Bryan J. Dolan
VP, Nuclear Plant Development

Duke Energy
EC09D/ 526 South Church Street
Charlotte, NC 28201-1006

Mailing Address:
P.O. Box 1006 – EC09D
Charlotte, NC 28201-1006

704-382-0605

bjdolan@duke-energy.com

November 24, 2008

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Request for Additional Information
Ltr# WLG2008.11-24

Reference: Letter from J.M. Muir (NRC) to B.J. Dolan (Duke Energy), *Request for Additional Information Regarding the Environmental Review of the Combined License Application for William States Lee Nuclear Station Units 1 and 2*, dated August 21, 2008

This letter provides the Duke Energy response to the Nuclear Regulatory Commission's (NRC) requests for the following additional information (RAI) items listed in the reference letter:

RAI 79, Terrestrial Ecology
RAI 86, Terrestrial Ecology
RAI 95, Ecology

Responses to these NRC requests are addressed in the enclosure which also identifies any associated changes that will be made in a future revision of the William States Lee III Nuclear Station application.

If you have any questions or need any additional information, please contact Peter S. Hastings at 980-373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

Enclosure:

1. Responses to RAI 79, Terrestrial Ecology, 86 Terrestrial Ecology, 95 Ecology

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Subscribed and sworn to me on November 24, 2008

Phoebe P. Elliott
Notary Public

My commission expires: June 26, 2011

SEAL

xc (wo/enclosure):

Michael Johnson, Director, Office of New Reactors
Gary Holahan, Deputy Director, Office of New Reactors
David Matthews, Director, Division of New Reactor Licensing
Scott Flanders, Director, Division of Site and Environmental Reviews
Glenn Tracy, Director, Division of Construction Inspection and Operational Programs
Luis Reyes, Regional Administrator, Region II
Loren Plisco, Deputy Regional Administrator, Region II
Thomas Bergman, Deputy Division Director, DNRL
Stephanie Coffin, Branch Chief, DNRL
Gregory Hatchett, Branch Chief, DSER

xc (w/enclosure):

Linda Tello, Project Manager, DSER
Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional information (RAI)

RAI Letter Dated: August 21, 2008

Reference NRC RAI Numbers: ER RAI 79, ER RAI 86, ER RAI 95

NRC RAIs:

ER RAI 79: Provide documentation of all ROW practices (including vegetation) (elaborating on the information presented in section 3.7.5 of the Environmental Report) that would be used to maintain the final transmission line corridor that will ultimately be selected. Include documentation of the specific procedures that will be used to avoid, minimize, and/or mitigate construction impacts to wetlands and flood plains and terrestrial habitats associated with the selected corridor

ER RAI 86: Provide information on any plans that would involve seeding non-native species in disturbed area to control erosion

ER RAI 95: Provide a copy of the following documents:

1. Duke's 1995 Best Management Practices (BMPs) handbook.
2. South Carolina Stormwater Management and Sediment Control Handbook.

Duke Energy Response:

The requested documents are included as attachments to this response.

ER RAI 79

Procedures used to mitigate impacts of transmission line construction, requested in RAI 79, are discussed in *Best Management Practices for Stormwater Management and Erosion Control, Policy and Procedures Manual* (Attachment 79-1/86-1/95-1).

Information on line maintenance practices are contained in *Duke Energy Carolinas Transmission Vegetation Management Program* (Attachment 79-2).

ER RAI 86

Information on seeding practices and mixtures for erosion control requested in RAI 86 are also discussed in *Best Management Practices for Stormwater Management and Erosion Control, Policy and Procedures Manual* (Attachment 79-1/86-1/95-1). The grass mixtures used comprise species typical for and long-used in the Southeast US. No noxious or exotic species are used for erosion control.

ER RAI 95

The requested documents are provided in Attachments 79-1/86-1/95-1 and 95-2.

Associated Revisions to the Lee Nuclear Station Combined License Application:

None

Associated Attachments:

Attachment 79-1/86-1/95-1:	Duke Energy, *Best Management Practices for Stormwater Management and Erosion Control, Policy and Procedures Manual*, 1995 (Revised 1999)
Attachment 79-2:	*Duke Energy Carolinas Transmission Vegetation Management Program*, not dated.
Attachment 95-2:	South Carolina Department of Health and Environmental Control, *South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities*, 2003.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 79-1 to RAI 79

Attachment 86-1 to RAI 86

Attachment 95-1 to RAI 95

Duke Energy, *Best Management Practices for Stormwater Management and Erosion Control, Policy and Procedures Manual*, 1995 (Revised 1999)

DUKE ENERGY

BEST MANAGEMENT PRACTICES FOR STORMWATER MANAGEMENT AND EROSION CONTROL

POLICY AND PROCEDURES MANUAL

September 1995

Revised February 1999

TABLE OF CONTENTS

DETAILS

1.0 INTRODUCTION

The following Best Management Practices have been developed by Duke Energy as a guide to help minimize soil erosion and prevent sedimentation pollution associated with land-disturbing activities involving the construction, modification, operation and/or maintenance of any Duke Energy facilities in North or South Carolina. The suggested measures, methods and/or practices are intended as tools to help meet or exceed the requirements of the North Carolina Department of Environment, Health and Natural Resources and the South Carolina Department of Health and Environmental Control.

In no case shall the following Best Management Practices substitute for site-specific permits or special requirements specifically requested by regulatory agencies or environmental reports.

2.0 REFERENCES

Practice standards, specifications, and design criteria for all best management practices given in this policy and procedures manual shall follow the applicable guidelines given in the references below:

1. "A Guide to Site Development and Best Management Practices for Stormwater Management and Sediment Control", South Carolina Land Resources Conservation Commission, May 1992.

2. "Erosion and Sedimentation Control Practices for Developing Areas", South Carolina Land Resources Conservation Commission, 1985.

3. "Erosion and Sediment Control Planning and Design Manual", North Carolina Department of Natural Resources and Community Development, September 1988.

4. "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, University of Kentucky, 1987.

5. "Standard Specifications for Highway Construction", South Carolina State Highway Department, 1986.

6. "Standard Specifications for Roads and Structures", North Carolina Department of Transportation, 1984.

7. "Virginia Erosion and Sediment Control Handbook", Virginia Division of Soil and Water Conservation, 2nd Edition, 1980.

8. "Urban Hydrology for Small Watersheds", SCS Technical Release No. 55 (TR-55), USDA Soil Conservation Service.

9. "Forestry Best Management Practices Manual", North Carolina Division of Forest Resources, Department of Environment, Health, and Natural Resources, September, 1989.

10. "Filter Strip Widths for Forest Roads in the Southern Appalachians", Lloyd W. Swift, Jr., Southern Journal of Applied Forestry.

