maintain separation of rock material from the underlying soil. Geotextile should be placed so that it is not stretched tight, and it conforms closely to the subgrade. Secure filter fabric by using anchor trenches, stakes, staples, sewing or any other means necessary according to manufacturer's recommendations.

4. Place a layer of aggregate or sand (if specified by design for use as a bedding layer or as a granular filter) so that the layer is smoothly graded and well-compacted. A typical layer of aggregate or sand is 4 inches thick when used only as a bedding material. A granular filter of aggregate or sand is usually 6 inches thick.

Rubble-Stone Riprap: Rubble-stone riprap is usually placed as one layer (12" deep), two layers (2 @ 6" deep), or an interlocking mixture of one and two layers. Rubble-stone riprap should be hand placed so that the stones are close together, are staggered at all joints as far as possible, and are placed so as to reduce the voids to a minimum. The larger rocks should be thoroughly chinked or anchored in place by using I" to 3" stones or aggregate by placing over the surface and compacting in any manner practical.

When rubble-stone riprap is constructed in layers, the layers should be thoroughly tied together with large stones protruding from one layer into the other. The average depth is usually determined by frequent measurements throughout installation. Any change in thickness should be accomplished gradually.

Installation of grouted rubble-stone riprap includes hand placement of large rocks, chinking with smaller rocks and aggregate, filling with grout, surface finishing, and curing.

Machined Riprap: Machined riprap material is generally dumped and placed by the use of appropriate power equipment. Placement should avoid segregating material by minimizing drop heights and by dumping material in large quantities. Riprap is then graded and compacted (using hand or mechanical tamping) to produce a surface uniform in appearance. Handwork may be required to correct irregularities. Place riprap carefully to avoid puncturing or displacing geotextile fabric.

Typical layer thickness and allowable surface tolerances are shown in Table 1. Class A-2 machined riprap is the same as Class A-1 riprap except that the depth may be decreased to 12 or 15 inches when placed by hand in accordance with rubble-stone installation procedure. Other classes of hand-placed riprap are listed in Table 2.

INSPECTION

The final step in riprap installation is to verify proper construction methods are used and that the specified gradation was installed. Visually inspect machined riprap to ensure that at least 20 percent of surface area consists of the D_{20} stone sizes specified within the materials section. Check that 50 percent of the surface area consists of stones no smaller than one-half of the maximum size specified.

Table 4 provides a rough guide to estimating the weight and equivalent diameter size of riprap material. A unit weight of 165 pounds per cubic foot is the same as a specific gravity of 2.65 with respect to water. Rectangular dimensions in a ratio of 3:2:I are also listed as a frame of reference.

MAINTAINANCE

Riprap slopes and channel linings should be checked after major storm events for slumping, displacement, scour or undermining of riprap. Replace or reposition riprap as necessary, making a note of any damage for future reference.

Weight and Size Equivalents of Riprap
(assuming a unit weight of 165 pounds per cubic foot)

Weight	Equivalent diameter (spherical)	Rectangular dimensions (assuming 3:2:1 ratio)
1 pound	2.7 inches	3.6" x 2.4" x 1.2"
2 pounds	3.4 inches	4.6" x 3.0" x 1.5"
5 pounds	4.6 inches	6.2" x 4.1" x 2.1"
10 pounds	5.8 inches	7.8" x 5.2" x 2.6"
20 pounds	7.4 inches	9.8" x 6.5" x 3.3"
30 pounds	8.4 inches	11.2" x 7.5" x 3.7"
40 pounds	9.3 inches	12.4" x 8.2" x 4.1"
50 pounds	10.0 inches	13.3" x 8.9" x 4.4"
75 pounds	11.4 inches	15.2" x 10.1" x 5.1"
100 pounds	12.6 inches	16.8" x 11.2" x 5.6"
150 pounds	14.4 inches	19.2" x 12.8" x 6.4"
200 pounds	15.9 inches	21.2" x 14.1" x 7.1"
250 pounds	17.1 inches	22.8" x 15.2" x 7.6"
300 pounds	18.2 inches	24.2" x 16.1" x 8.1"
500 pounds	21.5 inches	28.7" x 19.1" x 9.6"

Table 4

Source: Knoxville Engineering Department

Sediment Basin – SB

DEFINITION

A temporary basin consists of an embankment constructed across a drainage way, or of an excavation that creates a basin, or by a combination of both. A sediment basin typically consists of an impoundment, a dam, a riser pipe outlet, and an emergency spillway. The size of the structure will depend upon the location, size of the drainage area, soil type, land cover/use, rainfall amount, and any unique site conditions favorable to producing high runoff volume, velocity, or sediment.

PURPOSE

A sediment basin is used to retain runoff waters and trap sediment from disturbed areas to protect properties and waters below the installation from damage by excessive sedimentation and debris. The water is temporarily stored and the bulk of the sediment carried by the water falls out of suspension and is retained in the basin, while the water is slowly released over a period of time.

CONDITIONS

This practice is required by permit at locations within construction sites where the total disturbed drainage area at any given time is at least ten (10) acres. Sediment basins may also be used for drainages smaller than ten acres, however they are not mandatory. There must be sufficient space and appropriate topography for the construction of a temporary impoundment. Specifications described in this standard apply to temporary installations that are to be removed within 18 to 30 months and where the total drainage area does not exceed 50 acres. By virtue of their potential to impound and release large volumes of water, the design of sediment basins is required to be completed by professionals trained in the design of impoundment structures, and in accordance with good engineering practices.

DESIGN CRITERIA

Compliance with Laws and Regulations: Sediment basin design and construction shall comply with all applicable state and local laws, ordinances, permit requirements, rules, and regulations. Basins shall be constructed according to the approved SWPPP unless modified by the engineering design

professional. Additional regulations apply if vertical height of dam from downstream toe to crest of embankment exceeds 20 feet. Refer to “Embankment Cross-Section” later in this section.

Location: To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area. **Runoff from undisturbed areas should be diverted away from or around the disturbed areas and the basin.** The best locations are generally low areas and natural swales or drainageways below disturbed areas. It is recommended that the basin be located at least 50 feet outside the designated floodway or 25 feet from the top of bank of small streams or as otherwise required by local ordinance, whichever is greater. Basin efficiency can be improved by the use of diversions (refer to **Diversion - DI**) and by introducing chemical coagulants and coagulant aids (refer to **Polyacrylamide - PAM**). **Under no circumstance shall a basin be located in a stream or in any waters of the state.** Instead, the basin should be located to trap sediment-laden runoff before it enters a stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service to public utilities or roads.

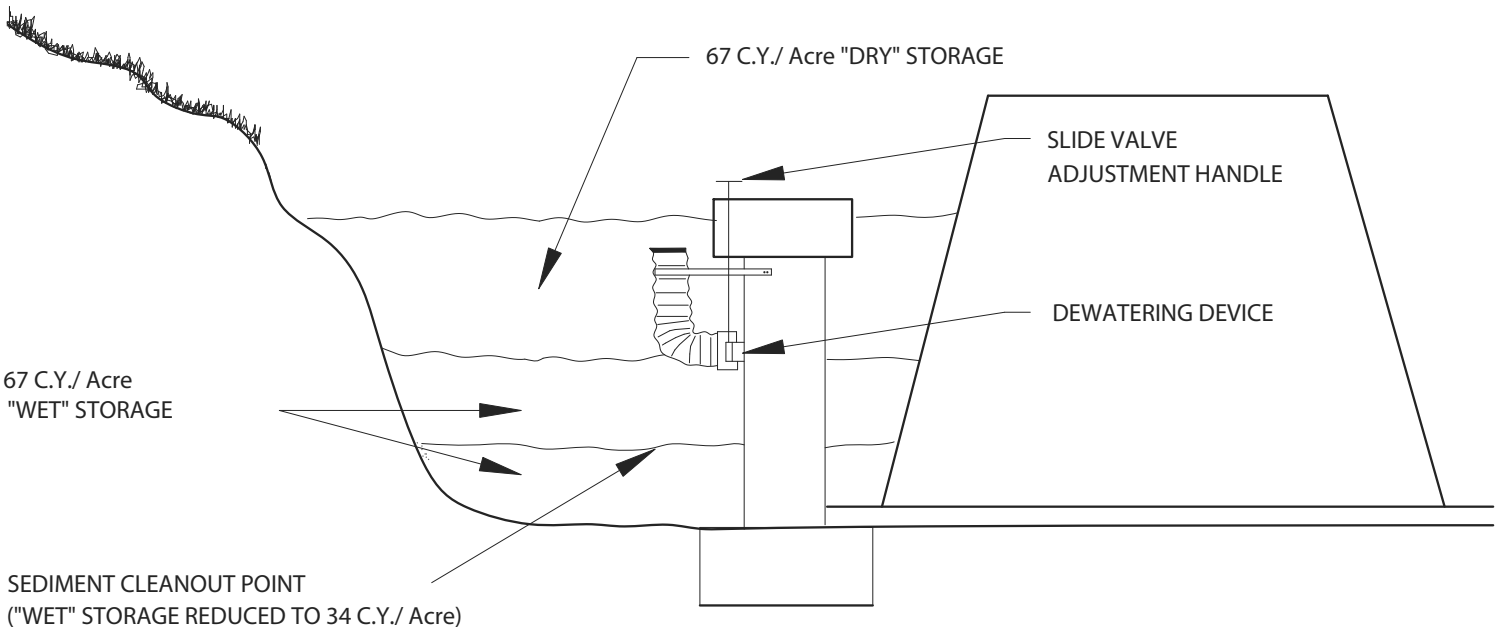
Maximum Drainage Area: The maximum allowable total drainage area (disturbed and undisturbed) feeding into a temporary sediment basin is 50 acres. It is recommended that when the drainage area to any one temporary basin exceeds 25 acres, an alternative design procedure that more accurately defines the specific hydrology, sediment loading, hydraulics of the site, and the control measures in use be utilized to perform design calculations. The design criteria in this manual do not generate hydrographs, estimate sediment erosion and delivery rates, provide hydraulic routing, or predict sediment capture efficiency. More rigorous and accurate design considerations, which are more site-specific than those in this manual, are acceptable and encouraged with any size basin.

Effectiveness and Volume: Sediment basins constructed according to these standards are, at best, 50 to 70 percent effective in trapping sediment that flows into them during large storm events, or during periods of minimal vegetative cover at a construction site. The performance of any sediment pond depends on several factors: (1) size and shape of the basin, (2) soil properties, (3) runoff volume and flow, (4) water chemistry, (5) permanent vs. dry pond design, and other factors. It should be understood that a sediment basin is a temporary, but defensive measure, and should be made functional before any upslope land disturbance takes place in order to keep sediment from escaping the site and washing into storm sewers, and filling streams and waterways. Basins should always be used in conjunction with primary erosion control and stabilizing practices (as found throughout this manual) such as temporary seeding, mulching, diversion dikes, etc. designed to prevent or reduce the possibility of soil from being eroded in the first place.

In order to maximize trapping and retaining the incoming sediment, the basin should have a permanent pool, or wet storage component and a dry storage component that dewaters over time. The volume of the permanent pool (needed to protect against re-suspension of sediment and to promote better settling conditions between runoff events) must be at least 67 cubic yards (1809 cubic feet) per acre of drainage area and the volume of dry storage above the permanent pool (needed to prevent "short-circuiting" of the basin during larger storm events) must be at least an additional 67 cubic yards (1809 cubic feet) per acre of drainage area. The total storage volume of the basin at the principal (service) spillway riser crest would, therefore, be a minimum of 134 cubic yards (3,618 cubic feet) per acre of drainage area (see Figure 1).

When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and runoff from undisturbed or permanently stabilized areas where such flows are diverted around both the disturbed area and the sediment basin. Otherwise, the calculations for determining basin size should include the entire drainage area, disturbed and undisturbed.

Minimum Storage Volume and Sediment Cleanout Point



Source: VA DSWC

Figure 1

The volume of the permanent pool shall be measured from the lowest point of the basin to the bottom of the dewatering device. This device should be installed at the elevation corresponding to one half the total storage volume. The volume of the active or drawdown zone shall be measured from the elevation of the permanent pool to the crest of the principal (service) spillway riser pipe. Sediment should be removed from the basin when the volume of the permanent pool has been reduced by one half. In no case shall the sediment cleanout level be higher than one foot below the bottom of the dewatering device for the drawdown zone. The elevation of the sediment cleanout level should be calculated and clearly marked on the plans and the riser. Since this part of the riser normally will be under water, a mark should appear above the permanent pool a measured distance above the cleanout elevation to provide a reference from which to measure the sediment depth.

The above volume requirements should be regarded to be minimum criteria and may be modified at the discretion of the engineering design professional to protect critical aquatic resources and safety/health of the public. It is noted that undisturbed areas can contribute significant amounts of runoff that can reduce the efficiency of a sediment basin. The following conditions and circumstances need to be considered in determining whether or not the basin volume would need to be increased:

- Highly erodible soils
- Steep upslope topography
- Space-limiting basin geometry (depth and/or shape)
- Degree to which off- and/or on-site runoff is diverted from contributing undisturbed areas
- Sediment cleanout schedule
- Degree to which chemical flocculent agents are added to inflowing runoff
- Extent to which other erosion and sediment control practices are used
- Critical downstream conditions

For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin is not feasible, multiple, smaller basins and/or sediment traps must be used. The total trapping capacity of these must have an equivalent storage of 134 cubic yards (3618 cubic feet) of runoff per acre.

Note: There are 27 cubic feet per cubic yard. Conversion between cubic feet and cubic yards is as follows:

number of cubic feet x 0.037 = number of cubic yards

or

number of cubic feet / 27= number of cubic yards

While attempting to attain the desired storage capacities, efforts should be made to keep embankment heights to a minimum. When site topography permits, the designer should give strong consideration to the use of excavation to obtain the required capacity and to possibly reduce the height of the embankment. This excavation can be designed in a manner which creates a wet storage forebay area or which increases the storage capacity over the entire length of the basin.

Basin Shape: It is important that the designer of a sediment basin incorporate features to maximize detention time within the basin in order to improve its trapping efficiency. Suggested methods of accomplishing this objective are:

- Recommended design effective length to width ratio is 4:1, but not less than 2:1, where length is the distance between the inlet and outlet.
- A wedge shape with the inlet located at the narrow end - ideally, the shape would be symmetrical about the pond's central axis formed by the inlet - riser - center of the dam.
- Installation of baffles or diversions.

The purpose of having a length to width ratio of at least 2:1 is to minimize the "short-circuiting" effect of the sediment-laden inflow to the riser and thereby increasing the effectiveness and efficiency of the sediment basin. Having a symmetrical basin about the central axis from the inlet to the riser tends to reduce dead or ineffective space.

The length of the flow path (L) is the distance from the point of inflow to the riser outflow point. The point of inflow is the point that the waste stream enters the active (sometimes called "normal") pool, created by the elevation of the riser crest. The pool area (A) is the area of the active pool. The effective width (We) is equal to the area (A) divided by the length (L). The length to width ratio (L:W) is found by the equation:

$$L:W = L/We = L/(A/L) = L^2/A$$

The designer is encouraged to locate all inflows at or near the point of the wedge. However, where there is more than one inflow point and where circumstances preclude this ideal arrangement, any inflow point which conveys more than 30 percent of the total peak inflow rate shall meet the above length-width ratio criteria. Ponds whose L:W ratios are less than 1, even if enhanced with baffling, are not permitted.

For ponds having L:W ratios less than 4:1, construction should consist of two wetpool cells using a separation berm, as shown in Figure 2. The first (upper) wetpool cell volume should hold between 25% to 35% of the total wetpool volume. Ponds with L:W ratios equal to or greater than 4:1 are suggested to follow this design, but may be single cell construction.

Baffles: The required basin shape should be obtained by proper site selection and by excavation to reduce dead storage and to maximize sediment removal efficiency. Where less than ideal conditions exist, a baffle may be constructed in the basin. The purpose of the baffle is to increase the effective flow length from the inflow point(s) to the riser. Baffles shall be placed mid-way between the inflow point and the riser. The baffle length shall be as required to achieve the minimum 2:1 length-width ratio at less than ideal site conditions. The effective length (Le) shall be the shortest distance the water must flow from the inflow point around the end of the baffle to the outflow point.

Then:

$$L:W = Le/We = Le^2/A$$

Three baffle examples are shown in Figure 3. Note that that for the third baffle case:

$$L = L_1 + L_2$$

The baffle material should be outdoor grade and weather resistant. The baffles should be placed in such manner to minimize interference with basin cleaning. Construction should be modular for easy maintenance and convenient replacement in event of damage from cleaning or from deterioration. The baffles should be inspected frequently for tears or breaks from weathering, high flows, and from cleaning damage. Damaged baffling should be replaced or repaired immediately.

The dimensions necessary to obtain the required basin volume and surface area shall be clearly shown on the plans to facilitate plan review and inspection.

Multiple Use: Sediment basins may remain in place after final site stabilization is completed to serve as permanent storm water management structures. Because the most practical location for a sediment basin is often the most practical location for a storm water management basin, it is often desirable to utilize these structures for permanent storm water management purposes. It should be noted, however, that in most cases, a typical structure's outlet control system would vary during construction and post-construction periods. Care must be taken to avoid constructing an outlet control system, which will achieve the desired post-construction quantity or quality control but will not provide the necessary facility for the containment and settling of sediment-laden construction runoff. Notably, the design for such permanent flow control ponds is beyond the scope of these standards and specifications.

Access Requirements: Maintenance access road(s) shall be provided to the sediment pond facility for convenient inspection and for access by maintenance and emergency vehicles. An access track around the pond is recommended for convenient removal of sediment from the

Sediment Basin Showing 2 Cells

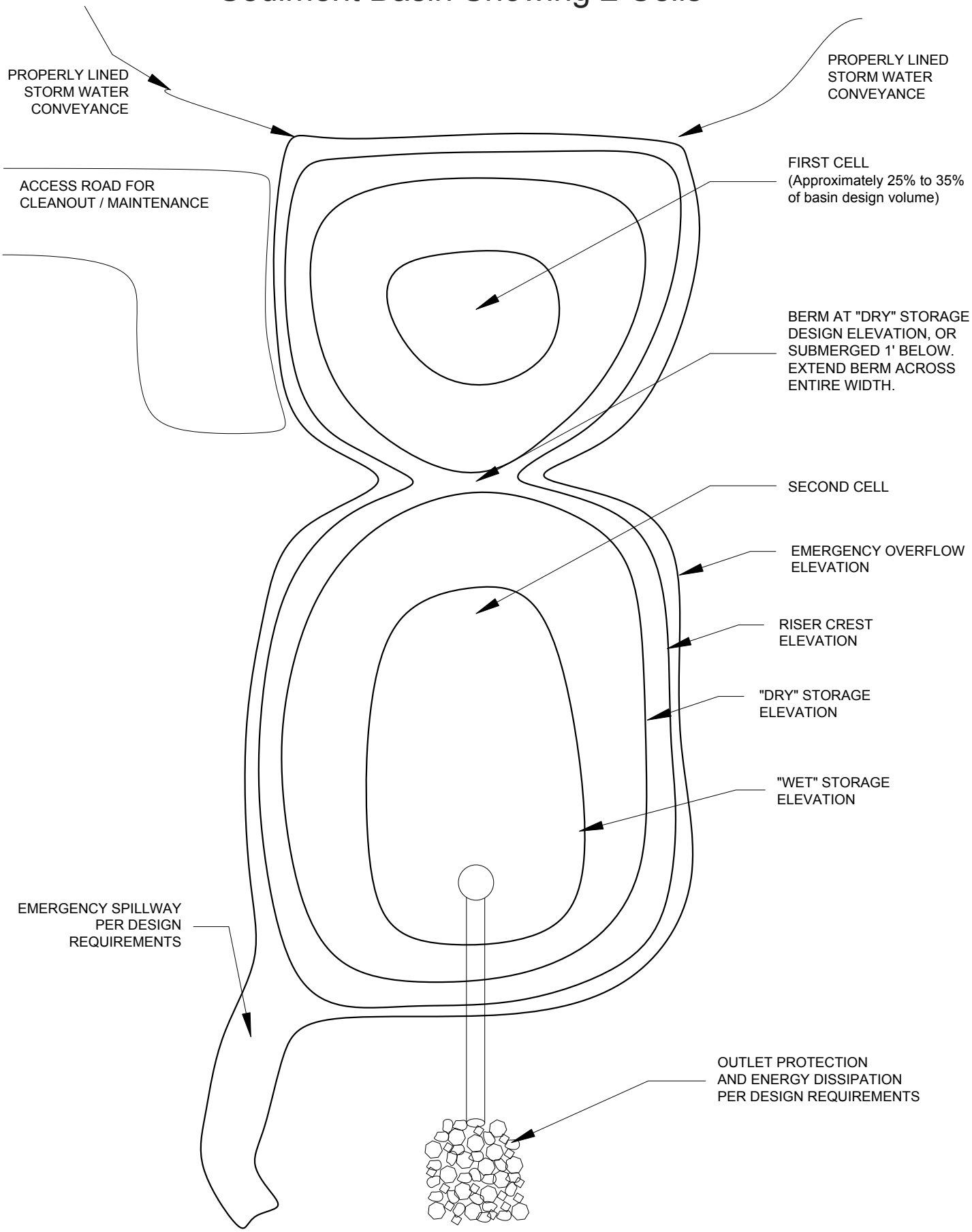
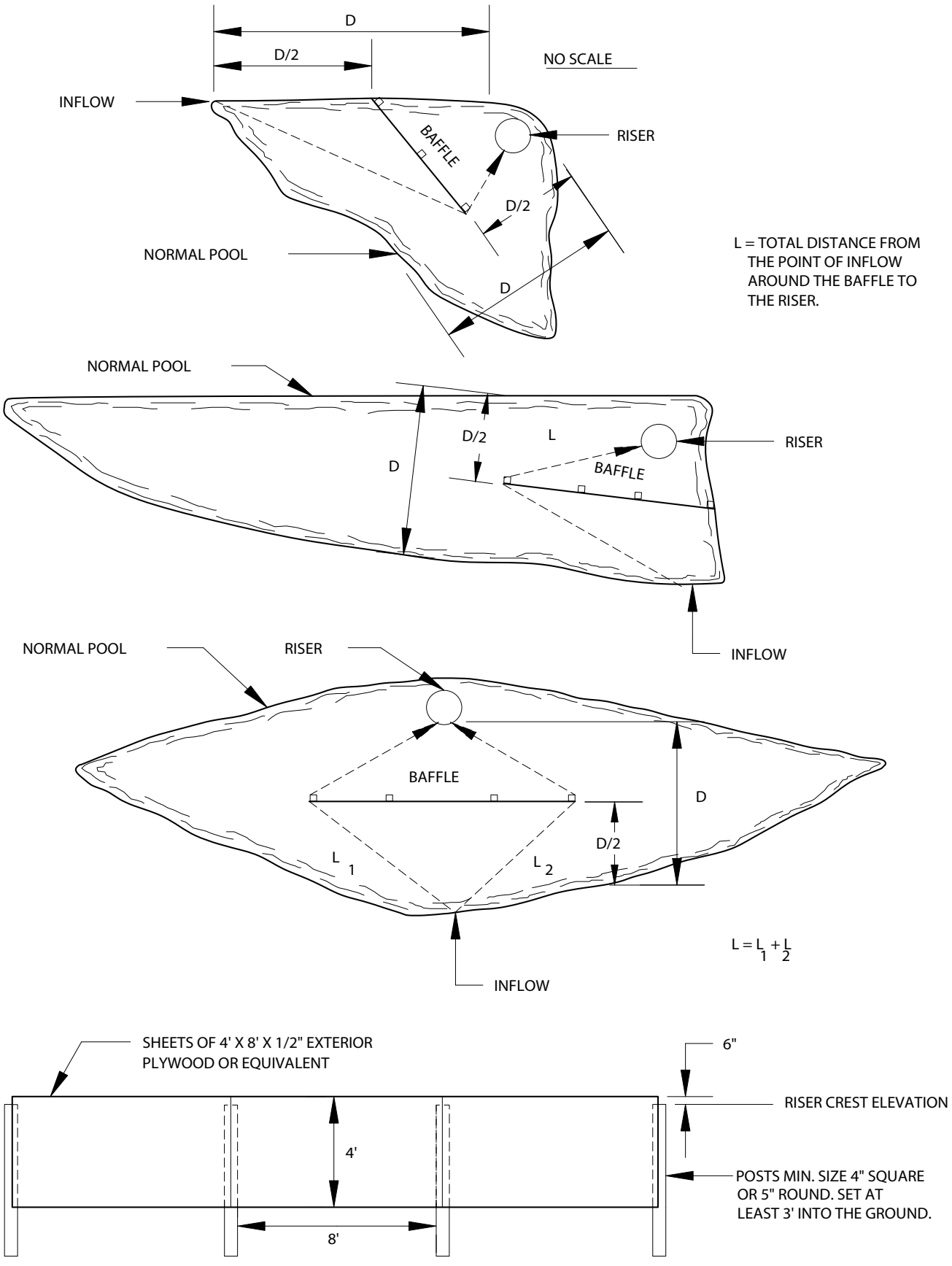


Figure 2

Baffle Locations in Sediment Basins



Source: US NRCS

Figure 3

pond or pond cells with appropriate equipment. An access ramp into the pond itself is discouraged because of the potential for creating equipment-generated rutting and stabilization problems.

Embankment Cross-Section: The height of the embankment dam is measured from its crest down to the lowest point of natural grade (at the downstream toe of the embankment). For dam heights less than 10-feet, the embankment must have a minimum top width of 6 feet, and the side slopes must be 2:1 or flatter to permit access and maintenance. In the case of an embankment 10 to 14 feet in height, the minimum top width shall be 8 feet and the side slopes 2.5:1 or flatter. For 15 to 19 high embankments, the top width must be 10 feet with maximum side slopes of 2.5:1. Embankments must comply with the Tennessee Safe Dams Act of 1973, as amended if either of the following two conditions exist: (a) the embankment is twenty feet or more in height, or (b) the impoundment will have a capacity, at maximum water storage elevation, of thirty (30) acre-feet (48,400 cy/yds) or more. Any such dam which is equal to or less than six feet in height, regardless of storage capacity, or which has a maximum storage capacity not in excess of fifteen (15) acre-feet (24,200 cy/yds), regardless of height, would not be regulated under the Safe Dams Act. If ponds and dams meet or exceed the criteria mentioned above, permit certificates of construction and operation are required by the Tennessee Dam Safety Office in the Division of Water Supply of the Tennessee Department of Environment and Conservation. Further information on safe dam design standards, regulations, and permit applications is available at the website:
http://www.state.tn.us/environment/permits/safedam.htm.

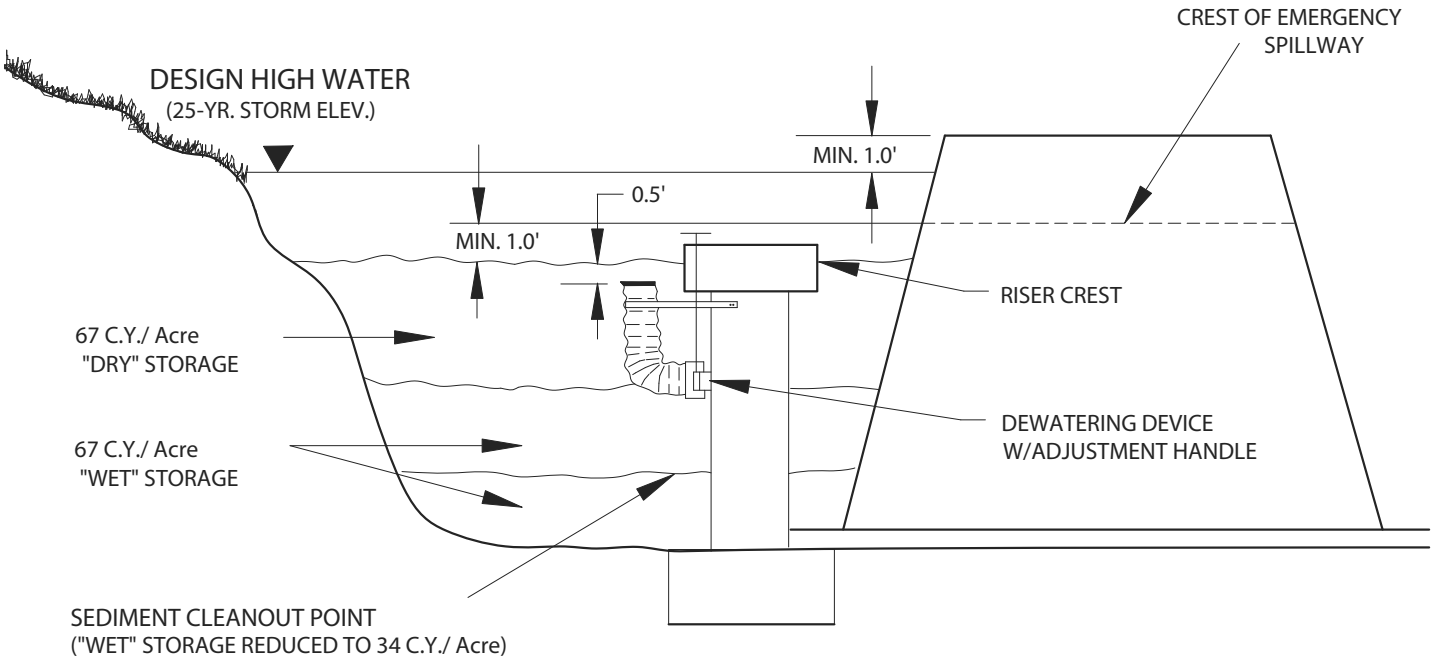
The site foundation for the embankment should be prepared by removing all vegetation, debris, topsoil, and large rocks down to competent material. Embankments should be keyed into the foundation soil with at least a 2-ft x 2-ft. trench. The embankment height should include a 10 percent settlement allowance across the longitudinal axis of the dam. A minimum 1-foot freeboard is required between the maximum design flow water level and top of the dam. (See Figure 4)

Spillways Design: The outlets for the basin should consist of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 25-year 24-hour storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 25-year 24-hour storm. However, an attempt to provide a separate emergency spillway should always be made (refer to "Emergency Spillway" later on in this section) because the principal spillway riser is vulnerable to clogging by debris during high runoff events. Runoff computations shall be based upon the soil cover conditions that are expected to prevail during the life of the basin. In determining total outflow capacity, the flow through the dewatering device cannot be credited when calculating the 25-year 24-hour storm elevation because of its potential to become clogged. However, principal spillway capacity can be credited with the emergency spillway capacity when determining the peak flow and maximum pond elevation from the 25-year 24-hour storm. Incoming flood flow and storage calculations must begin at the elevation of the principal spillway riser crest.

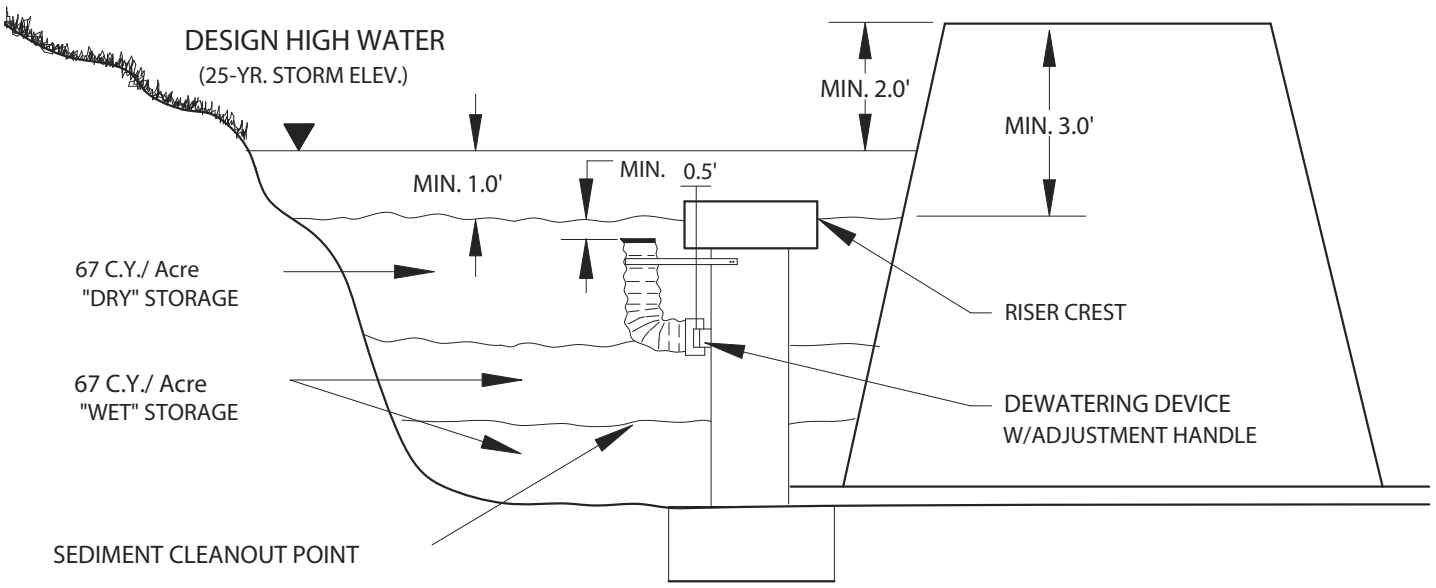
Temporary sediment pond storage and outflow controls are not normally designed to reduce incoming peak flows. Consequently, the spillways designed by the procedures contained in the standard and specification will not necessarily result in any reduction in the peak rate of runoff. If a reduction in peak runoff is desired, the appropriate hydrographs/storm routings should be generated to choose the basin and outlet sizes.

Dewatering: Provisions shall be made to dewater the basin down to the permanent (wet) pool elevation. It is well known that particle characteristics, flow-through velocity, surface loading rate, turbulence levels, sediment concentration and other lesser factors can have a significant effect on the sediment trapping efficiency in a pond. Studies have generally shown that the slower the flow-through velocity and, hence, the

Sediment Basin Schematic Elevations



Design Elevations With Emergency Spillway



Design Elevations Without Emergency Spillway

(Riser Passes 25-YR Event)

Source: VA DSWC

Figure 4

longer the detention storage time in a pond, the greater the sediment removal efficiency. TDEC recommends a 72-hour drawdown time.

Dewatering of the dry storage should be done in a manner that removes the "cleaner" water without removing the potentially sediment-laden water found in the wet storage area or any appreciable quantities of floating debris. An economical and efficient device for performing the drawdown is a "skimmer" type section of perforated vertical tubing, which is connected to and braced to the principal spillway at two locations. A slide gate type of valve is required at the bottom of this tubing for achieving the desired drawdown time and seasonal control. Figure 5 provides a schematic orientation of such a device. Because of the potential for the dewatering device or orifice becoming clogged, no credit should be given for drawdown by the device in the calculation of the principal or emergency spillway locations.

A dewatering operation procedure might be to keep the slide gate valve closed during dry periods, or close it before anticipated precipitation events. Then, during and after the precipitation event, the slide gate valve is manually adjusted to allow the draw down to begin. The amount of adjustment should be determined so that the draw down to the wet pool elevation occurs over a period of 72 hours, as stated above.

Principal (or Service) Spillway: For maximum effectiveness, the principal spillway should consist of a vertical riser pipe or box of corrugated metal or reinforced concrete, with a minimum diameter of 18 inches, joined by a watertight connection to a horizontal drain pipe (barrel) extending through the embankment and discharging beyond the downstream toe of the fill. The riser and all pipe connections shall be completely water tight except for the inlet opening at the top or dewatering openings, and shall not have any other holes, leaks, rips, or perforations. If the principal spillway is used in conjunction with a separate emergency spillway, the principal spillway must be designed to pass at least the peak flow expected from of 2-year 24-hour storm. If no emergency spillway is used, the principal spillway must be designed to pass the entire peak flow expected from a 25-year 24-hour storm. See Figure 6 for details.

Design Elevations: The crest of the principal spillway riser shall be set at the elevation corresponding to the total storage volume required (67 cubic yards/acre wet storage plus 67 cubic yards/acre dry storage = 134 cubic yards/acre). If the principal spillway is used in conjunction with an emergency spillway, this elevation shall be a minimum of 1.0 foot below the crest of the emergency spillway. In addition, a minimum freeboard of 1.0 foot shall be provided between the maximum 25-year pool level and the top of the embankment. If no emergency spillway is used, the crest of the principal spillway shall be a minimum of 3 feet below the top of the embankment; also, a minimum freeboard of 2.0 feet shall be provided between the 25-year pool level and the top of the embankment.

Anti-Vortex Device and Trash Rack: An anti-vortex device and trash rack shall be attached to the top of the principal spillway to improve the flow characteristics of water into the spillway and to reduce the possibility of floating debris from blocking the principal spillway. The anti-vortex device shall be of the concentric type as shown in Figure 7, and designed using the information provided in Table 1.

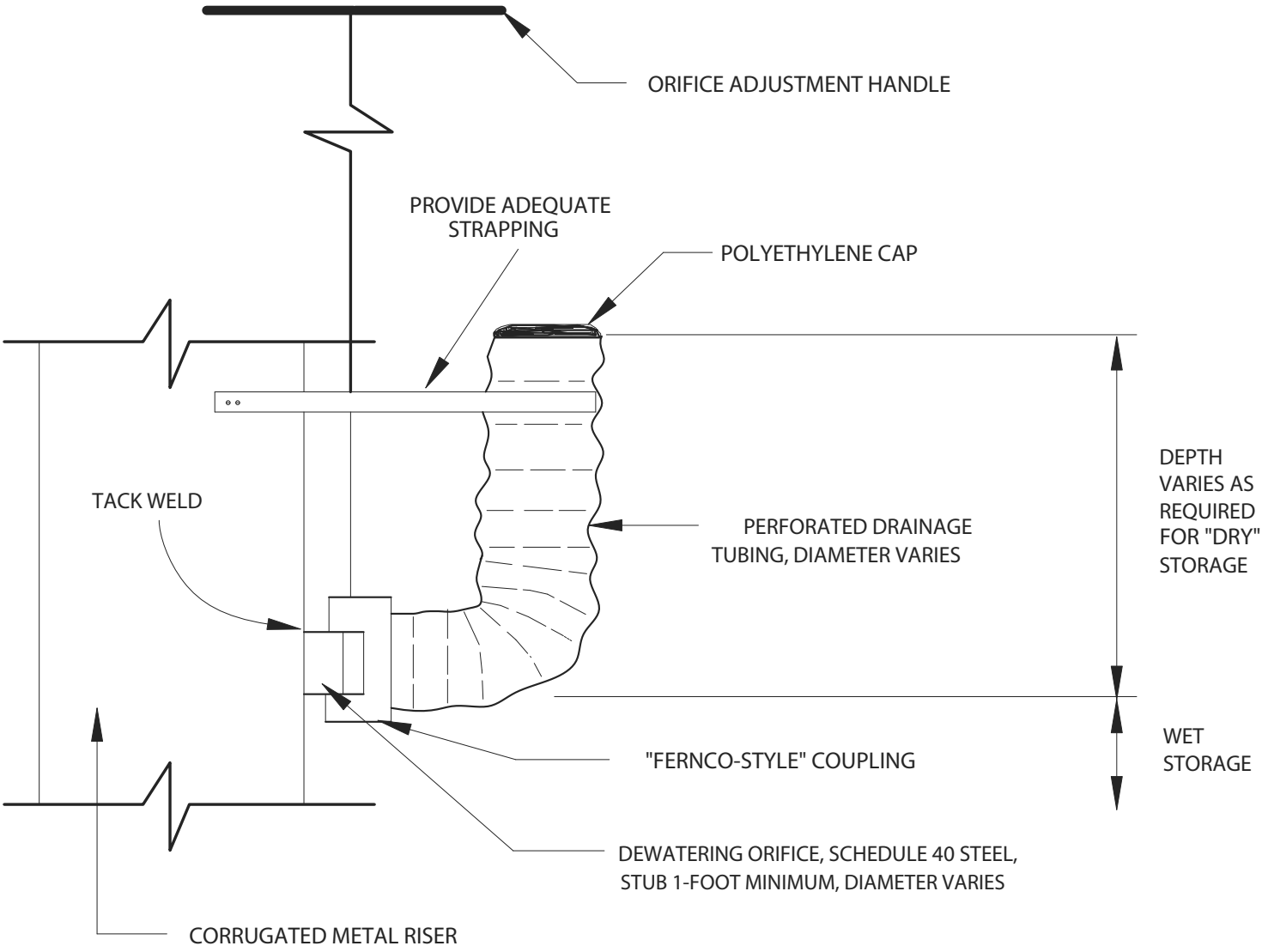
Spillway Foundation: The foundation base of the principal spillway must be firmly anchored to prevent its floating due to buoyancy. If the riser of the spillway is greater than 10 feet in height, computations must be made to determine the anchoring requirements to prevent flotation. A minimum factor of safety of 1.25 shall be used (downward forces = 1.25 x upward forces).

For risers 10 feet or less in height, the anchoring may be done in one of the two following ways:

1. A concrete base 18 inches thick and twice the width of riser diameter shall be used and the riser embedded at least 6 inches into the concrete. See Figure 8 for details.

2. A square steel plate, a minimum of 1/4-inch thick and having a width equal to

Recommended Dewatering System for Sediment Basins

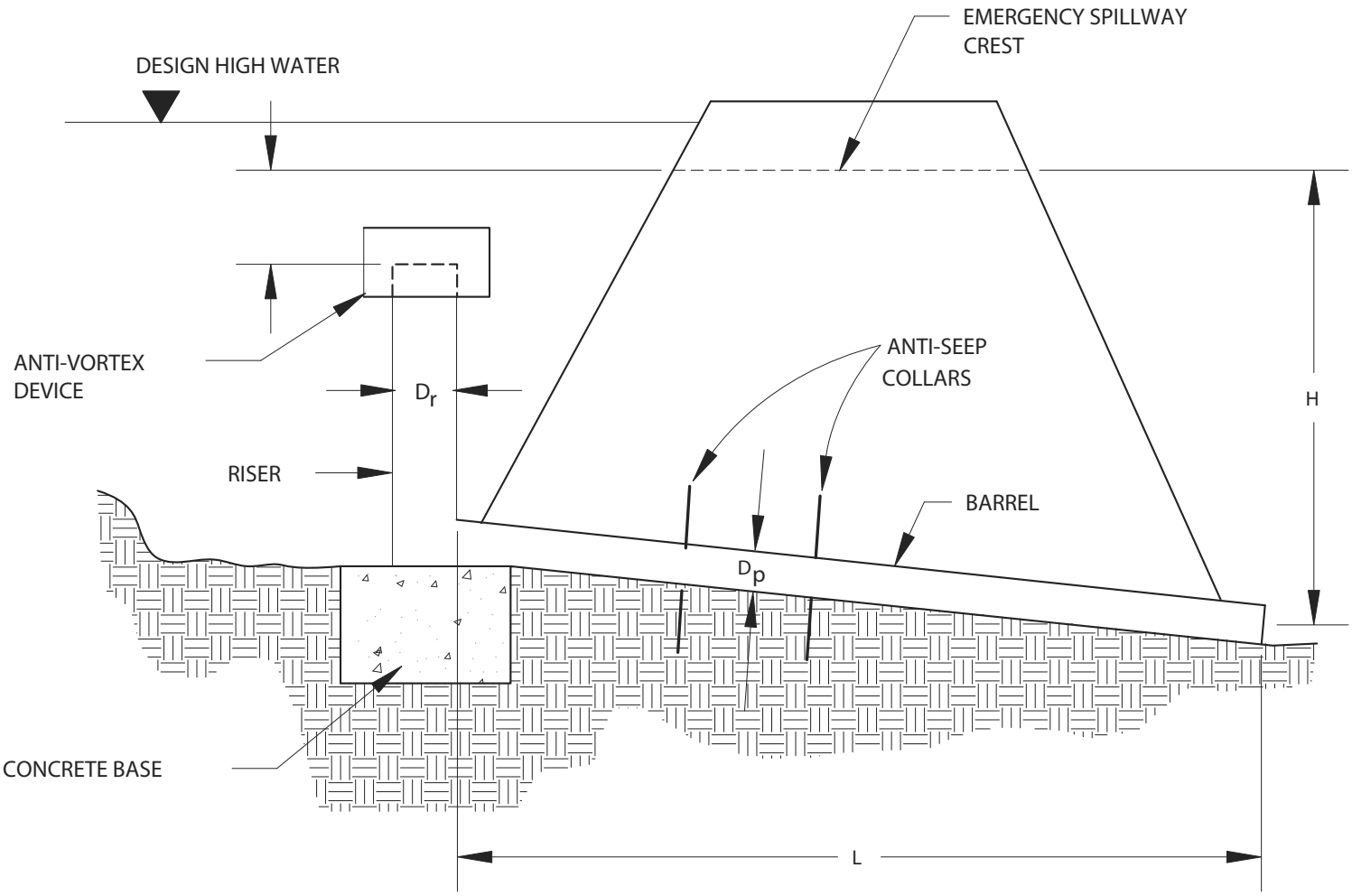


NOTE: WITH CONCRETE RISER, USE PVC SCHEDULE 40 STUB FOR DEWATERING ORIFICE

Source: VA DSWC

Figure 5

Principal Spillway Design



H = HEAD ON PIPE THROUGH EMBANKMENT

h = HEAD OVER RISER CREST

L = LENGTH OF PIPE THROUGH EMBANKMENT

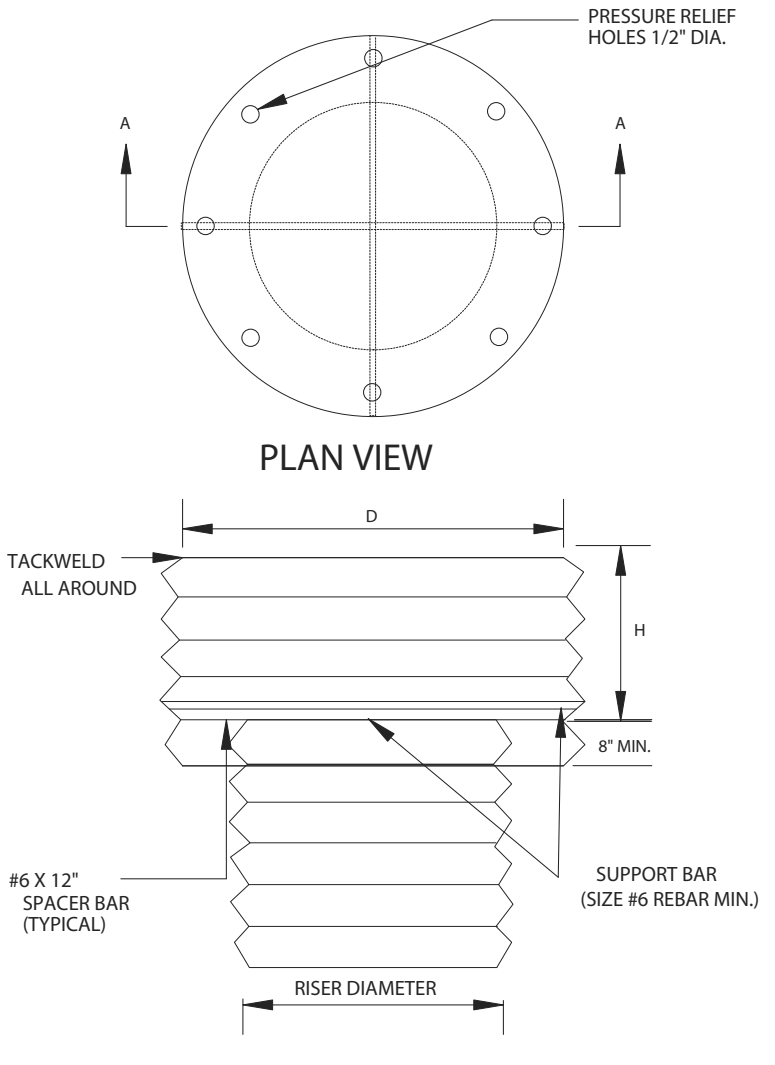
D_p= DIAMETER OF PIPE THROUGH EMBANKMENT

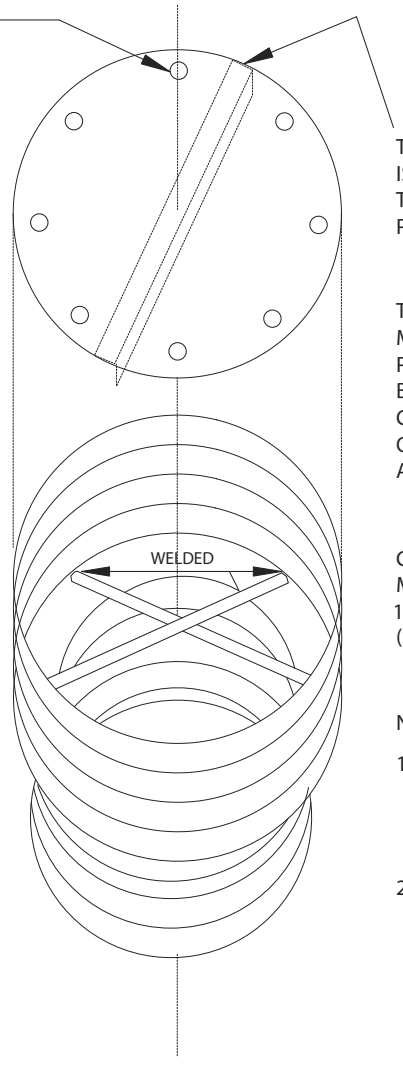
D_r= DIAMETER OF RISER

Source: VA DSWC

Figure 6

Anti - Vortex Device Design





TOP STIFFENER (IF REQUIRED) IS ~~X X~~ ~~ANGLE WEL~~DED TO TOP AND ORIENTED PER-PENDICULAR TO CORRUGATIONS.