3.0 GENERAL BEST MANAGEMENT PRACTICES

The following general Best Management Practices are applicable to all land disturbing activities associated with the construction, maintenance, operation, or modification of any Duke Energy facility. The linear nature of line corridors, rights-of-way, access limitations, variations in topography, and the routine nature of transmission and distribution line work and maintenance requires a somewhat unique approach to erosion control methods, measures, and practices. Therefore, the best management practices for transmission and distribution lines are outlined and described in Sections 4.0 and 5.0, respectively.

3.1 PRE-CONSTRUCTION CONSIDERATIONS

3.1.1 PLANNING

The planning process for a project will consider the following factors to determine the constraints, concerns, and possibilities for stormwater management and sediment / erosion control on the site:

Soils and geology
Degree and direction of slopes and topography
Regional location and elevation
Season and climate
Existing vegetation
Existing erosion concerns
Existing water quality
Receiving water bodies
Wetlands and special designation waters

Significant resources (trout streams, wetlands, designated watersheds, etc.), cultural resources, and any environmentally sensitive areas will be identified during the planning process prior to construction activities. Appropriate protection measures will be prescribed and implemented as required.

Erosion and sedimentation control plans will be developed for each construction project which will result in land disturbance of 1 acre or greater, and shall follow the specific design criteria, minimum standards, and specifications of the N.C. Dept. of Environment, Health and Natural Resources, the S.C. Dept. of Health and Environmental Control, and the Federal Clean Water Act (NPDES) Regulations. The appropriate notification of intent shall be made for disturbances to areas of 1 acre or greater in accordance with the stormwater control provisions or the NPDES program. Additionally, all plans shall meet or exceed the requirements of any applicable county or local government erosion control or stormwater regulations.

Plans will consist of drawings and specifications necessary for the location, construction, and maintenance of all erosion control features, and will be maintained on the project site or with a designated project manager. Plans will delineate limits of clearing and disturbance, buffer zones, receiving water bodies, and special designation waters. Plans will also incorporate protection measures as required for identified significant resources and environmentally sensitive areas.

3.1.2 PERMITTING

All permits and agency approvals associated with land disturbing activities will be obtained prior to construction activities.

Activities impacting waters (wetlands, ponds, lakes, rivers, streams, intermittent streams, etc.) by the placement or removal of any material will be reviewed for necessary permit requirements.

3.1.3 CONSTRUCTION SEQUENCING

Erosion and sedimentation control practices will proceed hand-in-hand with construction activities. All erosion control structures will be in place prior to land disturbing activities that are within a given contributing drainage area or sub-watershed. The sequencing of erosion control measures will be project specific, but will generally be installed in the following sequence:

1. Access site and install graveled construction entrance.
2. Delineate clearing limits, buffer zones, and any sensitive areas.
3. Install sediment traps and barriers (basins, traps, silt fence, etc.).
4. Install runoff control features (diversions, perimeter dikes, level spreaders, etc.).
5. Begin land clearing and grading.
6. Install runoff conveyance features (channels, culverts, storm drains, temporary slope drains, inlet - outlet protection, channel linings, streambank stabilization, etc.).
7. Complete land clearing and grading.
8. Stabilize surfaces (temporary and permanent grassing, paving, surfacing, etc.).
9. Construct facility.
10. Landscape and permanent stabilization.

Construction activities will proceed in such a manner as to minimize the extent of disturbed areas, and to minimize the time in which the areas remain in a disturbed state. Factors such as sequencing of activities, weather, and time of year will be considered during the planning process and during construction activities.

Temporary erosion control structures may be removed once all areas within a contributing drainage area have been established with permanent vegetation or otherwise have been permanently stabilized. Immediately following structure removal, permanent grassing or other appropriate stabilization will be applied to disturbed areas at the former structure location.

3.1.4 BUFFER ZONES

A minimum buffer zone width of 25 feet will be maintained between disturbed areas and any water body (stream banks, lakes, ponds, wetlands, etc.) to the greatest extent feasible. Mechanized equipment shall not enter buffer zones except as required for stream crossings.

Erosion control measures will be placed to minimize sediment transport into buffer zones if required by site conditions. If site constraints prevent the establishment of sufficient buffer zones, special precautions will be taken (intercept ditches, fencing, sediment traps and basins, etc.) to protect water bodies from sediment deposition.

3.2 CONSTRUCTION

3.2.1 SITE PREPARATION

3.2.1 (a) Clearing and Tree Removal

Clearing limits will be delineated in the field and care shall be taken to not remove or damage vegetation unnecessarily. Marketable trees will be removed if practical and economical. Remaining trees and brush will be removed and ground into mulch if feasible and economical, or will otherwise be disposed of (buried, burned, etc.) in accordance with local, state, and federal ordinances. Tree and brush debris may be used for the construction of brush barriers.

3.2.1 (b) Grubbing and Land Grading

Grubbing and land grading will be staged to the greatest extent feasible, and the disturbance of large areas by mass grading will be avoided if feasible and economical.

Cut and fill slopes will typically be no steeper than 2 to1 (preferably 3 to1) unless made in rock or otherwise stable material. If site constraints dictate the need for steeper slopes, appropriate measures shall be taken (matting, netting, riprap, etc.) to protect the slope from erosion. Benching will be used where feasible to provide slope breaks and limit erosion on long slopes.

Slopes to be accessed by mowing equipment will be no steeper than 3 to 1. Slopes 3 to 1 and steeper will be surface roughened to reduce erosion potential and aid the establishment of vegetation.

3.2.1 (c) Topsoiling

Topsoil may be retained, where feasible and economical, for application to areas where establishment of vegetation may be difficult (shallow or rocky soils, excessively drained soils, south facing slopes, soils of high acidity, etc.) or for areas where high maintenance turf or ornamental plants are desired.

3.2.1 (d) Temporary Graveled Construction Entrance

Graveled construction entrances will be provided at each location where construction traffic will exit the site onto public roads or other o f site paved areas. The graveled entrance shall consist of 6 inches of 2 to 3 inch size washed stone and shall be a minimum of 50 feet in length. The surface of the graveled entrance will be periodically cleaned and top-dressed as needed to prevent off-site mud and sediment transport.

3.2.2 SURFACE STABILIZATION MEASURES

3.2.2 (a) Surface Roughening

Cut and fill slopes 3 to 1 and steeper will be surface roughened following grading and prior to seeding.

Slopes will be grooved parallel to the slope contour by tracked equipment, disk, tiller, harrow, or teeth of front-end loader bucket. The top 4 to 6 inches of fill slopes will be left loose and uncompacted.

3.2.2 (b) Temporary Seeding **(Must Be Followed By "Permanent" Reseeding At Later Date)**

Temporary seeding will be applied to all disturbed areas that will not be brought to final grade for a period in excess of 14 working days. Temporary vegetation will have a maximum useful life of 1 year. If applicable, temporary seeding may also be applied to completed areas requiring permanent seeding in the interim between allowable seeding periods.

Typical temporary seeding guidelines are as follows:

<u>January through April:</u>
Rye (grain) ..... 120 lb/acre
Annual kobe lespedeza ..... 50 lb/acre

<u>May through mid-August:</u>
German millet ..... 40 lb/acre
Sudangrass ..... 50 lb/acre

3.2.2 (c) Permanent Seeding

Permanent seeding will be applied to all disturbed areas and slopes within 30 working days following completion of grading activities. Permanent seeding will also be applied to all uncompleted areas that will remain uncompleted for a period in excess of 1 year.

Grassing requirements will be tailored to site-specific conditions, steepness of slopes, climate, location, and elevation. Typical permanent seeding guidelines are as follows:

For Low Maintenance Areas:

<u>February through mid-April:</u>
Tall fescue ..... 60 to 100 lb/acre
Sericea lespedeza (scarified) ..... 20 to 30 lb/acre
Kobe lespedeza ..... 10 lb/acre

<u>Mid-April through July:</u>
* Weeping lovegrass..... 3 lb/acre
Sericea lespedeza (scarified) ..... 30 to 40 lb/acre
*Common bermudagrass (hulled) ..... 10 lb/acre
Tall fescue..... 40 lb/acre
***NOTE:** To be used in site specific situations only.

<u>August through February:</u>
Tall fescue ..... 60 to 100 lb/acre
Sericea lespedeza (unscarified) ..... 20 to 40 lb/acre
Rye (grain) ..... 40 lb/acre

For High Maintenance Areas and Grass-Lined Channels:

August through mid-April:
Tall fescue blend.....300 lb/acre

Mid-April through July:
Common bermudagrass (hulled).....100 lb/acre

Nurse crops may be added to aid the establishment of permanent vegetation. Typical application guidelines for nurse crops are as follows:

May through mid-August:
German millet (or).....10 lb/acre
Sudangrass.....15 lb/acre

August through April:
Rye (grain).....25 lb/acre

3.2.2 (d) Soil Amendments:

Lime and fertilizer will be applied to all seeded areas. In the absence of specific recommendations from soil test reports, soil amendments will generally be applied at the following rates:

Temporary Seeding:
Ground agricultural limestone.....2000 lb/acre
10-10-10 fertilizer.....750 lb/acre

Permanent Seeding - Low Maintenance Areas:
Ground agricultural limestone.....4000 lb/acre
10-10-10 fertilizer.....1000 lb/acre

Permanent Seeding - High Maintenance Areas:
Ground agricultural limestone.....4000 lb/acre
0-46-0 fertilizer.....100 lb/acre
10-10-10 fertilizer.....500 lb/acre

Lime and high-phosphorus fertilizer will typically be incorporated into the top 6 inches of the seedbed for high maintenance areas.

3.2.2 (e) Mulch

Mulch will typically be applied to all seeded areas or, if applicable, to all completed areas requiring permanent seeding in the interim between allowable seeding periods.

Mulch wi11 typically be dry unchopped straw applied at rates between 3000 to 4000 lbs/acre. Mulch may be spread by hand or mulch blower and will be anchored by a mulch anchoring tool or emulsified asphalt applied at a typical rate of 10 gaU1000 square feet. Mulch may be applied by hydro mulching at a typical rate of 2000 lb/acre of wood fiber and tackifier.

Matting or netting will be applied to steep slopes, channels, or problem areas as needed to reduce erosion and aid the establishment of permanent vegetation.

3.2.2 (f) Riprap

Riprap will be used as needed to protect slopes and channels where site conditions or runoff velocities prohibit the establishment of vegetation. Riprap will also be used as inlet and outlet protection for runoff conveyance features (culverts, slope drains, storm drain outlets, etc.), for spillway and outlet protection of sediment traps and basins, and for check dams to limit flow velocities in channels.

Required riprap stone size and layer thickness shall be determined by design velocity, channel grade and side slope, outlet discharge *and* outlet pipe size, and degree of embankment slope. In no case shall riprap layer thickness be less than 6 inches. An adequate graded stone or geotextile fabric filter blanket will be placed between riprap and subgrade soils.

3.2.3 RUNOFF CONTROL AND CONVEYANCE MEASURES

3.2.3 (a) Temporary Diversions

Temporary diversions will be used to direct sediment laden runoff from disturbed areas to appropriate sediment basins, traps, or deposition areas. Temporary diversions may also be used as perimeter protection to direct upstream runoff around or away from disturbed areas.

Temporary diversions will typically have a useful life of 1 year and will be designed to be stable and adequate for a 2-year design storm. Ideally, if the diversion is to serve longer than 30 days, it should be seeded and mulched or otherwise stabilized. Rock check dams may be installed as a means to slow runoff velocities along unstabilized diversions.

The diversion grade will be uniform or gradually increasing to prevent sediment deposition. Peak flow velocity should not exceed the maximum permissible velocity considering diversion slope, soil characteristics, and type of vegetative cover. Preferably, the side slopes of the diversion will be no steeper than 2 to 1, and no steeper than 3 to 1 where vehicles cross.

The contributing drainage area to a temporary diversion will be no more than 5 acres unless designed as a permanent diversion, and the diversion outlet will be stable and non-erosive.

3.2.3 (b) Permanent Diversions

Permanent diversions will be provided as needed to subdivide the site into distinct drainage areas for stormwater management and runoff control. Permanent diversions may be installed initially as temporary diversions but will be designed for worst case conditions.

Design criteria and stabilization requirements for permanent diversions shall be the same as for temporary diversions with the exception of the design storm and the contributing drainage area.

The design storm for permanent diversions will be determined in the initial planning process and will be a function of risk should failure occur, but will be no more frequent than the 10-year design storm. The following guidelines will be used for protecting off-site, public and private property:

Type of Property	*Design Storm*
Open areas, parking lots, recreation areas	10 year
Minor roads, minor structures	25 or 50 year
Homes, schools, major roads, major structures	100 year

The contributing drainage area will be based on topography, site layout, grade, and practicality diversion capacity.

3.2.3 (c) Grass-Lined Channels

Grass-lined channels will be located and designed as needed to convey stormwater discharge from overland flow, paved areas, or drainage outlets (culverts, diversions, etc.). Grass-lined channels shall not be subject to sediment deposition from disturbed areas.

Design criteria and stabilization requirements for grass-lined channels shall be the same as for permanent diversions. Unless site conditions or design criteria dictate otherwise, retardance classifications for grass-lined channel design will be assumed as "B" for channel capacity and "D" for channel stability.

3.2.3 (d) Riprap-Lined and Paved Channels

Riprap lining or paving will be used for channels where flow velocities or site conditions prohibit the use of a vegetative lining. Unless project requirements dictate otherwise, riprap lining will be preferred over paving for its ability to reduce outlet velocities, adjust to uneven foundation conditions, and allow infiltration.

Paved channels will be protected from undercutting by placing the channel below grade on stable material and by providing down turned sections at the beginning and end of the channel.

Design storm criteria for riprap-lined channels and paved channels shall be the same as for permanent diversions.