TOP IS ~~GAGE~~ CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.

CYLINDER IS ~~GAGE~~ CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.
(SEE TABLE 1 FOR DIMENSIONS)

NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.

2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.

Source: US - NRCS

Figure 7

Concentric Trash Rack and Anti-Vortex Device Design Table

Riser Diam., inches	Cylinder			Minimum Size Support Bar	Minimum Top	
	Diameter, inches	Thickness, gage	Height, inches		Thickness	Stiffener
12	18	16	6	#6 Rebar or 1 1/2" x 1 1/2" x 3/16" angle	16 ga. (F&C)	-
15	21	16	7	" "	" "	-
18	27	16	8	" "	" "	-
21	30	16	11	" "	16 ga.(C), 14 ga.(F)	-
24	36	16	13	" "	" "	-
27	42	16	15	" "	" "	-
36	54	14	17	#8 Rebar	14 ga.(C), 12 ga.(F)	-
42	60	14	19	" "	" "	-
48	72	14	21	1 1/4" pipe or 1 1/4" x 1 1/4" x 1/4" angle	14 ga.(C), 10 ga.(F)	-
54	78	14	25	" "	" "	-
60	90	14	29	1 1/2" pipe or 1 1/2" x 1 1/2" x 1/4" angle	12 ga.(C), 8 ga.(F)	-
66	96	14	33	2" pipe or 2" x 2" x 3/16" angle	12 ga.(C), 8 ga.(F) w/stiffener	2" x 2 1/4" angle
72	102	14	36	" "	" "	2 1/2" x 2 1/2" x 1/4" angle
78	114	14	39	2 1/2" pipe or 2" x 2" x 1/4" angle	" "	" "
84	120	12	42	2 1/2" pipe or 2 1/2" x 2 1/2" x 1/4" angle	" "	2 1/2" x 2 1/2" x 5/16" angle

Note: The table above is useful only for corrugated metal pipe. Concrete trash rack and anti-vortex devices are also available. Manufacturer's recommendations should be followed for concrete applications.

Note: Corrugation for 12"-36" pipe measures 2 2/3" x ½"; for 42"-84" the corrugation measures 5" x 1" or 8" x 1".

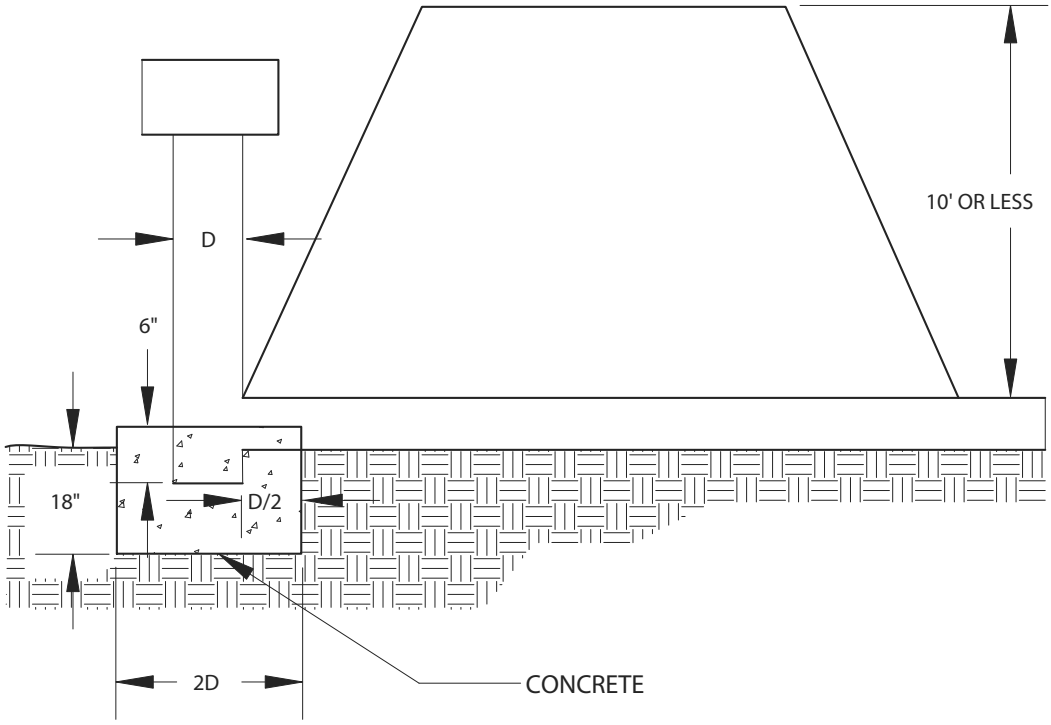
Note: C = corrugated; F = flat.

Source: VA DSWC

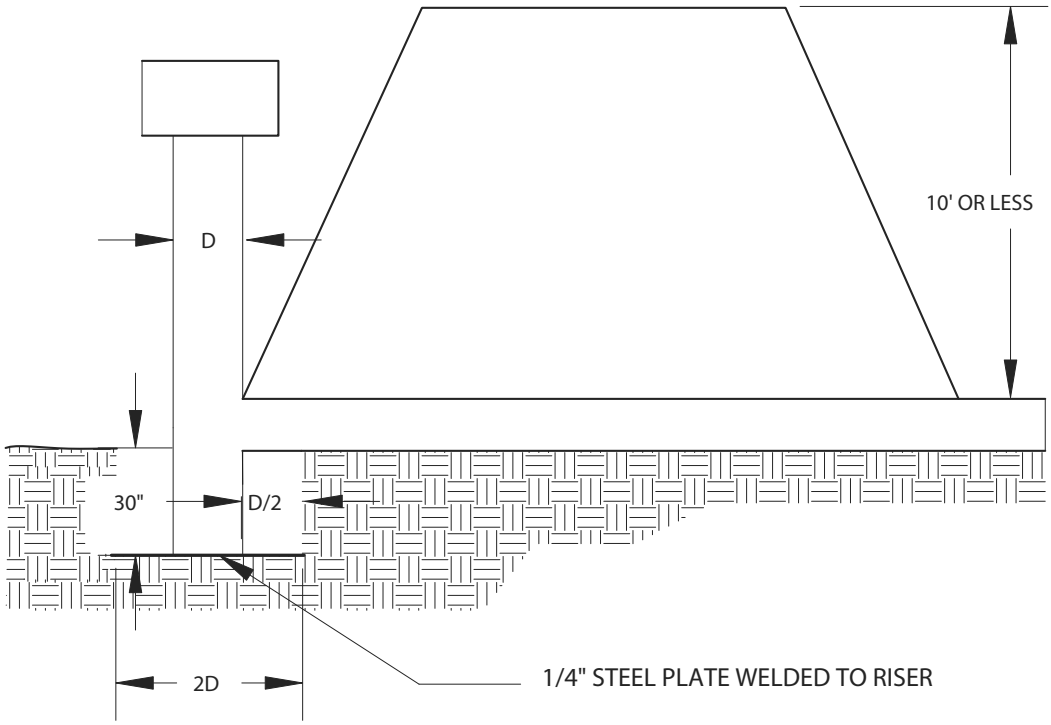
Table 1

Riser Pipe Base Conditions For Embankments Less Than 10' High

CONCRETE BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



STEEL BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



Source: VA DSWC

Figure 8

twice the diameter of the riser shall be welded to the riser pipe. It shall be covered with 2.5 feet of stone, gravel, or compacted soil to prevent flotation. See Figure 8 for details.

Note: If the steel base is used, special attention should be given to compaction so that 95% compaction is achieved over the plate. Also, added precautions should be taken to ensure that material over the plate is not removed accidentally during removal of sediment from basin. One method would be to use simple marker posts at the four corners.

Outlet Barrel: The drainpipe barrel of the principal spillway, which extends through the embankment, shall be designed to carry the flow provided by the riser of the principal spillway with the water level at the crest of the emergency spillway. The riser and all pipe connections shall be completely watertight and not have any other holes, leaks, gashes, or perforations other than designed openings. The minimum size of the pipe shall be 10 inches in diameter. The connection between the riser and the barrel must be watertight to prevent local scouring. The outlet of the barrel must be protected to prevent erosion or scour of downstream areas. Where discharge occurs at the property line, drainage easements will be obtained in accordance with local ordinances. Adequate notes and references regarding such easements will be shown on the erosion and sediment control plan. Measures may include excavated plunge pools, riprap, impact basins, revetments, or other effective methods. Refer to specification **Storm Drain Outlet Protection - OP**.

Caution should be given in directing all outlet water from the impoundment to a receiving watercourse so that natural flow paths are preserved above off-site property owners.

Anti-Seep Collars: Anti-seep collars are used to reduce uncontrolled seepage and prevent internal erosion or "piping" inside the dam along the drainpipe barrel. Anti-seep collars shall be used on the drainpipe barrel of the principal spillway within the normal saturation zone of the embankment to increase the seepage length by at least 10%, if either of the following two conditions is met:

1. The settled height of the embankment exceeds 10 feet.

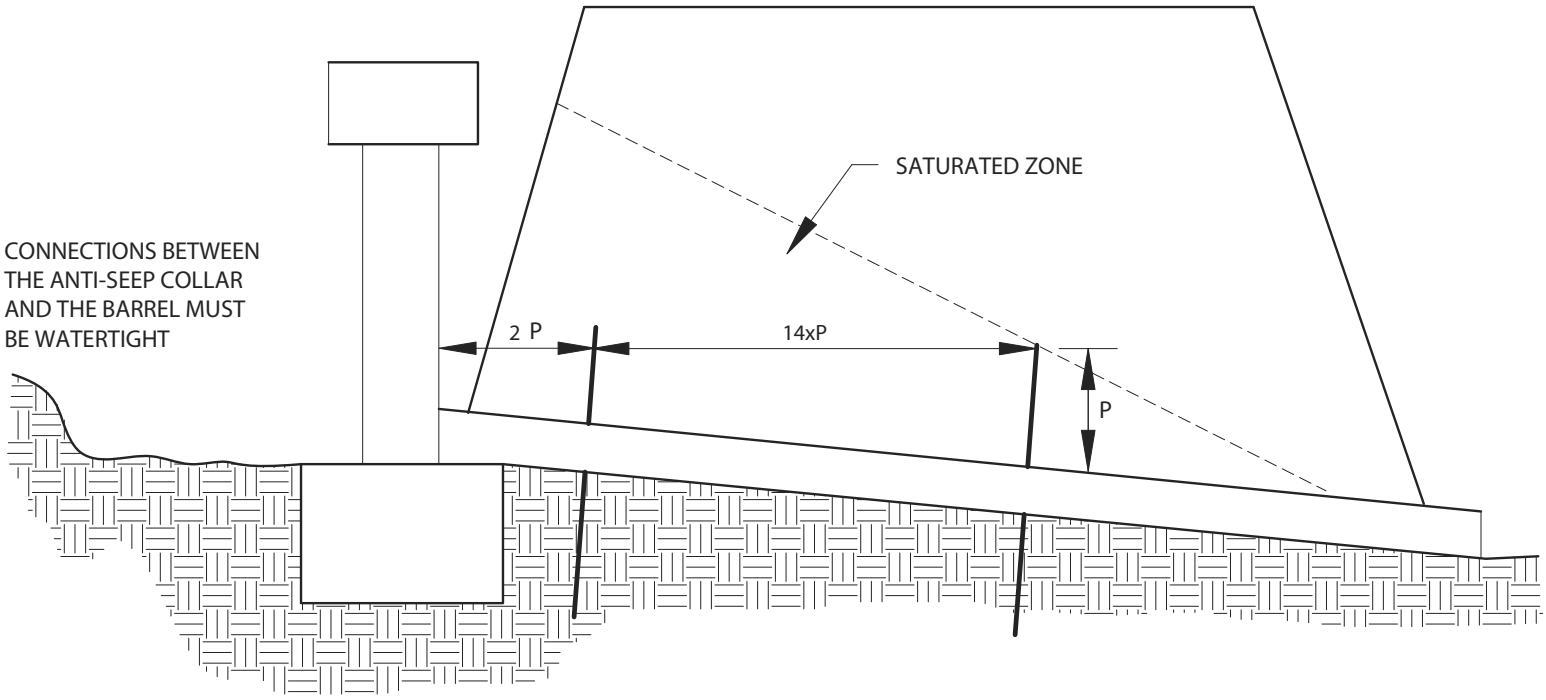
2. The embankment has a low silt-clay content (Unified Soil Classes SM or GM) and the barrel is greater than 10 inches in diameter.

The anti-seep collars shall be installed within the saturated zone. The maximum spacing between collars shall be 14 times the projection of the collars above the barrel. Collars shall not be closer than 2 feet to a pipe joint. Collars should be placed sufficiently far apart to allow space for hauling and compacting equipment. Precautions should be taken to ensure that 95% compaction is achieved around the collars. Connections between the collars and the barrel shall be watertight. See Figure 9 for details.

Emergency Spillway: The emergency spillway acts as a safety release for a sediment basin, or any impoundment type structure, by conveying the larger, less frequent storms through the basin without overtopping or damaging the embankment. The emergency spillway also acts as its name implies - an emergency outlet - in case emergency circumstances arise from excessive sedimentation or damage to the riser, which prevents flow through the principal spillway. The emergency spillway shall consist of an open channel constructed adjacent to the embankment over undisturbed material (not fill, such as the dam embankment). The emergency spillway shall be lined with a non-erodible material such as dumped and compacted riprap or engineered vegetation. Design of an emergency spillway requires the special expertise of a qualified, engineering design professional. The control section is a level portion of the spillway channel at the highest elevation in the channel. See Figure 10 for location of emergency spillway and Figure 11 for an example excavated earth spillway.

The designer must ensure that the spillway lining (either grassed or riprapped) would withstand the high velocities expected in the

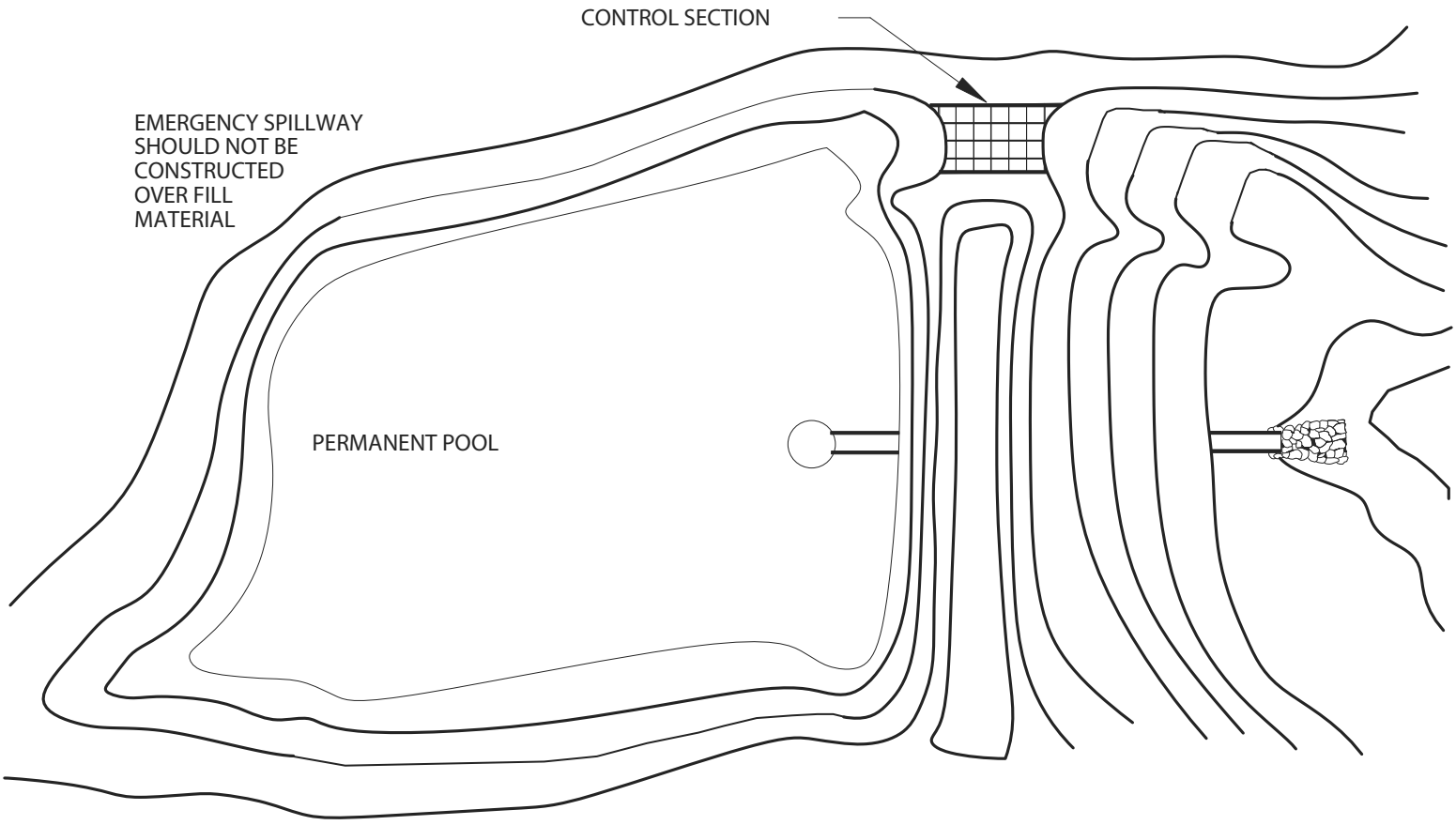
Anti-Seep Collar



Source: VA DSWC

Figure 9

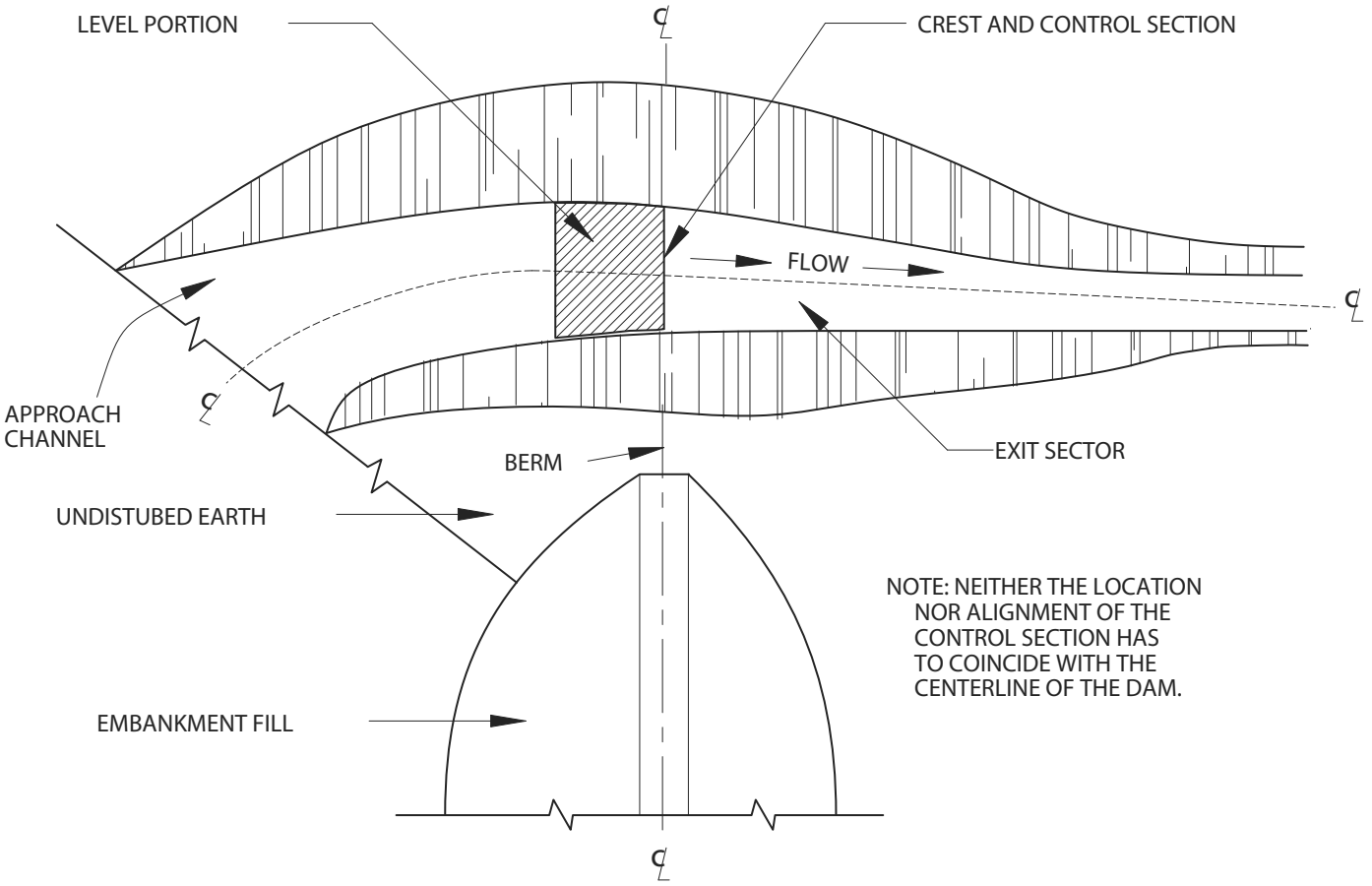
Emergency Spillway



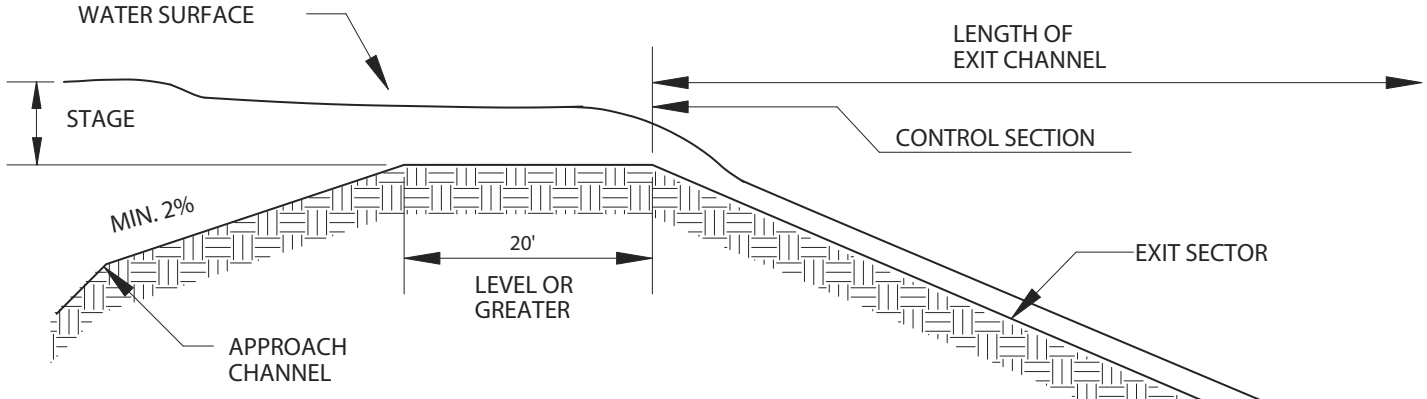
Source: VA DSWC

Figure 10

Excavated Earth Spillway



PLAN VIEW



PROFILE ALONG CENTERLINE

CROSS-SECTION AT CONTROL SECTION

Source: US - NRCS

Figure 11

spillway approach, crest and channel sections without causing erosion.

An evaluation of site and downstream conditions must be made to determine the feasibility and justification for the incorporation of an emergency spillway. In some cases, the site topography does not allow a spillway to be constructed in undisturbed material, and the temporary nature of the facility may not warrant the cost of disturbing more acreage to construct and armor a spillway. The principal spillway should then be sized to convey all the design storms. If the basin is designed as a permanent facility with downstream restrictions, the added expense of constructing and armoring an emergency spillway may be justified.

Capacity: The emergency spillway shall be designed to carry the portion of the peak runoff discharge expected from a 25-year 24-hour storm event that is not credited to the principal spillway.

Design Elevations: The maximum 25-year storm pool elevation shall have a freeboard of at least 1.0 foot below the top of the embankment. The control crest of the emergency spillway channel shall be at least 1.0 foot above the crest of the principal spillway.

Location: The emergency spillway channel should be located so that it is not constructed over erosion-susceptible fill material. The channel should be located so as to avoid sharp turns or bends. The channel should return the flow of water to a defined channel downstream from the embankment. Caution should be given in directing all outlet water from the impoundment to an established watercourse so that natural flow paths are preserved above off-site property owners.

Maximum Velocities: The maximum allowable velocity in the emergency spillway channel will depend upon the type of lining used. Vegetated linings should only be used for low velocity and non-scouring applications. Otherwise, non-erodible linings such as concrete or riprap should be used. For non-erodible linings, design velocities may be increased. However, the emergency spillway channel shall return the flow to the downstream receiving channel at a non-eroding velocity.

Stabilization: The embankment of the sediment basin shall receive vegetative cover immediately after installation. Refer to **Disturbed Area Stabilization (With Permanent Vegetation) - PS** for recommended vegetation details. If excavation is required in constructing the basin, side slopes should not be steeper than 1.5:1.

Disposal: Sediment should be removed from the basin before the sediment level reaches higher than 1 foot below the bottom of the dewatering orifice, or before one-half of the permanent pool volume has been filled in, whichever occurs first. Plans for the sediment basin should indicate the methods for disposing of sediment removed from the basin. Possible alternatives are to use the material in fill areas on-site, or removal to an approved off-site location.

Sediment basin plans should indicate the final disposition of the sediment basin after the upstream drainage area is stabilized. The plans should include methods for the removal of excess water lying over the sediment, stabilization of the basin site, and the disposal of any excess material. Where the sediment basin has been designed as a permanent storm water management basin, plans should also address the steps necessary for the conversion of the sediment basin into a permanent detention or retention structure.

Health and Safety: The designer and developer should be aware of the potential hazards that a temporary wet pond represents to the health and safety of a neighborhood. Sediment basins can be attractive to children and can be dangerous to those who may accidentally slip into the water and soft mud or who may become entrapped at flowing inlets. The basin area should, therefore, be fenced or otherwise made inaccessible to persons or animals, unless this is deemed unnecessary due to the remoteness of the site or other circumstances. Strategically placed signs around the impoundment reading “DANGER-QUICKSAND” should also be installed. In addition to signs and fences, consideration

should be given to frequent inspection, regular maintenance and provision for security at such facilities. In any case, local ordinances and regulations regarding health and safety must be adhered to.

Flocculant and Coagulant Aids: In situations with particularly fine-grained and erodible soil (i.e. loess or clays), the design professional may consider the use of flocculants added to the sediment-laden runoff prior to its entrance into the sediment basin. These flocculants encourage the fine sediment particles to "stick together" which allows them to settle more quickly and effectively. Coagulant aids such as polymers may be used. A common polymer for this purpose is synthetic polyacrylamide (PAM), which may be added to the sediment-laden runoff as it enters the basin, or sprayed on bare slopes to reduce erosion and the transport of sediment. Refer to specification **Polyacrylamide - PAM**. The means of delivery for these chemicals and their application rates will be provided by the engineer in the form of appropriate standard detail drawings and specifications. An example of such an application is shown in Figure 12.

CONSTRUCTION SPECIFICATIONS

Site Preparation: Areas under the proposed embankment (or any structural works related to the sediment basin) shall first be cleared, grubbed, and stripped of topsoil. All trees, vegetation, roots, and/or other objectionable or inappropriate materials should be removed and disposed of by appropriate methods. In order to facilitate clean out and restoration, the pool area, as measured from the top of the principal spillway, should be cleared of all brush and trees.

Cut-Off Trench: For earth-fill embankments, a cutoff trench shall be excavated along the centerline of the earth fill embankment (dam). The trench must extend at least 1 foot into a stable, impervious layer of soil and have a minimum depth of 2 feet. The cutoff trench shall extend up both abutments to the riser crest elevation. The minimum width shall be 4 feet, but also must be wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be drained during the backfilling/compacting operations.

Embankment: The fill material shall be taken from approved borrow areas (shown on the plans). It shall be clean mineral soil, free of roots, woody vegetation, stumps, sod, oversized stones, rocks, or other perishable or objectionable material. The fill material selected must have enough strength for the dam to remain stable and be tight enough, when properly compacted, to prevent excessive percolation of water through the dam. Fill containing particles ranging from small gravel or coarse sand to fine sand and clay in desired proportion is appropriate. Any embankment material should contain approximately 20% clay particles by weight. Using the Unified Soil Classification System, SC (Clayey sand), GC (clayey gravel) and CL ("low liquid limit" clay) are among the preferred types of embankment soils. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material should contain the proper amount of moisture to ensure that at least 95% compaction will be achieved. Fill material will be placed in 6-inch continuous layers over the entire length of the fill. Compaction shall be obtained by routing the hauling equipment over the fill so that the entire surface of the fill is traversed by at least one wheel or tread track of the equipment, or by using a compactor. Special care shall be taken in compacting around the anti-seep collars (compact by hand, if necessary) to avoid damage and achieve desired compaction. The embankment shall be constructed to an elevation 10% higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compactors are used for compaction, the overbuild may be reduced to not less than 5%.

Addition of Chemical Flocculent at Sediment Basin Entrance

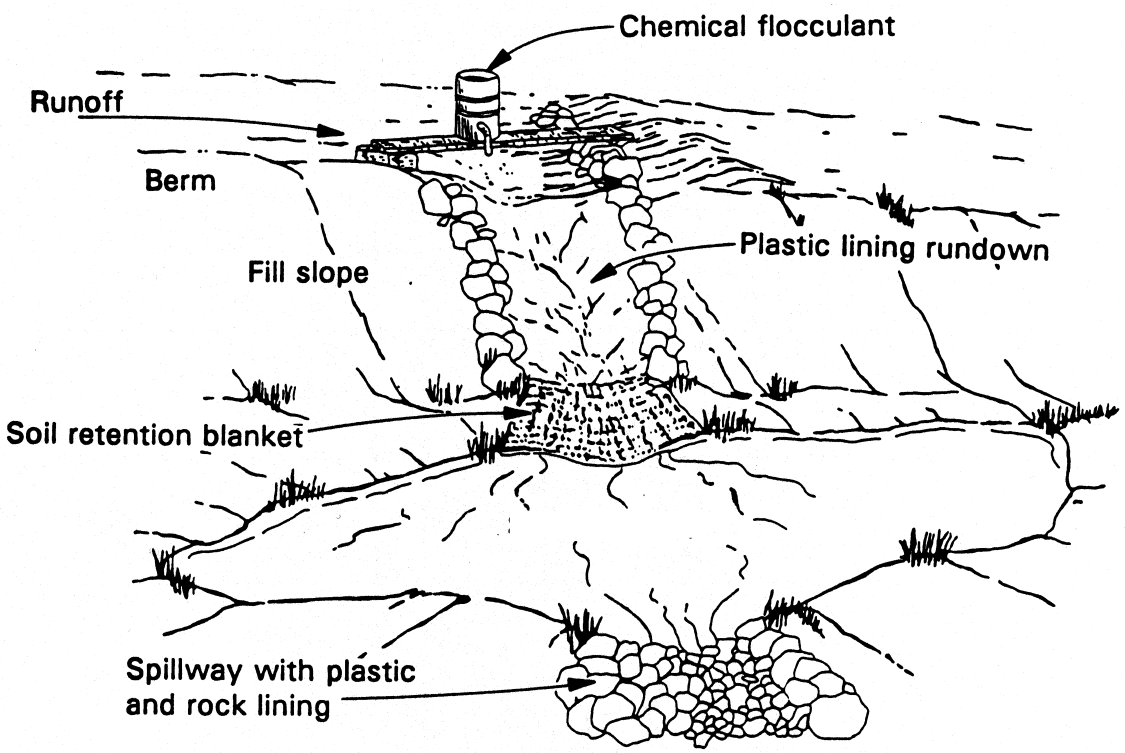


Figure 12

Note: Illustration shows exaggerated foreshortening. Sediment Basin length to width proportions are incorrect and not according to specifications within this standard.

Principal Spillway: The riser of the principal spillway shall be securely attached to the barrel pipe by welding the full circumference making a watertight connection. The barrel and riser shall be placed on a firmly compacted soil foundation. The base of the riser shall be firmly anchored according to design criteria to prevent its floating. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the barrel or anti-seep collars. Fill material shall be placed around the pipe in 4-inch layers and compacted until 95% compaction is achieved (compact by hand, if necessary). A minimum of two feet of fill shall be hand-compacted over the barrel before crossing it with construction equipment.

Emergency Spillway: The emergency spillway shall be installed in undisturbed ground. The implementation of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and must be constructed within a tolerance of 0.2 feet. If the emergency spillway requires erosion protection other than vegetation, the lining shall not compromise the capacity of the emergency spillway, e.g. the emergency spillway shall be over-excavated so that the lining will be flush with the designed slope surface.

Vegetative Stabilization: The embankment and emergency spillway of the sediment basin shall be stabilized with the appropriate temporary or permanent vegetation immediately after construction of the basin. Trees and/or shrubs should not be allowed to grow upon the embankment due to the ability for the roots of such vegetation to destabilize the embankment and/or encourage piping.

Erosion and Sediment Control: The construction of the sediment basin shall be carried out in a manner such that it does not result in sediment problems downstream.

Safety: All state and local requirements shall be met concerning fencing and signs warning the public of the hazards of soft, saturated sediment and flood water.

Final Disposal: When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits are to be leveled or otherwise disposed of in accordance with the SWPPP. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the embankment and trapped sediment must be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry, graded and backfilled.

INSPECTION

Inspections of sediment basins should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. The basin embankment should be checked according to permit requirements to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The emergency spillway should be checked to ensure that its lining is well established and erosion-resistant.

MAINTENANCE

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified. Accumulated sediment shall be removed from the basin when it reaches the specified distance below the top of the riser. Sediment shall not enter adjacent streams or drainage ways during sediment removal or disposal. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.

A recommended inspection and maintenance checklist is shown on the following page.

Sample Field Inspection and Maintenance Checklist

Name/location of site: _____
Date: _____
Inspector(s): _____
_____

- Inspect embankment slopes and crest for :
  - erosion _____
  - structural stability (slumping, bulging, sliding) _____
  - cracking (both longitudinal and lateral) _____
  - wet or soft spots or on lower downstream slope and toe area _____
  - discolored or muddy water seepage _____
  - uneven crest settlement (check if adequate freeboard above
  - emergency crest) _____

- Inspect basin slopes for:
  - erosion_____
  - sliding or slumping _____

- Check amount of sediment in pond for cleaning _____

- Check baffles for structural soundness and holes or breaks _____

- Inspect trash rack and anti-vortex device for debris and blockage _____

- Inspect emergency spillway for obstructions _____

- Check emergency spillway entrance, channelway, and exit for significant erosion and scouring _____

- Check principal spillway outlet for excessive scouring and erosion _____

- Check all safety- and health-related facilities (warning signs, fences, etc.)_____

- Check for vandalism, especially around and inside principal spillway riser _____

- Inspect dewatering device for debris/silt clogging and structural integrity _____

  - Inspect outside edge of outlet pipe for excessive seepage (i.e., flowing water) -- look for discolored or muddy water along the sides as a sign of serious piping or pipe joint separation.

  _____

  Other comments and observations:
  _____
  _____
  _____
  _____
  _____
  _____

Sediment Trap - ST

DEFINITION

A temporary ponding area formed by constructing an earthen embankment with a stone outlet.

PURPOSE

To detain sediment-laden runoff from small, disturbed areas long enough to allow the majority of the sediment to settle out.

CONDITIONS

Sediment traps should be used below disturbed areas where the total contributing drainage area is **less than 10 acres**. If the contributing drainage area is **10 acres or greater**, refer to **Sediment Basin - SB**. The maximum useful life of the sediment trap should be no longer than 18 months.

Sediment traps, along with other controls intended to retain sediment, should be constructed as a first step in any land disturbing activity and should be made functional before upslope land disturbance takes place. The sediment trap may be constructed either independently or in conjunction with a diversion. Refer to specification **Diversion - DI**.

Sediment should be periodically removed from the trap to maintain the required volume. The SWPPP should detail how excavated sediment is to be disposed of, such as by use in fill areas on site or removal to an approved off-site location.

DESIGN CRITERIA

Professionals familiar with the design of storm water basins should prepare construction plans and drawings. The trap should be designed using sound engineering practice.

Trap Capacity: The sediment trap should have an initial storage volume of 3618 cubic feet or 134 cubic yards per acre of drainage area, half of which should be in the form of a permanent pool or wet storage to provide a stable settling medium. The remaining half should be in the form of a draw down or dry storage that will provide extended settling time during less frequent, larger storm events. Excavation may be required to attain the necessary storage volume. The volume

of the wet storage should be measured from the low point of the excavated area to the base of the outlet structure. (See Figure 1) The volume of the dry storage should be measured from the base of the outlet to the crest of the outlet (overflow mechanism). Sediment should be removed from the basin when the volume of the wet storage is reduced by one-half.

For a sediment trap, the wet storage volume may be approximated as follows:

$$V_1 = 0.85 \times A_I \times D_I$$

where,

V_I = the wet storage volume in cubic feet

A_I = the surface area of the flooded area at the base of the outlet in square feet

D_I = the maximum depth in feet, measured from the low point in the trap to the base of the outlet

The dry storage volume may be approximated by the average end method as follows:

$$V_2 = [(A_1 + A_2)/2] \times D_2$$

where,

V_2 = the dry storage volume in cubic feet.

A_I - the surface area of the flooded area at the base of the outlet in square feet

A_2 - the surface area of the flooded area at the crest of the outlet (overflow mechanism), in square feet

D_2 - the depth in feet, measured from the base of the outlet to the crest of the outlet

The designer should seek to provide a storage area that has a minimum 2:1 length to width ratio (measured from point of maximum runoff introduction to outlet).

Note: There are 27 cubic feet per cubic yard. Conversion between cubic feet and cubic yards is as follows:

number of cubic feet x 0.037 = number of cubic yards

or

number of cubic feet / 27= number of cubic yards

Excavation: Side slopes of excavated areas should be no steeper than 1:1. The maximum depth of excavation within the wet storage area should be 4 feet to facilitate clean-out.

Embankment Cross-Section: The maximum height of the sediment trap embankment should be 5 feet as measured from the base of the stone outlet. Minimum top widths (W) and outlet heights (Ho) for various embankment heights (H) are shown in Figure 2. Side slopes of the embankment should be 2:1 or less.

Outlet: The outlet for the sediment trap should consist of a stone section of the embankment located at the low point in the basin. A combination of coarse aggregate and riprap should be used to provide for filtering/detention as well as outlet stability. The smaller stone should be TDOT #3, #357, or #5 Coarse Aggregate (smaller stone sizes will enhance filter efficiency) and riprap should be "Class A-1". See specification **Riprap – RR** for aggregate size tables.

Geotextile should be placed beneath the stone outlet, separating it from the subsoil surface. The geotextile should be placed immediately adjacent to the subgrade without any voids and extend five feet beyond the down stream toe of the outlet to prevent scour. Refer to specification **Geotextile – GE**.

The minimum length of the outlet should be 6 feet times the number of acres comprising the total area draining to the trap. See Figure 1 for further illustration. The crest of the stone outlet must be **at least 1.0 foot below the top of the embankment** to ensure that the flow will travel over the stone and not the embankment.

Removal: Sediment traps must be removed after the contributing drainage area is stabilized. The SWPPP should show how the site of the sediment trap is to be graded and stabilized after removal.

CONSTRUCTION SPECIFICATIONS

1. The area under the embankment should be cleared, grubbed, and stripped of any vegetation and root mat.

2. Fill material for the embankment should be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. The embankment should be compacted in 6-inch layers by traversing with construction equipment.

3. All cut and fill slopes should be 2:1 or less (except for excavated, wet storage area which may be at a maximum 1:1. grade).

4. Construction operations should be carried out in such a manner that erosion during construction of the structure is minimized.

5. The earthen embankment should be seeded with temporary or permanent seeding immediately after installation. Refer to specification **Disturbed Area Stabilization (With Temporary Vegetation) - TS** and/or **(With Permanent Vegetation) – PS**.

6. The structure should be removed and the area stabilized when the upslope drainage area has been stabilized.

INSPECTIONS

Inspections of temporary sediment traps should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspections may be conducted only once per month.

The structure should be checked regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet should be checked to ensure that its center is at least 1 foot below the top of the embankment.

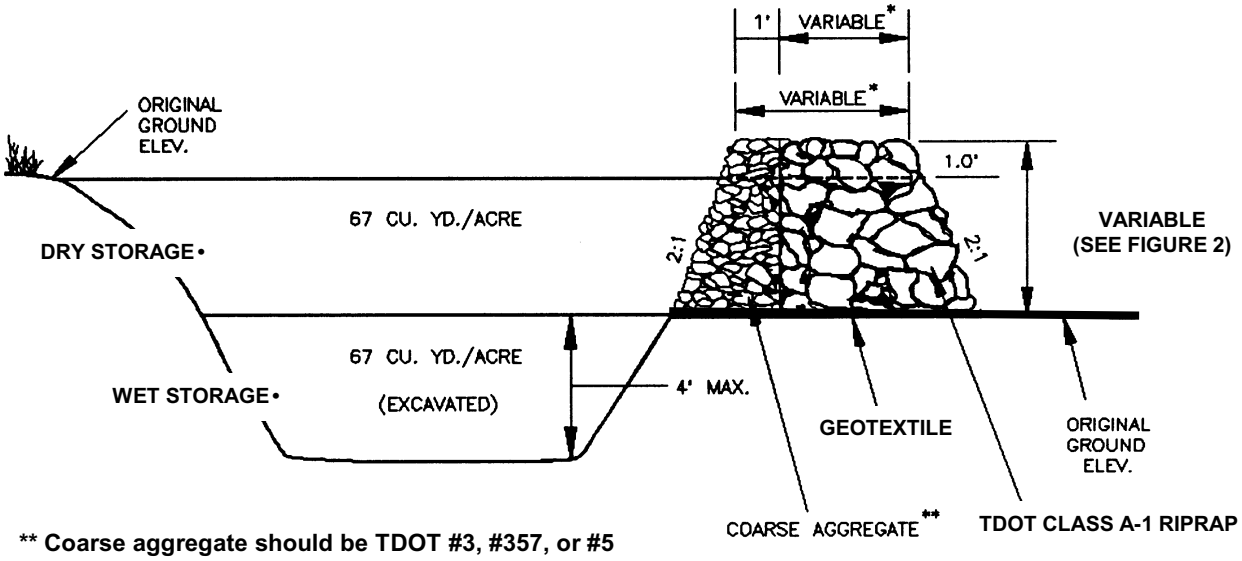
Filter stone should be checked to ensure that filtration performance is maintained. Stone choked with sediment should be removed and cleaned or replaced.

MAINTENANCE

Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Sediment removal from the basin should be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

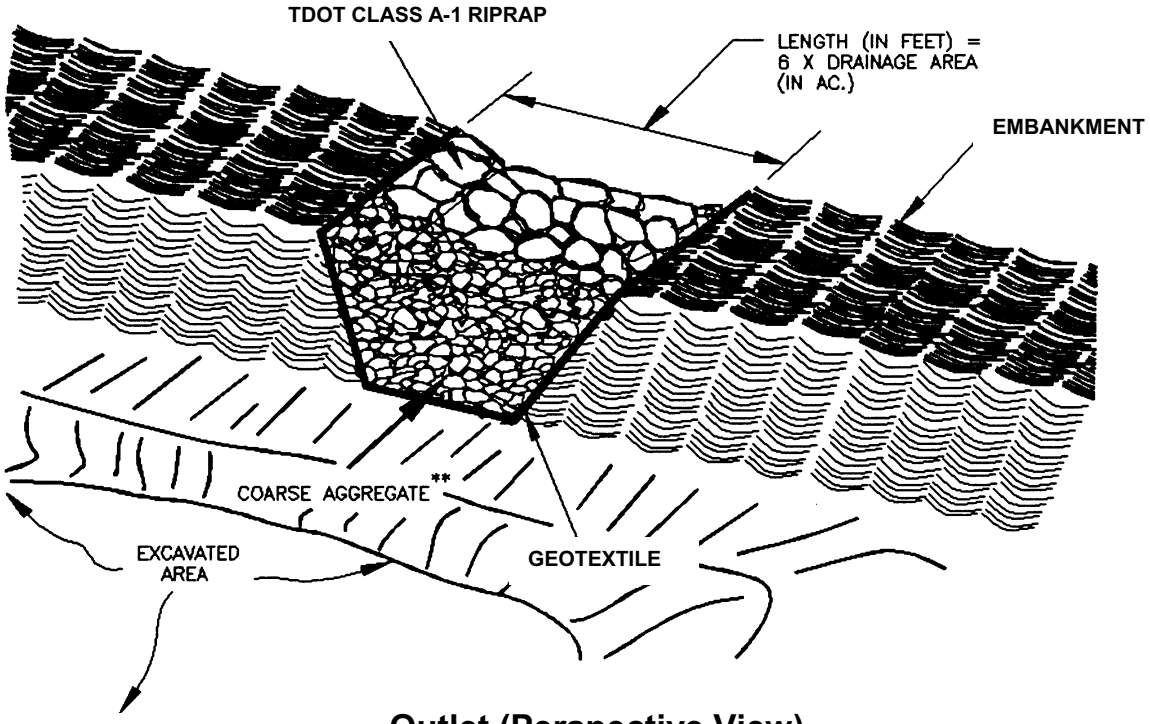
Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Sediment Trap



** Coarse aggregate should be TDOT #3, #357, or #5

Cross Section of Outlet

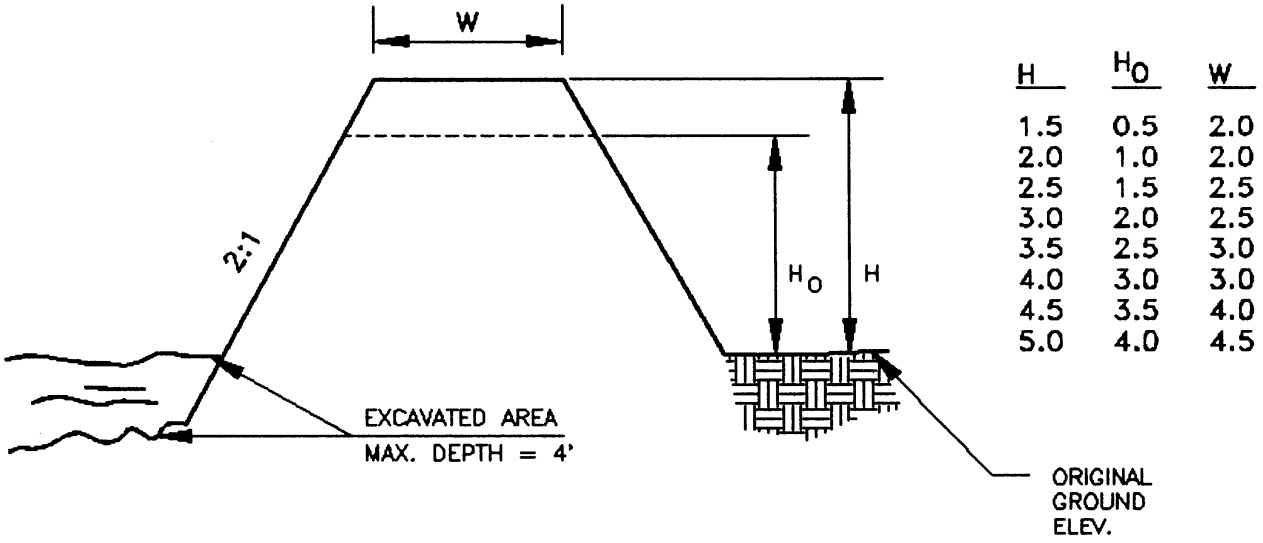


Outlet (Perspective View)

Figure 1

Source: VA DSWC

Minimum Top Width (W) Required for Sediment Trap Embankments According to Height of Embankment (Feet)



H	H_O	W
1.5	0.5	2.0
2.0	1.0	2.0
2.5	1.5	2.5
3.0	2.0	2.5
3.5	2.5	3.0
4.0	3.0	3.0
4.5	3.5	4.0
5.0	4.0	4.5

Figure 2

Source: VA DSWC

Silt Fence - SF

DEFINITION

A silt fence is a temporary sediment barrier made of woven, synthetic filtration fabric supported by steel or wood posts.