3.2.3 (e) Temporary Slope Drains

Temporary slope drains will be used to collect and convey runoff down the face of unprotected slopes. An earthen dike ridge along the top of the slope will be used to direct runoff into the pipe inlet. The drain will consist of flexible conduit securely anchored to the slope face.

The pipe will be sized for the peak discharge from the 10-year design storm, or by use of the following general guidelines:

Contributing Drainage Area	*Pipe Diameter*
0.50 acre	*12 in.*
0.75 acre	*15 in.*
1.00 acre	*18 in.*

Contributing drainage area to individual slope drain inlets should be limited to no more than 1 acre if possible.

3.2.3 (f) Subsurface Drains

Subsurface drains will be installed as needed to drain excess groundwater from areas for establishment of vegetation or stabilization of slopes. Subsurface drains may also be used to stabilize subsoils of temporary or permanent access roads and parking areas. Drains will discharge into stabilized outlets.

3.2.4 INLET AND OUTLET PROTECTION MEASURES

3.2.4 (a) Temporary Inlet Protection

Various temporary protection measures will be used to trap sediment at the approach to stormwater inlets to allow early use of permanent stormwater conveyance systems.

Protection measures will consist of using shallow excavations around inlets, surrounding drop inlets with filter fabric, or using block and gravel inlet protection.

Filter fabric and block and gravel type protection measures will not be used in locations where runoff might be diverted away from the drain inlet, over the edges of slopes, or to otherwise unprotected areas. Filter fabric protection will not be used at inlets receiving concentrated flows.

The contributing drainage area shall not exceed 1 acre for each temporary inlet protection measure unless frequent removal of accumulated sediment is specified.

3.2.4 (b) Outlet Stabilization Structures

Stabilization measures will be used at the outlets of pipes, culverts, diversions, and channels as needed to protect the receiving channel or outlet area from scour and erosion.

Outlet stabilization will generally consist of riprap aprons sized with respect to the design discharge, pipe size, and tailwater conditions. Riprap shall be well graded and founded on a layer of graded gravel or an appropriate geotextile fabric. The geotextile fabric shall have sufficient strength to avoid tearing in situations where riprap is placed directly on fabric.

Alternative outlet stabilization measures (stilling basins, plunge pools, etc.) may be needed in specific situations where overfall outlets exist or excessive apron lengths would be required.

3.2.5 SEDIMENT TRAPS AND BARRIERS

3.2.5 (a) Temporary Sediment Traps and Basins

Temporary sediment traps and basins may be used to prevent off site sedimentation and to protect receiving water bodies from sediment deposition.

They may be formed by embankment, excavation, or a combination of both methods, and shall provide for a minimum sediment storage capacity of 3600 cu. ft./disturbed acre, or otherwise, based on actual expected sediment yields.

Temporary sediment traps and basins will be sized with sufficient surface area, volume, and length-width ratio to provide adequate sediment trapping efficiency based on the 2-year design storm peak discharge. The contributing drainage area for a trap will typically not exceed 5 acres. The contributing drainage area for a basin will generally be greater than 5 acres but no more than 100 acres.

Temporary sediment traps and basins will be located in such a manner as to be accessible for periodic cleanout and maintenance. The trap or basin will be cleaned out and restored to full capacity when sediment has accumulated to one half of the design depth. Traps and basins will not be located in perennial streams.

The earth embankment and any surrounding area disturbed during trap or basin construction will be stabilized with temporary seeding and mulched. Permanent seeding will be applied if the sediment trap will be in place over 1 year.

3.2.5 (b) Rock Dams

Rock dams may be used to prevent off-site sedimentation in situations where riprap and gravel are readily available, and construction of a sediment basin would be difficult.

They shall generally be used for contributing drainage areas greater than 5 acres and less than 50 acres, and will have a useful life of no more than 3 years.

Rock dams are generally formed by embankment construction of rip-rap and washed stone across a natural drainage area. Embankment height shall be limited to 8 feet. Some excavation may be required in the impoundment area to provide adequate surface area or storage capacity. The design criteria for settling efficiency and sediment storage shall be the same as for temporary sediment basins.

3.2.5 (c) Silt Fence

Silt fence will be used to trap and retain sediment from small disturbed areas, or to direct sediment-laden runoff to sediment traps, basins, or appropriate deposition areas. Fence fabric will be a geotextile filter fabric material having a minimum useful life of 6 months. Silt fences will not be installed across areas of concentrated flow.

The contributing drainage area will typically not exceed .25 acres for each 100 feet of silt fence, and the depth of impounded runoff from the drainage storm shall not exceed 1.5 feet at any point along the fence. Outlets at end of fence, or at low points where fences cross natural depressions, will be stabilized with riprap or other appropriate measures.

3.2.6 STREAM PROTECTION MEASURES

3.2.6 (a) Temporary Stream Crossings

Bridges, fords, or culverts will be used as temporary means for stream crossings daring construction activities. The use of temporary stream crossings will be considered in the planning process and minimized to the greatest extent feasible for the project. If possible, stream crossings will be made at right angles and will be constructed during dry periods to minimize stream disturbance. Any required federal or state permits associated with streams, stream crossings, or wetlands will be obtained prior to construction of stream crossings.

Culverts used for temporary stream crossings will be sized adequate to pass the discharge from the 2-year design storm without overtopping the fill. Culverts located in perennial streams will be placed just below grade to allow the movement of aquatic organisms. Culvert fills will be raised at least 1 foot above the adjacent approach sections, and outlets of culverts will be stabilized as needed.

Fords may be used for temporary stream crossings where normal flow is shallow or intermittent, where crossings are infrequent, and generally where watercourses are wide or flat. Approach sections for fords will be no steeper than 5:1 and washed stone will be placed in the channel and on the approach sections.

12.6 (b) Permanent Stream Crossings

Permanent stream crossings will be designed and installed in accordance with applicable department of transportation guidelines. The design storm for permanent stream crossings will be determined in the initial planning process and will be a function of risk should failure occur, but will be no more frequent than the 10-year design storm. Measures will be taken to ensure that the peak flow velocity from the design storm is non-erosive to the stream at the crossing outlet. Various measures (paved flumes, riprap-lined channels, stabilized pipe drops, etc.) will be used to ensure that runoff entering the stream at the crossing does not cause erosion. Any required federal or state permits associated with streams, stream crossings, or wetlands will be obtained prior to construction of stream crossings.

3.2.6 (c) Streambank Stabilization

Streambanks will be stabilized and protected as required by the establishment of vegetation or by structural measures. Any required permits will be obtained prior to construction activities within streams.

Vegetation will be the preferred method of streambank stabilization for flow conditions up to approximately 6 ft/sec. The frequency of bank full flow conditions, future watershed development, and variations in channel roughness coefficient will be considered in the planning process when specifying vegetation for stream bank stabilization.

Structural measures (riprap, gabions, grid pavers, etc.) will be used when flow conditions prohibit the establishment of vegetation.

3.2.7 MISCELLANEOUS PRACTICES

3.2.7 (a) Construction Road Stabilization

Consideration will be given in the planning and site preparation phases to location of temporary construction access roads, parking, and construction storage areas.

Temporary construction roads will follow natural contours as much as possible, and will avoid areas with high water tables. Road grades will generally be no steeper than 12%, or no steeper than 15% for short distances. Side slopes of embankments will be no steeper than 2 to 1 and will be stabilized with temporary or permanent vegetation as required. Aggregate b e course will be applied to difficult areas (steep grades, rutting areas, high water table areas, etc.) as required to stabilize the road surface.

3.2.7 (b) Grade Stabilization Structures

Grade stabilization structures may be used where grass-lined channels or diversions are desired but excessive grade results in prohibitive flow velocities. Grade stabilization structures may also be used where channels intersect at different elevations or to stabilize problem areas in existing channels.

The design storm for grade stabilization structures will be determined in the initial planning process and will be a function of risk should failure occur, but will be no more frequent than the 10-year design storm. If possible, an emergency bypass wi11 be provided around the structure for higher flow conditions. Outlet protection (concrete stilling basin, riprap, etc.) will be provided to protect the downstream channel.

3.2.7 (c) Check Dams

Check dams may be used as a temporary or emergency measure to reduce velocities and gullying in channels and diversions until vegetation is established. Check dams may be removed following repair or stabilization of the channel.

3.2.7 (d) Dust Control

Various methods will be used during construction as required to minimize blowing dust. Preferred methods will include the establishment of vegetation, mulching, water sprinkling, and placement of wind barriers. Gravel surfacing will be considered for use on temporary construction roads, parking areas, and storage yards. Consideration will be given in the planning process to leaving tree lines or other natural wind breaks.

3.2.7 (e) Herbicides

Herbicides will be applied in accordance with the manufacturer's guidelines by a licensed applicator, or under the direct supervision of a licensed applicator.

Personnel handling herbicides will be familiar with current regulations and Duke Energy Company procedures regarding handling, storage, disposal, and spill reporting requirements.

3.2.7 (f) Waste and Spills

Discarding or disposing of all lubricants, fuels, chemicals, containers, construction debris, or miscellaneous trash will follow appropriate regulations and Duke Energy Company procedures. Spills will be reported as required by applicable regulations and Duke Energy Company procedures.

3.2.8 INSPECTION AND MAINTENANCE PRACTICES

3.2.8 (a) Inspections

During the construction period, all erosion control structures, disturbed areas, recently stabilized areas, and temporary construction roads will be inspected weekly or following any rainfall event producing more than 0.5 inches of precipitation within a 24 hour period. All problems resulting in off site sedimentation will be corrected immediately. On-site problems will be prioritized and corrected within 7 calendar days.

3.2.8 (b) Maintenance

Sediment will be removed from temporary sediment traps and basins when deposits have reached cleanout levels. Sediment will be removed from behind silt fences and straw bales when deposit depth exceeds 6 inches, and from behind brush barriers when deposits reach one-half of the barrier height.

Rills and washes in slopes will be filled and immediately seeded and mulched. Sediment trap spillway stones will be cleaned or replaced as required if the trap no longer drains properly. Graveled construction entrances and graveled stream fords will be top dressed as needed to prevent sediment from leaving the site or being carried into the stream. Any seeded area that becomes damaged will be filled as needed, reseeded, and mulched.

All, sediment removed from erosion control structures will be deposited in a controlled manner and stabilized with temporary or permanent vegetation and mulch.

3.3 POST - CONSTRUCTION STORMWATER MANAGEMENT

Various methods and practices will be considered in the planning process for flood control and water quality enhancement.

Stormwater detention for flood control will generally be accomplished by the use of various types of wet or dry detention ponds.

To enhance infiltration of runoff, grassed swales and riprap ditches will be preferred over paved waterways. Grassed or forested filter strips will be considered for use on perimeters of paved areas to receive and filter overland sheet flow, to protect infiltration trenches, and to establish riparian buffer zones. The use of infiltration trenches and dry wells will also be considered for infiltration of runoff.

4.0 TRANSMISSION LINES – BEST MANAGEMENT PRACTICES

Transmission line construction and maintenance is a routine operation within Duke Energy Company. As previously stated, the linear nature of line corridors, variations in topography, right-of-way width limitations, and access constraints requires a somewhat unique approach to erosion control methods, measures and practices. These best management practices result in minimal alteration of the topography, short-lived soil disturbance, and timely revegetation, as stated in the General Best Management Practices, the suggested measures, methods andlor practices are intended as tools to help meet or exceed the requirements of the N.C. Department of Environment, Health and Natural Resources and the S.C Department of Health and Environmental Control.

4.1 PRE-CONSTRUCTION CONSIDERATIONS

4.1.1 PLANNING

The planning process for transmission line construction will consider the impact of line routes, corridor access, and corridor clearing on the earth, water, biological, cultural, visual, social and economic resources in the area. Existing and future land use as well as overall public health and safety will also be considered during the planning process. The following factors will be considered in the selection of stormwater management and sedimentation erosion control methods and procedures prior to and during the construction process:

Soils and geology
Degree and direction of slopes and topography along the line corridor
Regional location, elevation, season, and climate
Existing vegetation
Existing erosion problems
Receiving water bodies

The planning process will incorporate actions that will reduce or preclude impacts to significant resources (trout streams, wetlands, designated watersheds, etc.), water quality, rare species as listed by state Natural Heritage Programs, and other culturally or environmentally sensitive areas.

Transmission line plan and profile drawings will be issued with each project and will delineate limits of clearing and corridor topography. Specific erosion control details may be indicated on these drawings, however, additional erosion control measures are typically added and/or relocated as per field requirements, in accordance with established best management practices.

All best management practices shall be adequate to meet or exceed the requirements of any applicable county or local government erosion control or stormwater regulations.

4.1.2 PERMITTING

All required permits and agency approvals will be obtained prior to construction activities. Activities impacting waters (wetlands, ponds, lakes, rivers, streams, intermittent streams, etc.) by the placement or removal of any material will be reviewed for necessary permitting requirements.

4.1.3 CONSTRUCTION SEQUENCING

Erosion and sedimentation control practices will proceed hand-in-hand with construction activities. The sequencing of erosion control measures will be project specific, but will generally be implemented in the following sequence:

1. Mark clearing limits
2. Install construction entrances to right-of-way
3. Begin clearing, grubbing and seeding operations
4. Install sediment and erosion control measures (brush barriers, silt fence, sediment traps, etc.)
5. Install culverts with inlet loutlet protection for right-of-way access
6. Install runoff control features (water bars, broad-based dips, etc.)
7. Complete clearing, grubbing and seeding operations
8. Perform grading and excavation for tower foundations
9. Stabilize surfaces (reseed damaged areas for permanent vegetative, gravel paving, etc.)