PURPOSE

The purpose of a silt fence is to prevent sediment carried by sheet flow from leaving the site and entering natural drainage ways or storm drainage systems by slowing storm water runoff and causing the deposition of sediment at the structure. Silt fencing encourages sheet flow and reduces the potential for development of rills and gullies.

CONDITIONS

Silt fence should be installed where sheet flow runoff can be stored behind the barrier without damaging the barrier or the submerged area behind the barrier.

Silt fence should not be installed across streams, ditches, waterways, or other concentrated flow areas.

DESIGN CRITERIA

All silt fence should be installed along the contour, never up or down a slope.

Where all sheet flow runoff is to be stored behind the fence (where no storm water disposal system is present), maximum slope length behind a silt fence should not exceed those shown in Table 1. **The drainage area should not exceed l/4 acre for every 100 feet of silt fence.**

Criteria for Silt Fence Placement

Land Slope (percent)	Maximum Slope Length Above Fence (feet)
<2	100
2 to 5	75
5 to 10	50
10 to 20	25
>20*	15
* In areas where the slope is greater than 20 %, a flat area length of 10 feet between the toe of the slope and the fence should be provided	

Table 1

Source: GA SWCC

Type A Silt Fence - SF-A: This 36-inch wide filter fabric should be used on developments where the life of the project is six months or greater. See Figure 1.

Type B Silt Fence - SF-B: Though only 22-inches wide, this filter fabric allows the same flow rate as Type A silt fence. Type B silt fence should be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six months. See Figure 2.

Type C Silt Fence - SF-C: Type C fence is 36-inches wide with wire reinforcement. The wire reinforcement is necessary because this fabric allows almost three times the flow rate as Type A silt fence. Type C silt fence should be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10 feet. See Figure 3.

Along stream buffers and other sensitive areas, two rows of Type C silt fence may be used.

Table 2 contains specific information concerning specification requirements for all three types of material.

CONSTRUCTION SPECIFICATIONS

Silt fence should be placed on the contour. On slopes with grades greater than 7%, the silt fence should be located at least 5 to 7 feet beyond the base. Turn the ends of the silt fence upslope so that a certain depth of storm water may be retained in front of the silt fence. The impounded depth should be at least 12 inches, but no more than the height of the silt fence. Hay or straw bales should be staked in place at the end of the row of silt fence as an emergency overflow. This will allow detained water, exceeding the capacity of the silt fence, to be filtered and released quickly (see Figure 4). **The bottom edge of silt fence must be entrenched and backfilled to be effective.**

The silt fence should be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter cloth should be spliced together only at a supporting post, with a minimum 6-inch overlap, and securely sealed. See Figure 5 for splicing requirements.

Post installation should start at the center of the low-point (if applicable) with remaining posts spaced 6 feet apart for Type A and B silt fences and 4 feet apart for Type C silt fence. While Type A and B silt fences can be used with both wood and steel posts, only steel posts should be used with Type C silt fence due to the flow capacity of the fabric. See Table 3, for post size and fasteners requirements. See Figure 6 for fastener placement.

INSPECTION

Inspect silt fence before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspections may be conducted only once per month.

MAINTENANCE

Sediment should be removed once it has accumulated to one-half the original height of the barrier. Filter fabric should be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months). Silt fence should remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the fence should be removed and properly disposed of before the fence is removed.

Silt Fence Specifications

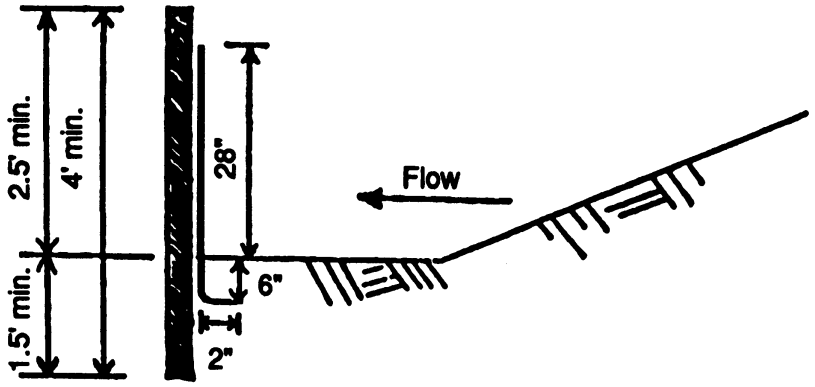
TYPE FENCE	A	B	C
Tensile Strength (Lbs. Min.) (1) (ASTM D-4632)	Warp - 120 Fill - 100	Warp - 120 Fill - 100	Warp - 260 Fill - 180
Elongation (% Max.) (ASTM D-4632)	40	40	40
AOS (Apparent Opening Size) (Max. Sieve Size) (ASTM D-4751)	#30	#30	#30
Flow Rate (Gal/Min/Sq. Ft.) (GDT-87)	25	25	70
Ultraviolet Stability (2) (ASTM D-4632 after 300 hours weathering in accordance with ASTM D-4355)	80	80	80
Bursting Strength (PSI Min.) (ASTM D-3786 Diaphragm Bursting Strength Tester)	175	175	175
Minimum Fabric Width (Inches)	36	22	36

(1) Minimum roll average of five specimens.
(2) Percent of required initial minimum tensile strength.

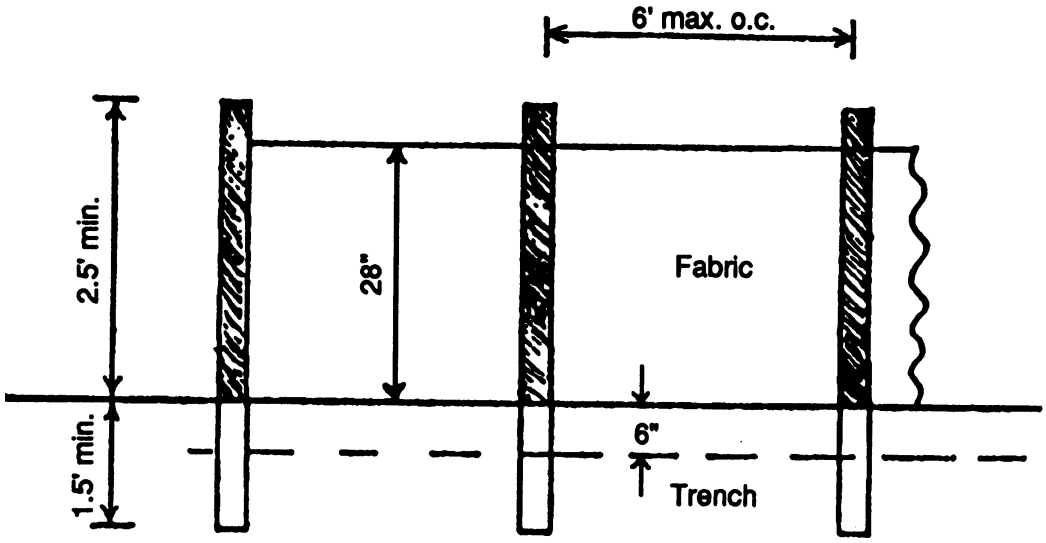
Table 2

Source: GA SWCC

Silt Fence – Type A



SIDE VIEW

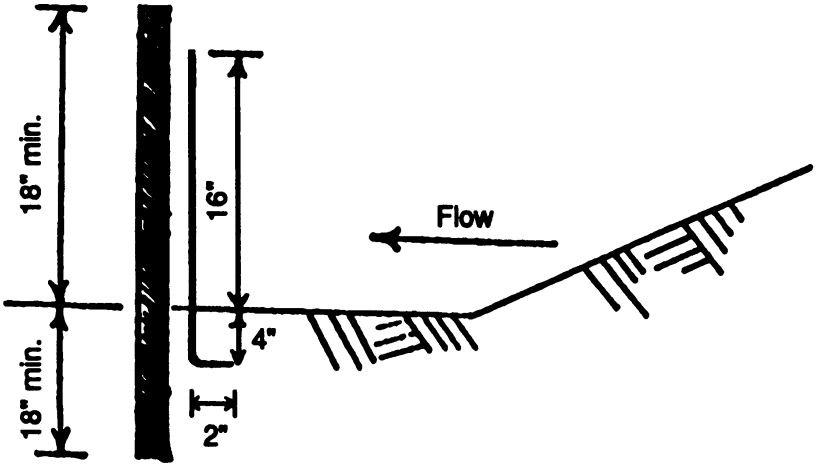


FRONT VIEW

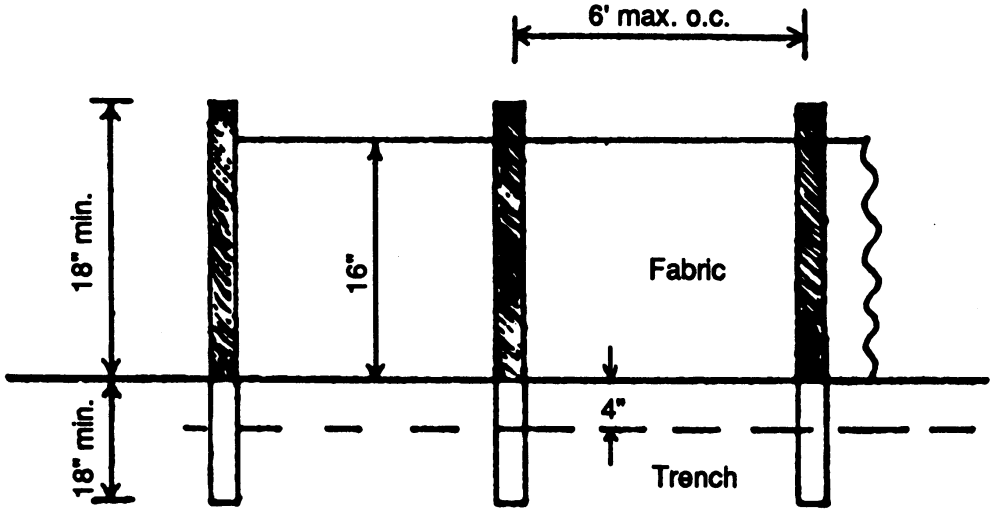
Figure 1

Source: GA SWCC

Silt Fence – Type B



SIDE VIEW

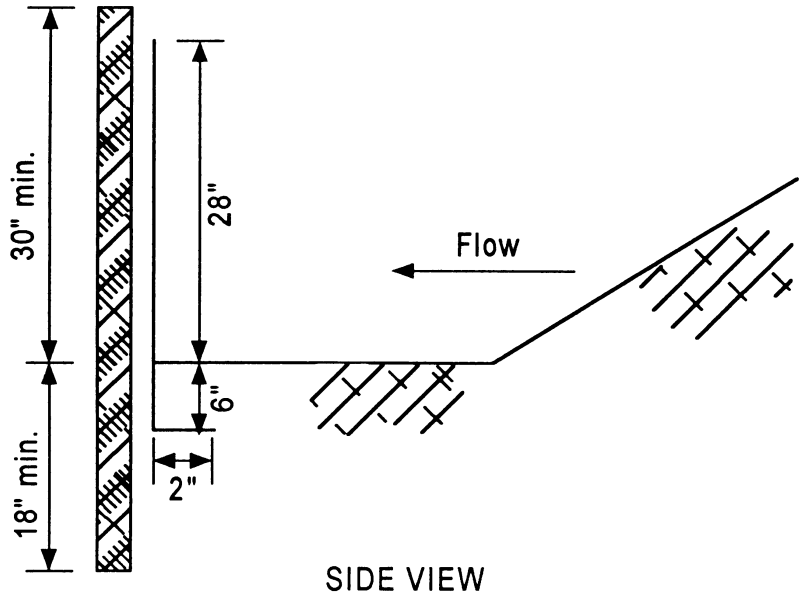


FRONT VIEW

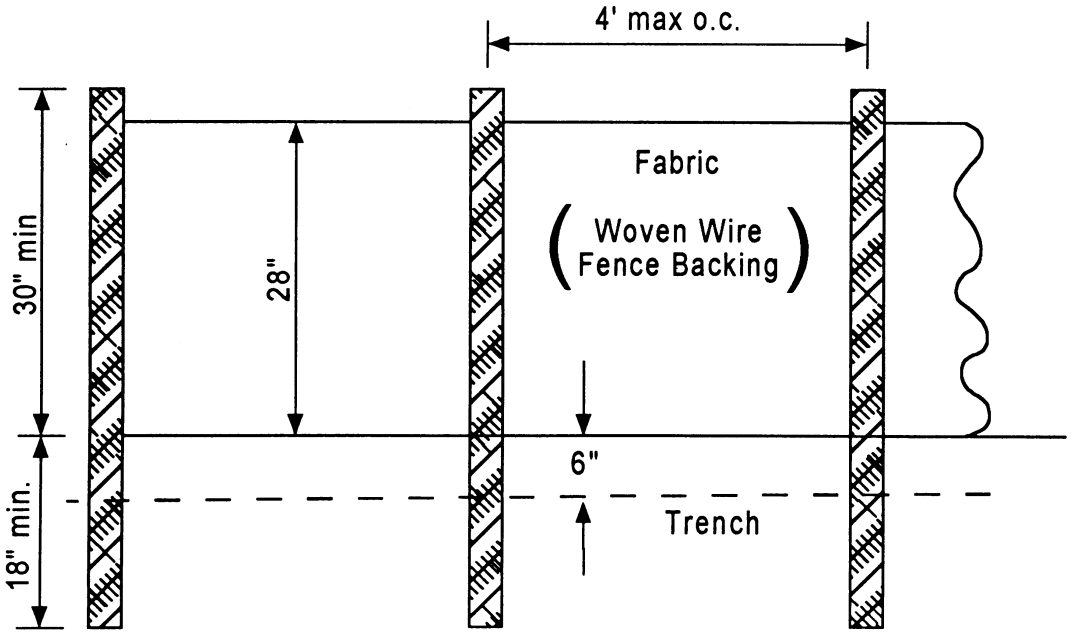
Figure 2

Source: GA SWCC

Silt Fence – Type C



SIDE VIEW



FRONT VIEW

Figure 3

Source: GA SWCC

Silt Fence Below a Steep or Long Grade

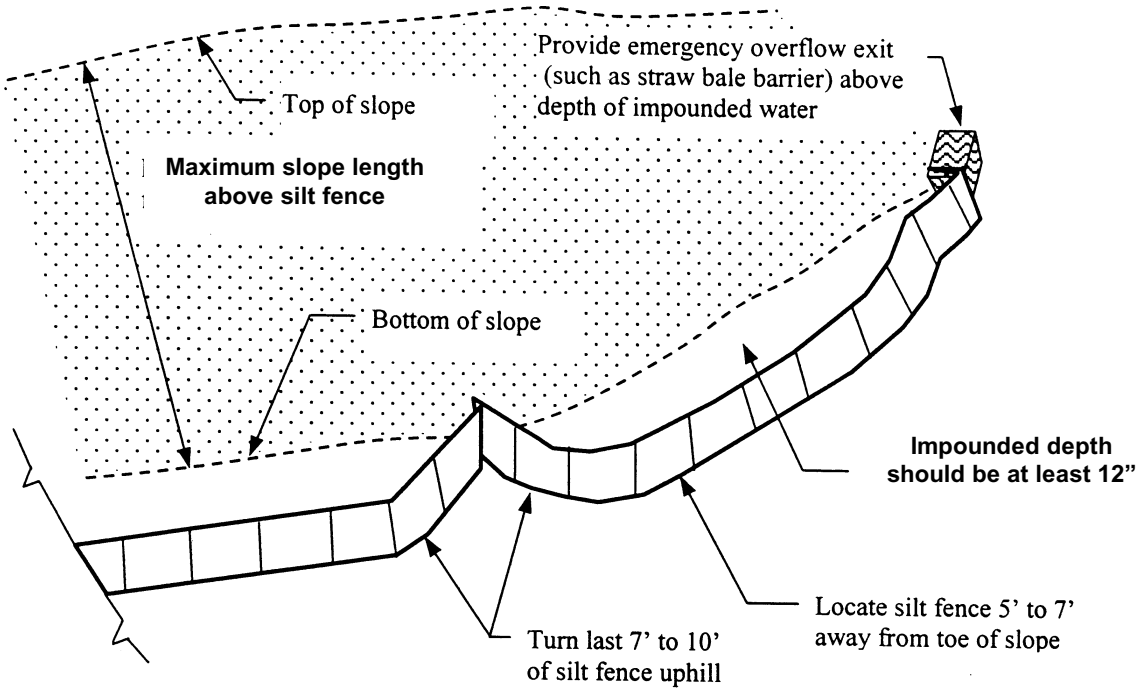


Figure 4

Source: Knoxville Engineering Department

Joining Silt Fence Sections

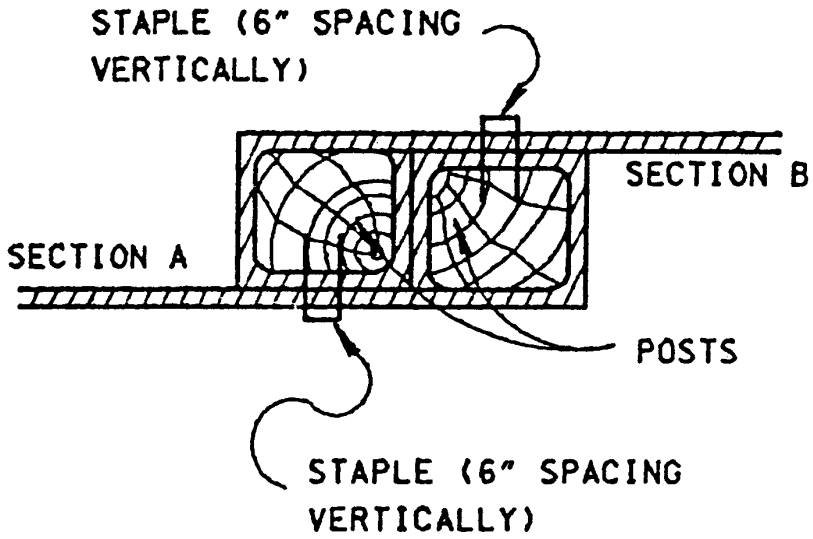


Figure 5

Source: TDOT English Standard Drawings

Post Size and Fastener Requirements

POST SIZE

	Minimum Length	Type of Post	Size of Post
Type A	4'	Soft wood Oak Steel	3" dia. or 2x4 1.5" x 1.5" 1.3lb./ft. min.
Type B	3'	Soft wood Oak Steel	2" dia. or 2x2 1" x 1" .75lb./ft. min.
Type C	4'	Steel	1.3lb./ft. min.

FASTENERS FOR WOOD POSTS

	Gauge	Crown	Legs	Staples/Post
Wire Staples	17 min.	3/4" wide	1/2" long	5 min.
	Gauge	**Length**	**Button Heads**	**Nail/Post**
Nails	14 min.	1"	3/4"	4 min.

Note: Filter fabric may also be attached to the post by wire, cord, and pockets.

Table 3

Source: GA SWCC

Fastener Placement

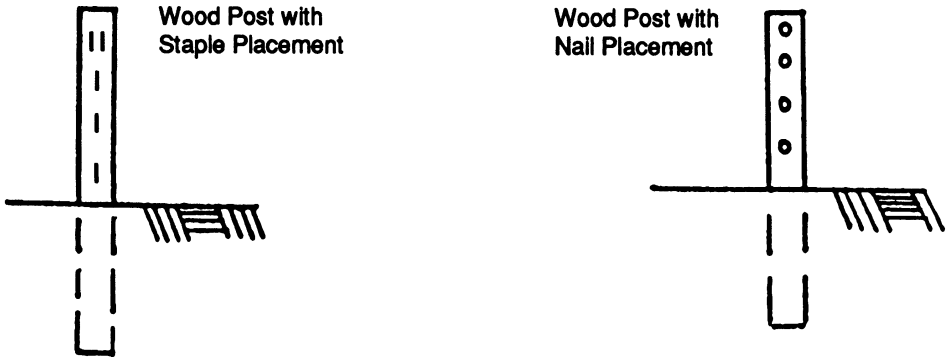
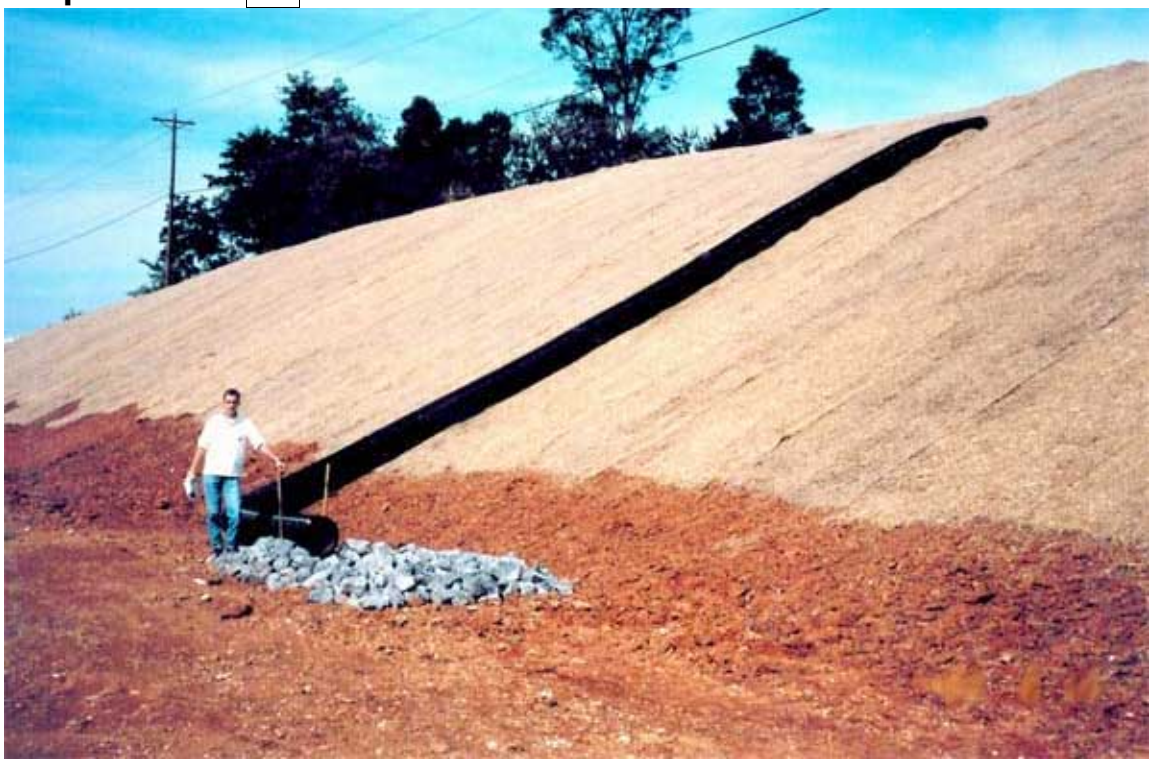


Figure 6

Source: GA SWCC

Slope Drain - SD



DEFINITION

A temporary pipe installed from top to bottom of a cut or fill slope.

PURPOSE

To convey storm water runoff down the face of a cut or fill slope without causing erosion on or below the slope.

CONDITIONS

Temporary slope drains are used where sheet or concentrated storm water flow could cause erosion as it moves down the face of a slope. These structures are removed once the permanent storm water disposal system is installed.

DESIGN CRITERIA

Formal design is not required. The following standards should be used:

Placement: The temporary slope drain should be located on undisturbed soil or well-compacted fill.

Diameter: The diameter of the temporary slope drain should provide sufficient capacity required to convey the maximum runoff expected during the life of the drain. Refer to Table 1 for selecting the pipe diameter of a slope drain.

Slope Drain Pipe Specifications

Maximum Drainage Area Per Pipe (acre)	Pipe Diameter (inches)
0.3	10
0.5	12
1	18

Table 1

Source: GA SWCC

Slope Drain Inlet and Outlet: See Figure 1 for typical slope drain details. Diversion structures are used to route runoff to the slope drain's "Tee" or "Ell" inlet at the top of the slope. The entrance section should slope toward the entrance to the slope drain at a minimum of 1/2–inch per foot. Thoroughly compact selected soil around the inlet section to prevent the pipe from being washed out by seepage or piping. A stone

filter ring or other inlet protection may be placed at the inlet for added sediment filtering capacity. Refer to the specifications **Filter Ring - FR or Storm Drain Inlet Protection - IP.** These sediment-filtering devices should be removed if flooding or bank over wash occurs.

Rock riprap should be placed at the outlet for energy dissipation. A Tee outlet, flared end section, or other suitable device may be used in conjunction with the riprap for additional protection. Refer to **Storm Drain Outlet Protection - OP**.

Pipe Material: Design the slope drain using heavy-duty, flexible materials such as non-perforated, corrugated plastic pipe or specially designed flexible tubing. Use reinforced, hold-down grommets or stakes to anchor the pipe at intervals not to exceed 10 feet with the outlet end securely fastened in place. The pipe must extend beyond the toe of the slope.

CONSTRUCTION SPECIFICATIONS

A common failure of slope drains is caused by water saturating the soil at the inlet section and seeping along the pipe. This creates voids and piping to occur, causing washouts. Proper back filling around and under the pipe with stable soil material, and hand compacting in 6-inch lifts to achieve firm contact between the pipe and the soil at all points, will eliminate this type of failure.

1. Place slope drains on undisturbed soil or well-compacted fill.

2. The entrance section should slope toward the inlet to the slope drain at a minimum of 1/2–inch per foot.

3. Hand compact the soil under and around the inlet and exit sections in lifts not to exceed 6 inches.

4. Ensure that the fill used to anchor the slope drain inlet at the top of the slope has minimum dimensions of 1.5 ft. depth, 4 ft. top width, and 3:l side slopes.

5. Ensure that all slope drain connections are watertight.

6. Ensure that all fill material is well compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart.

7. Place the drain slightly diagonally across the slope, extending the drain beyond the toe of the slope. Curve the outlet uphill and adequately protect the outlet from erosion.

8. If the drain is conveying sediment-laden runoff, direct all flows into a sediment trap or sediment basin.

9. Make the settled, compacted diversion no less than one foot above the top of the pipe at every point.

10. Immediately stabilize all disturbed areas following construction.

INSPECTION

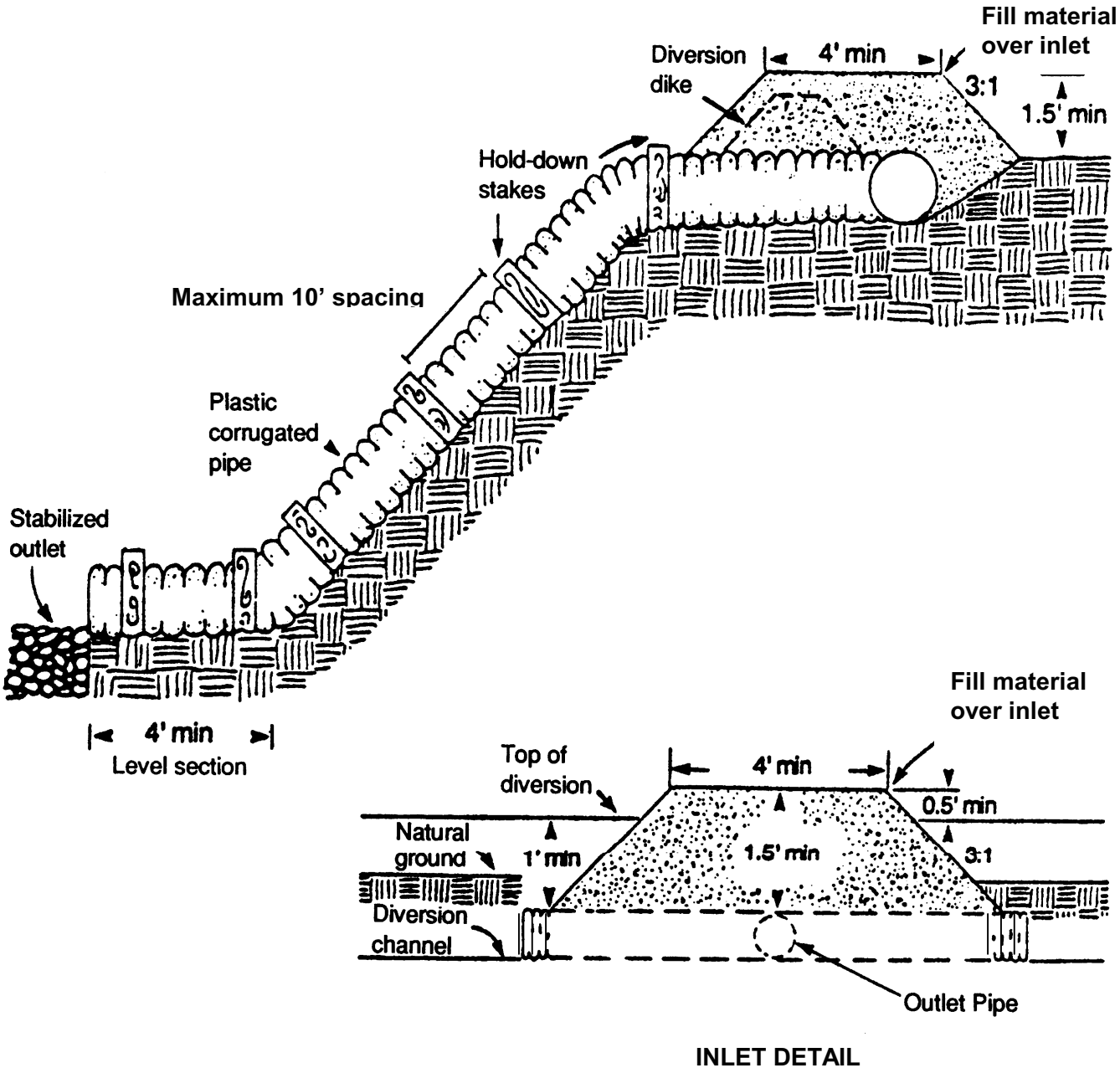
Inspections of the slope drain and supporting diversion should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days.

MAINTENANCE

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

When the protected area has been permanently stabilized and the permanent storm water disposal system is fully functional, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately. Refer to specifications **Disturbed Area Stabilization (With Permanent Vegetation and with Sod) - PS** and **SO**, respectively, and **Matting and Blankets - MA**.

Slope Drain Pipe and Inlet Detail



INLET DETAIL

Make all pipe connections watertight and secure so that the joints will not separate in use.

Figure 1

Source: GA SWCC

Storm Drain Inlet Protection - IP

DEFINITION

A temporary protective device formed around a storm drain drop inlet to trap sediment.

PURPOSE

To prevent sediment from entering storm drainage systems, prior to temporary or permanent stabilization of the disturbed area.

CONDITIONS

Storm drain inlet protection should be installed at or around all storm drain drop inlets that receive runoff from disturbed areas.

DESIGN CRITERIA

Many sediment-filtering devices can be designed to serve as storm drain inlet protection. Inlet protection must be self-draining unless otherwise protected in a fashion that will not present a safety hazard. **The drainage area served by the inlet protection should be no greater than one-half acre.** Runoff from larger drainage areas should be routed to a Sediment Trap or Sediment Basin. Refer to specifications for **Sediment Trap – ST** or **Sediment Basin – SB**.

If runoff may bypass the protected inlet, a berm should be constructed on the down slope side of the structure to prevent undercutting and erosion under the structure. Refer to **Diversion – DI**. Also, a stone filter ring may be used on the up slope side of the inlet to slow runoff and filter larger soil particles. Refer to **Filter Ring – FR.**

CONSTRUCTION SPECIFICATIONS

Inlet protection may be constructed on natural ground surface, on an excavated surface, or on machine compacted fill.

Silt Fence Inlet Protection IP-SF: This method of inlet protection is applicable where the inlet drains a relatively flat area (slope no greater than 5%) and should not apply to inlets receiving concentrated flows, such as in street or highway medians. As shown in Figure I, Type C silt fence supported by 2x4-inch wood or equivalent steel posts, with a

minimum length of three feet, should be used. The stakes should be spaced evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely driven into the ground, approximately 18 inches deep.

The silt fence should be entrenched 12 inches and backfilled with crushed stone or compacted soil. Silt fence and wire should be securely fastened to the posts, and silt fence ends must be overlapped a minimum of 18 inches or wrapped together around a post to provide a continuous barrier around the inlet. Refer to **Silt Fence – SF** for installation requirements. Sediment should be removed when the sediment has accumulated to one-half the height of the inlet protection.

Baffle Box Inlet Protection IP-BB: This method is applicable for inlets receiving runoff with a higher volume or velocity. As shown in Figure 2, the baffle box should be constructed of 2" x 4" or 4" x 4" boards spaced a maximum of 1 inch apart or of plywood with weep holes 2 inches in diameter. The weep holes should be placed approximately 6 inches on center vertically and horizontally. The entire box is wrapped in Type C filter fabric that should be entrenched 12 inches and backfilled. Refer to **Silt Fence – SF** for installation requirements.

Clean coarse aggregate should be placed outside the box, all around the inlet, to a depth of 2 to 4 inches. Coarse aggregate should be TDOT #3, #357, or #5. If the aggregate filter becomes clogged with sediment so that it no longer adequately performs its function, the aggregate should be pulled away from the structure, cleaned, and replaced. Sediment should be removed when the sediment has accumulated to one-half the height of the inlet protection.

Block and Gravel Inlet Protection IP-BG: This method of inlet protection is applicable where heavy flows are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure. As shown in Figure 3, one block is placed on each side of the structure on its side in the bottom row to allow pool drainage. The foundation should be excavated at least 2 inches below the crest of the storm drain. The bottom rows of blocks are placed against the edge of the storm drain for lateral support and to avoid washouts when overflow occurs. If needed, lateral support may be given to subsequent rows by placing 2" x 4" wood studs through block openings.

Hardware cloth or comparable wire mesh with l/2 inch openings should be fitted over all block openings to hold gravel in place. Clean coarse aggregate should be placed up to 2 inches below the top block on a 2:l slope or flatter and smoothed to an even grade. Coarse aggregate should be TDOT #3, #357, or #5. If the aggregate filter becomes clogged with sediment so that it no longer adequately performs its function, the aggregate should be pulled away from the structure, cleaned, and replaced. Sediment should be removed when the sediment has accumulated to one-half the height of the inlet protection.

Gravel Inlet Protection IP-G: This method of inlet protection is applicable where heavy concentrated flows are expected. As shown in Figure 4, wire mesh should be laid over the drop inlet grate so that the wire extends a minimum of one foot beyond each side of the inlet structure. Wire mesh with ½ inch openings should be used. Clean coarse aggregate should be placed over the entire inlet structure, to a total depth of at least 12 inches. The aggregate should extend beyond the inlet structure at least 18 inches on all sides. Coarse aggregate should be TDOT #3, #357, or #5.

Sediment should be removed when the sediment has accumulated to one-half the height of the inlet protection. If the aggregate filter becomes clogged with sediment so that it no longer adequately performs its function, the aggregate should be pulled away from the structure, cleaned, and replaced.

Sod Inlet Protection IP-S: This method of inlet protection is applicable only at the time of permanent seeding, to protect the inlet from sediment and mulch material until permanent seeding has become established. As shown in Figure 5, the sod should be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure. Sod strips should be staggered so that adjacent strip ends are not aligned. Refer to **Disturbed Area Stabilization (With Sod) – SO** for soil

preparation, and sod installation and maintenance.

INSPECTIONS

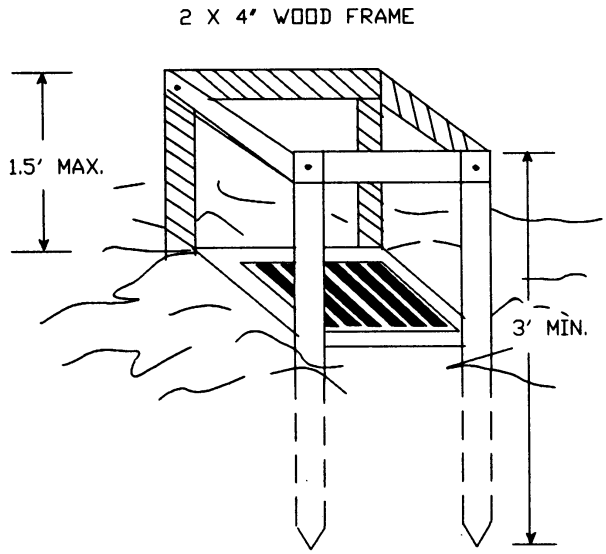
Inspections of storm drain inlet protection methods should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, such inspection may be conducted only once per month.

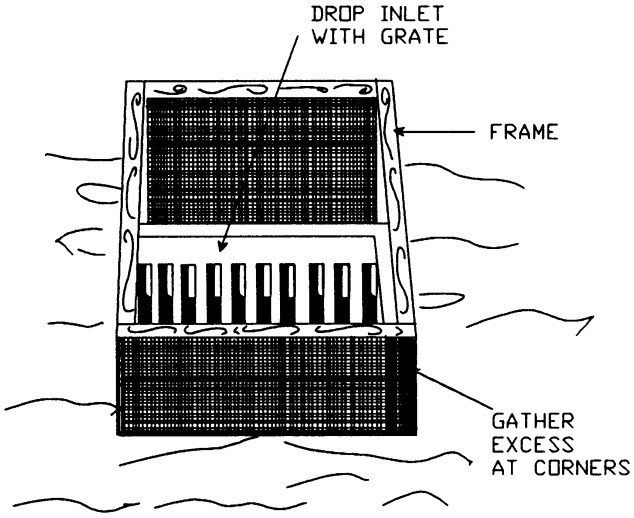
MAINTENANCE

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

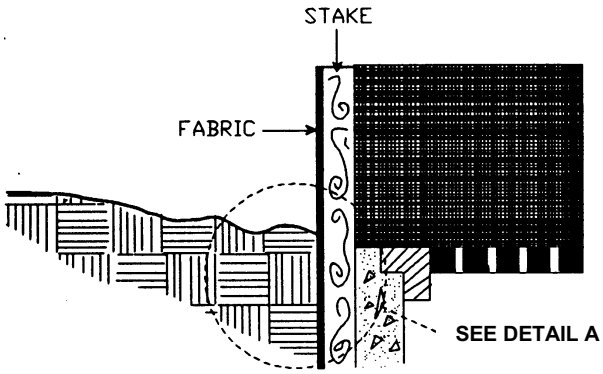
Sediment should not be allowed to wash into the storm drain inlet. It should be removed from the inlet protection and disposed of and stabilized so that it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment should be removed, and either salvaged or disposed of properly. The disturbed area should be brought to proper grade, then smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

Silt Fence Inlet Protection – IP-SF

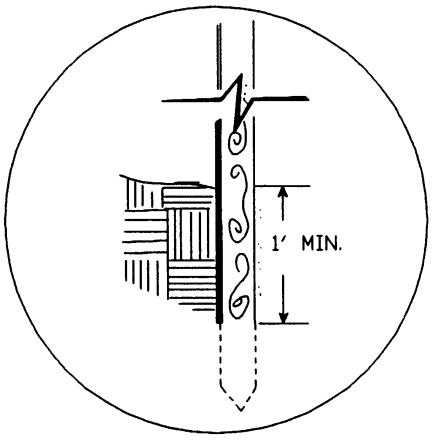




Perspective Views



Elevation of Stake and Silt Fence Orientation

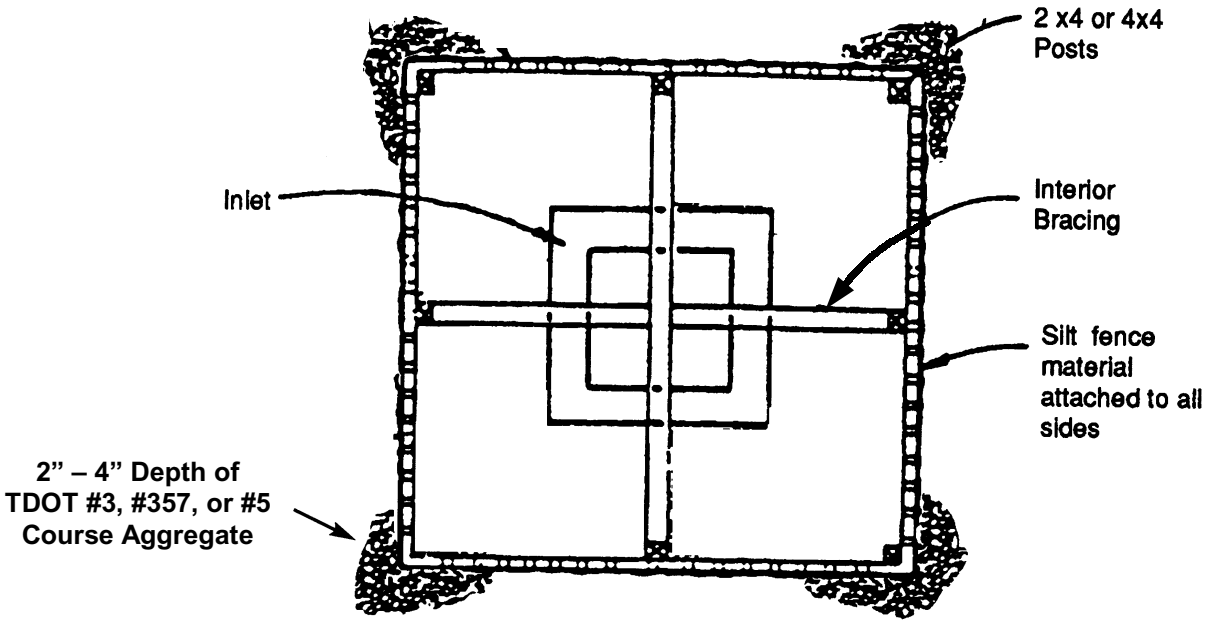


Detail A

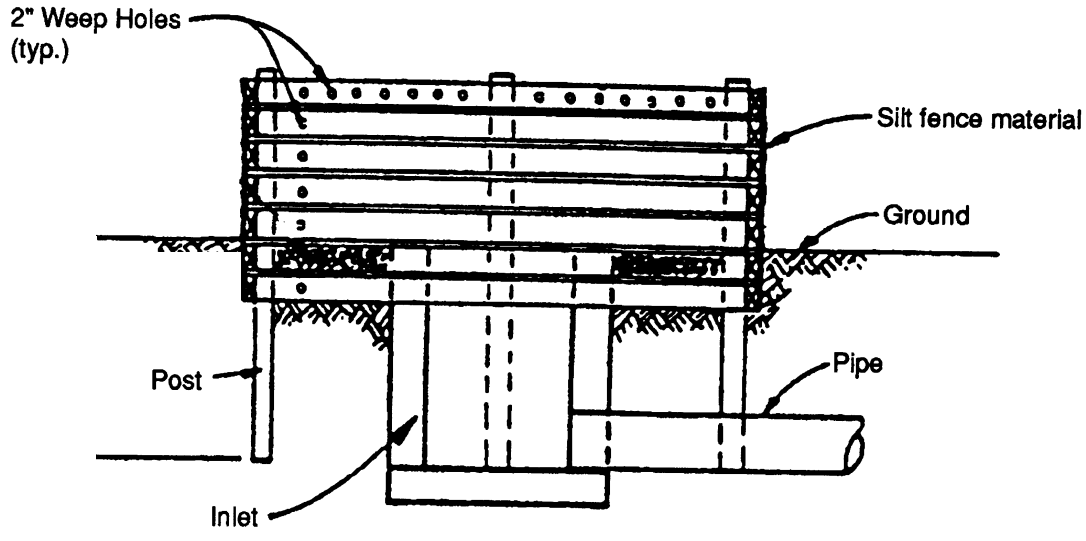
Figure 1

Source: NC SCC

Baffle Box Inlet Protection – IP-BB



PLAN



SIDE

Figure 2

Source: GA SWCC

Block and Gravel Inlet Protection - IP-BG

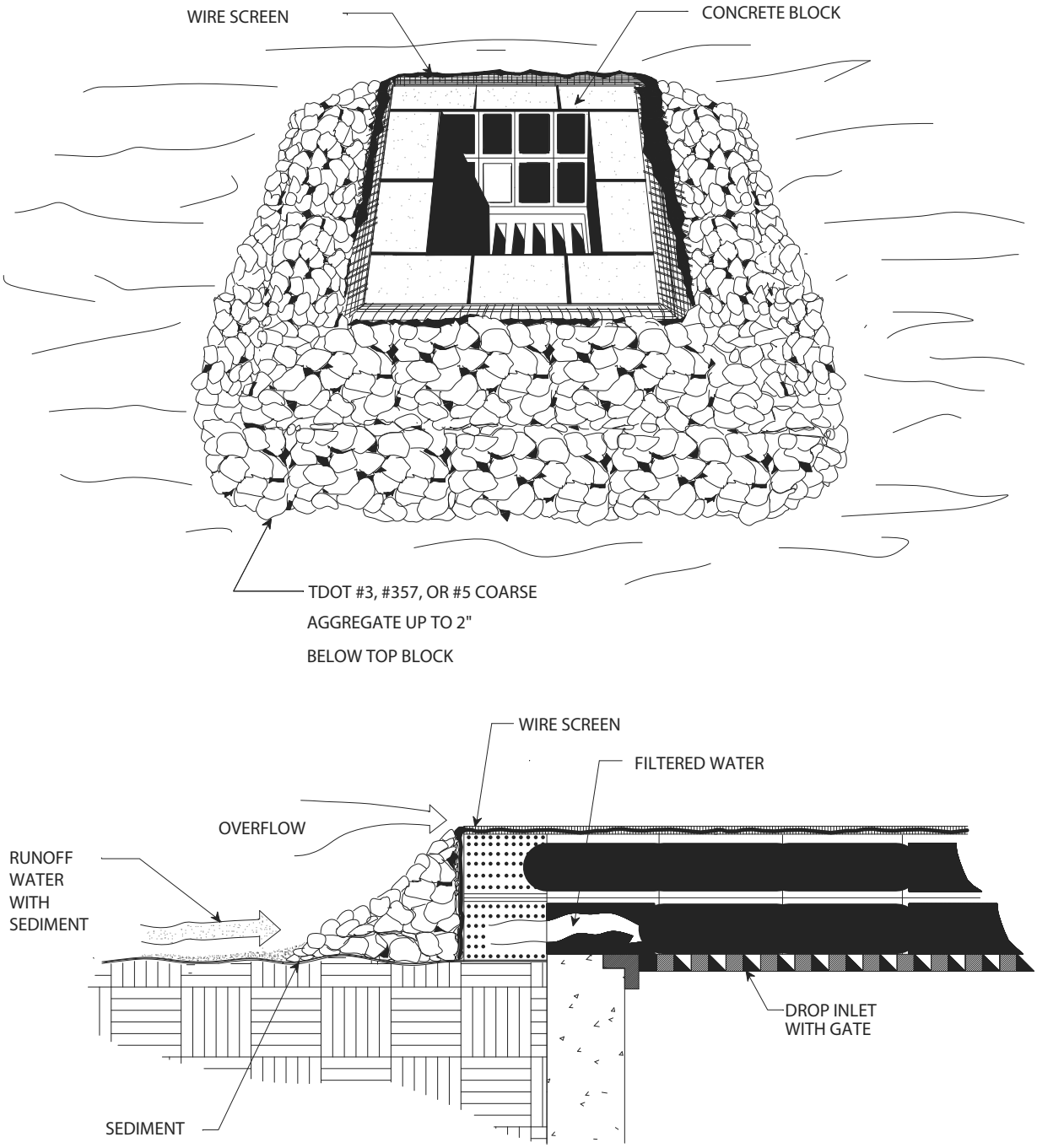
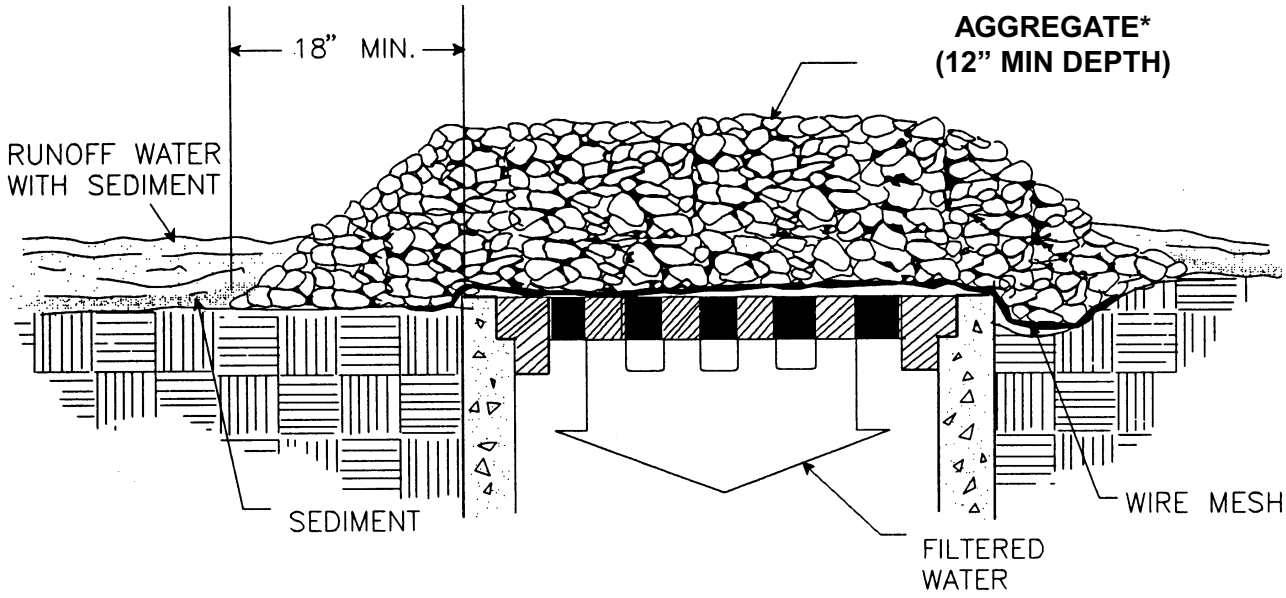


Figure 3

Source: VA DSWC

Gravel Inlet Protection – IP-G

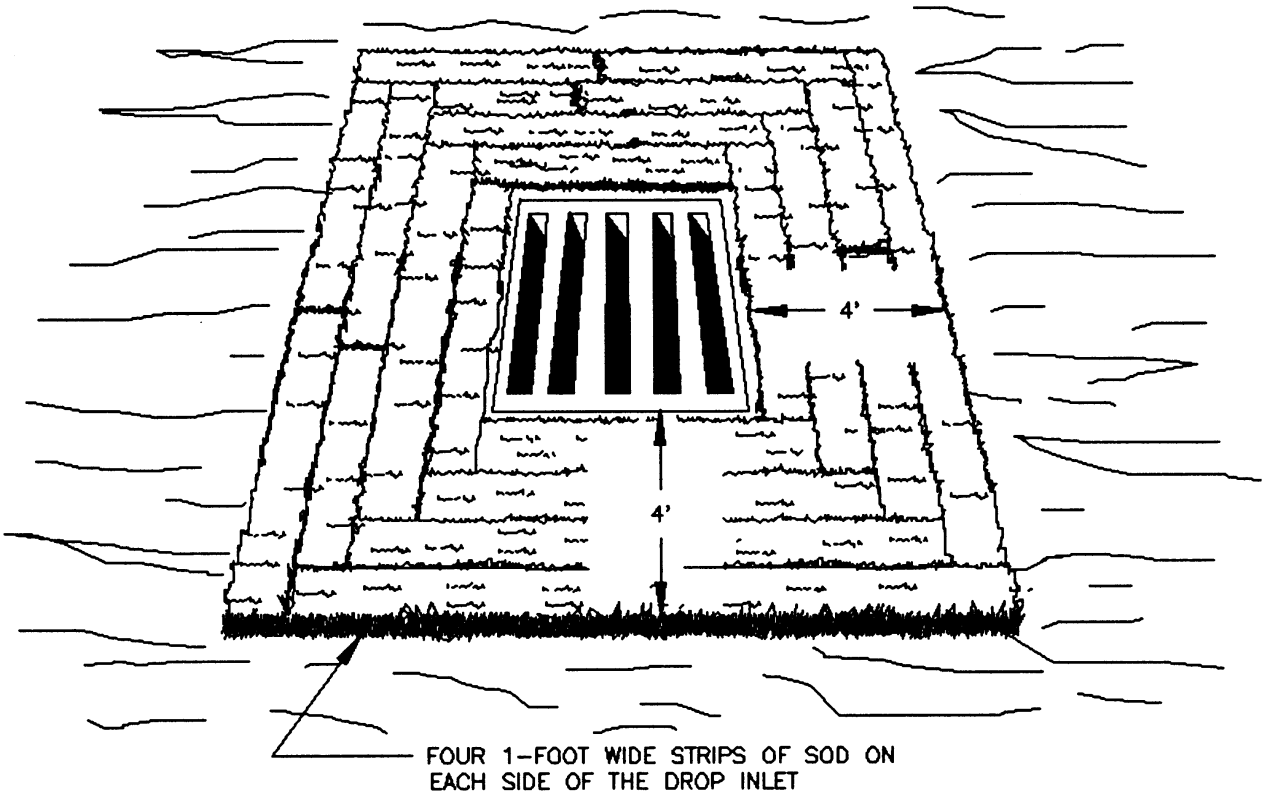


*** COARSE AGGREGATE SHOULD BE TDOT #3, #357, OR #5.**

Figure 4

Source: VA DSWC

Sod Inlet Protection – IP-S



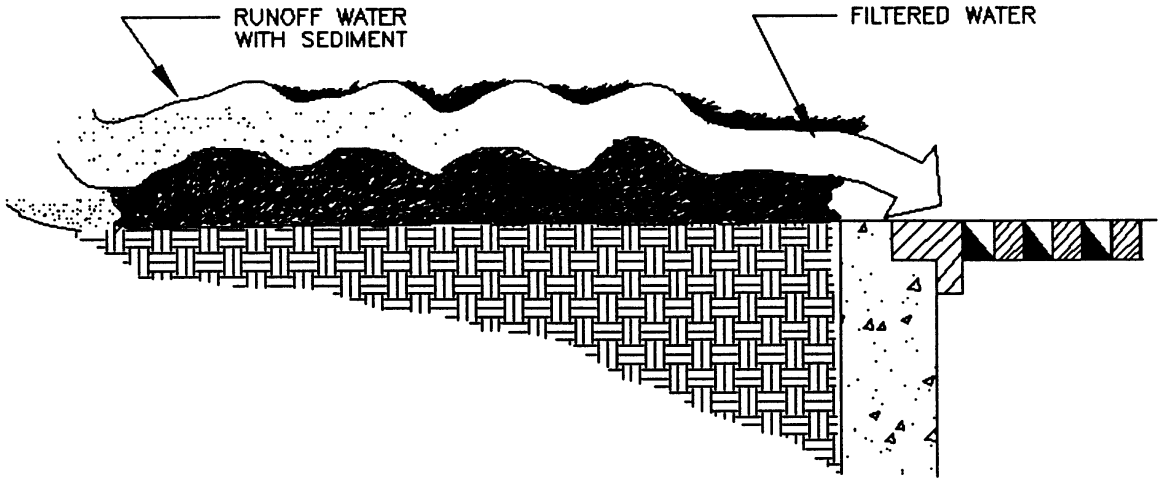


Figure 5

Source: VA DSWC

Storm Drain Outlet Protection - OP

DEFINITION

Paved and/or riprapped channel treatment, placed below storm drain outlets.