Construction activities will proceed in such a manner as to minimize the extent of disturbed areas, and to minimize the time in which the areas remain in a disturbed state. Factors such as sequencing of activities, weather, and time of year will be considered during the planning process and during construction.

Erosion control structures within right-of-way corridors have typically been left in place following construction. Experience has proven that in many cases, leaving erosion control structures in place had little consequence, whereas, attempts to access and remove these structures often resulted in redisturbance to previously seeded or stabilized areas. In areas where mechanized equipment may be used for maintaining the right-of-way, erosion control measures should be removed, if possible, as conditions permit. Erosion control structures should also be removed from areas of high visibility or from other areas of cultural or environmental significance, as identified.

4.1.4 BUFFER ZONES

A buffer zone will be maintained between disturbed areas and any water body (streams, lakes, ponds, wetlands, etc.). Mechanized equipment will not enter buffer zones except as required for access. Appropriate erosion control structures may be installed between disturbed areas and buffer zones to minimize sediment deposition in buffer zones.

Buffer zone widths will vary according to the slope of the adjacent topography and stream classification, but will be a minimum of 25 feet on each side of the stream or water body. General guidelines for buffer zone width, as measured along the approaching ground slope from the edge of the water to the nearest edge of the disturbed area, are as follows:

With erosion control structures in place:

Approaching ground slope	Buffer Zone Width
0%	25'
10%	35'
20 %	40'
30 %	45'
40 %	50'
50 %	55'
60%	60'
70 %	65'

Without erosion control structures in place:

Approaching ground slope	Buffer Zone Width
0%	50'
10%	60'
20%	75'
30%	85'
40 %	100'
50 %	115'
60 %	130'
70%	140'

The removal of vegetation from stream-side areas and stream buffers will be limited to that required for adequate conductor clearances. Should site conditions require the removal of canopy trees, under story vegetation will be left in place to provide shading and protection for streams. Trees and vegetation will not be felled into or across streams. Felled trees in stream buffers will typically be limbed, sectioned, and left in place to decompose. If felled trees are to be removed from stream buffers, care will be taken to minimize damage to remaining vegetation.

4.2 TRANSMISSION LINE CONSTRUCTION

Based on experience and judgment, field personnel may implement additional erosion control measures and/or modify indicated measures to provide the best results under specific situations, topography, and site conditions. Major field revisions and/or modifications shall be discussed with Engineer prior to installation.

4.2.1 RIGHT-OF-WAY PREPARATION

Clearing techniques will vary along transmission right-of-way corridors depending upon terrain features and vegetation types. In designated sensitive areas and buffer zones, care will be taken to preserve small undergrowth trees which usually remain safely below conductor heights. Where conventional clearing is required, all vegetation will be shear-cleared by bulldozers equipped with K-G blades, straight blades, and root rakes. Where bulldozers cannot be used, trees and brush shall be hand cut. Marketable timber will be removed first if practical and economical. Remaining trees and brush will either be used for brush barrier construction or disposed (buried, burned, etc.) in accordance with local, state, and federal ordinances.

Normally, topsoil shall not be graded, removed, or redistributed on rights-of-way, nor shall contours be altered (except around structure foundations and to construct diversions and roads). Root systems shall be left intact as much as possible. Where transmission right-of-way corridors cross open land (pastures, fields, etc.), no land disturbance will occur except as required for access roads, diversions, and structure foundations.

Where feasible, cut and fill slopes required on rights-of-way shall be no steeper than 3:1. Vertical cuts, however, may be used in rock or other stable materials.

Graveled construction entrances will be provided at each location where construction traffic will exit the site onto public roads or other off-site paved areas. The graveled entrance shall consist of 4 inches of gravel and shall be a minimum of 50 feet in length. The surface of the graveled entrance will be periodically top-dressed as needed to prevent off-site mud and sediment transport.

4.2.2 SEDIMENT TRAPS AND BARRIERS

Temporary sediment traps, rock dams, silt fences and brush barriers are typically used on line rights-of-way to prevent off-site sedimentation from disturbed areas. These devices are described in Section 3.2.5(a, b & c), respectively.

Trees, roots and vegetative debris cleared from line corridors may be used to construct brush barriers across slopes and/or along the base of slopes to trap sediment and help reduce the velocity of water runoff. The brush barrier shall be between 3 to 5 feet in height. Brush shall be clean of earth, piled primarily end to end, and walked thoroughly with equipment to compact. It should be emphasized that brush barriers shall only be used as a secondary sediment and erosion control measure, with approved measures currently in place. In addition to helping curb erosion and contain sediment, brush barriers also prove very useful in helping to dispose of cleared debris.

4.2.3 ACCESS ROADS

All access roads shall be designed and located to minimize ground disturbance and to avoid excessive cutting and filling. Access roads on grades exceeding 10%, on poorly drained soils, or on potential problem areas shall be surfaced with gravel or aggregate base course for stabilization. In addition, access roads will be seeded with permanent vegetation following completion of construction activities. At intersections with paved roads, construction entrances (graveled for a minimum distance of 50 feet), shall be installed to stabilize the access road and to prevent sediment tracking.

Vehicle exclusion plans will be developed to prevent nuisance vehicles from accessing transmission line corridors. Barriers (gates, fencing, etc.) to unauthorized access will be constructed prior to final seeding.

4.2.4 STREAM CROSSINGS

Temporary metal bridges, fords, or culverts will be used as a means for stream crossings during construction activities. The use of stream crossings will be considered in the planning process and minimized to the greatest extent feasible for the project. If possible, stream crossings will be made at right angles and will be constructed during dry periods to minimize stream disturbance. Any required federal or state permits associated with streams, stream crossings, or wetlands will be obtained prior to construction of stream crossings.

Culverts used for stream crossings will be sized for permanent installation but will be a minimum of 24 inches in diameter. The design storm for culvert installation will be determined in the initial planning process and will be a function of risk should failure occur, but will be no more frequent than the 10-year design storm. In the absence of specific designs, culverts will be sized in the field in accordance with the following guidelines:

Drainage Area	Culvert Size Piedmont Areas	Culvert Size Mountain Areas
10 ac and Below	24 in	24 in
20 ac	30 in	36 in
30 ac	36 in	42 in
40 ac	42 in	48 in
50 ac	48 in	54 in
70 ac	54 in	60 in
100 ac	60 in	72 in
150 ac	72 in	Shall Be Designed
>150 ac	Shall Be Designed	Shall Be Designed

Culverts located in perennial streams will be placed just below grade to allow the movement of aquatic organisms. If possible, backfill for perennial stream culverts shall consist of rip-rap and washed stone only (no earthen bacilli) to prevent sediment from entering stream. Culvert fills shall be raised approximately 1 foot above the adjacent approach sections to provide overflow routes. Culvert outlets and inlets shall be armored with oversized stone (rip-rap) for erosion protection. Dissipater pads (rip-rap placed on a geotextile fabric to help absorb or disperse energy of water leaving culvert) shall be constructed at the outlet ends of culverts to help prevent channel scouring and gullying. As a general guide, pipe culverts shall be covered by a depth of approximately one half the pipe diameter, but not less than twelve inches.