PURPOSE

To reduce storm water velocity and dissipate the energy of flow leaving a storm drain before it empties into receiving channels, and to armor erodible materials.

CONDITIONS

This standard applies to all storm drain outlets, road culverts, paved channel outlets, etc., discharging into natural or constructed channels. Treatment will extend between the points where flow exits the storm drain and where flow velocity and/or flow energy from the design storm event is dissipated to the degree where there is minimal to no risk of erosion of the receiving channel.

DESIGN CRITERIA

Structurally lined aprons at the outlets of pipes and paved channel sections should be designed by professionals familiar with storm water conveyance systems and according to the following criteria:

Capacity: The structure should be designed to handle the peak storm flow (Q), in cubic feet per second (cfs), from the 25-year, 24-hour frequency storm, or the design discharge of the water conveyance structure, whichever is greater.

Tailwater Depth: The design depth of thetailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. Manning's Equation may be used to determine tailwater depth. If the tailwater depth is less than half the diameter of the outlet pipe, it should be classified as a low tailwater condition. If the tailwater depth is greater than half the pipe diameter, it should be classified as a high tailwater condition. Pipes which outlet onto flat areas

with no defined channel may be assumed to have a low tailwater condition.

Materials: The apron may be lined with riprap, grouted riprap, or concrete. The median sized stone for riprap (d_{50}) should be determined according to tailwater conditions described in Table 1. Maximum stone size is equal to 1.5 times the d_{50} value. The gradation, quality and placement of riprap should conform to the specifications in **Riprap – RR.**

Apron Length (L_A): The apron length should be determined according to tailwater conditions described in Table 1.

Apron Width (W_A): See Figure 1. If the pipe discharges directly into a well-defined channel, the apron should extend across the channel bottom and up the channel banks to an elevation one foot above the high tailwater depth or to the top of the bank (whichever is less). If the pipe discharges onto a flat area with no defined channel, the width of the apron should be determined as follows:

1. The upstream end of the apron, adjacent to the pipe, should have a width three times the diameter of the outlet pipe.
2. For a low tailwater conditions, the downstream end of the apron should have a width equal to the pipe diameter plus the length of the apron.
3. For a high tailwater conditions, the down stream end should have a width equal to the pipe diameter plus 0.4 times the length of the apron.

Bottom Grade: The apron should be constructed with no slope along its length (0.0% grade). The invert elevation of the downstream end of the apron should be equal to the elevation of the invert of the receiving channel. There should be no turbulence at the end of the apron.

Side Slope: If the pipe discharges into a well-defined channel, the side slopes of the channel should not be steeper than 2:1.

Alignment: The apron should be located so that there are no bends in the horizontal alignment.

Geotextile: Geotextiles should be used as a separator between the graded stone, the soil base, and the abutments. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. The geotextile should be placed in direct contact with the subgrade without any voids. Refer to specification **Geotextile – GE.**

Energy Dissipaters and Stilling Basins: Structural controls, generally made from precast concrete or from pour-in-place concrete, should be used whenever concrete aprons are installed. The design of the energy dissipaters and stilling basins shown in Figure 2 are discussed in the Federal Highways Administration (FHWA) publication HEC- 14, Hydraulic Design of Energy Dissipaters for Culverts and Channels.

Stilling basins are used to convert flows from supercritical to subcritical flow rates by allowing a hydraulic jump to occur. The stilling basin allows a controlled hydraulic jump to occur within the structure over a wide range of flow conditions and depths. A professional engineer using hydraulic computations must design energy dissipaters and stilling basins. A primary concern for both energy dissipaters and stilling basins is whether sediment and trash can accumulate. TDOT drawing standards include a riprap basin energy dissipater, based upon procedures in HEC- 14. The United States Bureau of Reclamation (USBR) also has developed many designs of such structures.

CONSTRUCTION SPECIFICATIONS

1. Ensure that the subgrade for the geotextile and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.
2. Geotextile - Install a geotextile liner to prevent soil movement through the

openings in the riprap. Refer to specification **Geotextile – GE**.

3. Geotextile must meet design requirements and be properly protected from punching or tearing during installation. Repair any damage by removing the riprap and placing another piece of geotextile over the damaged area. All connecting joints should overlap a minimum of 1 foot. If the damage is extensive, replace the entire geotextile liner.
4. Riprap may be placed by equipment, but take care to avoid damaging the geotextile.
5. The minimum thickness of the riprap should be 1.5 times the maximum stone diameter, but not less than 6".
6. The outlet structure must conform to the specified grading limits shown on the plans.
7. Construct the apron on zero grade with no turbulence at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.
8. Ensure that the apron is properly aligned with the receiving stream and, preferably, straight throughout its length.
9. Immediately after construction, stabilize all disturbed areas with vegetation.
10. Stone quality - Select stone for riprap from fieldstone or quarry stone. The stone should be hard, angular, and highly weather-resistant. The specific gravity of the individual stones should be at least 2.5. Refer to specification **Riprap – RR**.

MAINTENANCE

Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

Riprap Outlet Protection Specifications

This table is intended to select two parameters for the design of riprap outlet protection, based upon outlet velocities that correspond with circular culverts flowing full. Flow values less than the lowest value for the culvert size usually indicate a full-flow velocity less than 5 feet per second, for which riprap is usually not necessary. Flow values more than the highest value for the culvert size usually indicates that a concrete stilling basin or energy dissipater structure is necessary.

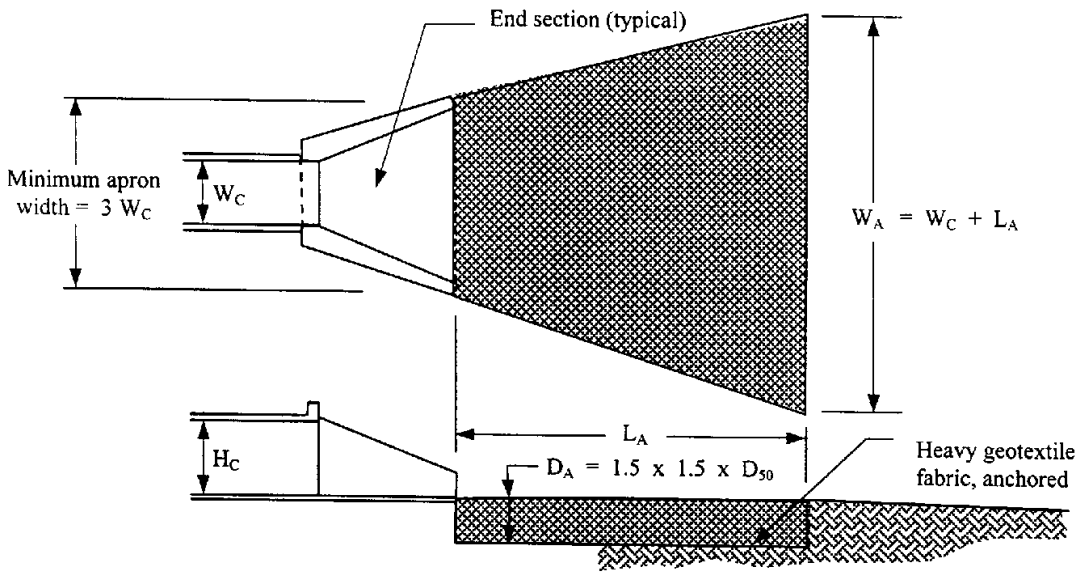
Adjust values upward if the circular culvert is not flowing full based upon outlet conditions. For noncircular pipe, convert into an equivalent cross-sectional area of circular culvert to continue design.

Riprap Aprons for Low Tailwater (downstream flow depth < 0.5 x pipe diameter)															
Culvert Diameter	Lowest value			Intermediate values to interpolate from									Highest value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12"	4	7	2.5	6	10	3.5	9	131	6	12	16	7	14	17	8.5
15"	6.5	8	3	10	12	5	15	16	7	20	18	10	25	20	12
18"	10	9	3.5	15	14	5.5	20	17	7	30	22	11	40	25	14
21"	15	11	4	25	18	7	35	22	10	45	26	13	60	29	18
24"	21	13	5	35	20	8.5	50	26	12	65	30	16	80	33	19
27"	27	14	5.5	50	24	9.5	70	29	14	90	34	18	110	37	22
30"	36	16	6	60	25	9.5	90	33	15.5	120	38	20	140	41	24
36"	56	20	7	100	32	13	140	40	18	180	45	23	220	50	28
42"	82	22	8.5	120	32	12	160	39	17	200	45	20	260	52	26
48"	120	26	10	170	37	14	220	46	19	270	54	23	320	64	37
Riprap Aprons for High Tailwater (downstream flow depth > 0.5 x pipe diameter)															
Culvert Diameter	Lowest value			Intermediate values to interpolate from									Highest value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12"	4	8	2	6	18	2.5	9	28	4.5	12	36	7	14	40	8
15"	7	8	2	10	20	2.5	15	34	5	20	42	7.5	25	50	10
18"	10	8	2	15	22	3	20	34	5	30	50	9	40	60	11
21"	15	8	2	25	32	4.5	35	48	7	45	58	11	60	72	14
24"	20	8	2	35	36	5	50	55	8.5	65	68	12	80	80	15
27"	27	10	2	50	41	6	70	58	10	90	70	14	110	82	17
30"	36	11	2	60	42	6	90	64	11	120	80	15	140	90	18
36"	56	13	2.5	100	60	7	140	85	13	180	104	18	220	120	23
42"	82	15	2.5	120	50	6	160	75	10	200	96	14	260	120	19
48"	120	20	2.5	170	58	7	220	85	12	270	105	16	320	120	20

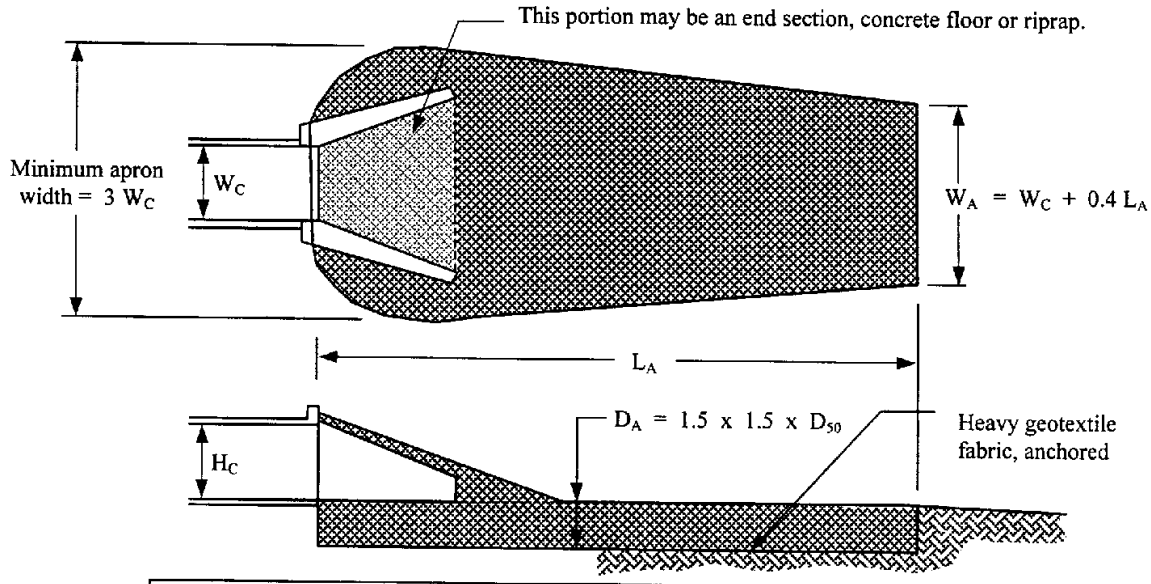
Table 1

Source: Knoxville Engineering Department

Riprap Outlet Protection



Tailwater < 0.5 H_C and Assuming Full Culvert Flow (Low Tailwater Conditions)



Tailwater > 0.5 H_C and Assuming Full Culvert Flow (High Tailwater Conditions)

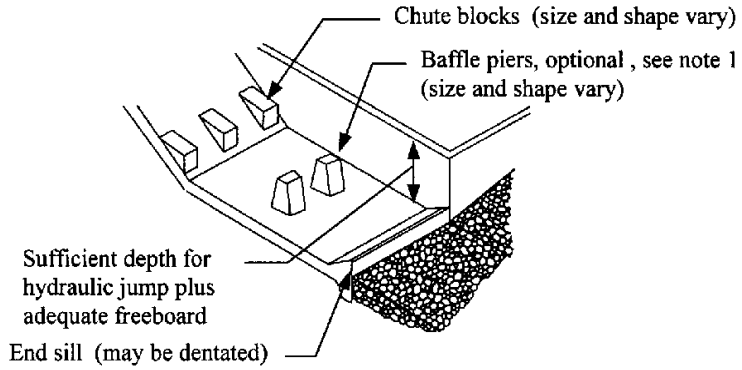
NOT TO SCALE

H_C	= height of culvert
W_C	= width of culvert
L_A	= length of riprap apron
W_A	= width of riprap apron at end
D_{50}	= median riprap size
D_{MAX}	= maximum size of riprap = 1.5 D_{50}
D_A	= depth of riprap apron = 1.5 D_{MAX}

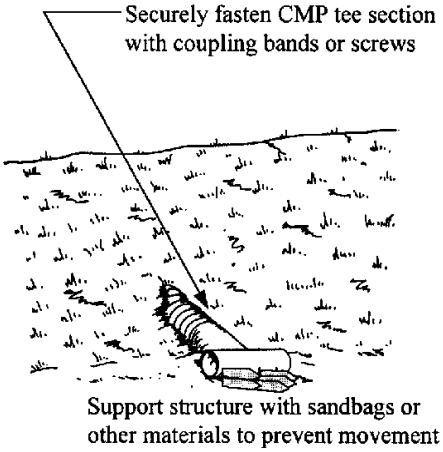
Figure 1

Source: Knoxville Engineering Department

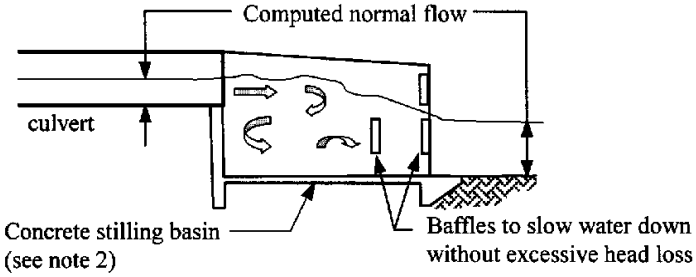
Various Energy Dissipaters and Stilling Basins



Typical Stilling Basin At End of Paved Flume or Chute



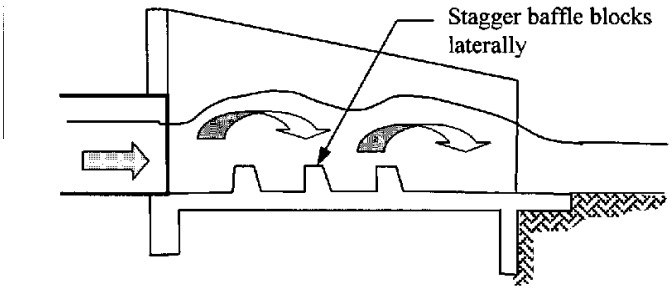
Temporary CMP Energy Dissipator



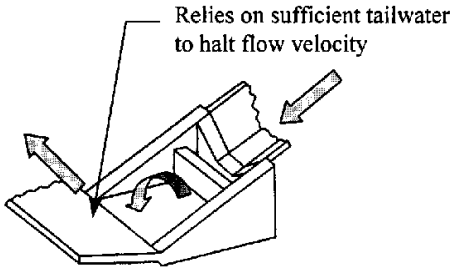
Typical Stilling Basin Using Baffles and Elevation Drop

Notes:

1. This is the basic format for several types of stilling basins. USBR Type II basin does not contain baffle piers, but does have a dentated end sill. USBR Type III basin has baffle piers and a smooth undentated end sill. See HEC-14 for detailed design of concrete structures.
2. Concrete stilling basin should be approximately as wide as the downstream channel. Design baffles to retain sufficient stormwater to act as a plunge pool for a wide range of flow values.



Typical Energy Dissipator – Baffle Blocks Within Headwall



Typical Impact Energy Dissipater (Virginia DOT)

Figure 2

Source: Knoxville Engineering Department

Surface Roughening - SR

DEFINITION

The use of mechanized equipment to apply a rough texture to soils at final grade.

PURPOSE

Surface roughening or scarification is a technique used for creating unevenness on bare soil to prevent slope erosion and the formation of rills. The primary functions of surface roughening are to:

- Reduce erosion potential by decreasing runoff velocities
- Trap sediment
- Increase infiltration of water into the soil
- Aid in the establishment of vegetative cover

DESIGN CRITERIA

Roughening methods with agricultural equipment include tilling, disking or harrowing, which must be done across the slope along the contour. Tracking (Figure 1) with tracked equipment, by contrast, must be done up and down the slope. Factors to be considered in choosing a method include slope steepness, long term slope maintenance and mowing requirements, type of soil, and whether the slope is formed by cutting or filling. Generally, a slope cannot be mowed if it is steeper than 3:1 (H:V). Roughening is performed after the slopes have been graded and dressed. Steep slopes may require the techniques discussed in specification **Gradient Treatment - GT.**

Cut Slope Roughening: Cut slopes are created by the removal of soil and/or rock material leaving a newly exposed slope face. Tilling, disking, and harrowing are acceptable methods of roughening a cut slope. Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour. Make grooves less than 10 inches apart and not less than 1 inch deep. Excessive roughness is undesirable where mowing is planned.

Roughening with tracked machinery should preferably be limited to soils with a sandy textural component to avoid undue

compaction of the soil surface. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Each pass should move across the slope gradually. Apply fertilizer, mulch, topsoil, or other soil amendments as necessary prior to grooving or tracking. Do not blade or scrape the final slope face.

Fill Slope Roughening: Fill slopes are created by the placement of fill material in a position that creates a slope. Fill slopes are not as stable as cut slopes, no matter how much compaction is applied. The face of the slope should consist of loose uncompacted fill 4 to 6 inches deep.

Use grooving or tracking to roughen the face of the slopes as necessary. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Each pass should move across the slope gradually. Apply fertilizer, mulch, topsoil, or other soil amendments as necessary prior to grooving or tracking. Do not blade or scrape the final slope face.

Stabilization: Once the treatment has been applied take the appropriate measures to stabilize all the bare area. Refer to specifications **Disturbed Area Stabilization (With Permanent Vegetation) - PS,** and **Matting and Blankets - MA.**

MAINTENANCE

Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

Surface Roughening

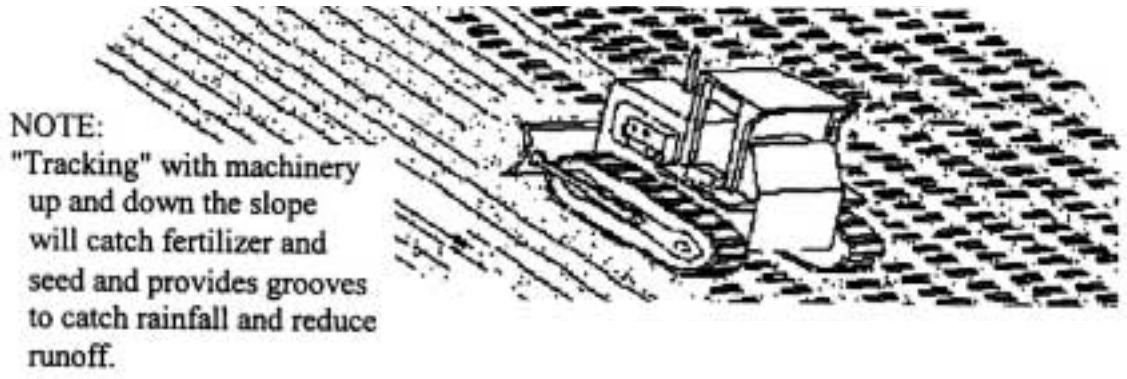


Figure 1

Source: Knoxville Engineering Department

STREAM ALTERATION PRACTICES

Stream Diversion Channel SDC

DEFINITION

A temporary channel constructed to convey stream flow around in-stream construction.

PURPOSE

Stream diversion channels are used to allow in-stream work to be conducted separate from flowing water as required by Aquatic Resource Alteration Permits.

CONDITIONS

Linear projects, such as utilities or roads, frequently cross streams creating a potential for excessive sediment loss into a stream, by both the disturbance of the approach areas, and by the work within the streambed and banks. Disturbance within the confines of stream banks are required to be conducted "in the dry" or separate from flowing water. **No excavation equipment should ever be operated in flowing waters.**

In cases where in-stream work is unavoidable, a stream diversion channel should be considered to prevent excessive damage from sedimentation. To limit land-disturbance, overland pumping of the stream should be considered in low-flow conditions whenever possible.

Some streams are too large to construct a diversion channel for. In those cases, consider the use of alternative structures in order for work to be conducted in dry conditions. Examples of alternative structures are cofferdams and geotextile tubes.

The duration of use of the diversion should be minimized to the shortest period of time possible. Clearing of the streambed and banks should be kept to a minimum.

Work that requires a stream diversion channel requires authorization from the Tennessee Division of Water Pollution Control and United States Army Corps of Engineers.
For more information, see Appendix C and:
http://www.state.tn.us/environment/permits/arap.htm

DESIGN CRITERIA

Professionals familiar with the design of water conveyance systems should prepare construction plans and drawings for this technique.

Size: The bottom width of the stream diversion should be equal to the bottom width of the existing streambed, at a minimum. The capacity of the temporary channel should be designed to be equivalent to the bankfull capacity of the existing channel.

Side Slopes: Side slopes of the stream diversion channel should be no steeper than 2:l.

Depth and Grade: Depth and grade may be variable, dependent on site conditions, but should be sufficient to ensure continuous flow of water in the diversion.

Channel Lining: See Figure 1. A stream diversion channel should be lined to prevent erosion of the channel and sedimentation in the stream. The lining is selected based upon the expected velocity of bankfull flow. Table 1 shows the selection of channel linings that may be used: turf reinforcement mat or sod – **SDC-A**; geotextile – **SDC-B**; or TDOT Class A-1 riprap and geotextile – **SDC-C**. Refer to specifications **Riprap - RR**, **Matting – MA**, and **Geotextile** – **GE.**

Geotextile: Geotextiles should be used as a protective cover for soil or, if the channel is to be lined with riprap, as a separator between graded stone and the soil base. The geotextile will prevent erosion of the channel and the migration of soil particles from the subgrade into the graded stone. Care should be taken to place the geotextile in direct contact with the soil such that no void spaces exist between the underlying soil and the geotextile.

CONSTRUCTION SPECIFICATIONS

1. The channel should be excavated, and constructed with plugs at both ends. Plugs may be constructed of riprap, sandbags or sheet piling, or may be undisturbed soil left in place. See Figure 2.

2. Silt fence or a diversion berm should be placed along the sides of the channel to prevent unfiltered runoff from entering the stream. The diversion berm can be constructed using the material excavated for the stream diversion. Refer to specifications **Silt Fence - SF** or **Diversion** – **DI**.

3. The channel surface should be smooth (to prevent tearing of the liner) and lined with the material specified in the plans. The outer edges of the geotextile should be secured at the top of the channel with compacted soil.

4. The plugs are removed when the liner installation is complete, removing the downstream plug first.

5. As soon as construction in the streambed is complete and the streambed has been restored to its previous condition, the diversion should be replugged and backfilled. The liner may be inspected for damage and salvaged if possible.

6. Upon removal of the liner, the diversion channel should immediately be restored and properly stabilized.

MAINTENANCE

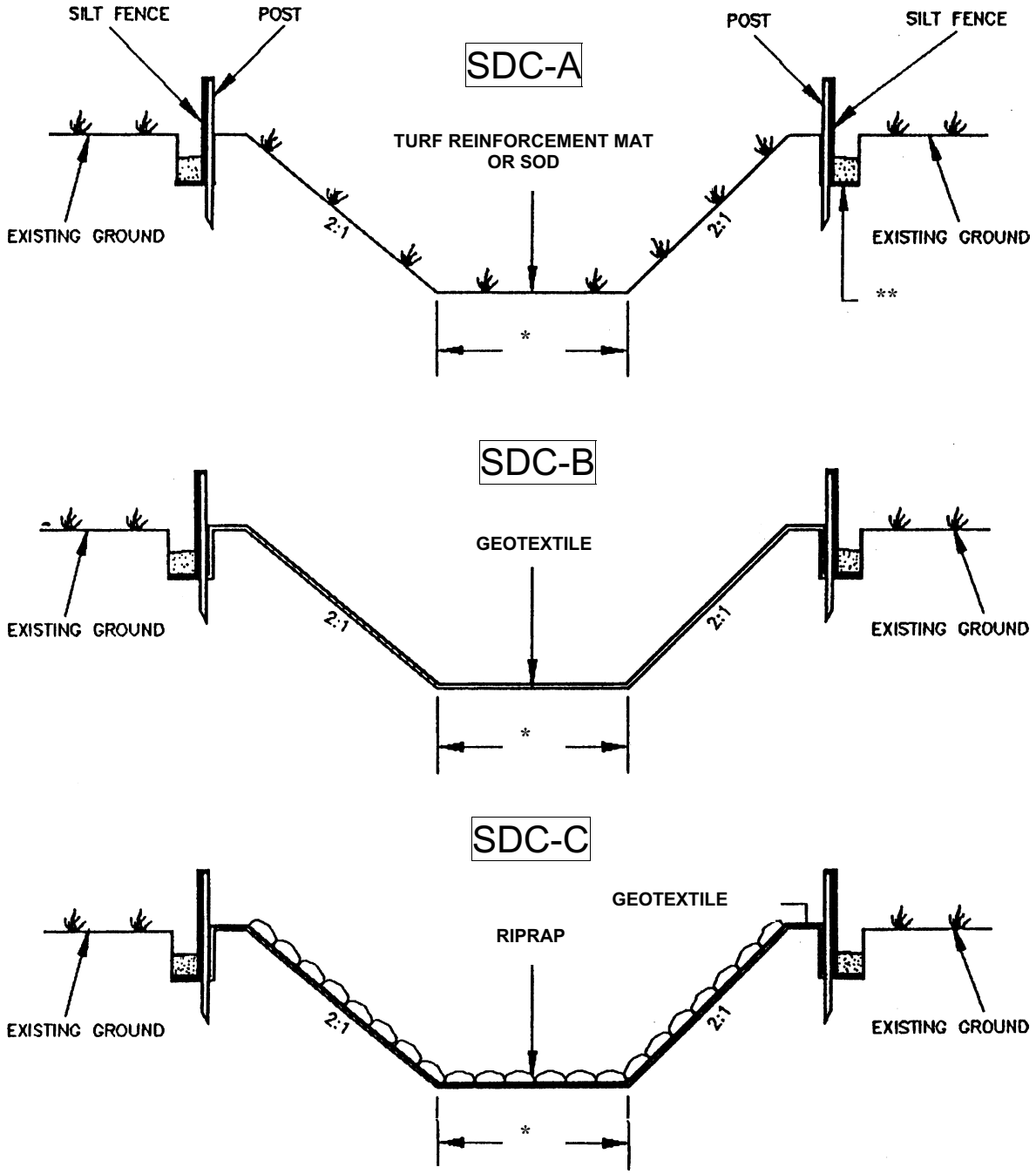
The stream diversion channel should be inspected at the end of each day to make sure that the stream flow control measures and construction materials are positioned securely. This will ensure that the work area stays dry and that no construction materials float downstream. All repairs should be made immediately.

Temporary Stream Diversion Channel Linings

Lining Materials	Symbol	Acceptable Velocity Range
Turf Reinforcement Matting or Sod	SDC-A	0 - 2.5 ft./sec.
Geotextile	SDC-B	2.5 - 9.0 ft./sec.
TDOT Class A-1 Riprap and Geotextile	SDC-C	9.0 - 13.0ft./sec.

Table 1

Stream Diversion Channel Linings



* WIDTH OF EXISTING STREAM CHANNEL BOTTOM

** ENTRENCH SILT FENCE AND GEOTEXTILE IN SAME TRENCH.

Figure 1

Source: GA SWCC

Stream Diversion Channel (perspective view)

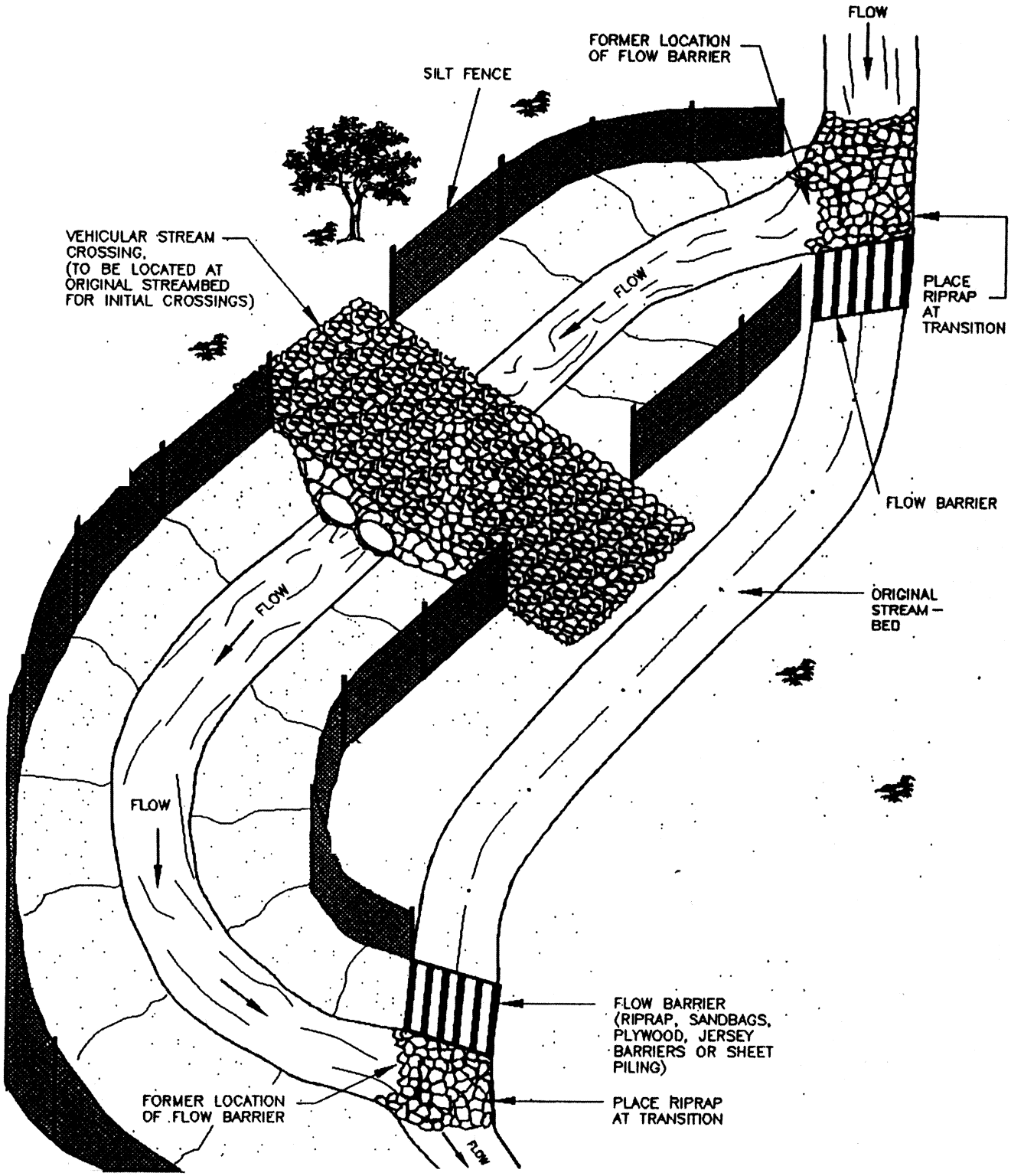


Figure 2

Source: GA SWCC

Temporary Stream Crossing - TSC

DEFINITION

A temporary structure installed across a flowing stream or watercourse for use by construction equipment.

PURPOSE

This standard provides a means for construction vehicles to cross streams or watercourses without moving sediment into the stream, damaging the streambed or channel, or causing flooding.

CONDITIONS

All stream crossings require authorization from the Tennessee Division of Water Pollution Control and United States Army Corps of Engineers prior to construction. For more information, see Appendix C and: http://www.state.tn.us/environment/permits/arap.htm

Structures may include bridges, round pipes, or pipe arches. Temporary stream crossings should be in place for less than one year, and should not be accessible to the general public.

DESIGN CRITERIA

Professionals familiar with the hydraulic calculations necessary to accomplish the work should design stream crossing construction plans and drawings using sound engineering practices.

Size: The structure may be sized large enough to convey the bankfull flow of the stream, typically flows produced by a 2-year, 24-hour frequency storm, with normal high water protection since the flood plain will become effective at the bankfull elevation. However, if the crossing is designed as a low-water crossing, provision must be made for additional overflow protection of the structure, to prevent washout during high flow events.

Location: The temporary stream crossing should be perpendicular to the stream. Where approach conditions dictate, the crossing may vary up to 15º from the perpendicular.

Overflow Protection: Structures should be protected from washout during periods of peak discharges by diverting high flows around or over the structures. Methods to be considered for washout protection may include elevation of bridges above adjacent flood plain lands, crowning of fills over pipes, or by the use of diversions, dikes or island type structures. Frequency and intended use, stream channel conditions, overflow areas, potential flood damage, and surface runoff control should be considered when selecting the type of temporary stream crossing to be used.

Temporary Bridge Crossing - SC-B: A temporary access bridge causes the least erosion of the stream channel crossing when the bridge is installed and removed (See Figure 1). It also provides the least obstruction to flow and fish migration. Provided that the bridge is properly designed and appropriate materials are used, a temporary access bridge typically is long lasting and requires little maintenance. It may also be salvaged at project's end and used again in the future. However, a temporary bridge crossing is generally the most expensive crossing to design and construct. It also creates the greatest safety hazard if not adequately designed, installed, and maintained.

Temporary Culvert Crossing - SC-C: A temporary access culvert is the most common stream crossing. It can control erosion effectively, but can cause erosion when it is installed and removed. A temporary culvert can be easily constructed and enables heavy equipment loads to be used. However, culverts create the greatest obstruction to flood flows and are subject to blockage and washout.

The crossing may be designed based on the stream flows resulting from a 2-year, 24-hour frequency storm, in which case, Class A or B riprap may be used for normal erosion protection of the aggregate fill, and the roadbed would be at the elevation of the top of the banks. For temporary crossings of streams with large watersheds, the crossing may also be designed based on the low-flow channel conditions as a low water crossing. The culvert size would be adequate to convey base flows, but high water events would overtop the structure and make the crossing temporarily unusable. Additional erosion protection of the fill would be necessary for this design, in the form of Class C or larger riprap to prevent the washout of the culverts.

CONSTRUCTION SPECIFICATIONS

All Crossings

1. In-stream work should be performed in dry conditions. Utilize a stream diversion channel or cofferdams to provide dry conditions for conducting the work. Refer to specification **Stream Diversion Channel – SDC**. Clearing of the streambed and banks should be kept to a minimum.

2. All surface water from the construction site should be diverted onto undisturbed areas adjoining the stream. Unstable stream banks should be lined with riprap or otherwise appropriately stabilized.

3. The crossing alignment shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary up to 15º from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. The centerline of both roadway approaches should coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. A water diverting structure such as a waterbar diversion should be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet distance is measured from the top of the waterway bank. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is

not required. Refer to specification **Diversion – DI.**

6. The crossing structure should be removed as soon as it is no longer necessary for access. During structure removal, utilize a stream diversion channel or cofferdams to provide dry conditions for conducting the work.

7. Upon removal of the crossing structure, the stream should immediately be restored to its original cross-section and properly stabilized.

Temporary Bridge Crossing - SC-B

1. The temporary bridge should be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

2. Abutments should be placed parallel to the stream and on stable banks.

3. Bridges should be constructed to span the entire channel. If the channel width exceeds eight feet (as measured from the tops of the banks), a temporary footing, pier, or bridge support may be constructed within the waterway.

4. Decking materials should be of sufficient strength to support the anticipated load. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

5. Bridges should be securely anchored at only one end using steel cable or chain. This will prevent channel obstruction in the event that floodwaters float the bridge. Large trees, large boulders, or driven steel anchors can serve as anchors.

Temporary Culvert Crossing - SC-C

1. All culverts must be strong enough to support their cross-sectioned area under maximum expected loads.

2. The invert elevation of the culvert should be installed on the natural streambed grade at both ends.

3. A geotextile should be placed on the streambed and stream banks prior to the placement of the pipe culvert(s) and aggregate. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. The geotextile should cover the streambed and extend a minimum of six inches and a maximum of one foot beyond the end of the culvert and bedding material. Refer to specification **Geotextile – GE.**

4. The culverts should extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert.

5. The culvert(s) should be covered with small riprap, such as TDOT Class A-1. The depth of riprap above the top of the culvert should be one-half the diameter of the culvert or 18” whichever is greater.

6. Multiple culverts should be separated by one-half the diameter of the culvert or 12”, whichever distance is greater. A final layer of coarse aggregate, such as TDOT #57, should be applied to minimum depth of 6-inchs.

MAINTENANCE

The structure should be inspected after every rainfall and at least once a week, and all damages repaired immediately. The structure should be removed immediately after construction is finished, and the streambed and banks must be stabilized and restored to pre-construction conditions.

Temporary Bridge Crossing – SC-B

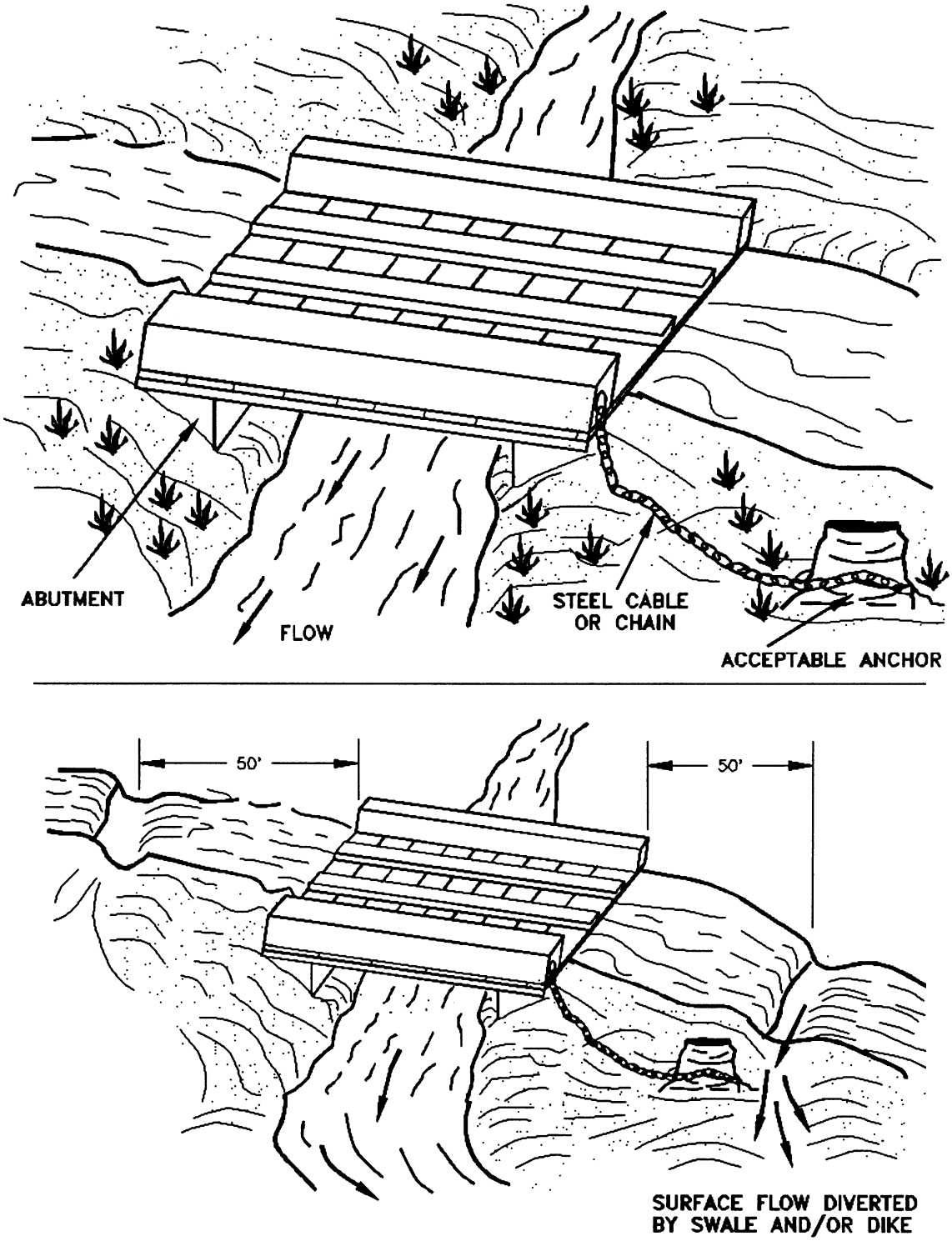
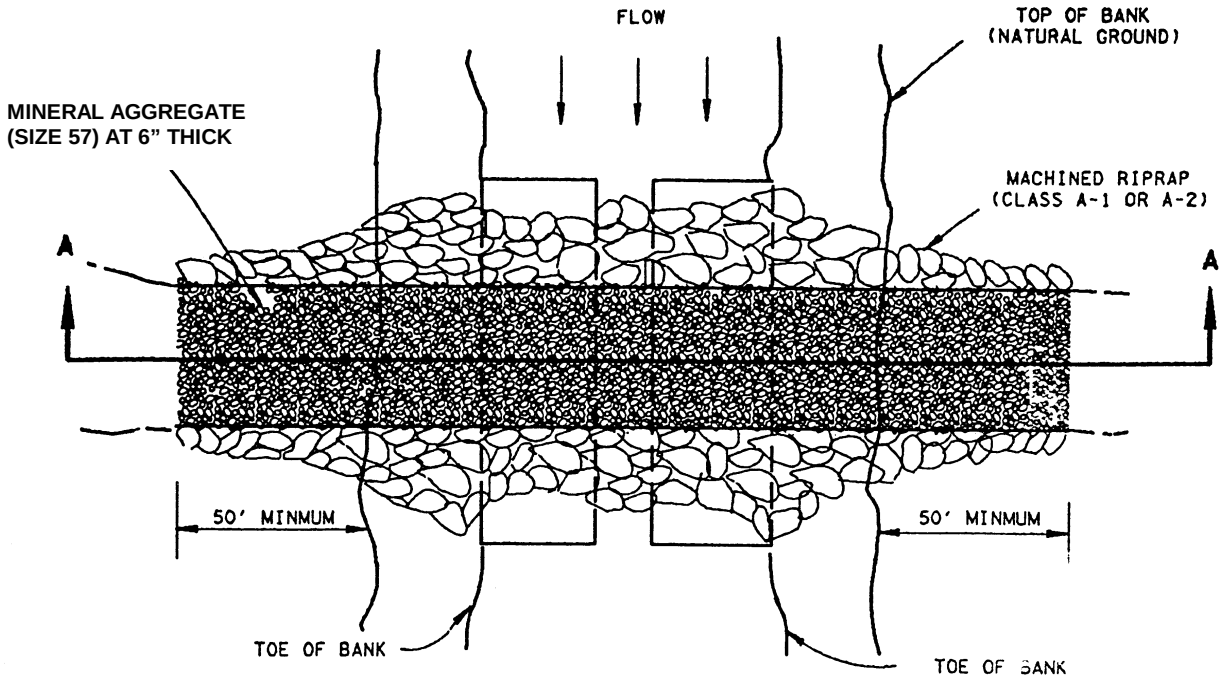


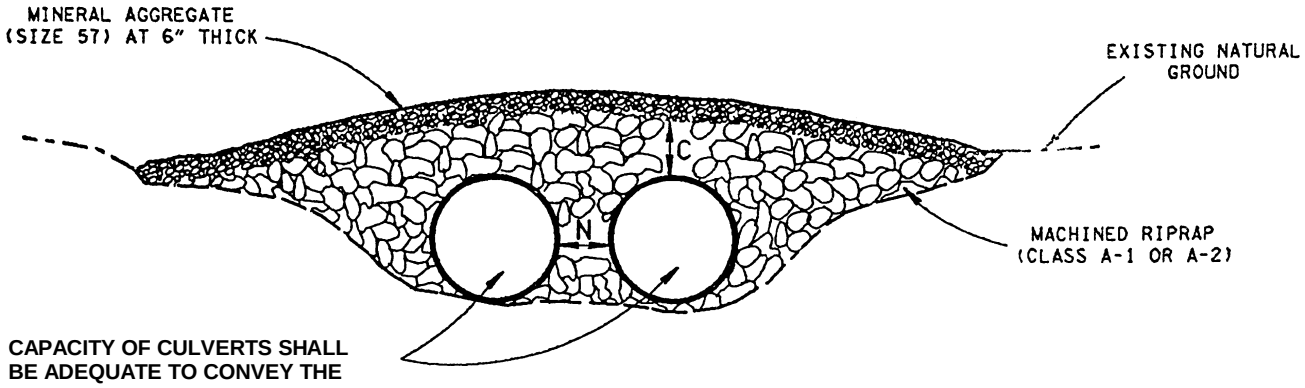
Figure 1

Source: Maryland Water Resources Administration

Temporary Culvert Crossing – SC-C



PLAN VIEW OF TEMPORARY
CULVERT STREAM CROSSING



CAPACITY OF CULVERTS SHALL
BE ADEQUATE TO CONVEY THE
DESIGN FLOW

SECTION A - A

C = ½ DIAMETER OF PIPE OR 18" WHICHEVER IS GREATER.
N = ½ DIAMETER OF PIPE OR 12" WHICHEVER IS GREATER.

Figure 2

Source: TDOT English Standard Drawings

Bioengineered Stream Bank Stabilization - SBS

DEFINITION

The use of readily available native plant materials to maintain and enhance stream banks; or to prevent, or repair and restore small stream bank erosion problems.

PURPOSE

- Trap sediment from adjacent land
- Form a root mat to stabilize and reinforce the soil on the stream bank
- Provide wildlife habitat
- Enhance the appearance of the stream
- Lower summertime water temperatures providing a healthy aquatic environment

DESIGN CRITERIA

Bioengineering is a stream bank stabilization technique that uses natural materials such as grasses, shrubs, trees, roots, and logs to divert water away from eroding banks, and stabilize the bank. Bioengineering is the preferred method of stream bank stabilization, and is permitted without notification where no work is done in stream with mechanized equipment; and where the work is done in accordance with an approved bioengineering plan from the United States Department of Agriculture, Natural Resource Conservation Service (NRCS).

Stream bank stabilization without an NRCS approved plan requires authorization from the Tennessee Division of Water Pollution Control and may require authorization from the United States Army Corps of Engineers.
For more information, see Appendix C and:
http://www.state.tn.us/environment/permits/arap.htm

SELECTED MEASURES

Careful thought, planning and execution are required to assure that the stream bank stabilization project will be successful and long living.

Revegetation includes seeding and sodding of grasses, seeding grasses in combination with erosion control fabrics, and the planting of woody vegetation (shrubs and trees). Refer to specifications **Disturbed Area Stabilization**

Area Stabilization (With Sod) - SO, and Buffer Zone - BF.

Use erosion control blankets to aid in soil stabilization and revegetation. Refer to specification **Erosion Control Blanket/Matting - MA.**

Live Stake: Fresh, live cut woody plant cuttings are driven into the ground as stakes, intended to root and grow into mature shrubs that will stabilize soils and restore the riparian zone habitat. Live stakes provide no immediate stream bank stabilization. Only certain species of woody plants will work well for this application. Willow species work best. See Figure 1.

Live Stake

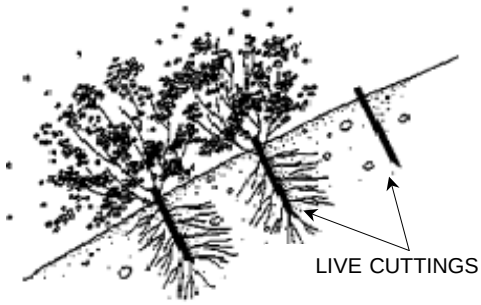


Figure 1

Note: The following information applies to all of the figures in this standard:

Rooted/leafed condition of the living plant material is not representative at the time of installation. Source of all figures: GA SWCC

Live stakes may also be driven into riprap protected banks to help with permanent stabilization, and improve aesthetics.

Live Fascine: Live fascines are sausage-like bundles of live cut branches placed into trenches along the stream bank. See Figure 2. They provide immediate protection from erosion when properly used and installed. Willow species work best.

Live fascines create very little site disturbance as compared to other systems and works especially well when combined with surface covers such as jute mesh or coir fabrics.

Live Fascine

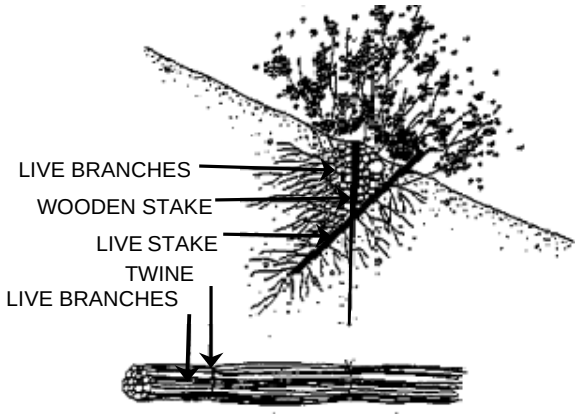


Figure 2

Brushmattress: A combination of living units that forms an immediate protective surface cover over the stream bank. See Figure 3. Living units used include live stakes, live fascines, and a mattress branch cover (long, flexible branches placed against the bank surface).

Brushmattreses require a great deal of live material, and are complicated as well as expensive to evaluate, design, and install.

Brushmatresses capture sediment during flood conditions, produce habitat rapidly, and quickly develop a healthy riparian zone.

Brushmattress

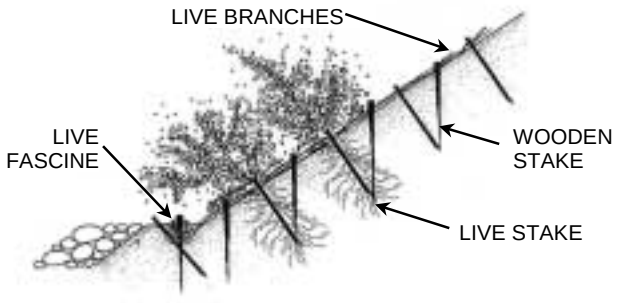


Figure 3

Live Cribwall: A rectangular framework of logs or timbers, rock, and woody cuttings. See

Figure 4. This requires a great deal of assessment and understanding of stream behavior.

Cribwalls can be complicated and expensive if a supply of wood is not available.

Benefits include developing a natural stream bank or upland slope appearance after it has begun to grow and provides excellent habitat for a variety of fish, birds, and animals. It is very useful where space is limited on small, narrow stream corridors.

Live Cribwall

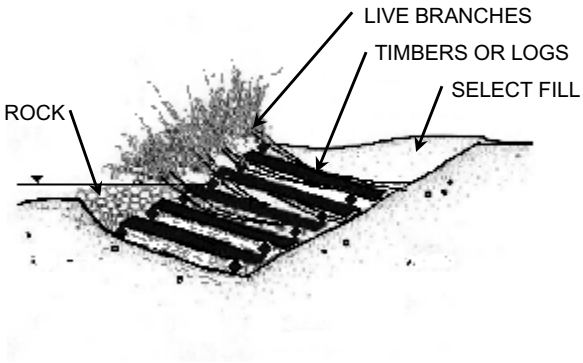


Figure 4

Branchpacking: Process of alternating layers of live branches and soil, incorporated into a hole, gully, or slumped-out area in a slope or stream bank. See Figure 5. There is a moderate to complex level of difficulty for construction.

Branchpacking produces an immediate filter barrier, reducing scouring conditions, repairing gully erosion, and providing habitat cover and bank reinforcement.

This is one of the most effective and inexpensive methods for repairing holes in earthen embankments along small stream sites.

Branchpacking

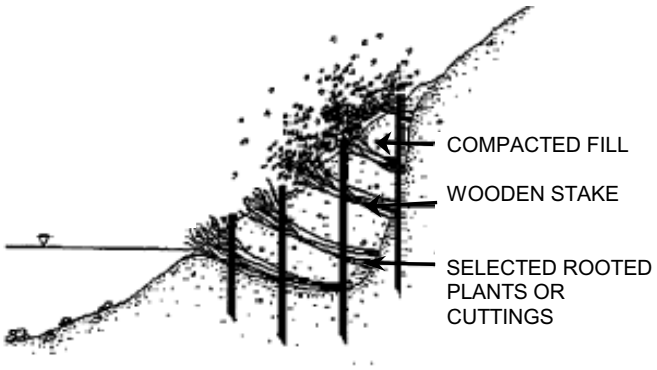


Figure 5

MAINTENANCE

Check banks after every high-water event, fixing gaps in the vegetative cover at once with structural materials or new plants, and mulching if necessary. Fresh cuttings from other plants may be used for repairs.

APPENDIX A.
CONSTRUCTION GENERAL PERMIT

Tennessee General Permit No. TNR10-0000
Storm Water Discharges from Construction Activities

Table of Contents

Tennessee General Permit No. TNR10-0000
Storm Water Discharges from Construction Activities

On this page...Part I.

Part I. Conditions of coverage under this permit

I.A. Permit area

This general permit covers all areas of the State of Tennessee.

I.B. Discharges covered by this permit

1. Storm water discharges associated with construction activity

This permit authorizes discharges of storm water from construction activities defined as follows:

> construction activity including clearing, grading and excavation activities except: operations that result in the disturbance of less than five acres of total land area and which are not part of a larger common plan of development or sale.

This permit may authorize discharges from sites that result in the disturbance of less than five acres of total land area if: **i.** the Director has determined that the discharge from a site is contributing to, or is likely to contribute to, a violation of a State water quality standard; or is a significant contributor of pollutants to waters of the State, or is likely to be a significant contributor of pollutants to waters of the State; or **ii.** changes in State or Federal rules require sites of five acres or less to obtain a storm water permit. Otherwise, projects or developments of less than five acres of land disturbance are not required to obtain authorization under this permit.

Note: Any discharge of storm water or other fluid to an improved sinkhole or other injection well, as defined, must be authorized by permit or rule as a Class V underground injection under the provisions of Tennessee Rule Chapter 1200-4-6.

2. Storm water discharges from construction support activities

This permit also authorizes storm water discharges from support activities (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

a. The support activity is primarily related to a construction site that is covered under this general permit and the owner/operator of the support activity is the same as the owner/operator of the construction site;
b. The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and
c. Appropriate controls and measures are identified in a storm water pollution prevention plan covering the discharges from the support activity areas.

Process wastewater discharges from these activities are not authorized by this permit. Process wastewaters must be authorized by an individual permit or appropriate, other general permit.

On this page...Section I.B.3.; I.C.; I.D.

3. Certain non-storm water discharges are covered by this permit.

   The following non-storm water discharges from active construction sites are authorized by this permit provided the non-storm water component of the discharge is in compliance with section IV.D.5 (non-storm water discharges): dewatering of work areas of collected storm water and ground water; waters used to wash vehicles (of dust and soil, not process materials such as concrete) where detergents are not used and detention and/or filtering is provided before the water leaves site; water used to control dust in accordance with item IV.D.2.c.ii.; potable water sources including waterline flushings; routine external building washdown which does not use detergents; uncontaminated ground water or spring water; foundation or footing drains where flows are not contaminated with process materials such as solvents.

I.C. Discharges not authorized by this permit

The following storm water discharges are <u>not</u> authorized by this permit:

1. Post-Construction Discharges - Storm water discharges that originate from the construction site after construction activities have been completed and the site has undergone final stabilization.
2. Discharges Mixed with Non-storm Water - Discharges that are mixed with sources of non-storm water, other than discharges which are identified in section III.A.2. of this permit and which are in compliance with section IV.D.5 (non-storm water discharges) of this permit. Any discharge authorized by a different NPDES permit may be commingled with discharges authorized by this permit.
3. Discharges Covered by Another Permit - Storm water discharges associated with construction activity that have been issued an individual permit in accordance with paragraph VII.L.
4. Discharges Threatening Water Quality - Storm water discharges from construction sites that the Director determines will cause, or have the reasonable potential to cause, violations of water quality standards. (Where such determinations have been made, the discharger will be notified by the Director in writing that an individual permit application is necessary. The individual permit application will be on forms as determined by the Director.)
5. Discharges Causing or Contributing to the Impairment of a Section 303(d)-Listed Water – The State shall not grant coverage under this permit for discharges that are causing or contributing to the impairment of a Section 303(d) listed water or any water identified as impaired since promulgation of the latest 303(d) list.
6. Discharges Not Protective of Federally or State listed Threatened and Endangered Species - Storm water discharges and storm water discharge-related activities that are not protective of legally protected listed or proposed threatened or endangered aquatic fauna in the receiving stream(s); or discharges or activities that would result in a “take” of a Federally listed endangered or threatened fish or wildlife species; if the State finds that storm water discharges or storm water related activities are likely to result in any of the above effects, the State will deny the coverage under this general permit unless and until project plans are changed to protect the listed species.
7. Discharges from a New or Proposed Mining Operation – Discharges from a new or proposed mining operation are not covered by this permit.
8. Discharges Negatively Affecting a Property on the National Historic Register – Storm water discharges that would negatively affect a property that is listed or is eligible for listing in the National Historic Register maintained by the Secretary of Interior.

On this page...beginning at I.D.; I.E.

I.D. Submitting an NOI is required to obtain coverage under the permit.

1. Preparation of pollution prevention plan prior to submitting NOI

   In order for storm water discharges from construction activities to be authorized to discharge under this general permit, a discharger must:

   a. First develop a pollution prevention plan (covering either the entire site or all portions of the site for which they are operators; see definition in Part IX.) according to the requirements in Part IV (preparation and implementation of the Plan may be a cooperative effort where there is more than one operator at a site); and

   b. Submit a Notice of Intent (NOI) in accordance with the requirements of Part II, using an NOI form provided by the Director (or a photocopy thereof). The Pollution Prevention Plan must be prepared prior to submittal of NOI and implemented upon commencement of construction activities.

2. New NOI for new operator

   For construction sites where an operator changes, or where a new operator is added after the submittal of the NOI under Part II, a new NOI for the new operator must be submitted in accordance with Part II.

3. Effective date of coverage under the permit

   Discharges from a construction activity are covered by this permit and the operator is authorized to discharge storm water associated with construction activity as of the effective date and time the Division of Water Pollution Control prepares a Notice of Coverage for the construction site. The Director may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information. If the Division has not been able to transmit an NOC to a permittee within 30 days of receipt of NOI, discharges are authorized under this permit if the NOI has been assigned a valid NPDES permit number and the permittee has been informed of this permit number.

I.E. Request for termination of coverage under the permit

1. NOT form

   Operators wishing to terminate coverage under this permit must submit a Notice of Termination (NOT) in accordance with Part VIII. of this permit. The NOT form is attached to this permit as Appendix B.

2. NOT form to be submitted after final stabilization of site

   All permittees must submit the NOT after completion of their construction activities and final stabilization of their portion of the site, or after within 30 days after another operator has taken over all of their responsibilities at the site. Appropriate enforcement actions may be taken for permit violations where a permittee submits a NOT but the permittee has not transferred operational control to another permittee or the site has not undergone final stabilization.

On this page...Part II.

II. Notice of Intent (NOI) requirements

II.A. NOI processing

An NOI shall be submitted by the construction site operator (or operators) to the appropriate Environmental Assistance Center(s) (EAC). The Division of Water Pollution Control's central office can serve as an EAC for NOIs submitted for projects of the Tennessee Department of Transportation and the Tennessee Valley Authority. The EAC will review the NOI for completeness and accuracy and as necessary will investigate the project for possible impact to threatened and endangered species of aquatic fauna. Upon completing the review, the EAC will transmit a Notice of Coverage (NOC) to the operator identified as owner/developer on the NOI form.

II.B. Who must submit an NOI?

1. Operators must submit the NOI.

"Operator" for the purpose of this permit and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

a. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

(This will typically be the owner or developer - one who has control over project specifications.)

b. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

(This will typically include the general contractor and would also include erosion control contractors.)

2. All operators shall sign the same NOI form.

All operators shall apply for permit coverage on the same NOI form, insofar as possible. The Division's NOI form is designed for more than one operator. The Division can accept separate NOIs from different operators.

However, if one is filing an NOI as an operator at a site for which other operator(s) have already applied and received a construction storm water permit number, then the NOI should include the permit number assigned to the first NOI for the particular site. The description of the site should match the description on the first NOI.

3. When operators change, new operators shall submit a new NOI.

In a case where one or more of the operators changes during the course of a construction project, new operators shall submit new NOIs for their roles at the site. See below for deadlines.

On this page...beginning at II.C.; II.D.; II.E.

II.C. Deadlines for notification

1. 30 days prior to construction

Except as provided below, operators must submit an initial Notice of Intent (NOI) in accordance with the requirements of this Part at least 30 days prior to the commencement of construction activities (i.e., the initial disturbance of soils associated with clearing, grading, excavation activities, or other construction activities).

2. When there is a change of operator

For storm water discharges from construction sites where the operator changes, or projects where an operator is added after an initial NOI has been submitted as above, an NOI in accordance with the requirements of this Part should be submitted as soon as practicable and at least 48 hours prior to when the new operator assumes operational control over site specifications or commences work at the site.

3. Late NOIs

Dischargers are not prohibited from submitting late NOIs. When a late NOI is submitted, authorization is only for future discharges, and prior, unpermitted discharges are subject to the liabilities of subpart VII.Q.

II.D. Contents of Notice of Intent (NOI)

1. NOI Form/Appendix A

Notices of Intent for construction projects shall be on the form provided in Appendix A of this permit, or on photocopy thereof. This form and its instructions set forth the required content of the NOI.

The NOI form must be designed to contain the names and addresses of operators of the construction activity; location and name of the construction site; map showing location of the site; size of the construction activity; estimated starting and ending dates of the construction; name of stream into which storm water enters from the site; and whether or not a storm water pollution prevention plan has been prepared for the project.

2. Completeness of the NOI

The Division may reject an NOI that is not complete with all the requested information.

3. Proper signature(s) on the NOI

The operator(s) of the construction site shall sign the NOIs. Persons who sign shall meet the criteria in subpart VII.G. of this permit.

II.E. Where to submit and what to do with NOIs

1. The applicant shall submit the NOI to the appropriate Environmental Assistance Center (EAC).

One shall submit NOIs to the Division of Water Pollution Control in the EAC responsible for the county(ies) where the construction activity is located and where storm water discharges enter

On this page.. Section II.E.1. (continued)

waters of the State. If a site straddles a county line of counties that are in areas of different EACs, the operators shall send NOIs to each EAC. EAC counties and addresses are given below. All EACs may be reached by telephone at the toll-free number 1-888-891-8332(TDEC). Below are the EACs organized from West to East Tennessee.

Fayette, Shelby and Tipton Counties:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2510 MT MORIAH ROAD SUITE E-645
MEMPHIS TN 38115-1520

Benton, Carroll, Chester, Crockett, Decatur, Dyer, Gibson, Hardeman, Hardin, Haywood, Henderson, Henry, Lake, Lauderdale, McNairy, Madison, Obion, Weakly counties:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
362 CARRIAGE HOUSE DRIVE
JACKSON TN 38305-2222

Cheatham, Davidson, Dickson, Houston, Humphreys, Montgomery, Robertson, Rutherford, Stewart, Sumner, Williamson, Wilson:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
537 BRICK CHURCH PARK DRIVE
NASHVILLE TN 37243-1550

Bedford, Coffee, Franklin, Giles, Hickman, Lawrence, Lewis, Lincoln, Marshall, Maury, Moore, Perry, Wayne

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2484 PARK PLUS DRIVE
COLUMBIA TN 38401

Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Macon, Pickett, Putnam, Overton, Smith, Trousdale, Van Buren, Warren, White

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
1221 SOUTH WILLOW AVE
COOKEVILLE TN 38506

Bledsoe, Bradley, Grundy, Hamilton, McMinn, Marion, Meigs, Polk, Rhea, Sequatchie

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
STATE OFFICE BUILDING SUITE 550
540 MCCALLIE AVE
CHATTANOOGA TN 37402-2013

On this page...section II.E.1. continued; II.E.2.

Anderson, Blount, Campbell, Claiborne, Cocke, Grainger, Hamblen, Jefferson, Knox, Loudon, Monroe, Morgan, Roane, Scott, Sevier, Union

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2700 MIDDLEBROOK PIKE SUITE 220
KNOXVILLE TN 37921

Carter, Greene, Hancock, Hawkins, Johnson, Sullivan, Unicoi, Washington Counties

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2305 SILVERDALE ROAD
JOHNSON CITY TN 37601

Water Pollution Control Central Office (may be used by TVA and TDOT)

STORM WATER NOI PROCESSING
TENNESSEE DIVISION OF WATER POLLUTION CONTROL, PERMIT SECTION
6TH FLOOR, L & C ANNEX
401 CHURCH STREET
NASHVILLE, TN 37243-1534

2. Certain applicants shall also submit a copy of the NOI to the local municipality

Applicants that discharge storm water through an NPDES-permitted municipal separate storm sewer system (MS4) shall submit a signed copy of the NOI (and at project completion, the NOT) to the owner/operator of the MS4. This is in addition to the original that is submitted to the EAC. As of the effective date of this general permit, the following municipalities are NPDES permitted:

City of Memphis
125 North Main Street, Room 620
Memphis, TN 38103-2091

Nashville/Davidson County
Metro Department of Public Works/NPDES Program
Point Place Business Park, Suite 350
441 Donelson Pike
Nashville, TN 37214-3558

City of Knoxville/Engineering
City County Building, Suite 480
P.O. Box 1631
Knoxville, TN 37901-1631

Chattanooga Department of Public Works – Storm Water
1001 Lindsey Street
Chattanooga, TN 37402

On this page...Section II.E.3; Part III.; III.A.; III.B.

3. Permittee shall post copy of NOC at site.

The Notice of Coverage (NOC) is a written notice from the Division of Water Pollution Control sent to the permittee, informing permittee that the NOI was received and has been approved by the Division. Permittees shall post, near the main entrance of the construction site, a copy of the Director's notice of coverage (NOC), and post the telephone number and address of a person whom the public can contact for information. See section IV.B.2. also.

Part III. Special conditions, management practices, and other non-numeric limitations

III.A. Prohibition on non-storm water discharges

1. Storm water discharges only

Except for discharges from support activities, as described in section I.B.2. and certain non-storm water discharges listed in section I.B.3., all discharges covered by this permit shall be composed entirely of storm water.

2. Other NPDES-permitted discharges

Discharges of storm water or wastewater that are in compliance with an NPDES permit (other than this permit) issued for that discharge may be mixed with discharges authorized by this permit.

3. Non-storm water discharges

The following non-storm water discharges from active construction sites are authorized by this permit provided the non-storm water component of the discharge is in compliance with section IV.D.5 (non-storm water discharges): dewatering of work areas of collected storm water and ground water (see also paragraph IV.D.2.a. iii.(c) and (d)); waters used to wash vehicles (of dust and soil, not process materials such as concrete) where detergents are not used and detention and/or filtering is provided before the water leaves site; water used to control dust in accordance with item IV.D.2.c.ii.; potable water sources including waterline flushings; routine external building washdown which does not use detergents; uncontaminated ground water or spring water; foundation or footing drains where flows are not contaminated with process materials such as solvents.

III.B. Releases in excess of Reportable Quantities

The discharge of hazardous substances or oil in the storm water discharge(s) from a facility shall be prevented or minimized in accordance with the applicable storm water pollution prevention plan for the facility. This permit does not relieve the permittee of the reporting requirements of 40 CFR 117 and 40 CFR 302. Where a release containing a hazardous substance in an amount equal to or in excess of a reporting quantity established under either 40 CFR 117 or 40 CFR 302, occurs during a 24 hour period:

On this page...Section III.B.1.; III.C.; III.D.

1. The permittee is required to notify the National Response Center (NRC) (800-424-8802) and the Tennessee Emergency Management Agency (emergencies: 800-262-3300; non-emergencies: 800-262-3400) in accordance with the requirements of 40 CFR 117 and 40 CFR 302 as soon as he or she has knowledge of the discharge;
2. The permittee shall submit within 14 calendar days of knowledge of the release a written description of: the release (including the type and estimate of the amount of material released), the date that such release occurred, the circumstances leading to the release, what actions were taken to mitigate effects of the release, and steps to be taken to minimize the chance of future occurrences, to the appropriate Environmental Assistance Center at the address provided in subpart II.E. above; and
3. The storm water pollution prevention plan required under Part IV. of this permit must be modified within 14 calendar days of knowledge of the release: to provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

III.C. Spills

This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

III.D. Discharge compliance with State Water Quality Standards

1. Violation of Water Quality Standards Prohibited

This permit does not authorize storm water or other discharges that would result in a violation of a State water quality standard (Rule Chapters 1200-4-3, 1200-4-4). Such discharges are a violation of this permit.

Where a discharge is already authorized under this permit and the Division determines the discharge to cause or contribute to the violation of applicable State water quality standards, the permitting authority will notify the operator of such violation(s). The permittee shall take all necessary actions to ensure future discharges do not cause or contribute to the violation of a water quality standard and shall document these actions in the pollution prevention plan. See also paragraph III.F.4. in cases where such a discharge affects a Section 303(d)-listed or impaired waterbody.

2. Discharge quality

a. The construction activity shall be carried out in such a manner as will prevent violations of water quality criteria as stated in Rule 1200-4-3-.03 of the Rules of the Tennessee Department of Environment and Conservation. This includes but is not limited to the prevention of any discharge that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the uses designated for that water body by Rule 1200-4-4. Use classifications for surface waters include fish and aquatic life, livestock watering and wildlife, recreation, irrigation, navigation, industrial water supply, and domestic water supply.

b. There shall be no distinctly visible floating scum, oil or other matter contained in the storm water discharge.

On this page...Section III.D.2.c.; III.E.

c. The storm water discharge must not cause an objectionable color contrast in the receiving stream.

d. The storm water discharge must result in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

III.E. Responsibilities of operators

A permittee may meet one or both of the operational control components in the definition of "operator" found in Part IX. Either section III.E.1. or III.E.2. below, or both, will apply depending on the type of operational control exerted by an individual permittee. Section III.E.3. applies to all permittees.

1. Permittees with operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications (e.g., developer or owner) must:

   a. Ensure the project specifications that they develop meet the minimum requirements of Part IV (Storm Water Pollution Prevention Plans (SWPPP)) and all other applicable conditions;

   b. Ensure that the SWPPP indicates the areas of the project where they have operational control over project specifications (including the ability to make modifications in specifications), and ensure all other permittees implementing portions of the SWPPP impacted by any changes they make to the plan are notified of such modifications in a timely manner; and

   c. If parties with day-to-day operational control of the construction site have not been identified at the time the SWPPP is initially developed, the permittee with operational control over project specifications shall be considered to be the responsible party until such time as the authority is transferred to another party (e.g., general contractor) and the plan updated.

2. Permittee(s) with day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., general contractor) must:

   a. Ensure that the SWPPP for portions of the project where they are operators meets the minimum requirements of Part IV (Storm Water Pollution Plan) and identifies the parties responsible for implementation of control measures identified in the plan;
   b. Ensure that the SWPPP indicates areas of the project where they have operational control over day-to-day activities;

3. Permittees with operational control over only a portion of a larger construction project (e.g., one of four homebuilders in a subdivision) are responsible for compliance with all applicable terms and conditions of this permit as it relates to their activities on their portion of the construction site, including implementation of BMPs and other controls required by the SWPPP. Permittees shall ensure either directly or through coordination with other permittees, that their activities do not render another party's pollution control ineffective. Permittees must either implement their portions of a common SWPPP or develop and implement their own SWPPP.

On this page...Section III.F.; Part IV.

III.F. Additional requirements for discharges into waters listed on the Tennessee 303(d) list for siltation, or discharges upstream of waters impaired by siltation, that may affect the impaired waters; and for discharges to waters identified by the Department as high quality waters

1. The Storm Water Pollution Prevention Plan shall be submitted to the local Environmental Assistance Center. Plans for TDOT and TVA projects may be submitted to the central office of the Division of Water Pollution Control. This plan may be submitted with the NOI, but must be submitted prior to start of construction (including grubbing, clearing, excavation).

2. The permittee shall perform the inspections described in section IV.D.4. before anticipated storm events (or series of storm events such as intermittent showers over one or more days), and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once per week.

3. The permittee must certify on a weekly basis, on the form provided in Appendix D of this permit: i. that the weekly inspection of erosion and sediment controls and of outfall points was performed; and ii. whether or not all planned and designed erosion and sediment controls are installed and in working order. The certification must be executed by a person who meets the signatory requirements of subpart VII.G. of this permit. The record of certifications on the form in Appendix D must be submitted by the 15th of the month (postmarked) following the end of the quarter, to the address indicated in section II.E.1. Quarters are January – March, April – June, July – September, and October – December.

4. If the Division finds that a discharge is causing a violation of water quality standards or causing or contributing to the impairment of a 303(d) listed water or any water identified as impaired since promulgation of the latest 303(d) list, and finds that the discharger is complying with storm water pollution prevention plan requirements of this permit, the discharger will be notified by the Director in writing that the discharge is no longer eligible for coverage under the general permit and that continued discharges must be covered by an individual permit. To obtain the individual permit, the operator must file an individual permit application.

Part IV. Storm Water Pollution Prevention Plan (SWPPP)

A pollution prevention plan is required and a designated individual is to be responsible.

At least one storm water pollution prevention plan (SWPPP) shall be developed for each construction project or site covered by this permit. For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWPPP is encouraged. Individual operators at a site may, but are not required to develop separate SWPPPs that cover only their portion of the project. In instances where there is more than one SWPPP for a site, the permittees must ensure the storm water discharge controls and other measures are compatible with one another and do not prevent another operator from complying with permit conditions.

The General Purpose of the Plan

Storm water pollution prevention plans shall be prepared in accordance with good engineering practices. The plan shall identify potential sources of pollution which one would reasonably expect to affect the quality of storm water discharges from the construction site. The plan shall describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and to assure compliance with the terms and conditions of this permit.

On this page...Section IV.A.; IV.B.

IV.A. Deadlines for plan preparation and compliance

1. For discharges authorized under a previous or existing general permit

   a. Immediate compliance, at a minimum, with requirements for a construction site storm water control plan, construction management techniques, vegetative controls, structural controls, discharge quality, and reporting and recordkeeping requirements in Appendix F [former Tennessee Rule Chapter 1200-4-10-.05, paragraphs (5), (6) and (7)]
   b. No later than January 1, 2001, for discharges addressed by part III.F. of this permit, compliance with subparts III.F.2. and 3., or by an earlier date if so notified in writing by the Division
   c. No later than December 31, 2001, or earlier if so notified in writing by the Division, compliance with all parts of this permit

2. For discharges not authorized under an NPDES permit as of the effective date of this permit, the plan shall:

   a. Be completed prior to the submittal of an NOI to be covered under this permit and updated as appropriate; and
   b. The plan shall provide for compliance with the terms and schedule of the plan beginning with the initiation of construction activities.

IV.B. Signature, plan review and making plans available

1. Plan must be correctly signed.

   The plan shall be signed by the operator (operators) in accordance with subpart VII.G., and be retained on-site at the facility which generates the storm water discharge in accordance with Part VI (retention of records) of this permit. If the site is inactive or does not have an onsite location adequate to store the pollution prevention plan, the location of the plan, along with a contact phone number, shall be posted on site. If the plan is located offsite, reasonable local access to the plan, during normal working hours, must be provided as described below.

2. The permittee shall post a notice near the main entrance of the construction site with the following information:

   a. A copy of the Notice of Coverage (NOC) with the NPDES permit number for the project;
   b. The name and telephone number of a local contact person;
   c. A brief description of the project; and
   d. The location of the SWPPP if the site is inactive or does not have an on-site location to store the plan.

   If posting this information near a main entrance is infeasible due to safety concerns, the notice shall be posted in a local public building. If the construction project is a linear construction project (e.g., pipeline, highway, etc.), the notice must be placed in a publicly accessible location near where construction is actively underway and moved as necessary. This permit does not provide the public with any right to trespass on a construction site for any reason, including inspection of a site. This permit does not require that permittees allow members of the public access to a construction site.

On this page... beginning at IV.B.3.; IV.C.; IV.D.

3. Plans are subject to revision because of deficiencies identified by the Director.

   The Director, or authorized representative, may notify the permittee(s) at any time that the plan does not meet one or more of the minimum requirements of this Part. Such notification shall identify those provisions of the permit which are not being met by the plan. The dischargers shall have 48 hours, unless additional time is provided by the Director, after such notification to make changes to sediment and erosion controls to prevent the discharges of sediment from the site and 14 days to make necessary changes to the plan. The Director may take appropriate enforcement action for the period of time the permittee was operating under a plan that did not meet the minimum requirements of the permit. The Director, or authorized representative, may require revisions to the plan necessary to prevent a negative impact to legally protected state or federally listed or proposed threatened or endangered aquatic fauna.

4. The permittee shall make plans available upon request to the Director; or local agency approving sediment and erosion plans, grading plans, or storm water management plans; or in the case of a storm water discharge associated with industrial (construction) activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system.

IV.C. Keeping plans current

The permittee must amend the plan:

i. Whenever there is a change in the scope of the project, which would be expected to have a significant affect on the discharge of pollutants to the waters of the State and which has not otherwise been addressed in the plan;
ii. Whenever inspections or investigations by site operators, local, State or federal officials indicate the storm water pollution prevention plan is proving ineffective in eliminating or significantly minimizing pollutants from sources identified under section IV.D.2 of this permit, or is otherwise not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity;
iii. To identify any new contractor and/or subcontractor that will implement a measure of the storm water pollution prevention plan (see subpart III.E. for further description of which contractors must be identified); and
iv. To include measures necessary to prevent a negative impact to legally protected state or federally listed or proposed threatened or endangered aquatic fauna. Amendments to the plan may be reviewed by the State of Tennessee and EPA in the same manner as subpart IV.B above.

IV.D. Components of Storm Water Pollution Prevention Plan

The storm water pollution prevention plan (SWPPP) shall include the following items:

1. Site description

   Each plan shall provide a description of pollutant sources and other information as indicated:

   a. A description of the nature of the construction activity;
   b. A description of the intended sequence of major activities which disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation, etc.);
   c. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities;

On this page...beginning at Section IV.D.1.d.; IV.D.2.

d. Any data describing the soil (data may be referenced or summarized) or the quality of any discharge from the site;
e. An estimate of the runoff coefficient of the site after construction activities are completed;
f. A general location map (e.g. portion of a city or county map or similar scale) and a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, an outline of areas which are not to be disturbed, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters including wetlands, sinkholes, and locations where storm water is discharged to a surface water;
g. Careful identification on the site map of outfall points for storm water discharges from the site; the plan shall identify outfall points intended for coverage under the general permit;
h. A description of any discharge associated with industrial activity other than construction storm water that originates on site and the location of that activity; and
i. The name of the receiving water(s), and approximate size and location of affected wetland acreage at the site.

2. What storm water runoff controls must be used?

Each plan shall include a description of appropriate controls and measures that will be implemented at the construction activity. The plan must clearly describe for each major activity identified in paragraph IV.D.1.b: (a) appropriate control measures and the general timing during the construction process that the measures will be implemented and (b) which permittee is responsible for implementation of which controls. The description and implementation of controls shall address the following minimum components; additional controls may be necessary to comply with section III.D.2:

a. Erosion and sediment controls

i. General criteria and requirements

(a) The construction-phase erosion and sediment controls shall be designed to retain sediment on site.
(b) All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permittee must replace or modify the control for site situations.
(c) If sediment escapes the construction site, off-site accumulations of sediment that have not reached a stream must be removed at a frequency sufficient to minimize offsite impacts (e.g., fugitive sediment that has escaped the construction site and has collected in street must be removed so that it is not subsequently washed into storm sewers and streams by the next rain and/or so that it does not pose a safety hazard to users of public streets). Permittees shall not initiate remediation/restoration of a stream without consulting the Division first. This permit does not, however, authorize access to private property.
(d) Sediment should be removed from sediment traps, silt fences, sedimentation ponds, and other sediment controls as necessary, and must be removed when design capacity has been reduced by 50%.
(e) Litter, construction debris, and construction chemicals exposed to storm water shall be picked up prior to anticipated storm events (e.g. forecasted by local

On this page...Section IV.D.2.a.i.(e) (continued); IV.D.2.a.ii.

weather reports), or otherwise prevented from becoming a pollutant source for storm water discharges (e.g., screening outfalls, daily pick-up, etc.). After use, silt fences should be removed or otherwise prevented from becoming a pollutant source for storm water discharges.

(f) Offsite material storage areas (also including overburden and stockpiles of dirt, etc.) used solely by the permitted project are considered a part of the project and shall be addressed in the pollution prevention plan.

(g) Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to grading or earth moving unless the area is seeded and/or mulched or other temporary cover is installed.

(h) Clearing and grubbing must be held to the minimum necessary for grading and equipment operation.

(i) Construction must be sequenced to minimize the exposure time of graded or denuded areas.

(j) Construction must be phased for projects in which over 50 acres of soil will be disturbed. Areas of the completed phase must be stabilized within 21 days after another phase has been initiated.

(k) Erosion and sediment control measures must be in place and functional before earth moving operations begin, and must be constructed and maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but must be replaced at the end of the work day.

(l) The following records shall be maintained on site: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

ii. Stabilization practices

The plan shall include a description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Site plans should give consideration to using waterway buffer areas in which construction activities, borrow and/or fill are prohibited. Stabilization practices may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be avoided.

(a) Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has temporarily or permanently ceased. Except in the following two situations: i. where the initiation of stabilization measures by the seventh day is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable; or ii. where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 15 days, temporary stabilization measures do not have to be initiated on that portion of site.

On this page...Section IV.D.2.a.ii.(b); IV.D.a.iii.

(b) Temporary or permanent soil stabilization shall be accomplished within 15 days after final grading or other earth work. Permanent stabilization with perennial vegetation (using native herbaceous and woody plants where practicable) or other permanently stable, non-eroding surface shall replace any temporary measures as soon as practicable.

iii. Structural practices

The plan shall include a description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Structural controls shall not be placed in streams or wetlands except as authorized by a section 404 permit and/or Tennessee Aquatic Resource Alteration Permit.

(a) Erosion and sediment control measures shall be designed according to the size and slope of disturbed or drainage areas to detain runoff and trap sediment. In addition, erosion and sediment controls shall be designed to control the rainfall and runoff from a 2 year, 24 hour storm, as a minimum. (Approx. values: Memphis, 4.0 inches/24 hours; Nashville, 3.5 inches/24 hours; Chattanooga, 3.6 inches/24 hours; and Knoxville, 3.2 inches/24 hours. See Appendix C.) Permittees shall maintain a rain gauge at the site.
(b) For common drainage locations that serve an area with 10 or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2 year, 24 hour storm and runoff coefficient from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and 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 are not attainable, multiple, smaller sediment basins and/or sediment traps must be used.
(c) Discharges from sediment basins and traps must be through a pipe or lined or well grassed channel so that the discharge does not cause erosion.
(d) Muddy water to be pumped from excavation and work areas must be held in settling basins or filtered prior to its discharge into surface waters. Water must be discharged through a pipe, well grassed or lined channel or other equivalent means so that the discharge does not cause erosion and sedimentation.

On this page...Section IV.D.2.b.

b. Storm water management

The SWPPP shall include a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. This permit only addresses the installation of storm water management measures, and not the ultimate operation and maintenance of such structures after the construction activities have been completed and the site has undergone final stabilization. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with construction activity have been eliminated from the site.

i. Such practices may include: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The pollution prevention plan shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

ii. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

c. Other items needing control

i. No solid materials, including building materials, shall be discharged to waters of the United States, except as authorized by a section 404 permit and/or Tennessee Aquatic Resource Alteration Permit.
ii. Off-site vehicle tracking of sediments and the generation of dust shall be minimized.
iii. For installation of any waste disposal systems on site, or sanitary sewer or septic system, the plan shall provide for the necessary sediment controls. Permittees must also comply with applicable State and/or local waste disposal, sanitary sewer or septic system regulations for such systems to the extent these are located within the permitted area.
iv. The plan shall include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP shall also include a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response.
v. A description of storm water sources from areas other than construction and a description of controls and measures that will be implemented at those sites.
vi. The plan shall include measures to protect legally protected state or federally listed threatened or endangered aquatic fauna and/or critical habitat (if applicable).

d. Approved local government sediment and erosion control requirements

i Permittees must include in their plan any procedures and requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or site permits approved by local officials.

On this page...Section IV.D.2.a.iii.d. (continued); IV.D.3.

Permittees shall comply with any such requirements during the term of the permit. This provision does not apply to provisions of master plans, comprehensive plans, non -enforceable guidelines or technical guidance documents that are not identified in a specific local government plan or permit that is issued for the construction site.

ii. Storm water pollution prevention plans must be amended to reflect any change that is instituted by the local government to sediment and erosion site plans or site permits, or storm water management site plans or site permits for which the permittee receives written notice.

3. Maintenance

The plan shall describe procedures to ensure that vegetation, erosion and sediment control measures and other protective measures identified in the site plan are kept in good and effective operating condition. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

4. Inspections

a. Inspector training and certification

(Reserved)

b. Schedule of inspections

i. Except for construction sites identified according to Part III.F.*, inspections, described in paragraphs c., d., and e. below, shall be done before anticipated storm events (or series of storm events such as intermittent showers over one or more days), and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Where sites have been finally or temporarily stabilized, or runoff is unlikely due to winter conditions (e.g. site covered with snow, ice, or frozen ground), such inspection only has to be conducted once per month.

ii. For discharges identified for additional requirements under Part III.F.*, inspections, described in paragraphs c., d., and e. below, shall be performed before anticipated storm events (or series of storm events such as intermittent showers over one or more days), within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once per week.

* Discharges into waters listed on the Tennessee 303(d) list for siltation or waters identified by the Department as impaired because of siltation since promulgation of the latest 303(d) list; and for discharges to waters identified by the Department as high quality waters.

iii. Inspections and associated, necessary repairs done 60 hours before a rain event constitute compliance with “before anticipated storm events,” and inspections and repairs on a Friday meet the requirement for rain events over the weekend.

On this page...Section IV.D.4.c.

c. Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site.

d. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly.

e. Outfall points (where discharges from the site enter streams or wet weather conveyances) shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected if possible. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

f. Based on the results of the inspection, any inadequate control measures or control measures in disrepair shall be replaced or modified, or repaired as necessary, before the next rain event if possible, but in no case more than seven days after the need is identified. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

g. Based on the results of the inspection, the site description identified in the plan in accordance with paragraph IV.D.1 of this permit and pollution prevention measures identified in the plan in accordance with paragraph IV.D.2 of this permit shall be revised as appropriate, but in no case later than 14 calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan in no case later than 21 calendar days following the inspection.

h. Inspections shall be documented and include the scope of the inspection, name(s) and title or qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan (including the location(s) of discharges of sediment or other pollutants from the site and of any control device that failed to operate as designed or proved inadequate for a particular location), and actions taken in accordance with paragraph IV.D.4.f. of the permit.

5. Non-storm water discharges

Sources of non-storm water listed in section III.A.3 of this permit that are combined with storm water discharges associated with construction activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge. Any non-storm water must be discharged through stable discharge structures.

On this page...Part V.; Part VI.; Part VII.; VII.B.

Part V. (Reserved)

Part VI. Retention of records

VI.A. Documents

The permittee shall retain copies of storm water pollution prevention plans and all reports required by this permit, and records of all data used to complete the Notice of Intent to be covered by this permit, for a period of at least three years from the date the notice of termination is filed. This period may be extended by written request of the Director.

VI.B. Accessibility

The permittee shall retain a copy of the storm water pollution prevention plan required by this permit (including a copy of the permit language) at the construction site (or other local location accessible to the Director and the public) from the date construction commences to the date of final stabilization. The permittees with day to day operational control over pollution prevention plan implementation shall have a copy of the plan available at a central location onsite for the use of all operators and those identified as having responsibilities under the plan whenever they are on the construction site.

VII. Standard permit conditions

VII.A. Duty to comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of CWA and is grounds for enforcement action; for termination of permit coverage, or for denial of a permit renewal application.

VII.B. Continuation of the expired general permit

This permit expires five years after the effective date. However, an expired general permit may continue in force and effect until a new general permit replaces the expired one. To retain coverage under the continued permit, permittees should provide notice of their intent to remain covered under this permit at least 30 days prior to the expiration date. Coverage under the expired general permit will terminate 90 days after the effective date of a new general permit that replaces the expired one. The notice must be signed in accordance with section VII.G.1. of this permit and must contain the following information:

i. Name, address and telephone number of the operator; and
ii. The existing storm water construction permit number.

This information may be submitted on a post card or in a letter and shall be submitted to the appropriate Environmental Assistance Center of the Division of Water Pollution Control, as given in subpart II.D.

VII.C. Need to halt or reduce activity not a defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

On this page…beginning at VII.D.

VII.D. Duty to mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit.

VII.E. Duty to provide information

The permittee shall furnish to the Director or an authorized representative of the Director any information which is requested to determine compliance with this permit or other information.

VII.F. Other information

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report to the Director, he or she shall promptly submit such facts or information.

VII.G. Signatory requirements

All Notices of Intent, storm water pollution prevention plans, reports, certifications or information either submitted to the Director or the operator of a large or medium municipal separate storm sewer system shall be signed as follows:

1. All Notices of Intent shall be signed as follows:

   a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25,000,000 (in second-quarter 1980 dollars) if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. Storm water pollution prevention plans, reports, certifications or other information submittals shall be signed as follows:

   All reports required by the permit and other information requested by the Director or authorized representative of the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

On this page... Section VII.G.2. (continued); VII.H.; VII.I.

a. The authorization is made in writing by a person described above and submitted to the Director.

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).

c. Changes to authorization. If an authorization under section II.B.3. is no longer accurate because a different operator has responsibility for the overall operation of the construction site, a new notice of intent satisfying the requirements of paragraph II.B must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

3. Certification. Except as noted in section 4 below, any person signing documents under paragraph VII.G shall make the following certification. Thus, this certification must precede the signature on any report to be signed and submitted pursuant to this permit:

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

4. Construction contractors required to sign an NOI because they meet the definition of an operator but who are not primarily responsible for preparing an NOI, shall sign the following certification statement on the NOI:

> I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above and/or my inquiry of the person directly responsible for assembling this Notice of Intent, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, for failure to comply with these permit requirements.