Fords may be used for stream crossings where normal flow is shallow or intermittent, where crossings are infrequent, and generally where watercourses are wide or flat. Approach sections will be no steeper than 5:1, and washed stone will be placed in the channel and on the approach sections.

4.2.5 RUNOFF CONTROL MEASURES

Water bars and broad-based dips will be used for erosion protection across access roads to prevent gullying and reduce flow velocities, and will generally be spaced as follows:

Slope Range of Road	Water Bar Spacing	Broad-Based Dip Spacing
under 5 %	125 '	180'
5%to 10%	80'	140'
10%to20%	60 '	Not used
20 % to 35 %	40 '	Not used
over 35 %	25 '	Not used

Spacing of water bars and broad-based dips will be adjusted to take advantage of the most favorable outlet locations, and outlets will be stabilized if required by site conditions.

Typically, access roads will be out sloped (cross-drained) and side ditching may be used to avoid discharging runoff onto unprotected fill slopes. Water bars and broad-based dips across roads will not discharge into intermittent or perennial streams unless road surfaces have been stabilized. Water bars and broad-based dips shall not discharge onto unprotected fill slopes.

Erosion control structures will be located in such a manner as to not impede drainage from access roads.

4.2.6 STRUCTURE PLACEMENT

Soil excavated or augured for transmission tower foundations will be temporarily stockpiled adjacent to the excavation during foundation construction if practical. The excavation will be backfilled and compacted following construction of the tower to above ground level. Excess soil will be spread around the foundation and properly seeded.

In some situations, poles may be used for transmission lines. The setting of poles will result in minor soil disturbance from hole auguring and backfilling. Soil removed during auguring will be tamped firmly around the pole base and mounded to accommodate any potential settling. Excess soil will be spread around the pole base and properly seeded.

4.2.7 SURFACE STABILIZATION MEASURES

Seeding will be completed immediately following site reclamation and prior to project completion. Temporary or intermediate seeding, mulching, matting, or other surface stabilization measures will be placed on disturbed areas which will not be completed within 14 working days following initial soil disturbance. Surface roughening will be performed on cut and fill slopes prior to seeding.

Seeding mixtures shall be tailored to site-specific conditions, steepness of slopes, climate, location, and elevation. Typical seeding guidelines are as follows:

Mid-February through mid-April:
Tall fescue ..... 100 lb/acre
Sericea lespedeza (scarified) ..... 50 lb/acre

Mid-April through July:

* Weeping lovegrass ..... 10 lb/acre
*Common bermudagrass (hulled) ..... 10 lb/acre
Sericea lespedeza (scarified) ..... 50 lb/acre
Tall fescue ..... 50 lb/acre

*** NOTE: To be used in site specific situations only**

August through mid-February:
Tall fescue ..... 100 lb/acre
Sericea lespedeza (unscarified) ..... 50 lb/acre

Nurse crops shall be added to aid the establishment of permanent vegetation. General guidelines for nurse crop seeding rates are as follows:

May through mid-August:
German Millet (or) ..... 10 lb/acre
Sudangrass ..... 15 lb/acre

Mid-August through April:
Rye grain ..... 25 lb/acre

In the absence of soil tests, fertilizer and lime will generally be applied at the following rates:

19-19-19 fertilizer (or equivalent rate of applied N) ..... 500 lb/acre
Ground agricultural limestone ..... 2000 lb/acre

Liquid lime or alternative fertilizers may be substituted in various situations. Mulch, straw or matting may be applied to aid in the establishment of vegetation on steep slopes, wash areas, or other difficult sites.

Rock check dams may be used as a temporary measure to reduce flow velocities in channels and diversions. Check dams will generally be used in new or existing channels, and should be removed following proper stabilization of the channel. Erosion control matting may also be used to line slopes and channels to provide temporary cover to soil until vegetation is established. Properly lined and stabilized channels will be preferred over the use of check dams.

4.2.8 CONSTRUCTION INSPECTIONS AND MAINTENANCE

During the construction period all erosion control structures, disturbed areas, recently stabilized areas, and construction roads will be inspected every 7 days, or every 14 days and 24 hours after every rain event of ½" or greater.

All problems resulting in off-site sedimentation will be corrected immediately. Rills, washes, and other eroded areas should be regraded, smoothed and reseeded as required to provide long-term stabilization. On-site problems shall be corrected within 7 calendar days.

Environmental audits will be performed on a monthly basis during the construction period and following completion of the project, until site has fully stabilized.

4.3 TRANSMISSION LINE MAINTENANCE

4.3.1 RIGHT-OF-WAY CORRIDORS

Existing erosion problems on right-of-way corridors will be identified and prioritized according to the severity of the problem. Severe problems shall be rectified immediately. Minor problems will be corrected as efficiently as possible considering available workforce and seeding times.

Existing road drainage features (water bars, broad-based dips, culverts, etc.) will be repaired and maintained as required. Additional features shall be installed as required to correct existing problems.

Washed out culverts will be replaced as required. Rock fords should be considered for use as replacements for culverts for low use stream crossings in situations where culverts periodically wash out.

Vegetation maintenance equipment will not be used on fight-of-way corridors when soil moisture conditions would result in excessive rutting or damage to existing vegetation. Care will be taken to preserve small maturing trees which usually remain safely below conductor heights. Replacement trees will be encouraged in lieu of trimming or topping out existing trees.

Herbicides may be applied in accordance with the manufacturer's guidelines by a licensed applicator, or under the direct supervision of a licensed applicator to control vegetation growth.

Personnel handling herbicides will be familiar with current regulations and Duke Power Company procedures regarding hauling, storage, disposal, and spill reporting requirements.

Rare species (as listed by state Natural Heritage Programs) known to occur within the corridors, will be adequately protected during corridor maintenance. The process(es) for protection of these species will be reviewed biennially with appropriate resources agencies.

4.3.2 BUFFER ZONES

Vegetative stream buffers will be established for existing transmission corridors (rights-of-way) where woody streamside vegetation can be maintained without jeopardizing conductor safety. Buffers will be a minimum of 25 feet on each side of the stream bank or water body, and will provide shading to the stream. Buffers, designated leave areas, and other special treatment areas that were established during the construction of the transmission lines shall be maintained.

Protection plans for areas of special concern (stream crossing, rare species, leave areas, buffer zones, etc.) within right-of-way corridors will be incorporated in maintenance activities.

4.3.3 CORRIDOR USE AND CONTROL

Landowner uses of transmission line corridors will take precedence over other uses assuming compliance with applicable regulations and right-of way agreements is maintained all landowner agreements will be documented and followed.