VII.H. Penalties for falsification of reports

Knowingly making any false statement on any report required by this permit may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act and in T.C.A. §69-3-115 of the Tennessee Water Quality Control Act.

VII.I. Oil and hazardous substance liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject

On this page... Section VII.I. (continued)

under section 311 of the CWA or section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

VII.J. Property rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. The issuance of this permit does not authorize trespassing or discharges of storm water or non-storm water across private property.

VII.K. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

VII.L. Requiring an individual permit

1. Director can require a site to obtain an individual permit.

   The Director may require any person authorized by this permit to apply for and/or obtain an individual NPDES permit. Any interested person may petition the Director to take action under this paragraph. Where the Director requires a discharger authorized to discharge under this permit to apply for an individual NPDES permit, the Director shall notify the discharger in writing that a permit application is required. This notification shall include a brief statement of the reasons for this decision, an application form if needed, a statement setting a deadline for the discharger to file the application, and a statement that on the effective date of issuance or denial of the individual NPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Applications shall be submitted to the appropriate Environmental Assistance Center of the Division as indicated in subpart II.E of this permit. The Director may grant additional time to submit the application upon request of the applicant. If a discharger fails to submit in a timely manner an individual NPDES permit application as required by the Director under this paragraph, then the applicability of this permit to the individual NPDES permittee is automatically terminated at the end of the day specified by the Director for application submittal.

2. Permittee may request individual permit instead of this permit.

   Any discharger authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. In such cases, the permittee shall submit an individual application in accordance with the requirements of 40 CFR 122.26(c)(1)(ii), with reasons supporting the request, to the Water Pollution Control office of the appropriate Department Environmental Assistance Center. The request may be granted by issuance of an individual permit, or alternative general permit, if the reasons cited by the permittee are adequate to support the request.

3. Individual permit terminates general permit.

   When an individual NPDES permit is issued to a discharger otherwise subject to this permit, or the discharger is authorized to discharge under an alternative NPDES general permit, the

On this page…Section VII.L.3. (continued); VII.M.

applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. When an individual NPDES permit is denied to an owner or operator otherwise subject to this permit, or the owner or operator is denied for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the date of such denial, unless otherwise specified by the Director.

VII.M. Other, non-storm water, program requirements

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

VII.N. Proper operation and maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans.

Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

VII.O. Inspection and entry

The permittee shall allow authorized representatives of the Environmental Protection Agency, the Director or an authorized representative of the Director of the Division of Water Pollution Control, or, in the case of a construction site which discharges through a municipal separate storm sewer, an authorized representative of the municipal operator or the separate storm sewer receiving the discharge, upon the presentation of credentials and other documents as may be required by law:

i. To enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
ii. To have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and
iii. To inspect any facilities or equipment (including monitoring and control equipment).

VII.P. Permit actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

VII.Q. Liabilities

1. Civil and criminal liability

Except as provided in this permit, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the State of Tennessee, including

On this page... Section VII.Q.1. (continued); Part VIII.

but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the discharge of waste water to any surface or subsurface waters. Additionally, notwithstanding this permit, it shall be the responsibility of the discharger to conduct its waste water treatment and/or discharge activities in a manner such that public or private nuisances or health hazards will not be created.

2. Liability under State law

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or the Federal Water Pollution Control Act, as amended.

Part VIII. Termination of coverage

VIII.A. Notice of Termination (NOT)

1. Where a site has been finally stabilized and all storm water discharges from construction activities that are authorized by this permit are eliminated, or where storm water discharges have otherwise been eliminated, or where the operator of all storm water discharges at a facility changes, the permittee must submit a Notice of Termination that is signed in accordance with Subpart VII.G of this permit.

2. The Notice of Termination shall be submitted on the Division's NOT form provided in Appendix B of this permit.

3. The following certification signed in accordance with Subpart VI.G (signatory requirements) of this permit:

> I certify under penalty of law that either: (a) all storm water discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or (b) I am no longer an operator at the construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with construction activity under this general permit, and that discharging pollutants in storm water associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

4. For the purposes of this certification, elimination of storm water discharges associated with construction activity means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time to insure final stabilization is maintained, or that all storm water discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have otherwise been eliminated from the portion of the construction site where the operator had control.

VIII.B. Addresses

All Notices of Termination are to be sent, using the form provided by the Director (or a photocopy thereof), to the address of the appropriate Environmental Assistance Center.

On this page...Part IX.

Part IX. Definitions

"Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Clearing," in the definition of discharges associated with construction activity, does not refer to clearing of vegetation along roadways, highways or power lines for sight distance or other maintenance and/or safety concerns, or cold planing, milling, and/or removal of concrete and/or bituminous asphalt roadway pavement surfaces. Clearing typically refers to removal of vegetation and disturbance of soil prior to grading or excavation in anticipation of construction activities. Clearing may also refer to wide area land disturbance in anticipation of non-construction activities; for instance, clearing forested land in order to convert forest land to pasture for wildlife management purposes.

"Control measure"--As used in this permit, refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the United States.

"Commencement of construction"--The initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

"CWA" means the Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C 1251 et seq.

"Director" means the Director of the Division of Water Pollution Control of the State of Tennessee.

"Discharge of storm water associated with construction activity"--As used in this permit, refers to storm water point source discharges from areas where soil disturbing activities (e.g., clearing, grading, or excavation, etc.), or construction materials or equipment storage or maintenance (e.g., earth fill piles, fueling, etc.) are located.

"Final stabilization" means that all soil disturbing activities at the site have been completed, and that a perennial vegetative cover sufficient to prevent erosion has been well established on all unpaved areas, and/or equivalent permanent stabilization measures have been employed.

"Grading" and "excavation" do not refer to cold planing, milling, and/or removal of concrete and/or bituminous asphalt roadway pavement surfaces.

"High quality waters" are surface waters of the State of Tennessee that are identified by the Department as high quality waters. Characteristics of high quality waters are listed at Rule 1200-4-3-.06 of *the official compilation - rules and regulations of the State of Tennessee.* Characteristics include waters designated by the Water Quality Control Board as Outstanding National Resource Waters (ONRW); waters that provide habitat for ecologically significant populations of certain aquatic or semi-aquatic plants or animals; waters that provide specialized recreational opportunities; waters that possess outstanding scenic or geologic values; or waters where existing conditions are better than water quality standards. High quality waters are sometimes referred to as Tier II or Tier III (ONRW) waters.

"Large and Medium municipal separate storm sewer system" means all municipal separate storm sewers that are either:

(i) Located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and G of 40 CFR 122); or

(ii) Located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or

(iii) Owned or operated by a municipality other than those described in paragraph (i) or (ii) and that are designated by the Director as part of the large or medium municipal separate storm sewer system.

"NOI" means notice of intent to be covered by this permit (see Part II of this permit.)

"NOT" means notice of termination (see Part VIII of this permit).

"Monthly" refers to calendar months.

On this page... Part IX. continued

"Operator" for the purpose of this permit and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

i. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

(This will typically be the owner or developer - one who has control over project specifications.)

ii. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan for the site or other permit conditions

iii. (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

(This will typically include the general contractor and would also include erosion control contractors.)

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

"Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

"Storm water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

"Storm water associated with industrial activity" is defined at 40 CFR 122.26(b)(14) and incorporated here by reference. Most relevant to this permit is 40 CFR 122.26(b)(14)(x), which relates to construction activity including clearing, grading and excavation activities.

"Storm water discharge-related activities" include: a. activities which cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to: excavation, site development, grading and other surface disturbance activities; and b. measures to control storm water including the siting, construction and operation of best management practices (BMPs) to control, reduce or prevent storm water pollution.

"Take" of an endangered species means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct.

"Waters" or "waters of the state" is defined in the Tennessee Water Quality Control Act and means any and all water, public or private, on or beneath the surface of the ground, which are contained within, flow through or border upon Tennessee or any portion thereof except those bodies of water confined to and retained within the limits of private property in single ownership which do not combine or effect a junction with natural surface or underground waters.

(End of body of permit; appendices follow.)

Department of Environment and Conservation
Division of Water Pollution Control

CONSTRUCTION ACTIVITY – STORM WATER DISCHARGES
NOTICE OF INTENT (NOI)

Name of the construction project (site) **County/(ies)**	Existing NPDES Permit No. (if site is already permitted) TNR
Street address (or description of location) and nearest city ❑ Map attached (required)	Latitude Longitude
Construction project (site) description Area to be disturbed (acres)	Start date Estimated end date
Construction site owner/developer: legal name and mailing address, including zip code	Contact person, phone number and e-mail address
Name(s) of stream(s), wetland(s), lake(s) or other waters of the state receiving storm water runoff from the construction site	
Do there appear to be streams ❑ and/or wetlands ❑ on the construction site? ❑ Yes ❑ No	
If an Aquatic Resource Alteration Permit (ARAP) has been obtained for this site, provide the permit number.	
Has the Storm Water Pollution Prevention Plan (SWPPP) been developed? ❑ Yes ❑ No	
Note that the NOI will be considered incomplete if you answered "No" to the above question. Submit the NOI when the SWPPP is developed.	

Permit Application Certification and Signature (must be signed by President, Vice-President or equivalent, or ranking elected official)

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

Representative of owner/developer; print or type	Signature	Date

Certification for Contractor(s) (must be signed by President, Vice President or equivalent, or ranking elected official)

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this Notice of Intent, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements.

1. Company name of primary contractor; print or type	Signature by representative of primary contractor	Date
2. Company name of other contractor; print or type	Signature by representative of other contractor	Date
3. Company name of other contractor; print or type	Signature by representative of other contractor	Date

OFFICIAL STATE USE ONLY

Received Date	EAC	Permit Number **TNR**	Reviewer	Notice of Coverage Date
303d Receiving Stream	High Quality Water	Threatened and Endangered Aquatic Fauna		

CONSTRUCTION ACTIVITY – STORM WATER DISCHARGES
NOTICE OF INTENT (NOI) - INSTRUCTIONS

Purpose of this form. A completed Notice of Intent (NOI) must be submitted to obtain coverage under the Tennessee General NPDES Permit for discharges of storm water associated with construction activity. This permit is required for storm water discharge(s) from construction sites that involve grubbing, clearing, grading or excavation of five or more acres of land. This form should be submitted at least 30 days prior to the start date of any land disturbing activities such as grubbing, clearing, grading or excavation.

Notice of Coverage. The Division will process your application and return to you a Notice of Coverage (NOC). Runoff from the construction site will not be permitted until the Division has prepared this NOC.

Completing the form. Type or print clearly, using ink and not markers or pencil. Answer each item or enter "NA," for not applicable, if a particular item does not fit the circumstances or characteristics of your construction site or activity. If you need additional space, attach a separate piece of paper to the NOI form.

Who must submit the NOI form? The NOI form must be signed by the "operator(s)" of the construction site. Operators will most likely include the developer of the site, and the primary contractor(s). "Operator" means any party associated with the construction project that meets either of the following two criteria: (1) the party has operational control over project specifications (including the ability to make modifications in specifications); or (2) the party has day-to-day operational control of those activities at a project site which are necessary to ensure compliance with the storm water pollution prevention plan or other permit conditions (e.g., they are authorized to direct workers at the site to carry out activities identified in the storm water pollution prevention plan or comply with other permit conditions). If a contractor has not been identified at the time the NOI is submitted by the developer, the contractor(s) must submit a separate NOI in order to obtain authorization under this permit. The contractor must include the NPDES permit number that is already assigned to the site, along with the name of the construction project and its location.

Describe and locate the project. Use the legal or official name of the construction site. If a construction site lacks street name or route number, give the most accurate geographic information available to describe the location (reference to adjacent highways, roads and structures; e.g. intersection of state highways 70 and 100). Latitude and longitude of the center of the site can be located on USGS quadrangle maps. The quadrangle maps can be obtained at 1-800-USA-MAPS, or at the Census Bureau Internet site: http://www.census.gov/cgi-bin/gazetteer. Attach a copy of a portion of a 7.5 minute quad map, showing location of site, with boundaries at least one mile outside the site boundaries. Provide estimated starting date of clearing activities and completion date of the project, and an estimate of the number of acres of the site on which soil will be disturbed, including borrow areas, fill areas and stockpiles.

Give name of the receiving stream. Trace the route of storm water runoff from the construction site and determine the name of the river(s), stream(s), creek(s), wetland(s), lake(s) or any other water course(s) into which the storm water runoff drains. Note that the receiving water course may or may not be located on the construction site. If the first water body receiving construction site runoff is unnamed ("unnamed tributary"), determine the name of the water body which the unnamed tributary enters.

ARAP permit may be required. If your work will disturb or cause alterations of a stream or wetland, you must obtain an appropriate Aquatic Resource Alteration Permit (ARAP). If you have a question about the ARAP program or permits, contact your local Environmental Assistance Center.

You must prepare a Storm Water Pollution Prevention Plan (SWPPP) prior to submitting the NOI.

Submitting the form and obtaining more information. Note that this form must be signed by the company President, Vice-President, or a ranking elected official in the case of a municipality. For more information, contact your local Environmental Assistance Center at the toll-free number 1-888-891-8332 (TDEC). Submit the completed NOI form to the appropriate EAC below (call the toll-free number to determine), addressed with **Attention: Storm Water NOI Processing**.

Environmental Assistance Centers(EACs) - Division of Water Pollution Control - Addresses

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R. S. Gass Boulevard	37216	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

Department of Environment and Conservation
Division of Water Pollution Control

NOTICE OF TERMINATION (NOT) – STORM WATER DISCHARGES CONSTRUCTION ACTIVITY

The purpose of this form is to notify the Tennessee Department of Environment and Conservation that you, as a permitted operator of storm water discharges from a construction activity, no longer have responsibilities related to erosion and sediment controls at the construction site. Type or print clearly, using ink and not markers or pencil.

NPDES Permit Number TNR __ __ __ __ __ __ (Include the NPDES permit number for the site.)

Name of the construction project (site)

Street address (or description of location)

Legal name of the construction site operator

Mailing address	Telephone number and/or e-mail address ( )

Have the storm water discharges associated with construction activity been eliminated? ❑ Yes ❑ No

If YES, provide the date at which the construction site was finally stabilized.

Construction activities at the site continue, but my responsibilities with respect to the construction activities have ceased. ❑ Yes ❑ No

If YES, provide the name, mailing address and telephone number of any new operators (for instance, an operator who has taken over your responsibilities) involved with soil disturbance at the construction site.

Certification and Signature (must be signed by President, Vice President or equivalent, or ranking elected official)

I certify under penalty of law that either: (a) all storm water discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or (b) I am no longer an operator at the construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with construction activity under this general permit, and that discharging pollutants in storm water associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

For the purposes of this certification, elimination of storm water discharges associated with construction activity means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time to insure final stabilization is maintained, or that all storm water discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have otherwise been eliminated from the portion of the construction site where the operator had control.

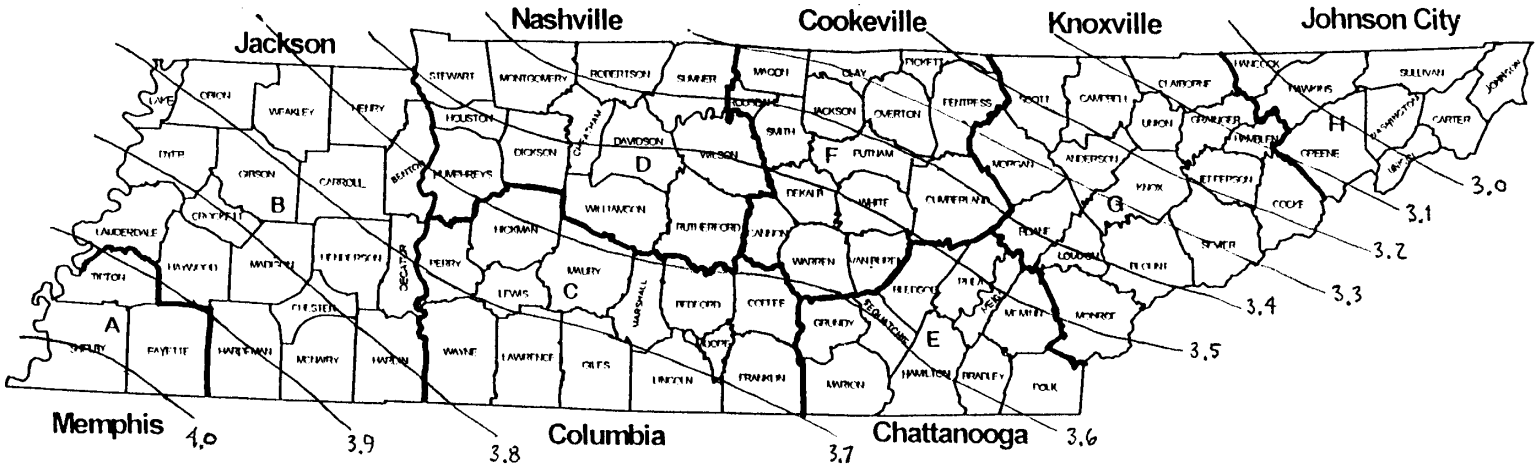
Printed name (construction site operator)	Signature	Date

Permittees who are presently covered under the Tennessee General NPDES Permit to Discharge Storm Water Associated with Construction Activity must submit a Notice of Termination (NOT) after completion of their construction activities and final stabilization of their portion of the site, or within 30 days after another operator has taken over all of their responsibilities at the site. A permittee cannot submit a NOT without final stabilization unless another party has agreed to assume responsibility for final stabilization of the site. A completed NOT form should be submitted to the local Division of Water Pollution Control Office address (see table below), and marked "**Storm Water Notice of Termination**".

Environmental Assistance Centers (EACs) - Division of Water Pollution Control - Addresses
EAC Offices may be reached by dialing toll-free 1-888-891-TDEC.

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R. S. Gass Boulevard	37243	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

TENNESSEE



2 YEAR 24 HOUR RAINFALL (INCHES)

Based on Technical Paper No. 40, Weather Bureau

(Environmental Assistance Center boundaries are shown also.)

Department of Environment and Conservation
Division of Water Pollution Control

Construction Storm Water Inspection Report

(This form is required only for discharges into siltation-impaired streams and into high quality waters.)

Construction Site Information

NPDES Permit No. TNR _____ Notice of Coverage (NOC) Date _____ County _____

Name of Project _____

Developer and/or Contractor Name _____

Outfall No. _____ (or station no. or other identifier of drainage area represented)

Month/Year	Week 1	Week 2	Week 3	Week 4	Week 5
	Yes or ***No***/ Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials
January, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
February, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
March, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
April, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
May, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
June, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
July, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
August, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
September, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
October, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /

(continued on reverse)

November, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
December, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /

Provide the following information for the person(s) who have performed and initialed the above inspections. If more than two persons have performed these inspections, give information for the two persons who performed the most numbers of inspections.

Initials _____	Name _____ Phone No. (_____)_____
Initials _____	Name _____ Phone No. (_____)_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated information presented. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that inspections of storm water discharge points (outfalls) and of erosion and sediment controls have been performed as recorded in the table above. I certify that erosion and sediment controls in the drainage area of the identified outfall were installed as planned and designed and in working order as recorded in the table above. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name _____ Title _____ Signature _____

Company _____ Date _____

Information and Instructions

1. The purpose of this form is to report inspections of storm water discharge points and the condition of erosion and sediment controls (E&S Controls) at the construction site. You are required to complete this form only if discharges from the construction site enter waters listed on the Tennessee 303(d) list for siltation or have been identified as impaired since the last 303(d) list, or enter high quality waters. You can determine whether you are discharging to a listed stream by looking at the Notice of Coverage (NOC) returned to you after you applied for the construction runoff permit. You may also call your local Environmental Assistance Center at the toll-free number of 1-888-891-TDEC.

2. You are required to inspect outfall points (where discharges from the site enter streams or wet weather conveyances) to ascertain whether your erosion control measures are effective in preventing soil from leaving the construction site and entering nearby streams. You are also required to inspect the erosion and sediment control measures being used at the site, whether these controls have been installed according to the storm water pollution prevention plan and whether these controls are in working order. These inspections are required at least once per week.

3. For each month, spaces are given for every week of the month. To record the inspections and observations for a given week, write the date on which the inspections were performed in the box labeled "**Date:**." In the two boxes immediately below the **Date:** box, circle ***Yes*** or ***No*** to indicate if the inspections of outfall points and of the erosion and sediment control measures were performed, and circle ***Yes*** or ***No*** to indicate if erosion and sediment controls were in place and in working order. Sign your initials beside the yes or no answers that you give.

4. The inspection results shall be submitted (postmarked) by the 15th day of the month following the end of the quarter, to the Environmental Assistance Center responsible for the area of the State where the construction project is located. Quarters are January – March, April – June, July – September, and October - December. Continue to use the same form, submitting it with original signatures each quarter, until the end of the year or until the Notice of Termination is filed.

Environmental Assistance Centers (EACs) - Division of Water Pollution Control - Addresses

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R. S. Gass Boulevard	37243	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

State of Tennessee 1998 303(d) List

You may find the 1998 303(d) list at the following web sites:

http://www.state.tn.us/environment/water.htm (find a downloadable text file);

and

http://www.epa.gov/owow/tmdl/states/tn.html (shows maps of impaired waters).

This appendix contains, by reference, those waters that are impaired in whole or part because of siltation.

Minimum Requirements for Storm Water Pollution Prevention Plan

Applicable to Storm Water Discharges from Construction Activities previously authorized under Tennessee Rule Chapter 1200-4-10-.05, or under the Tennessee Multi-Sector Storm Water General Permit

(1) Construction Site Storm Water Control Plan

(a) The construction activity must be covered by a written, site-specific plan to minimize erosion of soil and the discharge of other pollutants into waters of the State. The developer and contractor(s) must sign the plan, stating that the plan is workable, meets requirements of this rule, and if implemented will meet discharge quality requirements of this rule. The one who signs the plan must meet signatory requirements of part VII.G. this permit. The plan must be kept on site and be made available to the Division of Water Pollution Control inspector on request.

(b) The plan shall contain the following information:

1. A description of the nature of the construction activity, including a proposed timetable for activities;

2. Estimates of the total area of the site and the area of the site that is expected to undergo excavation or grading;

3. An estimate of the increase in impervious area after the construction is completed, and an estimate, along with supporting calculations, of the volume of runoff associated with a one-inch storm;

4. A description of any fill material to be used;

5. A site map indicating, at a minimum, areas of soil disturbance, areas of cut and fill, drainage patterns and approximate slopes anticipated after major grading activities, areas used for the storage of soils or wastes, the locations of outfalls, and of all structural controls and areas where vegetative practices are to be implemented, the locations of impervious structures (including buildings, roads, parking lots, etc.) after construction is completed, and of wetlands and other surface waters; and

6. The name of the receiving waters, or if the discharge is to a municipal separate storm sewer, the name of the municipal operator of the storm sewer and the name of receiving waters into which the storm sewer discharges.

(c) If the plan is reviewed by the Division, the Director or authorized representative may notify the dischargers that the plan does not meet minimum requirements. The dischargers shall have 48 hours, unless additional time is provided by the Director, after such notification to make changes to sediment and erosion controls to prevent the discharge of sediment from the site and 15 days to make necessary changes to the plan.

(d) The plan shall describe construction management techniques and sediment and erosion controls appropriate for the activity and set forth a schedule for implementing each such controls. At a minimum, the conditions in paragraph (6) of this rule must be addressed.

(e) The plan shall describe construction site planning and permanent measures that will minimize the discharge of pollutants via storm water discharges after construction operations have been finished. Examples include open, vegetated swales and natural depressions; structures for storm water retention, detention, or recycle; velocity dissipation devices to be placed at the outfalls of detention or retention structures or along the length of outfall channels.

(f) The discharger(s) shall implement the construction site storm water control plan.

Appendix F

(2) The following conditions apply to all land disturbance work conducted under this rule.

Construction Management Techniques

(a) Clearing and grubbing must be held to the minimum necessary for grading and equipment operation.

(b) Construction must be sequenced to minimize the exposure time of cleared surface area.

(c) Construction must be staged or phased for large projects. Areas of one phase must be stabilized before another phase can be initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rainfall impacts and runoff.

(d) Erosion and sediment control measures must be in place and functional before earth moving operations begin, and must be constructed and maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but must be replaced at the end of the work day.

(e) All control measures shall be checked, and repaired as necessary, weekly in dry periods and within 24 hours after any rainfall of 0.5 inches within a 24 hour period. During prolonged rainfall, daily checking and repairing is necessary. The permittee shall maintain records of checks and repairs.

(f) A specific individual shall be designated to be responsible for erosion and sediment controls on each project site.

Vegetative Controls

(g) Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to grading or earth moving.

(h) To the extent feasible, appropriate cover shall be applied within seven days on areas that will remain unfinished for more than 30 calendar days. Examples of cover are grass, sod, straw, mulch, fabric mats, etc..

(i) Permanent soil stabilization with perennial vegetation shall be applied as soon as practicable after final grading.

Structural Controls

(j) All surface water flowing toward the construction area shall be diverted by using berms, channels, or sediment traps, as necessary.

(k) Erosion and sediment control measures shall be designed according to the size and slope of disturbed or drainage areas, to detain runoff and trap sediment.

(l) Discharges from sediment basins and traps must be through a pipe or lined channel so that the discharge does not cause erosion.

(m) Muddy water to be pumped from excavation and work areas must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be discharged through a pipe or lined channel so that the discharge does not cause erosion and sedimentation.

Discharge Quality

(n) There shall be no distinctly visible floating scum, oil or other matter contained in the storm water discharge.

(o) The storm water discharge must not cause an objectionable color contrast in the receiving stream.

(p) The storm water discharge must result in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

(3) Reporting and Recordkeeping Requirements

(a) The permittee shall maintain records of checks and repairs on site or at a nearby office.

(b) Records and information resulting from the monitoring activities required by this rule shall be retained for a minimum of three (3) years, or longer if requested by the Division of Water Pollution Control.

(c) Knowingly making any false statement on any report required by this rule may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act and in Section 69-3-115 of the Tennessee Water Quality Control Act.

(end)

APPENDIX B.
EXAMPLE STORM WATER POLLUTION PREVENTION PLAN

STORM WATER POLLUTION PREVENTION PLAN

Prepared for:

Anytown Good Neighbor Development Corporation

PICKLE CREEK PLAZA
PHASE 1

Any County, Tennessee

Prepared by:

ABC, Inc.

April 2001

Table of Contents

General Information

This Storm Water Pollution Prevention Plan (SWPPP) is developed in accordance with the Tennessee General NPDES Permit (TNR100000) for Storm Water Discharges Associated with Construction Activity (TNCGP), and is prepared using sound engineering practices. ABC, Inc. personnel involved with the development of this plan have completed the *Design of Vegetative and Structural Measures for Erosion Prevention and Sediment Control* course available from the State of Tennessee.

As instructed by Part III.F of the TNCGP, this plan and all attachments are hereby submitted to the local Environmental Assistance Center (EAC), along with the complete, correctly signed Notice of Intent (NOI). Construction will not be initiated prior to 30 days from the date of submittal of this document, or prior to receipt of a Notice of Coverage (NOC) from the Tennessee Department of Environment and Conservation (TDEC).

Owner/Developer: Anytown Good Neighbor Development Corporation
459 Some Road, Suite 306
Anytown, TN 37XXX-XXXX
(XXX) XXX-XXXX
contact person: Joe Anybody – Executive Director
email: janybody23@agndc.com

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		
Representative of owner/developer and title; print or type Joe Anybody, Executive Director	Signature (must be signed by president, V.P. or equivalent, or ranking elected official)	Date 4/25/01

Primary Contractor: Move Dirt Excavating, Inc.
345 Some Avenue
Anytown, TN 37XXX-XXXX
(XXX) XXX-XXXX
contact person: Larry Goodguy – Owner
email: lg4567@aol.com

I certify under penalty of law that I have reviewed this document and any attachments. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this Storm Water Pollution Prevention Plan, I believe the information submitted is accurate. I am aware that this Plan, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements.		
Company name of primary contractor; print or type Move Dirt Excavating, Inc.	Signature (must be signed by president, V.P. or equivalent)	Date 4/25/01

The individual responsible for installation, maintenance, and inspections of erosion and sediment control measures will be Joe Smith of Move Dirt Excavating, Inc. Mr. Smith has completed the *Fundamentals of Erosion Prevention and Sediment Control* course offered by the State of Tennessee. Mr. Smith's mobile telephone number is (123) 456-7890.

Current versions of this SWPPP, the NOI, and the NOC will be kept on the site for the duration of the project. These items will be available for the use of all operators and site personnel involved with erosion and sediment controls, and be available to TDEC personnel visiting the site. A notice will be posted near the construction entrance during Phase 1, and then near both entrances during Phases 2 and 3, containing a copy of the NOC with the tracking number assigned by the EAC, the name and telephone number of a contact person for the development, and a brief description of the project.

Prior to initiating earthwork on the areas described as Phase 2 or 3, ABC, Inc. will provide additional information to TDEC in support of this document. Phase-specific plan drawings will be created at that time.

Any new contractor on the project that has any responsibility to install, inspect, or maintain erosion or sediment control measures will sign the contractor's certification on a copy of the NOI (Appendix A) and will submit it to the local EAC. Any correspondence with TDEC or any EAC will reference the tracking number assigned by TDEC to the project. ABC, Inc. will submit a Notice of Termination (NOT; Appendix B) after the complete installation and successful establishment of the final stabilization activities at the site.

It is the intention and goal of the TNCGP and this SWPPP that any discharge from the property described in this document have no objectionable color contrast to the water body that receives it. The construction activity will be carried out in such a manner as will prevent any discharge that would cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of the waters on the property or downstream of the property for fish and aquatic life, livestock watering and wildlife, recreation, irrigation, navigation, or industrial or domestic water supply.

This plan may be amended for reasons described below, or for other reasons. When the plans are revised, the contractor will implement the changes to erosion protection and sediment controls within 48 hours after the need for modification is identified.

Existing Site Conditions

The property consists of 70 acres of rolling woodland in northeast Any County. The property lies between Nashville Hwy (US 44) and Tennessee Avenue (US 19) and has additional access from Center Street. County soil surveys indicate that the soils present within the construction area of Phase 1 are in the Craven, Uchee, and Emporia series. These series consist of deep, well-drained soils exhibiting moderate erosivity. Typically, the surface layer of this series is dark grayish brown fine sandy loam about 4 inches deep. The subsurface layer is pale brown loam about 5 inches thick. The subsoil is reddish gray and typically extends to a depth of 42 to 67 inches. Detailed soil boundary information can be found on the Drainage/Soil Map (MP-2). Shales with high carbonate content of the Johns Creek formation underlie the area. No acid-producing material should be encountered during the construction. No sinkholes or other injection wells were observed during investigation of the site.

Three wet-weather conveyances are located on Phase 1 of the property and flow eastward into Pickle Creek. At the confluence of two of the conveyances and Pickle Creek there is a wetland of approximately 0.65 acre in size. The wetland is hydrologically connected to the stream. This information was confirmed by a site visit conducted by Mr. Joe Schmoe of the Tennessee Division of Water Pollution Control on 1/1/2001, and outlined in a letter by Mr. Schmoe dated 1/11/2001. Approximately 12 acres of the property lie to the west of the stream. Around 30 acres lie north of another tributary on the east side of Pickle Creek. The remaining 28 acres lie south and east of the streams. The **Pickle Creek Plaza** project covers 60 of the 70 acres. The 10 acres of the property not involved in the project will be developed at a later date into a city park and will protect the streams and wetland with buffers and provide the public with walking paths and recreational and educational opportunities.

Project Description

The project will provide building space for future business tenants. Retail shops and professional offices will be available within the development. XX00 linear feet of new roadway (Pickle Street and Pepper Boulevard) will provide access to the site from US 19 and US 44 and from Center Street. The new roads will be constructed with the intention of becoming City of Anytown public roads, and will be built to meet those requirements. XXXXXX square feet of office space will occur in eight individual two-story wood-framed buildings constructed during Phase 1. XXXXXX square feet of retail space will be available in three single-story structures built in Phases 2 and 3. XXXX parking spaces will be provided per City of Anytown requirements. The parking areas will constitute XXXXXX square feet of total area. *Special Pave* paving system will be used in some areas of Phase 2 and 3 to reduce impervious surface and provide infiltration of precipitation back into the ground. Detention basins will be constructed to serve as temporary sediment retention basins until the site is fully stabilized. The basins will then be modified to serve as storm water detention ponds to satisfy City of Anytown requirements. Utilities will be constructed within the right-of-way of, and at the same time as, the construction of the access roads through the site.

Road crossings of each of the two streams will be constructed during Phase 2 of the project. The construction of Phase 1 of Pickle Street is designed so that it can be extended across Pickle Creek with a clear span bridge during Phase 2. ABC, Inc. will

prepare an application for an Aquatic Resource Alteration Permit (ARAP) for the road crossing prior to the initiation of Phase 2. Due to the availability of utilities from Center Street and from US 19, there should be no need to cross the stream with any utility lines. If it is determined later to be necessary to cross the stream with utility lines, notification will be made to the local EAC by ABC, Inc.

Additional fill material from off of the property or off-site disposal of excess material is not anticipated in the grading plan of Phase 1. Should a need be determined later, it is the responsibility of the contractor to contact ABC, Inc. to revise this SWPPP to include those areas. If the new area is used solely by the project outlined in this plan, the new area is considered to be a part of this project, and the erosion prevention and sediment control at that location will also be the responsibility of the contractor.

303(d) Special Requirements

Discharges from the project enter Pickle Creek, which is 303(d) listed as being impaired by sediment. According to Part III.F. of the TNCGP, this plan and all attachments is being submitted to the local EAC, along with the completed NOI. In addition, inspections will be performed by qualified personnel before anticipated storm events (or series of storm events such as intermittent showers over one or more days), within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once per week. Inspections will cover, at a minimum, all disturbed areas that have not undergone final stabilization, sediment control structures, outfall points, and the stream. The inspections will be conducted with the purpose of determining whether erosion prevention and sediment control measures are effective in preventing impacts to receiving waters. If during these inspections it is discovered that repair or maintenance is required of any temporary or permanent control measure, the action taken to correct the problem will be documented.

If the controls are installed and maintained correctly but are found to provide an inadequate level of protection, ABC, Inc. will make revisions to this plan and these revisions will be implemented by the contractor. The inspector will certify on a weekly basis (on the form found in Appendix C) that the inspection described above has been performed and whether or not all of the erosion and sediment control measures are installed and in working order. The record of certifications on the form will be submitted to the local EAC by the 15th of the month following the end of the quarter. Quarters are January – March, April – June, July – September, and October – December. The inspector will maintain a rain gage and a daily log of readings.

Runoff Calculations

Natural Resource Conservation Service TR-55 method was used to estimate pre- and post-development runoff. The calculations indicate that there will be a net increase in runoff coefficient and in peak discharge as a result of the project. Therefore, the sediment basins will be converted to use as storm water detention basins for post-construction control. Post-development runoff curve number will be 83 and the peak discharge will be 17.6 cfs during the design storm. Worksheets for the TR-55 calculations are found in Appendix E.

Safe Dams Act Information

The sediment basins in use on Phase 1 of this project do not meet the definition of 'dams' as found in Chapter 1200-5-7 of the Rules of the Department of Environment and Conservation, Division of Water Supply, concerning the Safe Dams Act of 1973. Therefore, no certificate is required for the construction of the basins.

Spills and Non-Storm Water Contingencies

All fueling of equipment and vehicles on site will be conducted near the construction entrance/staging area off of Center Street. Any spillage will be removed immediately. Contaminated soils will be placed on heavy plastic and covered or placed into approved containers to prevent contact with storm water. All fuel tanks will be in the containment area. Oils, other vehicle fluids, paints, and solvents will be stored in the construction trailer. Any spill in excess of two gallons will be reported to a representative of Move Dirt Excavating, Inc.

If a release containing a hazardous substance in an amount equal to or in excess of a reporting quantity established under either 40 CFR 117 or 40 CFR 302 occurs during a 24-hour period, the contractor will immediately notify the permittee who shall then do the following: notify the National Response Center (NRC) (800-424-8802) and the Tennessee Emergency Management Agency (TEMA) (emergencies: 800-262-3300; non-emergencies: 800-262-3400); as well as the local Environmental Assistance Center. Also, ABC, Inc. will prepare a revision of this document to identify measures to prevent the reoccurrence of such releases.

Concrete trucks will wash out at the designated area near the construction entrance. Each contractor is responsible to provide litter control for trash generated by his crew. A dumpster for garbage will be located near the construction trailer and is limited to garbage and paper trash only. Paint cans, oil cans, used oil, and filters will be contained and disposed of by the contractor by taking them to the Any County Hazardous Waste Disposal Center on Division Road.

Phasing of Construction

Clearing, grading, and construction on the 60 acres will be accomplished in three phases. Phase 1 consists of 10 acres of disturbance, and includes the construction of the west office buildings, supporting utilities, and parking, along with the installation of Pickle Street to a point just west of Pickle Creek. This SWPPP has been developed and submitted for Phase 1 construction. Phase 2 constitutes the construction of the retail and office complex on the northeastern portion of the property, including all parking areas, utility installation, and road crossings over Pickle Creek and its tributary; and encompasses 28 acres of disturbance. Phase 3 will be the construction of the building complex and associated improvements located on the southeastern part of the project. Phase 3 covers the remaining 22 acres of disturbed area of the project. Phase 1 will be completed and stabilized to the extent possible before the initiation of Phase 2. Phase 2 will be completed, including landscaping, and any remaining bare soils stabilized prior to the initiation of Phase 3.

Sequencing of Phase 1

1. The site plan incorporates a streamside buffer zone to help protect the quality of the riparian area and prevent pollution to the streams. High-visibility safety fencing will be installed as indicated on the Structural Control Plan (MP-3) to indicate the boundary of the buffer zone. Care will be utilized to prevent the operation of equipment within, or otherwise disturbing the buffer zone. The same safety fencing will be used to identify trees to be protected on other parts of the property as well. ABC, Inc. will survey the limits of clearing and mark this boundary with flagging tape.
2. Since the area of Phase 1 drains away from the street, temporary sediment barriers will be installed down slope of this disturbance and moved further down slope as the ground-disturbing activity is extended toward the creek. All erosion prevention and sediment control best management practices identified in this SWPPP will be installed as recommended in the Tennessee Erosion and Sediment Control Handbook.
3. Land-disturbing activity at the project site will begin with the installation of the construction entrance/exit and the staging/equipment storage area off of Center Street. Due to the high traffic use of Center Street, a truck wash will be installed for the use of any vehicles leaving the site. The truck wash will recycle the wash water and will be self-contained so that no water can escape to the street or toward the stream.
4. After the exit has been constructed, work will commence to salvage any valuable timber from the property. The logger is a graduate of the Tennessee Division of Forestry's Master Logger Program and will not cut any trees within the streamside buffer zone.
5. Construction of sediment basins #1 and #2, including slope drains and outfall structures, will be completed and they will be functional prior to any further grade work. The basins incorporate a two stage design to slow down the storm water and drop out larger soil particles. These areas will also allow easy clean out of any built up sediment deposits. Diversion ditches and berms will be constructed as needed to divert any runoff from the active construction areas into the basins.
6. Diversion ditches will be constructed at the north and south margins of the property to divert any storm waters coming from off the site around the future construction area. Topsoil stripped for the footprint of the basins and storage areas will be used to construct the berms.
7. Seeding and mulching or other stabilization measure as identified per the Stabilization Plan (Appendix D) will occur after final grade is achieved at the basins and diversions, and before any further disturbance of the site. Slope drains will be used to convey storm water from the construction areas down slope to the sediment basins.
8. Topsoil in the area of the new road and parking areas will be removed next and stockpiled and immediately seeded per the Stabilization Plan (Appendix D). Construction of the roadbed, parking, primary utilities, sidewalks, shoulders, and permanent storm sewer system will be initiated at this time. The catch basins for the storm sewers will be sealed off from storm water until gravel subgrade or pavement is applied to the road and parking. Clearing and

grubbing will be kept to the minimum necessary to accomplish the grade work of this phase.

9. Work on the road and parking lots will progress until the point some durable surface is applied to these areas and the utilities and shoulders are at final grade and stabilized before disturbance of the building sites is initiated.
10. Storm drain inlet protection will be installed when the permanent system is in place and functioning.
11. Cut and fill activities to prepare the portion of the property for construction of the office buildings will progress at this point. Clearing and grubbing will be kept to the minimum necessary to accomplish the grade work of this phase.
12. It is anticipated that all fill material necessary to achieve proposed grades in the area of Phase 1 can be acquired within the area of Phase 1.
13. Sediment will be removed from sediment traps, silt fences, sedimentation ponds, and other sediment controls before the design capacity of the structure has been reduced by 50%. Litter, construction debris, and construction chemicals exposed to storm water will be picked up prior to anticipated storm events (e.g. forecasted by local weather reports), or otherwise prevented from becoming a pollutant source for storm water discharges (e.g., screening outfalls, daily pick-up, etc.). After use, silt fences will be removed or otherwise prevented from becoming a pollutant source for storm water discharges. Temporary measures may be removed at the beginning of the workday, but will be replaced at the end of the workday.
14. Stabilization will be accomplished as soon as practicable after attainment of final grade and no later than seven days after attaining final grade. Where earth-disturbing activity has temporarily ceased, temporary stabilization will be applied within seven days if the activity will not resume within 15 days. The dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated will be recorded and maintained on the site. Stabilization methods are outlined in the Stabilization Plan (Appendix D) and may include seed and mulch, or seed and erosion control blankets as identified on the Final Structures Plan (MP-4).
15. Phase 1 will be completed and stabilized to the extent possible before the initiation of Phase 2. At this point, all disturbed area will drain to the sediment basins only. Any unstable areas near the streams that will not drain to the basins will be stabilized before proceeding any further.

Appendix A

Notice of Intent

Department of Environment and Conservation
Division of Water Pollution Control

CONSTRUCTION ACTIVITY – STORM WATER DISCHARGES
NOTICE OF INTENT (NOI)

Name of the construction project (site)	**County/(ies)**	Existing NPDES Permit No. (if site is already permitted)
Pickle Creek Plaza – Phase 1	**Any County**	TNR

Street address (or description of location) and nearest city **Located between Nashville Hwy (US 44) and Tennessee Avenue (US 19) near Center Street in Anytown.** ☒ Map attached (required)	Latitude **37.3375** Longitude **-83.34583**
Construction project (site) description **The construction of retail shops and professional offices along with all supporting parking roadways, utilities, and storm water systems.** Area to be disturbed (acres): **Phase 1 = 10, Phase 2 = 28, Phase 3 = 22, Total = 60**	Start date **June 1, 2001** Estimated end date **August 31, 2003**
Construction site owner/developer: legal name and mailing address, including zip code **Anytown Good Neighbor Development Corporation** **459 Some Road, Suite 306** **Anytown, TN 37XXX-XXXX**	Contact person, phone number and e-mail address **Joe Anybody** **(123) 456-0987** **janybody23@agndc.com**
Name(s) of stream(s), wetland(s), lake(s) or other waters of the state receiving storm water runoff from the construction site **Pickle Creek and tributaries**	
Do there appear to be streams ☒ and/or wetlands ☒ on the construction site?	☒Yes ❑ No
If an Aquatic Resource Alteration Permit (ARAP) has been obtained for this site, provide the permit number.	In application
Has the Storm Water Pollution Prevention Plan (SWPPP) been developed?	☒Yes ❑ No
Note that the NOI will be considered incomplete if you answered "No" to the above question. Submit the NOI when the SWPPP is developed.	

Permit Application Certification and Signature (must be signed by President, Vice-President or equivalent, or ranking elected official)

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

Representative of owner/developer; print or type	Signature	Date
Joe Anybody – Executive Director		**4/25/01**

Certification for Contractor(s) (must be signed by President, Vice President or equivalent, or ranking elected official)

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this Notice of Intent, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements.

1. Company name of primary contractor; print or type	Signature by representative of primary contractor	Date
Move Dirt Excavating, Inc.		**4/25/01**
2. Company name of other contractor; print or type	Signature by representative of other contractor	Date
3. Company name of other contractor; print or type	Signature by representative of other contractor	Date

OFFICIAL STATE USE ONLY

Received Date	EAC	Permit Number	Reviewer	Notice of Coverage Date
		TNR		
303d Receiving Stream	High Quality Water	Threatened and Endangered Aquatic Fauna		

CN-0940 (rev. 9-00) RDAs 2399 and 2400

CONSTRUCTION ACTIVITY – STORM WATER DISCHARGES
NOTICE OF INTENT (NOI) - INSTRUCTIONS

Purpose of this form. A completed Notice of Intent (NOI) must be submitted to obtain coverage under the Tennessee General NPDES Permit for discharges of storm water associated with construction activity. This permit is required for storm water discharge(s) from construction sites that involve grubbing, clearing, grading or excavation of five or more acres of land. This form should be submitted at least 30 days prior to the start date of any land disturbing activities such as grubbing, clearing, grading or excavation.

Notice of Coverage. The Division will process your application and return to you a Notice of Coverage (NOC). Runoff from the construction site will not be permitted until the Division has prepared this NOC.

Completing the form. Type or print clearly, using ink and not markers or pencil. Answer each item or enter "NA," for not applicable, if a particular item does not fit the circumstances or characteristics of your construction site or activity. If you need additional space, attach a separate piece of paper to the NOI form.

Who must submit the NOI form? The NOI form must be signed by the "operator(s)" of the construction site. Operators will most likely include the developer of the site, and the primary contractor(s). "Operator" means any party associated with the construction project that meets either of the following two criteria: (1) the party has operational control over project specifications (including the ability to make modifications in specifications); or (2) the party has day-to-day operational control of those activities at a project site which are necessary to ensure compliance with the storm water pollution prevention plan or other permit conditions (e.g., they are authorized to direct workers at the site to carry out activities identified in the storm water pollution prevention plan or comply with other permit conditions). If a contractor has not been identified at the time the NOI is submitted by the developer, the contractor(s) must submit a separate NOI in order to obtain authorization under this permit. The contractor must include the NPDES permit number that is already assigned to the site, along with the name of the construction project and its location.

Describe and locate the project. Use the legal or official name of the construction site. If a construction site lacks street name or route number, give the most accurate geographic information available to describe the location (reference to adjacent highways, roads and structures; e.g. intersection of state highways 70 and 100). Latitude and longitude of the center of the site can be located on USGS quadrangle maps. The quadrangle maps can be obtained at 1-800-USA-MAPS, or at the Census Bureau Internet site: http://www.census.gov/cgi-bin/gazetteer. Attach a copy of a portion of a 7.5 minute quad map, showing location of site, with boundaries at least one mile outside the site boundaries. Provide estimated starting date of clearing activities and completion date of the project, and an estimate of the number of acres of the site on which soil will be disturbed, including borrow areas, fill areas and stockpiles.

Give name of the receiving stream. Trace the route of storm water runoff from the construction site and determine the name of the river(s), stream(s), creek(s), wetland(s), lake(s) or any other water course(s) into which the storm water runoff drains. Note that the receiving water course may or may not be located on the construction site. If the first water body receiving construction site runoff is unnamed ("unnamed tributary"), determine the name of the water body which the unnamed tributary enters.

ARAP permit may be required. If your work will disturb or cause alterations of a stream or wetland, you must obtain an appropriate Aquatic Resource Alteration Permit (ARAP). If you have a question about the ARAP program or permits, contact your local Environmental Assistance Center.

You must prepare a Storm Water Pollution Prevention Plan (SWPPP) prior to submitting the NOI.

Submitting the form and obtaining more information. Note that this form must be signed by the company President, Vice-President, or a ranking elected official in the case of a municipality. For more information, contact your local Environmental Assistance Center at the toll-free number 1-888-891-8332 (TDEC). Submit the completed NOI form to the appropriate EAC below (call the toll-free number to determine), addressed with **Attention: Storm Water NOI Processing**.

Environmental Assistance Centers(EACs) - Division of Water Pollution Control - Addresses

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R S Gass Boulevard	37206	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

Appendix B

Notice of Termination

To be completed and submitted to the local EAC when all construction and stabilization activities have been completed and stabilization measures are effective, or if an operator's responsibilities at this site have ended.

Department of Environment and Conservation
Division of Water Pollution Control

NOTICE OF TERMINATION (NOT) – STORM WATER DISCHARGES CONSTRUCTION ACTIVITY

The purpose of this form is to notify the Tennessee Department of Environment and Conservation that you, as a permitted operator of storm water discharges from a construction activity, no longer have responsibilities related to erosion and sediment controls at the construction site. Type or print clearly, using ink and not markers or pencil.

NPDES Permit Number TNR __ __ __ __ __ __ (Include the NPDES permit number for the site.)

Name of the construction project (site)

Pickle Creek Plaza – Phase 1

Street address (or description of location)

Located between Nashville Hwy (US 44) and Tennessee Avenue (US 19) near Center Street in Anytown.

Legal name of the construction site operator

Anytown Good Neighbor Development Corporation

Mailing address	Telephone number and/or e-mail address
459 Some Road, Suite 306 **Anytown, TN 37XXX-XXXX**	**(123) 456-0987** **Janybody23@agndc.com**

Have the storm water discharges associated with construction activity been eliminated? ❑ Yes ❑ No

If YES, provide the date at which the construction site was finally stabilized.

Construction activities at the site continue, but my responsibilities with respect to the construction activities have ceased. ❑ Yes ❑ No

If YES, provide the name, mailing address and telephone number of any new operators (for instance, an operator who has taken over your responsibilities) involved with soil disturbance at the construction site.

Certification and Signature (must be signed by President, Vice President or equivalent, or ranking elected official)

I certify under penalty of law that either: (a) all storm water discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or (b) I am no longer an operator at the construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with construction activity under this general permit, and that discharging pollutants in storm water associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

For the purposes of this certification, elimination of storm water discharges associated with construction activity means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time to insure final stabilization is maintained, or that all storm water discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have otherwise been eliminated from the portion of the construction site where the operator had control.

Printed name (construction site operator)	Signature	Date

Permittees who are presently covered under the Tennessee General NPDES Permit to Discharge Storm Water Associated with Construction Activity must submit a Notice of Termination after completion of their construction activities and final stabilization of their portion of the site, or within 30 days after another operator has taken over all of their responsibilities at the site. A permittee cannot submit a NOT without final stabilization unless another party has agreed to assume responsibility for final stabilization of the site. A completed NOT form should be submitted to the local Division of Water Pollution Control Office address (see table below), and marked "**Storm Water Notice of Termination.**"

Environmental Assistance Centers (EACs) - Division of Water Pollution Control - Addresses
EAC Offices may be reached by dialing toll-free 1-888-891-TDEC.

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	537 Brick Church Park Drive	37243-1550	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

Appendix C

Inspection Report

To be submitted to the local EAC every quarter.

Department of Environment and Conservation
Division of Water Pollution Control

Construction Storm Water Inspection Report

(This form is required only for discharges into siltation-impaired streams and into high quality waters.)

Construction Site Information

NPDES Permit No. TNR _____ Notice of Coverage (NOC) Date _____ County _____

Name of Project **PICKLE CREEK PLAZA – PHASE 1**

Developer and/or Contractor Name **ANYTOWN GOOD NEIGHBOR DEVELOPMENT CORPORATION**

Outfall No. _____ (or station no. or other identifier of drainage area represented)

Month/Year	Week 1	Week 2	Week 3	Week 4	Week 5
	Yes or ***No***/ Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials	***Yes*** or ***No*** / Initials
January, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
February, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
March, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
April, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
May, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
June, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
July, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
August, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
September, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
October, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /

CN-1173 RDAs 2399 and 2400

(continued on reverse)

November, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
December, _____	Date:	Date:	Date:	Date:	Date:
Inspections Performed	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /
E&S Controls in Order	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /	***Yes*** or ***No*** /

Provide the following information for the person(s) who have performed and initialed the above inspections. If more than two persons have performed these inspections, give information for the two persons who performed the most numbers of inspections.

Initials _____	Name _____ Phone No. (_____)_____
Initials _____	Name _____ Phone No. (_____)_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated information presented. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that inspections of storm water discharge points (outfalls) and of erosion and sediment controls have been performed as recorded in the table above. I certify that erosion and sediment controls in the drainage area of the identified outfall were installed as planned and designed and in working order as recorded in the table above. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name _____ Title _____ Signature _____

Company _____ Date _____

Information and Instructions

1. The purpose of this form is to report inspections of storm water discharge points and the condition of erosion and sediment controls (E&S Controls) at the construction site. You are required to complete this form only if discharges from the construction site enter waters listed on the Tennessee 303(d) list for siltation or have been identified as impaired since the last 303(d) list, or enter high quality waters. You can determine whether you are discharging to a listed stream by looking at the Notice of Coverage (NOC) returned to you after you applied for the construction runoff permit. You may also call your local Environmental Assistance Center at the toll-free number of 1-888-891-TDEC.

2. You are required to inspect outfall points (where discharges from the site enter streams or wet weather conveyances) to ascertain whether your erosion control measures are effective in preventing soil from leaving the construction site and entering nearby streams. You are also required to inspect the erosion and sediment control measures being used at the site, whether these controls have been installed according to the storm water pollution prevention plan and whether these controls are in working order. These inspections are required at least once per week.

3. For each month, space is given for each week of the month, with three boxes for each week. To record the inspections and observations for a week, write the date on which the inspections were performed in the box labeled "**Date:**." In the boxes below it, circle ***Yes*** or ***No*** to indicate if the inspections, both of outfall points and of the erosion and sediment control measures, were performed, and circle ***Yes*** or ***No*** to indicate if erosion and sediment controls were in place and in working order. Sign your initials beside the yes or no answers that you give.

4. The inspection results shall be submitted (postmarked) by the 15th day of the month following the end of the quarter, to the Environmental Assistance Center responsible for the area of the State where the construction project is located. Quarters are January – March, April – June, July – September, and October - December. Continue to use the same form, submitting it with original signatures each quarter, until the end of the year or until the Notice of Termination is filed.

Environmental Assistance Centers (EACs) - Division of Water Pollution Control - Addresses

EAC Office	Street Address	Zip Code	EAC Office	Street Address	Zip Code
Memphis	2510 Mt. Moriah Road STE E-645	38115-1520	Cookeville	1221 South Willow Ave.	38506
Jackson	362 Carriage House Drive	38305-2222	Chattanooga	540 McCallie Avenue STE 550	37402-2013
Nashville	711 R S Gass Boulevard	37206	Knoxville	2700 Middlebrook Pike STE 220	37921
Columbia	2484 Park Plus Drive	38401	Johnson City	2305 Silverdale Road	37601

Appendix D

Stabilization Plan

PERMANENT SEEDING MIXTURES

Seeding Dates	Grass Seed	Percentages
February 1 to July 1	Kentucky 31 Fescue	80%
	Korean Lespedeza	15%
	English Rye	5%
June 1 to August 15	Kentucky 31 Fescue	55%
	English Rye	20%
	Korean Lespedeza	15%
	German Millet	10%
April 15 to August 15	Bermudagrass (hulled)	70%
	Annual Lespedeza	30%
August 1 to December 1	Kentucky 31 Fescue	70%
	English Rye	20%
	White Clover	10%
February 1 to December 1	Kentucky 31 Fescue	70%
	Crown Vetch	25%
	English Rye	5%

TEMPORARY SEEDING MIXTURES

Seeding Dates	Grass Seed	Percentages
January 1 to May 1	Italian Rye	33%
	Korean Lespedeza	33%
	Summer Oats	34%
May 1 to July 15	Sudan - Sorghum	100%
May 1 to July 15	Starr Millet	100%
July 15 to January 1	Balboa Rye	67%
	Italian Rye	33%

Appendix E

TR – 55 Worksheets

Worksheet 2: Runoff curve number and runoff

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☑ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
CRAVEN and EMPORIA (C)	WOODED - GOOD	70			8.27	578.9
UCHEE (A)	WOODED - GOOD	30			1.46	43.80
	Totals ➡				9.73	622.7

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{622.7}{9.73} = 63.99$; **Use CN** ➡ 64

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	25	
Rainfall, P (24-hour)	in	3.36	6.5	
Runoff, Q	in	0.65	2.62	

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☑ Present ☐ Developed

Check one: ☐ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	AB	
1.	Surface description (table 3-1)	DENSE WOODS	
2.	Manning's roughness coefficient, n (table 3-1)	0.80	
3.	Flow length, L (total L † 300 ft) ft	185	
4.	Two-year 24-hour rainfall, P_2 in	3.36	
5.	Land slope, s ft/ft	0.16	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.43	+ = 0.43

Shallow concentrated flow

	Segment ID	BC	
7.	Surface description (paved or unpaved)	UNPAVED	
8.	Flow length, L ft	215	
9.	Watercourse slope, s ft/ft	0.14	
10.	Average velocity, V (figure 3-1) ft/s	6.0	
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.01	+ = 0.01

Channel flow

	Segment ID	CE	
12.	Cross sectional flow area, a ft^2	1.5	
13.	Wetted perimeter, p_w ft	3.6	
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft	0.42	
15	Channel slope, s ft/ft	0.0324	
16.	Manning's roughness coefficient, n	0.033	
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s	4.55	
18.	~~Flow~~ length, L ft	340	
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.02	+ = 0.02
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr		0.46

Worksheet 4: Graphical Peak Discharge method

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☑ Present ☐ Developed

1. Data

Drainage area ..... A_m = 0.015 mi^2 (acres/640)

Runoff curve number .....CN = 64 (From worksheet 2)

Time of concentration ..... T_c = 0.46 hr (From worksheet 3)

Rainfall distribution ..... = II (I, IA, II III)

Pond and swamp areas sprea
throughout watershed ..... = _____ percent of A_m (_____ acres or mi^2 covered)

	Storm #1	Storm #2	Storm #3
2. Frequency ..... yr	2		
3. Rainfall, P (24-hour) ..... in	3.36		
4. Initial abstraction, I_a ..... in (Use CN with table 4-1)	1.125		
5. Compute I_a / P	0.334		
6. Unit peak discharge, q_u ..... csm/in (Use T_c and I_a / P with exhibit 4– _____)	440		
7. Runoff, Q ..... in (From worksheet 2) Figure 2-6	0.65		
8. Pond and swamp adjustment factor, F_p ..... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond ans swamp area.)			
9. Peak discharge, q_p ..... ft^3/s	4.3		

(Where $q_p = q_u A_m Q F_p$)

Worksheet 2: Runoff curve number and runoff

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☐ Present ☑ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
C	OPEN SPACE	74			2.83	209.42
C	WOODS	70			3.30	231.0
	IMPERVIOUS	98			4.7	460.60
[1/] Use only one CN source per line				**Totals** ➡	10.83	901.02

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{901.02}{10.83} = 83.19$; **Use CN** ➡ 83

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	25	100
Rainfall, P (24-hour)	in	3.36	6.5	8.2
Runoff, Q	in	1.74	4.55	6.17

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☐ Present ☑ Developed

Check one: ☑ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	AB	
1.	Surface description (table 3-1)	DENSE GRASS	
2.	Manning's roughness coefficient, n (table 3-1)	0.24	
3.	Flow length, L (total L † 300 ft) ft	100	
4.	Two-year 24-hour rainfall, P_2 in	3.36	
5.	Land slope, s ft/ft	0.01	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.30 +	= 0.30

Shallow concentrated flow

	Segment ID	BC	
7.	Surface description (paved or unpaved)	PAVED	
8.	Flow length, L ft	200	
9.	Watercourse slope, s ft/ft	0.02	
10.	Average velocity, V (figure 3-1) ft/s	2.95	
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.02 +	= 0.02

Channel flow

	Segment ID	CD	DE
12.	Cross sectional flow area, a ft^2		1.5
13.	Wetted perimeter, p_w ft		3.6
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		0.42
15	Channel slope, s ft/ft		0.0324
16.	Manning's roughness coefficient, n	0.013	0.033
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s	Av. 5.1	4.55
18.	~~Flow~~ length, L ft	640	200
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.03 + 0.01	= 0.04
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr		0.36

Worksheet 4: Graphical Peak Discharge method

Project	By	Date
PICKLE CREEK PLAZA - Phase I	JCP	03/01
Location	**Checked**	**Date**
HWY 44 @ CENTER ST		

Check one: ☐ Present ☑ Developed

1. Data

Drainage area ..... A_m = 0.0169 mi^2 (acres/640)

Runoff curve number .....CN = 83 (From worksheet 2)

Time of concentration ..... T_c = 0.36 hr (From worksheet 3)

Rainfall distribution ..... = II (I, IA, II III)

Pond and swamp areas sprea
throughout watershed ..... = _____ percent of A_m (_____ acres or mi^2 covered)

	Storm #1	Storm #2	Storm #3
2. Frequency ..... yr	2	25	100
3. Rainfall, P (24-hour) ..... in	3.36	6.5	8.2
4. Initial abstraction, I_a ..... in (Use CN with table 4-1)	0.410	0.410	0.410
5. Compute I_a/P	0.122	0.063	0.05
6. Unit peak discharge, q_u ..... csm/in (Use T_c and I_a/P with exhibit 4– _____)	600	625	625
7. Runoff, Q ..... in (From worksheet 2) Figure 2-6	1.74	4.55	6.17
8. Pond and swamp adjustment factor, F_p ..... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond ans swamp area.)			
9. Peak discharge, q_p ..... ft^3/s	17.6	48.1	65.2

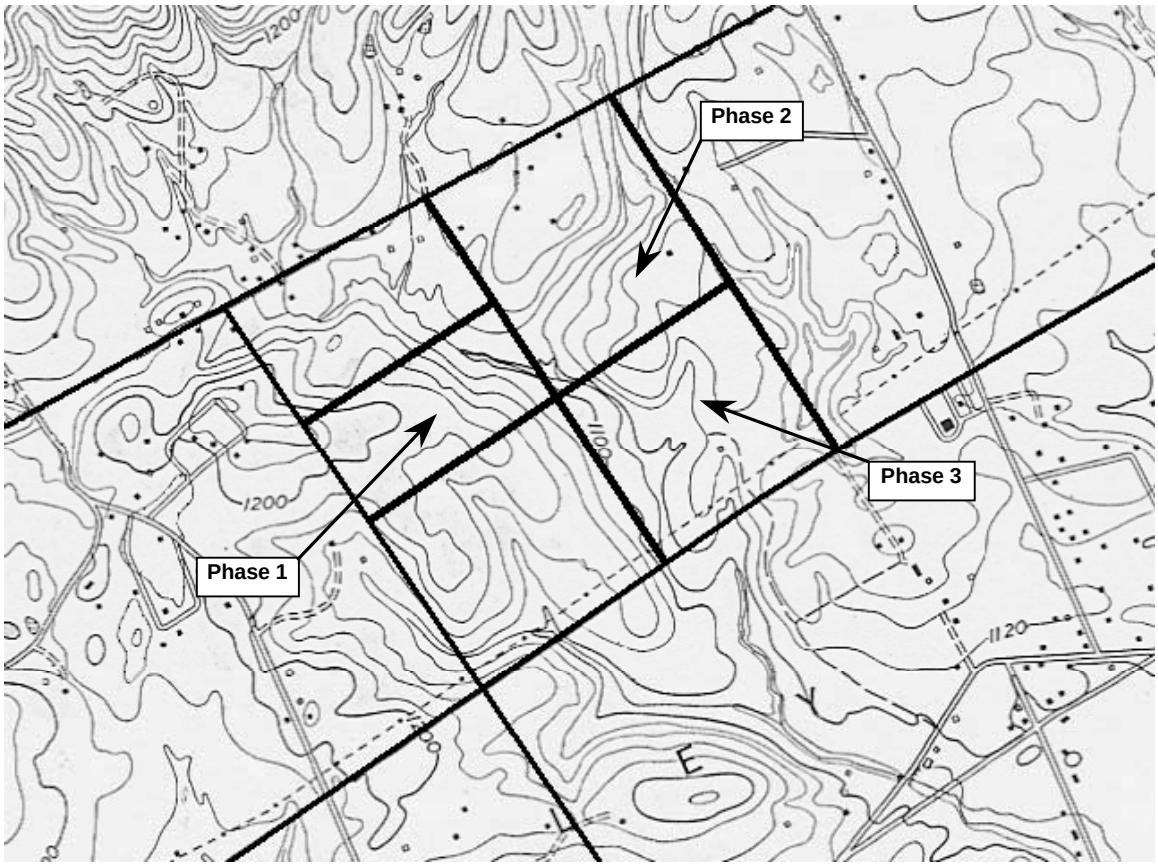
(Where $q_p = q_u A_m Q F_p$)

SITE LOCATION MAP

PICKLE CREEK PLAZA – PHASE 1

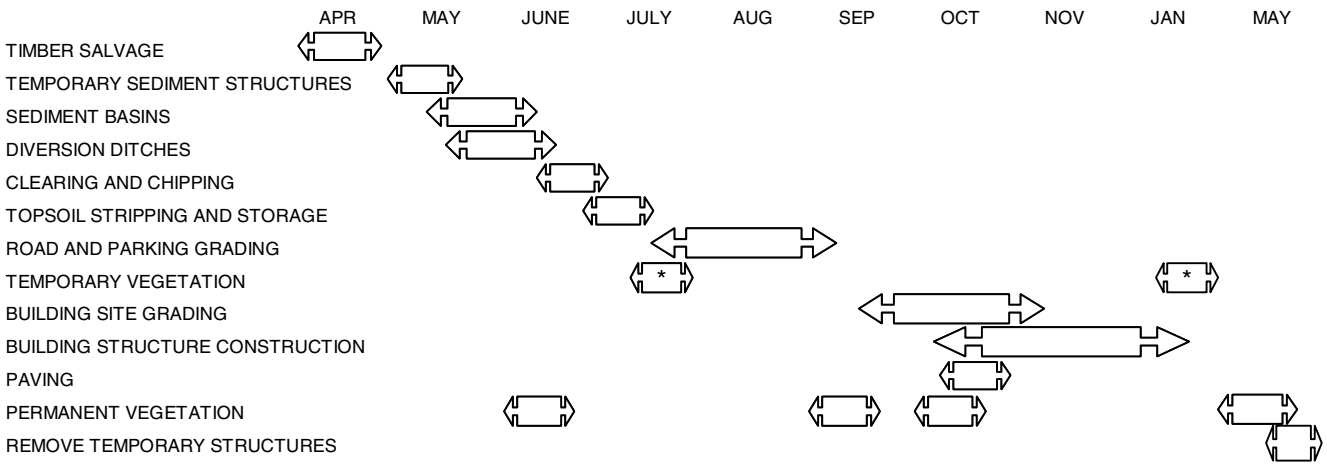
ANYTOWN GOOD NEIGHBOR DEVELOPMENT CORPORATION

Any County, Tennessee
Perry Springs 7.5' USGS Quadrangle
Latitude: 37.3375 Longitude: -83.34583



SCALE 1:24,000

CONSTRUCTION SCHEDULE



ABC, INC.

EXISTING ASPHALT PARKING

ASSUMED BENCHMARK NAIL IN POLE=100.00

EXISTING TWO STORY BLDG.

CENTER STREET

HEAVILY WOODED

HEAVILY WOODED

HEAVILY WOODED

EXISTING ONE STORY BLDG.

EXISTING GRAVEL PARKING

PROPERTY BOUNDARY

PICKLE CREEK

SOILS
10B-CRAVEN
11C-UCHEE
15F-EMPORIA

SOIL BOUNDARY
SAFETY FENCE
SILT FENCE

15F

11C

10B

SF

CE

NORTH

SITE PLAN

0 40 80 120
FEET

PICKLE CREEK PLAZA

DRAINAGE/SOIL MAP

MP-2

ABC, INC.

EXISTING ASPHALT PARKING

EXISTING TWO STORY BLDG.

ASSUMED BENCHMARK NAIL IN POLE=100.00

CENTER STREET R.O.W.

PROPERTY BOUNDARY

LIMIT OF CLEARING

LIMIT OF CLEARING

LIMIT OF CLEARING

EXISTING ONE STORY BLDG.

EXISTING GRAVEL PARKING

PICKLE CREEK

PROPERTY BOUNDARY

CE CONSTRUCTION EXIT
DI DIVERSION
OP OUTLET PROTECTION
SF SILT FENCE
SD SLOPE DRAIN
SB SEDIMENT BASIN
PS PERMANENT SEEDING W/ MULCH
IP INLET PROTECTION
CRS CONSTRUCTION ROAD STABILIZATION
CD CHECK DAM
ST SEDIMENT TRAP
MA EROSION CONTROL BLANKET W/ SEED

EXISTING GRADE
95 WORKING GRADE
LIMIT OF CLEARING
SAFETY FENCE

NORTH

SITE PLAN

0 40 80 120
FEET

PICKLE CREEK PLAZA

STRUCTURAL CONTROL PLAN

MP-3

ABC, INC.

EXISTING ASPHALT PARKING

ASSUMED BENCHMARK
NAIL IN POLE=100.00

EXISTING TWO STORY BLDG.

PROPERTY BOUNDARY

CENTER STREET

R.O.W.

EXISTING ONE STORY BLDG.

EXISTING GRAVEL PARKING

PICKLE CREEK

PROPERTY BOUNDARY

NORTH

SITE PLAN

0 40 80 120
FEET

EXISTING GRADE
95 FINISHED GRADE
TREE LINE
STORM SEWER
PS PERMANENT SEEDING W/ MULCH
IP INLET PROTECTION

PICKLE CREEK PLAZA

FINAL STRUCTURES PLAN

MP-4

APPENDIX C.
AQUATIC RESOURCE ALTERATION PERMIT

RULES
OF
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
WATER QUALITY CONTROL BOARD
DIVISION OF WATER POLLUTION CONTROL

CHAPTER 1200-4-7
AQUATIC RESOURCE ALTERATION

TABLE OF CONTENTS

1200-4-7-.01 GENERAL

(1) These rules are promulgated in order to prevent the future pollution of state waters and to plan for the future use of such waters so that the water resources of Tennessee might be used and enjoyed to the fullest extent consistent with the maintenance of unpolluted waters, T.C.A. §69-3-102(b). Persons who wish to conduct an activity that may impact a water of the state shall consider avoidance and minimization of such impacts. If impacts to the waters will occur, mitigation as set forth in part (7) of these rules must be proposed to offset any lost resource value.

(2) The Federal Water Pollution Control Act or Clean Water Act, §401 (33 U.S.C. §1341), provides that an applicant for a federal license or permit for a discharge into the waters of the United States must provide the federal licensing or permitting agency a certification from the State in which the discharge originates or will originate, and that any such discharge will comply with the applicable provisions of §§301, 302, 303, 306 and 307 of that Act.

(3) Additionally, the Tennessee Water Quality Control Act of 1977, T.C.A. §69-3-108(b)(1), provides that it is unlawful for any person, except in accordance with the conditions of a valid permit, to carry out any activity which may result in the alteration of the physical, chemical, radiological, biological, or bacteriological properties of any waters of the State, including wetlands. These activities include, but are not limited to: the discharge of dredge or fill material, dredging, stream channel modifications, water withdrawals, wetlands alterations including drainage, and other construction activities which result in the alteration of the waters of the State. State permits for these activities are either §401 Water Quality Certifications or Aquatic Resource Alteration Permits.

(4) This regulation prescribes procedures peculiar to these permits, in addition to the general requirements and procedures of Chapter 1200-4-1 of the Rules of the Water Quality Control Board and the Department of Environment and Conservation, and the Tennessee Water Quality Control Act of 1977. This regulation only applies to activities which do not require a National Pollutant Discharge Elimination System (NPDES) permit or which do not result from the operation of a treatment system.

***Authority**: T.C.A. §69-3-105(b) and 69-3-108.* ***Administrative History**: Original rule filed February 26, 1987; effective April 12, 1987. Amendment filed October 8, 1991; effective November 22, 1991. Amendment filed August 25, 2000; effective November 8, 2000.*

1200-4-7-.02 EXEMPTIONS

(1) Management activities such as timber harvesting and beaver control, which do not alter or adversely affect the classified uses of waters of the state, are not subject to these requirements.

(2) Agriculture and forestry activities and activities necessary to the conduct thereof and lands devoted to the production of agricultural or forestry products are exempt from the requirements of the Act and these rules,

unless there is a point source discharge, as provided in T.C.A. §69-3-120(g). Thus, normal farming, forestry and livestock management activities such as plowing, seeding, cultivating, minor drainage, water withdrawal for irrigation, and harvesting for the production of food, fiber, and forest products are exempt if they are part of an established (i.e., on-going) farming, forestry, or livestock management operation, unless there is a point source discharge.

(3) The Department of Agriculture provides guidance for development of best management practices (BMP's) for agriculture and forestry. One of the primary goals of these BMP's is the prevention of soil erosion and discharge of silt and sedimentation to streams. These BMP's should be followed. If silvicultural activities fail to use BMP's and a point source discharge results in water pollution, the Commissioner is authorized to issue a stop work order under P.Ch. 680 of the Acts of 2000.

(4) Existing water withdrawals on July 25, 2000, which do not adversely alter or effect the classified use of the source stream, are not subject to these requirements.

Authority: *T.C.A. §69-3-105(b) and §69-3-108.* ***Administrative History:*** *Original rule filed February 26, 1987; effective April 12, 1987. Amendment filed October 8, 1991; effective November 22, 1991. Amendment filed August 25, 2000; effective November 8, 2000.*

1200-4-7-.03 DEFINITIONS

As used in this rule chapter and in any ARAP permit issued, including General Permits, the following terms have these meanings:

(1) "Act" means The Tennessee Water Quality Control Act of 1977, as amended, T.C.A. §69-3-101 et seq.

(2) "Activity " means any and all work or acts associated with the performance, or carrying out of a project or a plan, or construction of a structure.

(3) "Adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the State by man-made dikes or barriers, natural river berms and the like are "adjacent wetlands".

(4) "Aquatic Resource Alteration Permit" means a permit pursuant to §69-3-108 of the Tennessee Water Quality Control Act of 1977, which authorizes the alteration of properties of waters of the State which result from activities other than discharges of wastewater through a pipe, ditch or other conveyance. Such a permit shall impose conditions, including standards and terms of periodic review, as are necessary to accomplish the purposes of the Act.

(5) "Background Conditions" means the biological (plant and animal species), chemical and physical conditions of the wetland or water body prior to the proposed activity. If the water body is disturbed, it may be necessary to use the biological, chemical and physical conditions of a similar water body as a reference condition.

(6) "Best Management Practices" means a schedule of activities, prohibition of practices, maintenance procedures and other management practices to prevent or reduce the pollution of waters of the State. BMP's include methods, measures, practices, and design and performance standards.

(7) "Certification" means an Aquatic Resource Alteration Permit under the Tennessee Water Quality Control Act of 1977, as required by §401 of the Federal Water Pollution Control Act, which certifies, either unconditionally or through imposition of terms under which the activity must be carried out, that the activity will comply with applicable provisions of §§301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act and Chapter 1200-4-1 of the Rules of the Water Quality Control Board and the Department of Environment and Conservation and the Act.

(8) "Channelization" means the alteration of stream channels including but not limited to straightening, widening, or enlarging.

(9) “Cofferdam” means an enclosure from which water can be pumped to expose the bottom of a body of water or a barrier constructed to divert the flow of water to allow construction work.

(10) “Commence Construction” means the physical initiation of on-site structural or earthmoving work.

(11) “Constructed Wetland” means intentionally designed, built and operated on previously nonwetland sites for the primary purpose of wastewater treatment or storm water retention; such wetlands are not created to provide mitigation for adverse impacts or other wetlands.

(12) “Clearing and Grubbing” means the removal of vegetation by cutting and digging up roots and stumps.

(13) "Cumulative Impacts" means the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. A cumulative impact to a wetland can be the loss of the variety of the natural wetland types, wetland acreage, functions and classified uses.

(14) “Debris” means woody materials, trash, flotsam, dislodged vegetation, and other potentially mobile materials, which may, when located within a stream channel, contribute to flow blockage. This does not include gravel, sand, soil or its constituents such as silt, clay or other sediments.

(15) “Ditch” means a man-made excavation for the purpose of conveying water. Ditches do not include streams, modified streams or canals.

(16) "Dredging" (sand and gravel dredging) means the removal of sand, gravel and similar sediments or deposits from a stream, river, or lake bed or wetland by any method.

(17) “Earthmoving” means any construction or other activity which disturbs the surface of the land including, but not limited to, excavation, embankment, fill, and cut of soil, rock, or earth.

(18) "Emergency" means a situation where life or substantive improvements to real property is in immediate danger.

(19) “Erosion” means the process by which the land surface is worn away by the action of water, wind, gravity, chemicals, or a combination thereof.

(20) “Excavation” (a) means a cavity formed by digging, quarrying, uncovering, displacing, or relocating soil or rock; or, (b) means to dig or remove soil, rocks, or other materials resulting in a change in all or part of the elevation of a site.

(21) "General Permit" means a permit issued under the Act and this Rule authorizing an alteration to state waters within the state for a specified category of activities that are substantially similar in nature.

(22) “Hydrogeomorphic System” means a classification system for wetlands based on geomorphic setting, water source, and hydrodynamics; used to identify and group functionally similar wetlands.

(23) "Individual Permit” means a permit issued by the Division of Water Pollution Control to a specified person to conduct specified activities at a specified location. This type of permit does not authorize an activity by a class of persons or the public in general.

(24) “In the Dry” means in such a manner that no equipment or dredged material is in contact with the stream or wetland and that the soil water boundary is not disturbed by equipment or that no infiltration is pumped to the stream from the dredge site.

(Rule 1200-4-7-.03, continued)

(25) "Minimal Impacts" means an activity for which the scope is very limited in area, the impact is very short in duration, and has no impact to waters just downstream of the location of the activity. Examples of activities with 'minimal impacts' include, but are not limited to, (1) minor channel changes associated with bank stabilization; and (2) an activity typically authorized by General Permit, but which requires an Individual Permit because the project falls under one of the listed exclusions.

(26) "Minor Road Crossing" is a bridged or culverted roadway fill across a stream or river which results in the alteration of 200 linear feet or less of streambed or shoreline.

(27) "Mitigation" means compensating for impacts in regulated areas as provided by Rule 1200-4-7-.04(7).

(28) "Practicable alternative" is an alternative that is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

(29) "Resource Values" are the benefits provided by the water resource. These benefits include, but are not limited to, the ability of the water resource to:

(a) filter, settle and/or eliminate pollutants;

(b) prevent the entry of pollutants into downstream waters;

(c) assist in flood prevention;

(d) provide habitat for fish, aquatic life, livestock and water fowl;

(e) provide drinking water for wildlife and water fowl;

(f) provide and support recreational uses; and

(g) provide both safe and adequate quality and quantity of drinking water.

(30) "Sediment" means soil or its constituents that has been deposited in water, is in suspension in water, is being transported, or has otherwise been removed or disturbed from its site of origin.

(31) "Sedimentation or Siltation" means the process by which sediment is deposited in or by the waters of the State.

(32) "Settling Basin" means a prepared storage area constructed to trap and store sediment from erodible areas in order to protect any streams below the construction areas from excessive siltation; an impoundment that accumulates transported sediment and has provisions for a principal spillway; a reservoir which retains high flows sufficiently to cause deposition of transported sediment.

(33) "Stabilize" means the proper placing, grading, and/or covering of soil, rock, or earth to insure their resistance to erosion, sliding or other movement.

(34) "Stream" means all waters of the State on the surface of the ground except wet weather conveyances; streams include, but are not limited to, creeks, rivers, canals, and tributaries.

(35) "Structure" means any building, pier, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, mooring structure, moored floating vessel, piling, aid to navigation, bridge, culvert or any other obstacle or obstruction.

(36) "Utility Line" means any pipe or pipeline for the transportation of any gaseous, liquid, liquefiable or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and radio and television communication.

(37) "Water Dependent" describes an activity that requires location in or adjacent to surface waters or wetlands in order to fulfill its basic purpose.

(38) "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

(39) "Wetland Dependent" means that the location of a project or conducting an activity in a wetland is essential to fulfill the purpose of the project. Examples of such projects are fish and wildlife management, nature trails, wildlife observation points, etc.

(40) "Wet Weather Conveyances" are man-made or natural watercourses, including natural watercourses that have been modified by channelization, that flow only in direct response to precipitation runoff in their immediate locality, and whose channels are above the groundwater table, and which do not support fish or aquatic life, and are not suitable for drinking water supplies.

(41) Terminology not specifically defined herein shall be defined in accordance with the Tennessee Water Quality Control Act of 1977, T.C.A. §69-3-101 et seq., and the rules adopted thereunder.

Authority: *T.C.A. §69-3-105(b) and 69-3-108.* ***Administrative History:*** *Original rule filed February 26, 1987; effective April 12, 1987. Amendment filed October 8, 1991; effective November 22, 1991. Amendment filed August 25, 2000; effective November 8, 2000.*

1200-4-7-.04 PERMITS

(1) Application for a Permit.

(a) Any person who plans to engage in any of the activities outlined in §69-3-108 must obtain a permit from the Commissioner to lawfully engage in such activity. There are three (3) types of permits: Individual Permits; §401 Water Quality Certifications; and General Permits. There are several types of General Permits: (1) a General Permit that authorizes the implementation of the activity in accordance with all the terms and conditions of the General Permit without prior notice and approval from the Commissioner; (2) a General Permit which requires the applicant notify TDEC of the planned activity prior to implementing the activity in accordance with the terms and conditions of the General Permit; and (3) a General Permit which requires the applicant to notify the Commissioner of the planned activity and receive approval from the Commissioner prior to implementing the activity in accordance with the terms and conditions of the General Permit. Certain of the General Permits authorize an activity that is authorized by a Nationwide Permit of the U.S. Corps of Engineers and therefore serve as a §401 Certification. Persons need not file an application with the Commissioner if they are conducting an activity pursuant to a General Permit that does not require Notice or approval. Persons who desire to implement an activity pursuant to a General Permit, which requires Notice or Notice and prior approval, must submit the necessary documentation required by the General Permit prior to implementing the planned activity in accordance with the terms and conditions of the General Permit. A person must file an application for an Individual Permit or for a §401 Water Quality Certification with the Department, in accordance with paragraph (3) and (5) of this rule, to implement any activity that is not authorized

by a General Permit. All General Permits in effect as of the date of this Rule shall continue in effect, and are not revoked by these Rules.[1]

(b) The application to the Commissioner for certification of activities which require §404 permits from the United States Army Corps of Engineers (Corps) shall be the application filed with the Army Corps of Engineers. The Joint Public Notice which shall be issued by the Corps, describes the activity and notifies the general public of the application for the §404 permit and state certification and of the public's right to submit comments and requests for public hearing. If further information is required for project evaluation, the Commissioner may request it from either the applicant or the Corps.

(2) General permits.

The Commissioner may use General Permits to authorize alterations to state waters for specific categories of activities that are substantially similar in nature within the state or other specified geographical areas. When the Commissioner determines that a category or activity is suitable for coverage by a General Permit, or that substantive modification of existing General Permits is consistent with §69-3-108 of the Tennessee Water Quality Control Act of 1977, the Commissioner will provide notice of and conduct a minimum of one (1) public hearing. The public notice will contain the relevant information, as set forth in part (4)(c). TDEC will distribute the public notice to interested persons who have requested TDEC notify them of ARAP applications and by posting on the TDEC website. Interested persons may submit written comments on the General Permit within thirty (30) days of the public notice or such greater period as the Commissioner allows. All written comments submitted shall be retained and considered in the final determination to issue a General Permit.

(3) §401 Water Quality Certification.

(a) General. Any person who plans to engage in any of the activities outlined in §404 of the Federal Clean Water Act must obtain a federal permit as well as either a state permit or a state water quality certification under §401 of the Clean Water Act to lawfully engage in such activity in the State of Tennessee. Section 401 of the Federal Clean Water Act requires the Commissioner to certify that the issuance of the federal §404 permit meets the requirements of sections of the Federal Clean Water Act and the Water Quality Control Act. Persons must make application for the planned activity with the Army Corps of Engineers for an individual §404 permit or make use of a Corps of Engineers' nationwide permit.

(b) An individual §404 permit. Where the activity requires an individual §404 permit, the application filed with the Army Corps of Engineers will serve as the application for either the state permit or the state §401 certification. The applicant must file the completed federal application with TDEC for the Commissioner to process and evaluate. The Commissioner will review a completed application and make a determination whether to issue a §401 Water Quality Certification. The application must describe the proposed activity and include all the necessary technical information for the Commissioner to make a determination, including an evaluation of practicable alternatives. The practicable alternatives analysis required by this part shall be satisfied by the applicants' submittal to the Division of a practicable alternatives evaluation for the proposed activity which has been submitted to the Army Corps of Engineers.

[1] The following activities were authorized by a General Permit on the date these rules were promulgated: Bank Stabilization, Gravel Dredging, Launching Ramps, Road Crossings, Alteration of Wet Weather Conveyance, Stream Restoration and Habitat Enhancement, Minor Wetlands, Bridge Scour Repair, Emergency Road Repair, Utility Line Crossings, Surveying and Geotechnical Exploration, Minor Dredging, Alteration and Restoration of Intermittent Streams for Mining, Maintenance Activities, Relocation of Intermittent Streams, Wetlands Restoration and Enhancement, and Impoundment of Intermittent Streams.

(Rule 1200-4-7-.04, continued)

(c) A nationwide permit. Where the activity can be authorized by a Corps of Engineers nationwide permit, the §401 certification can be obtained through the use of a state general permit, if applicable, or an individual permit pursuant to paragraph (5) of this rule. If the Commissioner issues a §401 Certification, the §401 Certification is the state permit.

(4) Public Notice and Participation.

(a) An ARAP Individual Permit or a §401 Certification requires the issuance of Public Notice seeking public participation and comment on the planned activity. However, Public Notice is not required for an activity authorized by General Permit since Public Notice is provided pursuant to part (2) of this part. Each completed application shall be subject to the public notice and participation requirements of Part (b) of this part with the following exceptions:

1. §401 Certification. The Department's procedure for issuing public notice for certification of an application for a federal license or permit pursuant to §401 of the Clean Water Act may be either a public notice issued jointly with the Corps, or a public notice issued by the Department. Such notice will describe the activity, advise the public of the scope of certification, their rights to comment on the proposed activity and to request a public hearing. The notice will also inform the public to whom they should send their requests and comments.

2. Minimal impact activities. For activities that are projected to have only minimal impacts to state waters, which can be readily addressed, the Commissioner may utilize a twenty (20) day public notice period.

3. When the Commissioner determines that a proposed permit modification will not materially change water quality aspects of the project, or will result in an improvement of water quality, as compared to the originally permitted activity, a permit may be modified without public notice.

4. Where the Commissioner determines an emergency situation exists, a permit for remedial action may be issued without prior public notice and participation. The emergency permit shall be advertised by public notice, however, no later than twenty (20) days after issuance. This permit shall be subject to all other provisions of Part (b) of this Rule. The remedial actions allowed shall be limited to those necessary to remedy the emergency.

(b) Upon receipt of a completed ARAP application, the Commissioner will review and evaluate the proposed activity or project to make a determination whether to issue an Individual Permit, as described in (5) of this Part. In order to inform interested and potentially interested persons of the proposed activity, a Public Notice seeking public participation and comment on the activity will be given.

(c) The Public Notice will include the following information:

1. Name, address, and telephone number of the applicant;

2. Name and address of TDEC contact person;

3. A brief description of the proposed activity;

4. A brief description of the scope of the proposed activity;

5. The location of the state waters impacted by the proposed activity;

6. A sketch or detailed description of the location of the proposed activity and the subject waters of the state;

7. The purpose of the proposed activity;

8. The watershed of the subject waters;

9. A description of the conditions of the subject waters and the watershed, (e.g., physical conditions of the waters, quality of the waters such as size, flow, substrate, channel, etc.);

10. The procedure to submit comments on the proposed activity;

11. The procedure for requesting a public hearing; and

12. A brief description of the procedure for the Commissioner to make a final determination to issue a permit.

(d) The approved Public Notice shall be distributed to interested persons and shall be circulated within the geographical area of the proposed activity as follows:

1. TDEC will distribute the approved Public Notice to interested persons who have requested TDEC notify them of ARAP applications and by posting on the TDEC website.

2. The Applicant shall distribute the approved Public Notice to the neighboring landowners by publishing in a local newspaper of general circulation and by posting a sign within view of a public road in the vicinity of the proposed project site as specified by the Division. The sign shall contain those provisions as specified by the Division. The sign shall be of such size that is legible from the public road. Also, the sign shall be maintained for at least thirty (30) days following distribution of the approved Public Notice.

3. The applicant shall provide certification to the Division of compliance with item 2.

(e) A copy of the public notice shall be sent to any person who specifically requests one. Interested persons may submit written comments on the proposed activity within thirty (30) days of public notice or such greater period as the Commissioner allows. All written comments submitted shall be retained and considered in the final determination to issue a permit.

(f) Interested persons, including the applicant, may request, in writing, that the Commissioner hold a public hearing on any application. Said request from interested persons must be filed no later than the end of the period allowed for public comment, and must indicate the interest of the party filing it, must concisely state the water quality issues being raised, and the reasons why a hearing is warranted. If there are water quality issues and significant public interest in having a hearing, the Commissioner shall hold one in the geographical area of the proposed activity. No less than thirty (30) days in advance of the hearing, public notice of it shall be circulated at least as widely as was notice of the application. The Commissioner will distribute notice of the public hearing as set forth in (d)(1) above, and by publishing in a local newspaper. The notice shall cite the date, time and place of the public hearing, a statement of the issues raised by the person requesting the hearing, and the purpose of the public hearing.

(Rule 1200-4-7-.04, continued)

(5) Individual Permits.

(a) Persons who plan to engage in any activity that requires an Aquatic Resource Alteration Permit, which is not governed by a General Permit or a §401 Water Quality Certification, must submit an application to the Commissioner for review and approval prior to implementing the planned activity. The Commissioner will review a completed application and make a determination whether to issue an Individual Permit. The application must describe the proposed activity and include all the necessary technical information for the Commissioner to make a determination. The applicant shall assess the practicable alternatives for a planned activity. If the activity does not avoid impacts to state waters, the individual must comply with Section 7 of this Part. However, if the nature of the affected waters is such that mitigation is not reasonably likely to result in no net loss of water resource values, and if there is a practicable alternative to the activity, which through avoidance or minimization of impacts would result in no net loss, then such alternative shall be selected.

(b) An applicant shall describe the proposed project including the use of technical terms in the definition section of this part where relevant. The sketch or plans and specifications submitted with the application shall describe the method for implementation of the planned activity. Where the proposed activity would result in an appreciable permanent loss of resource value, the applicant must propose adequate mitigation actions so that there is no overall net loss of state water resource values. The applicant shall set forth in the application a brief summary of the practicable alternatives considered to implement the proposed activity.

(c) An Individual Permit is required for water withdrawals, which will or will likely result in alteration of the properties of the source stream.

1. Persons proposing to withdraw water from waters of the state in a manner which will or will likely result in an alteration of the properties of the source stream, shall file an application with the Department which includes the following minimum information:

(i) proposed withdrawal rates and volumes;

(ii) proposed withdrawal schedule; and

(iii) flow data of the source stream (if free flowing).

2. Where a permit for water withdrawal is required, the Commissioner shall establish permit conditions which are protective of the source stream's resource value. These conditions may include flow levels below which no withdrawal may occur. The Commissioner may also establish a maximum withdrawal rate in order to maintain the natural flow fluctuation characteristics of the source stream.

(6) Permit Evaluation Criteria.

(a) Some activities may not be entitled to a permit. When a permit is granted, it shall require compliance with all provisions of the Act, the regulations adopted pursuant to the Act, and any special terms or conditions the Commissioner determines are necessary to fulfill the purposes or enforce the provisions of the Act.

(b) A permit may be modified, suspended, or revoked for cause by the Commissioner upon such notice to the permittee as required by law. Permits for activities that have been completed are not subject to modification. If a modification results in a less restrictive permit, then public notice and opportunity for hearing must be given prior to modification. Cause shall include, but not be limited to the following:

1. violation of any terms or conditions of the permit;

2. obtaining a permit by misrepresentation or failure to disclose fully all relevant facts;

3. causing a condition of pollution;

4. violation(s) of the Act or other environmental statutes;

5. a change in the Act or regulations that substantively impacts the content of the permit;

6. a change in the Federal Clean Water Act that substantively impacts the content of the permit; and

7. a significant change of the physical condition(s) of the site or the waters.

(c) The Act requires that no activity be authorized by the Commissioner unless any lost resource value associated with the proposed impact is offset by mitigation sufficient to result in no overall net loss of resource value. In a situation in which an applicant proposes mitigation that would not result in no overall net loss, the Commissioner shall not issue the permit unless the applicant redesigns the project to avoid impacts, minimize them, or provide mitigation as provided in paragraph (7) so that the redesigned project would result in no net loss of resource value. In making a decision on a permit application, the Commissioner shall determine the lost resource value associated with a proposed impact and the resource value of any proposed mitigation and shall consider the following factors:

1. direct loss of stream length, waters, or wetland area due to the proposed activity;

2. direct loss of in-stream, waters, or wetlands habitat due to the proposed activity;

3. impairment of stream channel stability due to the proposed activity;

4. diminishment in species composition in any stream, wetland, or state waters due to the proposed activity;

5. direct loss of stream canopy due to the proposed activity;

6. whether the proposed activity is reasonably likely to have cumulative or secondary impacts to the water resource;

7. conversion of unique or high quality waters as established in Rule 1200-4-3-.06 to more common systems;

8. hydrologic modifications resulting from the proposed activity;

9. the adequacy and viability of any proposed mitigation including, but not limited to, quantity, quality, likelihood of long term protection, and the inclusion of upland buffers;

10. quality of stream or wetland proposed to be impacted;

11. whether the state waters is listed on the §303(d) list; whether the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, waters designated as Outstanding National Resource Waters, or waters identified as high quality waters as defined in Rule 1200-4-3-.06, known as Tier II waters; whether the activity is located in a waterway which has been identified by the

Department as having contaminated sediments; and whether the activity will adversely affect species formally listed in State and Federal lists of threatened or endangered species; and

12. any other factors relevant under the Act.

(d) All permits which require mitigation of impacts shall contain conditions requiring that the mitigation is performed properly, performed in a timely manner and is adequately maintained.

(7) Mitigation.

(a) Mitigation of state waters other than wetlands.

If an applicant proposes an activity that would result in an appreciable permanent loss of resource value of a state water, the applicant must provide mitigation which results in no overall net loss of resource values. The applicant shall provide the Commissioner with a time schedule for completion of all mitigation measures for approval. Further, for any mitigation involving the relocation or re-creation of a stream segment, to the extent practicable, the applicant shall complete the mitigation before any impact occurs to the existing state waters. Mitigation measures include, but are not limited to:

1. Restoration of degraded stream reaches and/or riparian zones;

2. New (relocated) stream channels;

3. Removal of pollutants from and hydrologic buffering of storm water runoff; and

4. Any other measures which have a reasonable likelihood of increasing the resource value of a state water.

The Commissioner will assess the proposed mitigation to assure there is no overall net loss of resource value. The mitigation measures or actions should be prioritized in the following order: restoration, enhancement, re-creation, and protection.

(b) Mitigation of Wetlands.

1. If an applicant proposes an activity that would result in an appreciable permanent loss of resource value of wetlands, the applicant must provide mitigation which results in no overall net loss of resource value. The applicant shall provide the Commissioner with a time schedule for completion of all mitigation measures for approval. Further, for any mitigation involving the enhancement or preservation of existing wetlands, to the extent practicable, the applicant shall complete the mitigation before any impact occurs to the existing state waters. For any mitigation involving restoration or creation of a wetland, to the extent practicable, the mitigation shall occur either before or simultaneously with impacts to the existing state waters. Mitigation for impacts to wetlands are prioritized as follows:

(i) Restoration of a previously degraded or impacted wetland (with emphasis on prior converted areas) on-site or in the immediate project area;

(ii) Restoration, including mitigation banking, off-site but within the eight digit United States Geological Survey hydrological unit in which the project is located;

(Rule 1200-4-7-.04, continued)

(iii) Restoration, including mitigation banking, outside of the eight digit United States Geological Survey hydrological unit in which the project is located;

(iv) Creation of wetlands on-site or in the immediate project area;

(v) Creation of wetlands off-site;

(vi) Enhancement of existing wetlands;

(vii) Preservation of existing wetlands; or

(viii) A combination of any of the above activities.

2. The ratio of acres required for wetland mitigation should not be less than 2:1 for restoration activities; 4:1 for creation and enhancement; and 10:1 for preservation. Alternatively, the applicant may propose and utilize, subject to the Division's approval, best professional judgment ratios. The best professional judgment ratios shall be based on the resource value and functions of the affected wetland, resource value of the mitigation, and the likelihood of success of the mitigation.

3. All wetland mitigation projects shall include a monitoring and reporting program to document timely achievement of a successful mitigation wetland and remedial actions to correct any deficiency.

(8) Duration and Re-issuance of Permits.

(a) Each permit issued shall have a fixed term not to exceed five (5) years.

(b) Re-issuance of permits is not required for one-time alterations such as construction, as long as the alterations are completed within the time limit established by permit.

(c) For on-going alterations, such as water withdrawals, any permittee who wishes to continue the permitted activity after the expiration date of the permit must make application at least ninety (90) days prior to its expiration date.

(d) The Commissioner shall follow the procedures for public notice and participation detailed in paragraph (4), above, regarding each application for re-issuance of a permit.

(9) Review of Permit Denials, Suspensions, Revocations, Terms and Conditions.

Permittees and applicants for permits who disagree with the denial, suspension or revocation of a permit or the terms and conditions of a permit are entitled to review of the Commissioner's decision by the Water Quality Control Board pursuant to §69-3-105. Any action taken by the Commissioner regarding a permit remains in effect unless and until an order of the Water Quality Control Board or a reviewing court becomes final.

Authority: *T.C.A. §69-3-105(b) and 69-3-108.* ***Administrative History:*** *Original rule filed February 26, 1987; effective April 12, 1987. Amendment filed October 8, 1991; effective November 22, 1991. Amendment filed August 25, 2000; effective November 8, 2000.*

1200-4-7-.05 through 1200-4-7-.11 REPEALED

Authority: *T.C.A. §69-3-105(b) and 69-3-108.* ***Administrative History:*** *Original rule filed February 26, 1987; effective April 12, 1987. Amendment filed October 8, 1991; effective November 22, 1991. Repeal filed August 25, 2000; effective November 8, 2000.*

GENERAL PERMIT FOR EMERGENCY ROAD REPAIR

This general permit applies to stream alterations necessary to the repair of a public roadway or highway in the case of imminent threat to the public safety. No written permit or advanced authorization is required when a chief administrative officer of a public highway or transportation department repairs or causes the repair of highways or roads in emergency situations where immediate repairs are necessary to protect human safety and welfare.

Notification

1) The chief administrative officer of the public highway or transportation department shall notify the Division by telephone as soon as practicable that an emergency has arisen and of intentions to make repairs in response to the emergency.

2) Within ten (10) days of the completion of the emergency repair work the chief administrative officer shall notify the Division in writing of the action taken and the nature of the emergency necessitating such immediate repair.

General Terms and Conditions

1) The extent of stream alteration associated with the road repair undertaken pursuant to this section shall not exceed four hundred feet (400').

2) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

3) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

4) Excavation and fill activities shall be separated from flowing waters. All surface water flowing towards excavation or fill work shall be diverted through utilization of cofferdams, berms, temporary channels, or pipes. Temporary diversion channels must be protected by non-erodible material and lined to the expected high water level. Cofferdams must be constructed of sandbags, clean rock, steel sheeting or other non-erodible materials. Clean rock is rock of various type and size, depending upon application, which contains no fines, soils, or other wastes or contaminants.

5) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than twenty (20) feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

6) Check dams shall be utilized where runoff is concentrated. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to detain runoff and trap sediment. However, no such measures shall be used in streams. Clean rock is rock of various type and size, depending upon application, which contains no fines, soils, or other wastes or contaminants.

7) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary to accomplish emergency repairs and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Streams shall not be used as transportation routes for heavy equipment. Crossings must be limited to one point and erosion control measures must be utilized where the stream banks are disturbed. Where the streambed is not composed of rock, a pad of clean rock must be used at the crossing point. All temporary fill must be completely removed after the work is completed. Clean rock is rock of various type and size, depending upon application, which contains no fines, soils, or other wastes or contaminants.

10) Emergency repair work shall be limited to that necessary to restore pre-emergency conditions. Channel enlargements or realignments are not authorized under this section, other than to restore preemergency conditions.

11) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR LAUNCHING RAMPS

Construction of boat launching ramps is hereby permitted provided the activity is done in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where the proposed activity will adversely affect wetlands;

(b) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(c) when a portion of the proposed activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened, or endangered species; or (e) when an individual permit is required. Projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) Where construction of a launching ramp is located within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U. S. Army Corps of Engineers, notification to the Division is not required. However, prior to commencement of construction, the applicant must have received any necessary authorizations pursuant to applicable provisions of §10 of *The Rivers and Harbors Act of 1899*, §404 of *The Clean Water Act* and §26a of *The Tennessee Valley Authority Act*.

2) Where construction of a launching ramp is not located within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U.S. Army Corps of Engineers, persons proposing to construct a launching ramp in waters of the State shall notify the Division by submission of an application which includes the following minimum information:

   (a) a map showing the exact location of the proposed construction site; and
   (b) a single copy of construction plans which includes specifications for proposed stream channel alterations and pollution control methods or structures.

   Construction shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General Terms and Conditions

1) The total width, including base fill material, may not exceed 20 feet for the proposed ramp for projects not located within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U. S. Army Corps of Engineers.

2) The ramp shall be constructed in the dry to the maximum extent practicable during winter drawdown periods of lakes/reservoirs or during low flow periods of free flowing streams. If wet construction is necessary, cofferdams shall be utilized.

3) The excavation and fill activities associated with the ramp construction shall be kept to a minimum and all excess material shall be hauled to an upland site and properly stabilized to prevent reentry to the waterway.

4) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for slope construction and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

5) The use of the ramp must not interfere with the public's right to free navigation on all navigable waters of the United States.

6) Ramps constructed on fill shall have the side slopes stabilized with riprap.

7) Material may not be placed in such location or manner so as to impair surface water flow into or out of any wetland area.

8) The material to be discharged shall be free of contaminants, including toxic pollutants, hazardous substances, waste metal, construction debris, organic materials, etc.

9) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

10) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

11) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

12) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

13) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR ROAD CROSSINGS

Construction of road crossings of waters where the total length of stream encapsulation is 200 linear feet or less is hereby permitted provided the activity is done in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where the proposed activity will adversely affect wetlands;

(b) when the total length of stream encapsulation is more than 200 feet;

(c) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when a portion of the proposed activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(e) when the project will adversely affect a species formally listed on State or Federal lists of threatened, or endangered species; or

(f) when an individual permit is required.

Projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) Where the total width of fill or disturbance to the stream channel for construction of the road crossing is less than 25 feet, notification to the Division is required prior to commencing construction in accordance with this general permit. Work may commence without written authorization from the Division. However it is the applicant's responsibility to assure that all of the terms and conditions of this general permit are met.

2) Persons proposing to construct a minor road crossing in waters of State where the total width of fill or disturbance to the stream channel is greater than 25 feet shall notify the Division by submission of an application which includes the following minimum information:

    (a) a map showing the exact location of the proposed construction site; and

    (b) a single copy of construction plans which includes specifications for proposed stream channel alterations and pollution control methods or structures.

    Stream alteration activities shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General Terms and Conditions

1) Only clean rock may be placed directly into waters. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants. Other

fill materials to be discharged below ordinary high water must be free of fines, sediment, soil, pollutants, contaminants, toxic materials, trash, or other waste materials.

2) The width of the fill associated with the crossing shall be limited to the minimum necessary for the actual crossing.
3) Excavation and fill activities shall be separated from flowing waters. All surface water flowing toward the excavation or fill work shall be diverted through utilization of cofferdams, berms, or temporary channels. Temporary diversion channels must be protected by non-erodible material and lined to the expected high water level. Cofferdams must be constructed of sandbags, clean rock, steel sheeting or other non-erodible material. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

4) The crossing shall be culverted, bridged or otherwise designed to prevent the impoundment of normal or base flows. Base flow is that usual or normal flow of the stream that is supplied primarily by groundwater from springs and seeps, but not affected by rapid runoff during and after rainfall.

5) The crossing shall be designed and constructed so as not to disrupt the movement of aquatic life. Where practicable, the bottom of culverts should be constructed below the stream bed level, with natural substrate placed over the culvert bottom following construction.

6) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

7) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

8) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

9) Check dams shall be utilized where runoff is concentrated. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to detain runoff and trap sediment. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

10) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for slope construction and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

11) Streams shall not be used as transportation routes for heavy equipment. Crossings must be limited to one point and erosion control measures must be utilized where the stream banks are disturbed. Where the streambed is not composed of rock, a pad of clean rock must be used at the crossing point. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants. All temporary fill must be completely removed after the work is completed.

12) Construction debris must be kept from entering the stream channel.

13) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

14) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

15) The project should be consistent with all applicable local floodplain regulations. The applicant should contact local government officials to determine what these regulations are at a particular location.

16) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR MINOR WETLANDS ALTERATIONS

This general permit authorizes alteration of up to one acre of isolated wetlands. Alterations are addressed in two size categories. Under the stated terms and conditions, up to one fourth acre of qualifying wetlands may be altered without compensatory mitigation and up to one acre of qualifying wetlands may be altered with approved compensatory mitigation. Isolated wetlands are wetlands that are either not hydrologically connected to other waters of the state or are connected only by wet weather conveyance.

1) Fill or other alteration of up to one-fourth acre of isolated wetlands is allowed by this general permit without compensatory mitigation, provided the activity is done in accordance with the applicable terms and conditions of this general permit.

2) Fill or alteration of up to one acre of isolated wetlands is authorized by this general permit provided the activity is done in accordance with the applicable terms and conditions, and provided a plan for compensatory mitigation to offset unavoidable adverse wetlands impacts is submitted by the applicant, approved by the Division and implemented as approved.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where a portion of the activity is located in waters which have been identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(b) when the project will adversely affect a species formally listed on State or Federal lists of threatened, or endangered species;

(c) when the wetland represents a high quality ecological resource as compared to others within the ecoregion;

(d) when all available and practicable measures have not been employed to avoid and minimize adverse impacts on wetlands and other waters of the state; and

(e) when an individual permit is required.

Projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Persons proposing to alter wetlands with authorization by this general permit shall notify the Division by submission of an application, which includes, at a minimum, the following information:

(a) a map showing the exact location of the proposed activity;

(b) a description of the wetland to be altered including boundaries, vegetation and hydrologic characteristics; and

(c) a single copy of construction plans which includes specifications for proposed wetlands alterations and proposed pollution control methods or structures.

Construction shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit, or issues an individual permit.

General Terms and Conditions

1) Wetland alterations authorized by this general permit must be part of a single and complete project. This general permit can not be used in an incremental or piecemeal means to alter larger areas of wetlands.

2) The alteration shall not adversely affect the functions and classified use support of adjacent wetlands and other waters of the state.

3) The excavation and fill activities associated with the wetlands alteration shall be kept to a minimum and all excess material shall be hauled to an upland site and properly stabilized to prevent reentry to waters of the State.

4) Clearing, grubbing and other disturbance to areas in or immediately adjacent to waters of the state shall be limited to the minimum necessary to accomplish the proposed activity. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as possible.

5) Any material to be discharged into wetlands or other waters of the state shall be free of contaminants including toxic pollutants and hazardous substances.

6) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

7) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

8) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

9) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

10) Prior authorization must be obtained when necessary by the applicant pursuant to applicable provisions of §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

11) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR BRIDGE SCOUR REPAIR ACTIVITIES

Bridge scour repair activities are hereby permitted provided the activity is done in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Bank stabilization projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Persons proposing to conduct bridge scour repair activities in waters of the State shall notify the Division by submission of an application which includes the following minimum information:

(a) a cover letter explaining the scope of the project;

(b) an U.S.G.S. topographic map showing the exact location of the proposed construction site; and

(c) a single copy of construction plans which include specifications for stream channel alterations and detailed pollution control methods or structures.

Scour repair activities shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General Terms and Conditions

1) Temporary erosion control measures must be in place before any construction operations begin, maintained throughout the construction period and repaired, as necessary, until all erodible soil at the site is stabilized. Effective erosion control must be installed along the base of all fills and cuts, on the downhill side of stockpiled soil, and along stream banks in cleared areas to prevent erosion into streams.

2) Placement of material for scour protection or repair shall be limited to 50 linear feet either side of the outside edge of the bridge. Material shall be limited to clean rock, riprap, rock-filled wire baskets or mattresses, or concrete contained by formwork for footing repair. Stabilization materials shall not include gravel, sand, sediments, chert, soil, or other unconsolidated materials. Materials to be discharged shall be free of pollutants, contaminants, toxic materials, hazardous substances, waste metal, construction debris and trash, and other wastes as defined by T.C.A. 69-3-103(18).

3) Scour protection shall be designed and installed to prevent impairment of flow.

4) Scour protection shall not disrupt the movement of fish and aquatic life.

5) Bank shaping shall be limited to that necessary for placement of scour repair materials.

6) Where practicable, excavation activities shall be accomplished in the dry. All surface water flowing towards the excavation shall be diverted through utilization of cofferdams and/or berms. Cofferdams and berms must be constructed of sandbags, clean rock, steel sheeting, or other non-erodible material. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

7) No excavated material may be placed in the existing stream channels. Excavated material must be removed to a location that will prevent its reentry into waters of the State.

8) Water from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the waters upstream of the construction site. Settling basins shall not be located closer than 20 feet from the water line. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

9) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for placement of the scour protection materials. Unnecessary vegetation removal is prohibited. All disturbed areas shall be riprapped, sodded, or seeded and mulched within 30 days of disturbance. Seeding shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

10) Streams shall not be used as transportation routes for heavy equipment. Crossings shall be limited to one point and erosion control measures must be utilized where stream banks are disturbed. Crossings shall be constructed of clean rock and shall be sufficiently designed to convey flow without any impairment. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

11) Construction debris shall be kept from entering the stream channel and shall be disposed of in a manner that shall not impact any waters of the State.

12) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

13) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR UTILITY LINE CROSSINGS OF STREAMS

Construction, maintenance, repair, rehabilitation or replacement of utility line crossings of streams is hereby permitted without notification requirement, provided the activity is done in accordance with the terms and conditions of this general permit. For the purpose of this general permit, bodies of water defined as navigable pursuant to *Section 10 of the Rivers and Harbors Act of 1899* are subject to different restrictions than all other waters regarding the specific construction methodologies to be employed. This general permit cannot be used to authorize multiple crossings of the same stream by gravity sewers.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be affected by the proposed work, except as provided for in item three of the special terms and conditions below;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) where the proposed project involves multiple crossings of the same stream by gravity sewers;

(e) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(f) when an individual permit is required.

Utility line crossing projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Notification to the Division is required prior to commencing construction for utility line crossings and maintenance conducted in accordance with this general permit. Work may commence without written authorization from the Division. However it is the applicant's responsibility to assure that all of the terms and conditions of this general permit are met.

Special Terms and Conditions

1) Where the activity is located in waters which are not navigable pursuant to § 10, excavation and fill activities shall be separated from flowing waters. All surface water flowing toward the excavation or fill work shall be diverted, piped or flumed to the downstream side of the work. This can be accomplished through utilization of cofferdams or constructed berms in conjunction with a pipe or flume. Cofferdams must be constructed of sandbags, clean rock, steel sheeting or other non-erodible material. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

2) Where the activity is located in waters defined as navigable pursuant to § 10 of *the Rivers and Harbors Act of 1899,* excavation and fill work may be accomplished within the water column.

3) Maintenance, repair and rehabilitation of existing facilities in wetlands is authorized under the following special provisions:

(a) the total amount of excavation or fill does not exceed fifty cubic yards;

(b) the wetlands alteration is located within the right of way of the existing facility; and

(c) fill activities for the construction of equipment access roads is not authorized in wetlands.

General Terms and Conditions

1) New utility line crossings shall be located such as to avoid permanent alteration or damage to the integrity of the stream channel. Large trees, steep banks, rock outcroppings, etc. should be avoided.

2) In the case of proposed gravity sewer lines and other utility lines that follow the stream gradient or otherwise parallel the stream channel, the number of crossings shall be minimized. Where cumulative impacts are likely because of numerous crossings, an individual permit may be required.

3) The alignment of new utility line crossings shall intersect the stream channel as close to 90 degrees or as perpendicular as possible, and in no case less than 45 degrees angle from the centerline of the stream.

4) In the case of small streams with a bedrock streambed that must be blasted to form a trench, provision shall be made to prevent the loss of stream flow to fracturing of the bedrock. Where loss of surface flow is likely to occur, an individual permit may be required.

5) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

6) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

7) Backfill activities must be accomplished in a manner that stabilizes the streambed and banks to prevent erosion. Backfill materials shall consist of suitable materials free of contaminants. All contours must be returned to pre-project conditions. The completed work may not disrupt or impound stream flow.

8) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

9) Check dams shall be utilized where runoff is concentrated. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to detain runoff and trap sediment. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

10) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for slope construction and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

11) Streams shall not be used as transportation routes for heavy equipment. Crossings must be limited to one point and erosion control measures must be utilized where the stream banks are disturbed. Where the streambed is not composed of rock, a pad of clean rock must be used at the crossing point. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants. All temporary fill must be completely removed after the work is completed.

12) Construction debris must be kept from entering the stream channel.

13) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

14) Upon achievement of final grade, the disturbed streambank shall be stabilized with riprap or other suitable material. All other disturbed soils must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

15) Upon completion of construction, the stream shall be returned as nearly as possible to its original, natural conditions.

16) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR STREAM RESTORATION AND HABITAT ENHANCEMENT

This general permit applies to the activities associated with the restoration of altered or degraded streams, their banks and riparian lands. Riparian areas are the stream banks and adjacent low lying strip of land that is frequently scoured by high waters. The riparian area may typically correspond with the floodway. Stream in this case includes lakes, rivers, creeks, and other watercourses, but does not include wetlands. Stream restoration includes those activities that serve the purpose of restoring "natural" characteristics such as hydrology and substrates, native vegetation, and habitat functions to altered and degraded stream channels and riparian areas. Stream restoration activities include riparian revegetation, vegetative bank stabilization, and in-stream habitat improvement structures and activities. Authorized structures include, but are not limited to current deflectors, log sill structures, low head dams, bank crib units, rock substrates and boulder clusters. These structures and the activities necessary to their installation are hereby permitted by this general permit, provided the activities are done according to the general terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Stream restoration and habitat enhancement projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Persons proposing to perform stream restoration activities in waters of State shall notify the Division by submission of an application, which includes the following minimum information:

(a) a map showing the exact location of the proposed construction site; and

(b) a single copy of construction plans which includes specifications for proposed stream channel alterations and pollution control methods or structures.

Stream restoration activities shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General Terms and Conditions

1) Excavation, dredging, bank reshaping or grading shall be limited to the minimum necessary to install authorized structures or prepare the bank for revegetation. These activities are prohibited from taking place directly in the water column, except where necessary to key into the stream bank in-stream structures such as log-sills, wing deflectors, k-dams and other similar structures. In-stream excavation must be minimized and should not result in more than an insignificant

increase in turbidity or suspended solids and under no circumstance result in harm or detriment to fish and aquatic life or other classified uses of waters of the state.

2) All materials to be discharged or placed below ordinary high water must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69- 3-103(18).

3) Equipment that will cause the least damage to the environment shall be selected for performing stream restoration. First consideration shall be given to the use of hand operated equipment such as shovels, axes, chain saws, and winches. Bank shaping may be accomplished by small tractors, backhoes, small trackhoes, and small bulldozers. However, no work by larger equipment is authorized.

4) Where practicable, access to each area shall be made at one point only, limiting disruption of trees and other stream cover to an area less than twenty feet wide.

5) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

6) Instream sedimentation control devices are not approved as primary treatment devices. They may be used only as backup or fail-safe protection. Separate erosion and sedimentation controls and sediment treatment devices must be utilized.

7) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for grading work and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly revegetated as soon as practicable.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Upon achievement of final grade, all disturbed areas must be stabilized and revegetated within 30 days using appropriate native riparian species. Seed to be utilized shall include a combination of native species of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

10) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR THE ALTERATION OF WET WEATHER CONVEYANCES

Wet weather conveyances are defined in Rule 1200-4-3-.04 of the Rules of the Tennessee Department of Environment and Conservation. Wet weather conveyances are man-made or natural watercourses, including natural watercourses that have been modified by channelization, that flow only in direct response to precipitation runoff in their immediate locality, the channels of which are above the groundwater table and which do not support fish or aquatic life and are not suitable for drinking water supplies. Rule 1200-4-3-.02(7) requires that waters designated as wet weather conveyances shall be protective of wildlife and humans that may come in contact with them and maintain standards applicable to all downstream waters. No other use classification or water quality criteria apply to these waters.

Notification

Activities which result in the alteration of wet weather conveyances are hereby permitted without notification to the Division provided the general terms and conditions of this general permit are followed.

General Terms and Conditions

1) The activity may not result in the discharge of waste or other substances that may be harmful to humans or wildlife.

2) Soil materials must be prevented from entering waters of the state. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Erosion and sedimentation controls shall include, but are not limited to straw or hay bales and/or silt fence, brush barriers, berms, sediment ponds and other proven devices. Hay bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along stream banks in cleared areas to prevent sedimentation to streams. They must be installed on the contour, entrenched and staked, and extend the width of the area to be cleared. Erosion and sedimentation controls must be repaired, if necessary, after rainfall.

3) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR RELOCATION OF INTERMITTENT STREAMS

This general permit allows relocation of up to 500 feet of intermittent stream channel. In the case of this general permit, intermittent streams are defined as natural or man made watercourses that cease to flow for sustained periods during a normal rainfall year. Intermittent streams typically cease flow during the later summer through the fall months, although some may exhibit no flow in the channel during wetter months. Length of relocations is measured along the centerline of the channel. Relocation of intermittent streams is hereby permitted provided the activity is done in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) when a portion of the activity is located in a component of the national wild and scenic river system, a state scenic river, or waters designated as high quality waters such as trout streams or outstanding national resource waters subject to *The Tennessee Antidegradation Statement*, Rule 1200-4-3-.06;

(b) where the activity is likely to adversely affect wetlands;

(c) when the activity is located in a waterway which has been identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(d) when the project will adversely affect a species formally listed on state or federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Notification

Persons proposing to relocate up to 500 linear feet of an intermittent stream channel shall apply for coverage to the Division by submission of an original, signed notification which includes the following minimum information:

(a) a map showing the exact location of the proposed construction site; and

(b) a single copy of construction plans which includes specifications for proposed stream channel alterations and pollution control methods or structures.

Work within the stream channel shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General Terms and Conditions

1) The relocation activity may only be commenced where there is no flow in the channel and where sustained flow is not likely to recur during the period of construction. Work may only commence during seasonally dry periods in the case of intermittent streams that exhibit seasonal flow, or regardless of season in the case of channels that flow only periodically.

2) Relocated channels must be constructed to a stable condition which replicates pre-existing conditions or returns the channel to a more natural condition in terms of channel shape, dimensions, and substrate.

3) Provision must be made for the conveyance of water through the watercourse during construction, utilizing the original channel or lined diversion channels, etc., to prevent pollution of the stormwater runoff through the watercourse.

4) Backfill activities must be accomplished in a manner that stabilizes the streambed and banks to prevent erosion. Backfill materials shall consist of suitable materials free of contaminants. The completed work may not disrupt or impound stream flow.

5) Erosion and sediment control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along the waterbody in cleared areas to prevent movement of sediments into the waters. They must be installed parallel to the waterbody, entrenched and staked, and extend the width of the area to be cleared.

6) Check dams shall be utilized where runoff is concentrated. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to detain runoff and trap sediment. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

7) Excavated materials, construction debris, and other wastes shall be removed to an upland site and disposed in such a manner as to prevent the materials from entering the watercourse down stream of the work site.

8) All materials to be discharged or placed within the waterway below the ordinary high water level must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69-3-103(18).

9) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

10) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

11) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

12) Prior to commencing work under this general permit any necessary authorization must be obtained by the applicant pursuant to applicable provisions of §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act*.

13) Upon achievement of final grade, the disturbed streambank shall be stabilized with bioengineering methods, riprap or other suitable material. All other disturbed soils must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR MAINTENANCE ACTIVITIES

This general permit allows the maintenance of existing, previously authorized, currently serviceable, structures or fills such as dams, intake and outfall structures, utilities, culverts, etc. This general permit also authorizes the excavation of accumulated sediments and debris in the vicinity of existing structures such as bridges, culverted road crossings, and intake and outfall structures. Correspondingly, the placement of new or additional riprap to protect the structure is authorized. Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction. Minor deviations in the structure's configuration or filled area including those due to changes in materials, construction techniques, or current construction codes or safety standards which are necessary to make the repair, rehabilitation, or replacement are permitted. Maintenance activities are hereby permitted by this general permit, provided the activity is done according to the terms and conditions of this general permit.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) the structure or fill is to be put to uses differing from its original use or those uses specified in its original permit;

(c) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(d) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(e) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(f) when an individual permit is required.

Maintenance activities not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) Notification to the Division is not required where the work involves excavation of accumulated bedload and unconsolidated sediments from within culverts, and for a distance of one hundred feet up and down stream.

2) Notification to the Division is required of persons planning to conduct maintenance activities other than as specified in item one of this section. Notification shall be in the form of an original, signed document which includes the following minimum information:

    (a) a map showing the exact location of the proposed work; and

    (b) a single copy of construction plans or drawings which includes all dimensions and specifications for the proposed work.

Work shall not commence until the applicant has been notified by the Division that the activity may proceed under the general permit.

General Terms and Conditions

The following general terms and conditions apply to all activities authorized by this general permit.

1) The dredging or excavation of sediment shall be limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend further than 100 feet in any direction from the structure.

2) The placement of riprap must be the minimum necessary to protect the structure, or to ensure the safety of the structure.

3) All materials to be discharged or placed below ordinary high water must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69- 3-103(18).

4) Dredged materials shall be removed to an upland site and disposed in such a manner as to prevent reentry to waters of the State.

5) Erosion and sediment control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along the waterbody in cleared areas to prevent movement of sediments into the waters. They must be installed parallel to the waterbody, entrenched and staked, and extend the width of the area to be cleared.

6) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

7) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for grading work and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

10) Prior authorization must be obtained when necessary by the applicant pursuant to applicable provisions of §10 of *The Rivers and Harbors Act of 1897*, §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR SAND AND GRAVEL DREDGING

This general permit applies to the excavation of dry gravel bars from streams and rivers for the purpose of gravel or sand recovery. Gravel and sand dredging is hereby permitted provided it is done in accordance with all terms and conditions of this general permit.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Sand and gravel dredging projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) Notification and approval is not required where dredged sand or gravel is to be collected from and used on a private farm or residence, and where any trees growing on the gravel bar are less than two inches in diameter.

2) Notification to the Division is required for persons other than those covered by part one of this section proposing to dredge sand and gravel in waters of the State. Notification shall be in the form of an original, signed document which includes a work plan with the following minimum information:

    (a) a map showing the exact location of the proposed dredging site; and

    (b) a sketch or drawing of the gravel deposit in relation to the stream, including the access point.

Dredging shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit or issues an individual permit.

General terms and conditions

The following general terms and conditions apply to all sand and gravel dredging activities authorized by this general permit.

1) This general permit does not authorize the discharge of any substance into waters of the State, for any purpose, including dredged or fill material.

2) Authorization by this general permit does not relieve the applicant from requirements of other applicable federal, state, and local law.

3) This general permit does not authorize the removal of material from streams for the purpose of flood control or channelization.

4) The operation shall be conducted in the dry. Excavation equipment shall operate outside the stream flow at all times. A berm of at least five feet in width shall be left between the work area and the stream flow, or of such width as necessary to separate the excavation from the water in the stream. Berm is defined here as natural undisturbed material that is left between the dredging area and the stream.

5) Sand, gravel or other material shall not be excavated or removed below the approximate water level of the stream at the time of dredging.

6) Access to the work area shall be made at one point only, limiting disruption of trees and other stream cover to an area less than 20 feet wide.

7) Stream crossings shall be limited to a single right angle crossing directly adjacent to the gravel bar, or the most direct feasible route that minimizes impact to the stream.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Measures shall be taken to prevent erosion and sedimentation. When work is completed in an area, normal physical characteristics of the work area shall be recreated to the extent that machinery can do so without causing additional disturbance. This shall be accomplished by grading the site to smooth contours without disturbing the berm or its bank.

10) Vegetation and debris disturbed during dredging or dredge site preparation shall be removed to an upland location and placed in such a manner as to prevent re-entry into the stream.

11) Dredged material shall not be stored or stockpiled on the gravel bed or in the streambed.

12) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR BANK STABILIZATION ACTIVITIES

This general permit allows the repair and protection of eroded stream banks. Bank stabilization activities typically include grading of the stream bank to the appropriate slope in conjunction with placement of riprap or application of bioengineering techniques. Bioengineering involves the use of cedar tree revetments, rock or log current deflection weirs, live willow post application, log crib structures and other techniques that incorporate primarily materials found in the natural riparian environment. Bio-engineering is the preferred method and is permitted without notification where no work is done instream with mechanized equipment or where the work is done in accordance with an approved bio-engineering plan from the United States Department of Agriculture, Natural Resource Conservation Service. Bank stabilization activities are hereby permitted provided the activity is done in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(d) when an individual permit is required.

Bank stabilization projects not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) No notification to the Division is required where the length of stream bank to be treated is less than three times the top-of-bank width of the stream channel, not to exceed a total length of fifty feet; and where the total volume of soil, sand or gravel disturbed or re-deposited is less than ten cubic yards. Bank stabilization work conducted in accordance with this provision is limited to one site per 1000 linear feet of stream, and may be done only once without notification.

2) No notification to the Division is required where the work is done and maintained in accordance with a bio-engineering plan developed or approved by the United States Department of Agriculture, Natural Resource Conservation Service, or where recognized bio-engineering techniques are used and no work is done instream with mechanized equipment.

3) Notification to the Division is not required where the activity is located within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U. S. Army Corps of Engineers. However, prior to commencement of construction, the applicant must have received any necessary authorizations pursuant to applicable provisions of §10 of *The Rivers and Harbors Act of 1899*, §404 of *The Clean Water Act* and §26a of *The Tennessee Valley Authority Act*.

4) Except as provided in item one of this section, notification must be submitted to the Division where the primary bank protection is not conventional bioengineering techniques and the activity is not located within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U. S. Army Corps of Engineers. Notification shall be in the form of an original, signed document which includes the following minimum information:

(a) a map showing the exact location of the proposed work; and

(b) a single copy of construction plans or drawings which includes all dimensions and specifications for the proposed work.

Work shall not commence until the applicant has been notified that the activity may proceed under the general permit.

General Terms and Conditions

The following general terms and conditions apply to all bank stabilization activities authorized by this general permit.

1) The unnecessary removal of living trees and other riparian vegetation which help comprise the integrity of the stream bank or which help provide canopy or shade to the waters; or, the placement of fill which would otherwise injure or damage stream side vegetation is not authorized by this general permit.

2) Grading, sloping, dredging or reshaping of the stream banks or bed shall be limited to the minimum necessary to accommodate stabilization and armoring materials.

3) The placement of riprap is limited to 300 linear feet of stream bank. Vegetative or bioengineering methods of bank stabilization are not subject to this restriction.

4) Material may not be placed in such location or manner so as to impair surface water flow into or out of any wetland area.

5) The activity may not be conducted in a manner that would permanently disrupt the movement of aquatic life.

6) Materials used in stabilization shall include clean rock, riprap or anchored trees or other non-erodible materials found in the natural environment. **Except for activities covered by item one of the notification section,** stabilization materials shall not include gravel, sand, sediments, chert, soil, or other materials that are likely to erode. Materials used in bank stabilization projects shall be free of contaminants, including toxic pollutants, hazardous substances, waste metal, construction debris, organic materials, etc.

7) Streams shall not be used as transportation routes for heavy equipment. Crossings must be limited to one point and erosion control measures must be utilized where the stream banks are disturbed. Where the streambed is not composed of rock, a pad of clean rock must be used at the crossing point. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants. All temporary fill must be completely removed after the work is completed.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Vegetation and debris disturbed by activity at the construction site shall be removed from the site to such a location so as to prevent reentry into the waterway.

10) Upon achievement of final grade, all disturbed soil areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a

combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

11) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR SURVEYING AND GEOTECHNICAL EXPLORATION

This general permit authorizes scientific surveys and geotechnical exploration in waters of the state. It is intended to allow activities such as core sampling, seismic exploratory operations, soil survey and sampling, and historic resources surveys. This permit also allows the placement and operation of scientific measurement devices such as staff gages, water recording devices, water quality testing and improvement devices and similar structures. Drilling and excavation for test wells for oil and gas exploration is not authorized by this general permit. Surveying and geotechnical exploration is hereby permitted by this general permit, provided the activity is done according to the terms and conditions.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species;

(e) where the proposed activity is drilling and excavation for test wells for oil and gas exploration; or

(f) when an individual permit is required.

Surveying and geotechnical exploration activities not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Notification to the Division is not required for surveying and geotechnical exploration activities conducted in accordance with this general permit. However, all of the general terms and conditions below apply.

General Terms and Conditions

1) Prior authorization must be obtained when necessary by the applicant pursuant to applicable provisions of §10 of *The Rivers and Harbors Act of 1897*, §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

2) All materials to be discharged or placed below ordinary high water must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69- 3-103(18).

3) Erosion and sediment control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along the waterbody in cleared areas to prevent movement of sediments into the waters. They must be installed parallel to the waterbody, entrenched and staked, and extend the width of the area to be cleared.

4) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in sediment basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the water line. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

5) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for grading work and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

6) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

7) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

8) Surveying or geotechnical exploration activities conducted in navigable waters must be conducted in a manner that does not interfere with navigation.

9) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR MINOR DREDGING

This general permit allows minor dredging and filling activities within reservoirs managed by the Corps of Engineers and the Tennessee Valley Authority. Minor dredging activities typically include, but are not limited to, excavation of the lakebed to establish boat access by both private and commercial marinas and boathouses. Minor filling activities typically include fill for marina and boathouse construction. For the purposes of this general permit minor dredging is defined as projects where the total quantity of material excavated within the water column does not exceed 200 cubic yards, and total excavation or fill below ordinary high water does not exceed 500 cubic yards. Minor dredging and fill activities within water resource development project lands and waters, including flowage easement, managed by the Tennessee Valley Authority or the U. S. Army Corps of Engineers are hereby permitted by this general permit, provided the activity is done according to the terms and conditions of this general permit.

Notification

Notification to the Division is not required for minor dredging and filling activities within reservoirs managed by the Corps of Engineers and the Tennessee Valley Authority conducted in accordance with this general permit. However, all of the general terms and conditions below apply.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Minor dredging activities not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

General Terms and Conditions

1) Prior authorization must be obtained by the applicant pursuant to applicable provisions of §10 of *The Rivers and Harbors Act of 1897*, §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

2) Excavation or fill within the water column cannot exceed 200 cubic yards of material, and total excavation or fill below ordinary high water cannot exceed 500 cubic yards.

3) All materials to be discharged or placed below ordinary high water must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69- 3-103(18).

4) Dredged materials shall be removed to an upland site and disposed in such a manner as to prevent reentry to waters of the State.

5) Erosion and sedimentation control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along the lake shore in cleared areas to prevent movement of sediments into the waters. They must be installed parallel to the lakeshore, entrenched and staked, and extend the width of the area to be cleared.

6) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in sediment basins until at least as clear as the receiving waters. Sedimentation basins shall not be located on the bank closer than 20 feet from the water line. Sediment basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

7) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for grading work and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

8) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

9) Upon achievement of final grade, all disturbed areas above ordinary high water must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

10) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR ALTERATION AND RESTORATION OF INTERMITTENT STREAMS ASSOCIATED WITH MINING

This general permit allows alteration of ephemeral and intermittent streams associated with surface mining activities in the Cumberland Mountain and Cumberland Plateau ecoregions in Tennessee. The Department has determined that upper watersheds within these ecoregions meet criteria that affords mitigation in the form of restoration of the ephemeral stream reaches and conversion of intermittent reaches to emergent This general permit is intended to provide the mining industry with a planning tool and to provide longterm restoration of watersheds that range in size from 0-60 acres. This permit provides a mechanism for the establishment of aquatic habitats through the conversion of existing sediment control structures to an emergent marsh area that includes establishment of aquatic habitats and riparian zones as mitigation. The restoration plan must provide surface drainage continuity to the downstream, unmined reach. The approved mitigation plan must be completed as a post-mining or reclamation condition. Alteration of ephemeral and intermittent streams within the Cumberland Mountain and Cumberland Plateau ecoregions is hereby permitted provided the activity is completed in accordance with the terms and conditions below.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Alterations of ephemeral and intermittent streams associated with surface mining activities in the Cumberland Mountain and Cumberland Plateau ecoregions not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

1) The applicant shall apply for coverage to the Division by submitting an original, signed application which includes the following minimum information:

    (a) a map showing the exact location of the proposed work; and

    (b) a single copy of construction plans and which includes all dimensions and specifications for the proposed work including all items outlined below.

2) The applicant must have submitted an application for a coal mine permit issued by the Federal Office of Surface Mining and/or an NPDES permit issued by the Department. These permit numbers must be provided on the application.

3) The notification must include pre-mining conditions and information and post-mining aquatic conditions.

4) The applicant may use maps from the SMCRA or NPDES permit applications to indicate the location of the proposed target watershed(s) and for pond design information.

5) The mitigation for the impacted aquatic resource will consist of a marsh/wetland area with the size calculated by measuring the stream length proposed for alteration (both the blue line and the dashed line) from the applicable USGS quadrangle map and multiplying that length by the bankfull stage stream width at the lowest point of the proposed disturbance. The square footage of water surface calculated in this manner is the area that must be mitigated at a 3:1 ratio.

6) Hydrology sources must be identified and must include both primary (surface run-off) and secondary (ground water) sources. Any hydrology model runs with discharge calculations to support water budgets should be included. Groundwater sources may be "French drain" outlets with estimated discharge volumes.

7) The applicant must include sediment basin design plans that include the plan view and cross sections with spillway elevations to sustain a maximum depth of four feet and side slope depth of 18" to 0". (Basin geometry may require minor cut and fill areas to achieve the desired elevations when the basins are created from the existing sediment control structures.)

8) Construction shall not commence until the Division issues written notification that the proposal may proceed in accordance with the terms of this general permit, or issues an individual permit.

General Terms and Conditions

1) Prior authorization must be obtained by the applicant pursuant to applicable provisions of §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

2) The wetland / marsh area must provide aquatic habitat enhancements such as logs and rock piles.

3) Native tree and shrub species must be planted adjacent and contiguous to the fringe emergent wetland including inlet channels. This riparian zone should be planted on ten foot centers with twelve foot rows and should extend fifty feet from wetted edge. Tree composition should include at least 50% hard mast. Light seeded species should be avoided.

4) The channel below the wetland must be constructed to replicate the pre-existing condition or return the drainway to a more natural condition in terms of shape and substrate.

5) All materials, construction debris, and other wastes shall be removed to an upland site and disposed in such a manner as to prevent the materials from entering the watercourse down stream from the work site.

6) All materials to be discharged or placed within the waterway below the ordinary high water level must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69-3-103(18).

7) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

8) The applicant must contact the Division at the completion of the project milestones and upon completion of the project.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR WETLANDS RESTORATION AND ENHANCEMENT

This general permit authorizes wetland restoration and enhancement activities in waters of the state. It is intended to allow restoration and enhancement of altered and degraded wetlands. Restoration activities are typically associated with activities such as greenway development, compensatory mitigation activities, habitat enhancement and watershed protection. Such activities include installation and maintenance of small water control structures, dikes, and berms; backfilling of existing drainage structures; construction of small nesting islands; plowing and disking for seed bed preparation; and other related activities.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(b) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(c) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(d) when an individual permit is required.

Wetland restoration activities not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

The applicant shall apply for coverage to the Division by submission of an original, signed application, which includes the following minimum information:

(a) a map showing the exact location of the proposed work, and

(b) a single copy of construction plans or drawings which includes all dimensions and specifications for the proposed work.

Work shall not commence until the applicant has been notified that the activity may proceed under the general permit or with any special conditions imposed by the Division.

General Terms and Conditions

1) Prior authorization must be obtained, when necessary, by the applicant pursuant to applicable provisions of §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act.*

2) All materials to be discharged or placed below ordinary high water must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69- 3-103(18).

3) Erosion and sediment control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stockpiled soil, and along the waterbody in cleared areas to prevent movement of sediments into

the waters. They must be installed parallel to the waterbody, entrenched and staked, and extend the width of the area to be cleared.

4) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

5) Clearing, grubbing and other disturbance to riparian vegetation shall be limited to the minimum necessary for grading work and equipment operations. Unnecessary vegetation removal is prohibited. All disturbed areas shall be properly stabilized as soon as practicable.

6) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

7) Upon achievement of final grade, all disturbed areas must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

GENERAL PERMIT FOR IMPOUNDMENT OF INTERMITTENT STREAMS

This general permit allows construction of a dam and impoundment of up to 500 feet of intermittent stream channel. In the case of this general permit, intermittent streams are defined as natural or man made watercourses that cease to flow for sustained periods during a normal rainfall year. Intermittent streams typically cease flow during the later summer through the fall months, although some may exhibit no flow in the channel during wetter months.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

(a) where wetlands will be adversely affected by the proposed work;

(b) when the activity is located in any waterway which is identified by the Department as having contaminated sediments, and where the proposed work will likely mobilize the contaminants;

(c) where the activity is located in a component of the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters;

(d) when the project will adversely affect a species formally listed on State or Federal lists of threatened or endangered species; or

(e) when an individual permit is required.

Dam construction activities not qualifying for authorization by this general permit may be authorized by individual permit provided all requirements of the *Tennessee Water Quality Control Act of 1977* are met.

Notification

Persons shall apply for coverage to the Division by submission of an original, signed notification that includes the following minimum information:

(a) a map showing the exact location of the proposed work, and

(b) a single copy of construction plans or drawings which includes all dimensions and specifications for the proposed work.

Work shall not commence until the applicant has been notified that the activity may proceed under the general permit.

General Terms and Conditions

1) Prior authorization must be obtained, when necessary, by the applicant pursuant to applicable provisions of §404 of the *Clean Water Act* and §26a of *The Tennessee Valley Authority Act*.

2) The work may only be commenced where there is no flow in the channel and where sustained flow is not likely to recur during the period of construction. Work may only commence during seasonally dry periods in the case of intermittent streams that exhibit seasonal flow, or regardless of season in the case of channels that flow only periodically.

3) Provision must be made for the conveyance of water through the watercourse during construction, utilizing the original channel or lined diversion channels, etc., to prevent pollution of the stormwater runoff through the watercourse.

4) Erosion and sediment control measures are required where soil will be disturbed. The control measures must be in place before earthmoving operations begin, maintained throughout the construction period and repaired, if necessary, after rainfall. Control measures such as straw bales and/or silt fence must be installed along the base of all fills and cuts, on the down hill side of stock piled soil, and along the waterbody in cleared areas to prevent movement of sediments into the waters. They must be installed parallel to the waterbody, entrenched and staked, and extend the width of the area to be cleared.

5) Check dams shall be utilized where runoff is concentrated. Clean rock, log, sandbag, or straw bale check dams shall be properly constructed to detain runoff and trap sediment. Clean rock is rock of various type and size, depending upon application, that contains no fines, soils, or other wastes or contaminants.

6) All materials to be discharged or placed within the waterway below the ordinary high water level must be free of pollutants, contaminants, toxic materials, trash, creosote treated timbers, or other wastes as defined by T.C.A. 69-3-103(18).

7) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the state, including groundwater.

8) Slurry water pumped from work areas and excavations must be held in settling basins or treated by filtration prior to its discharge into surface waters. Water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream. Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

9) Adverse impact to formally listed state or federal threatened or endangered species or their critical habitat, or to cultural, historical, or archeological features or sites is prohibited.

10) Upon achievement of final grade, the disturbed streambank shall be stabilized with riprap or other suitable material. All other disturbed soils must be stabilized and re-vegetated within 30 days by sodding or seeding and mulching. Seed to be utilized shall include a combination of annual grains and grasses, legumes, and perennial grasses. Lime and fertilizer shall be applied as needed to achieve a vegetative cover.

Effective Date July 1, 2000 APPROVED: _____

Expiration Date June 30, 2005 Paul Davis, Director

APPENDIX D.
SOURCES OF ADDITONAL INFORMATION

TDEC Environmental Assistance Centers:

Water Pollution Control Central Office (may be used by TVA and TDOT):

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL, PERMIT SECTION
STORM WATER NOI PROCESSING
6TH FLOOR, L & C ANNEX
401 CHURCH STREET
NASHVILLE, TN 37243-1534
615-532-0625

Fayette, Shelby, and Tipton Counties:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2510 MT MORIAH ROAD SUITE E-645
MEMPHIS, TN 38115-1520
901-368-7939

Benton, Carroll, Chester, Crockett, Decatur, Dyer, Gibson, Hardeman, Hardin, Haywood, Henderson, Henry, Lake, Lauderdale, McNairy, Madison, Obion, Weakly counties:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
362 CARRIAGE HOUSE DRIVE
JACKSON, TN 38305-2222
731-512-1300

Cheatham, Davidson, Dickson, Houston, Humphreys, Montgomery, Robertson, Rutherford, Stewart, Sumner, Williamson, Wilson:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
711 R.S. GASS BOULEVARD
NASHVILLE, TN 37243
615-687-7000

Bedford, Coffee, Franklin, Giles, Hickman, Lawrence, Lewis, Lincoln, Marshall, Maury, Moore, Perry, Wayne:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2484 PARK PLUS DRIVE
COLUMBIA, TN 38401
931-380-3371

Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Macon, Pickett, Putnam, Overton, Smith, Trousdale, Van Buren, Warren, White:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
1221 SOUTH WILLOW AVE
COOKEVILLE, TN 38506
931-432-4015

Bledsoe, Bradley, Grundy, Hamilton, McMinn, Marion, Meigs, Polk, Rhea, Sequatchie:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
STATE OFFICE BUILDING SUITE 550
540 MCCALLIE AVE
CHATTANOOGA, TN 37402-2013
423-634-5745

Anderson, Blount, Campbell, Claiborne, Cocke, Grainger, Hamblen, Jefferson, Knox, Loudon, Monroe, Morgan, Roane, Scott, Sevier, Union:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2700 MIDDLEBROOK PIKE SUITE 220
KNOXVILLE, TN 37921
865-594-6035

Carter, Greene, Hancock, Hawkins, Johnson, Sullivan, Unicoi, Washington Counties:

TN DEPT OF ENV AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
2305 SILVERDALE ROAD
JOHNSON CITY, TN 37601
423-854-5400

United States Army Corps of Engineers Offices:

Cumberland and Tennessee River Basins:

Nashville District Office:

U.S. ARMY CORPS OF ENGINEERS
REGULATORY BRANCH
3701 BELL ROAD
NASHVILLE, TN 37214

Web address: http://www.orn.usace.army.mil/

Eastern Regulatory Field Office:

U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 465
LENOIR CITY, TN 37771-0465

Western Regulatory Field Office:

U.S. ARMY CORPS OF ENGINEERS
2042 BELTLINE ROAD, SW
BLDG. C, SUITE 415
DECATUR, AL 35601

Mississippi River Basin:

Memphis District Office:

U.S. ARMY CORPS OF ENGINEERS
B-202 CLIFFORD DAVIS FEDERAL BUILDING
167 NORTH MAIN STREET
MEMPHIS, TN 38103-1854

Web address: http://www.mvm.usace.army.mil/

Barren River Basin:

Louisville District Office:

U.S. ARMY CORPS OF ENGINEERS
600 DR. MARTIN LUTHER KING, JR.
LOUISVILLE, KY 40202-2232

Web address: http://www.lrl.usace.army.mil/

NPDES-Permitted Municipal Separate Storm Sewer System (MS4) Municipalities:

CITY OF MEMPHIS
PUBLIC WORKS DIVISION/STORM WATER MANAGEMENT
125 NORTH MAIN STREET, ROOM 620
MEMPHIS, TN 38103-2091
901-529-0237

Web address: http://www.ci.memphis.tn.us

NASHVILLE/DAVIDSON COUNTY
METRO DEPARTMENT OF PUBLIC WORKS/NPDES PROGRAM
POINT PLACE BUSINESS PARK, SUITE 350
441 DONELSON PIKE
NASHVILLE, TN 37214-3558
615-880-2420

Web address: http://www.nashville.org/pw/stormwater.html

CITY OF KNOXVILLE
DEPARTMENT OF ENGINEERING
CITY COUNTY BUILDING, SUITE 480
P.O. BOX 1631
KNOXVILLE, TN 37901-1631
865-215-2148

Web address: http://www.ci.knoxville.tn.us/engineering/

CITY OF CHATTANOOGA
DEPARTMENT OF PUBLIC WORKS/STORM WATER MANAGEMENT
1001 LINDSEY STREET
CHATTANOOGA, TN 37402
423-757-0039

Web address: http://www.chattanooga.gov/stormwater/index.htm

Various Web Resources:

Tennessee State Government: **http://www.tennesseeanytime.org/**

Department of Environment and Conservation: **http://www.state.tn.us/environment**

Tennessee Code Annotated (state laws):
http://198.187.128.12/tennessee/lpext.dll?f=templates&fn=fs-main.htm&2.0

Departmental Rules and Regulations (Water Pollution Control):
http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm

Division of Forestry: **http://www.state.tn.us/agriculture/forestry/**

Georgia Soil and Water Conservation Commission: **http://www.gaswcc.org/**

Virginia Soil and Water Conservation (Erosion and Sediment Control):
http://www.dcr.state.va.us/sw/e&s.htm

Revised Universal Soil Loss Equation: **http://www.sedlab.olemiss.edu/rusle/index.html**

Tennessee Valley Authority: **http://www.tva.gov/index.htm**

Natural Resource Conservation Service: **http://www.nrcs.usda.gov/**

International Erosion Control Association: **http://www.ieca.org/**

EPA Office of Wetlands, Oceans, and Watersheds: **http://www.epa.gov/owow/**

University of Tennessee Center for Industrial Services: **http://www.cis.utk.edu/**

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