Gates, fences and berms will be used to protect the roads and vegetation within the right-of-way from unauthorized dumping and vehicular access. Emphasis will be placed on controlling access as a means of discouraging unauthorized activities while promoting positive conservation measures. For safety concerns, single cables and/or chains should not be installed across access corridors to limit access.

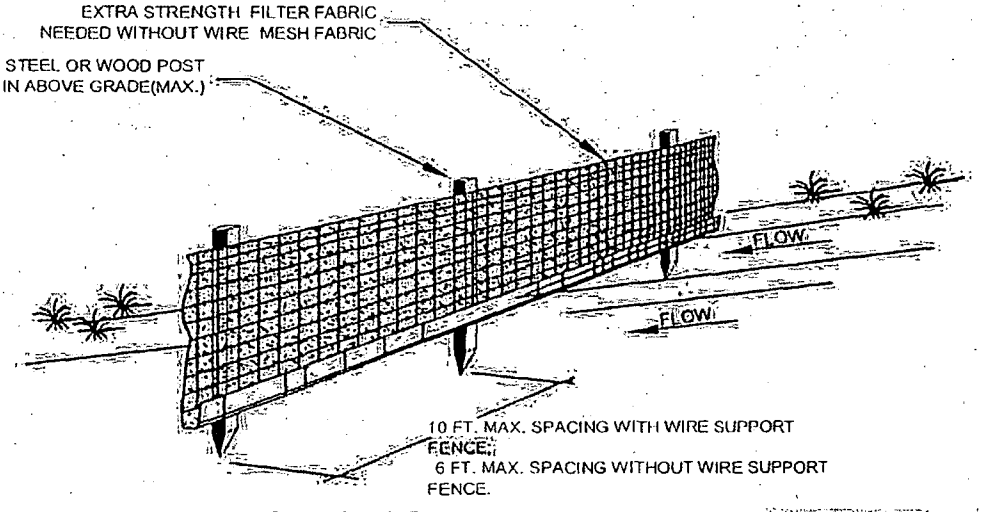
Wildlife food plats will be maintained and enhanced as appropriate. New plots shall be established when opportunities exist, especially in cooperation with various concerned groups (state wildlife agencies, environmental groups, etc.)

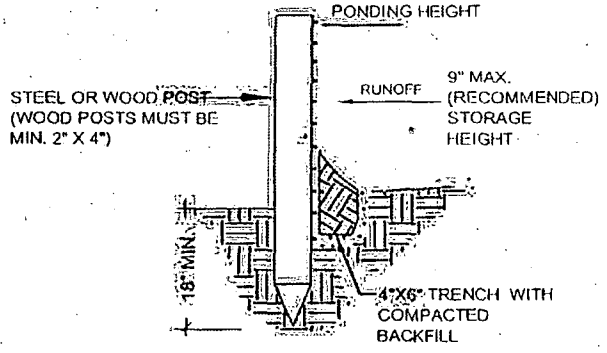
DETAILS

1. SILT FENCE
2. CONSTRUCTION ENTRANCE
3. CULVERT DISSIPATOR PAD
4. TEMPORARY CULVERT INSTALLATION
5. ACCESS ROAD SECTIONS
6. SILT FENCE WITH ROCK OUTLET
7. STREAM BUFFERS
8. ROCK CROSSING
9. WATERBAR
10. CULVERT INSTALLATION WITH ROCK BACKFILL
11. FARM GATE
12. DANGER TREES
13. FORD CROSSING
14. DIVERSION CHANNEL/SWALE
15. ROCK CHECK DAM
16. TEMPORARY SEDIMENT TRAP
17. EROSION CONTROL MATTING (WOOL CURL)

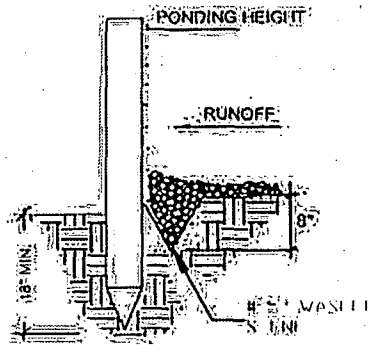
D-D

1 SILT FENCE DETAIL





STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL



ALTERNATE DETAIL
TRENCH WITH GRAVEL

NOTES:

1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN DEPOSITS REACH 30% OF FENCE HEIGHT.

2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

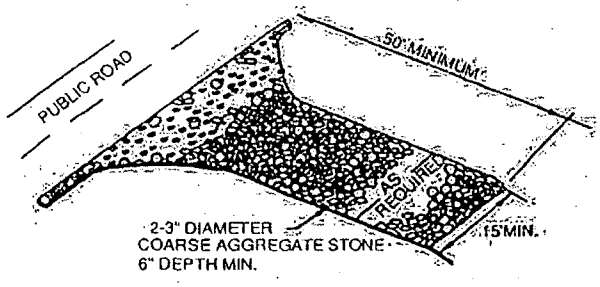
4. DRAINAGE AREA OF 1/4 ACRE OR LESS PER 100 LF.

5. USE WOOD POST (MIN 2"X4") FOR TRANSMISSION LINE INSTALLATION.

2 CONSTRUCTION ENTRANCE PAD

DESIGN CRITERIA

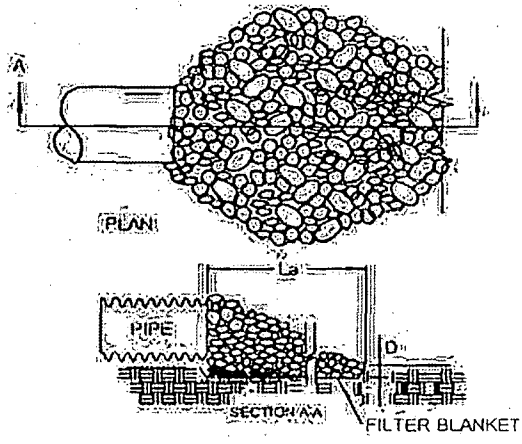
AGGREGATE SIZE: 2-3" DIAMETER WASHED STONE
PAD THICKNESS: 6" MINIMUM
PAD WIDTH: 15' MINIMUM
PAD LENGTH: 50' MINIMUM
PAD LOCATION:
LOCATE CONSTRUCTION ENTRANCES AND EXITS TO LIMIT SEDIMENT FROM LEAVING THE SITE AND TO PROVIDE MAXIMUM UTILITY BY ALL CONSTRUCTION VEHICLES. AVOID STEEP GRADES AND ENTRANCES AT CURVES IN PUBLIC ROADS.



PERSPECTIVE VIEW

D-2
MH

3 CULVERT DISSIPATOR PAD



NOTES:

1. La IS THE LENGTH OF THE RIP RAP APRON.

2. D=1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6".

3. IN A WELL DEFINED CHANNEL EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF THE BANK, WHICHEVER IS LESS.

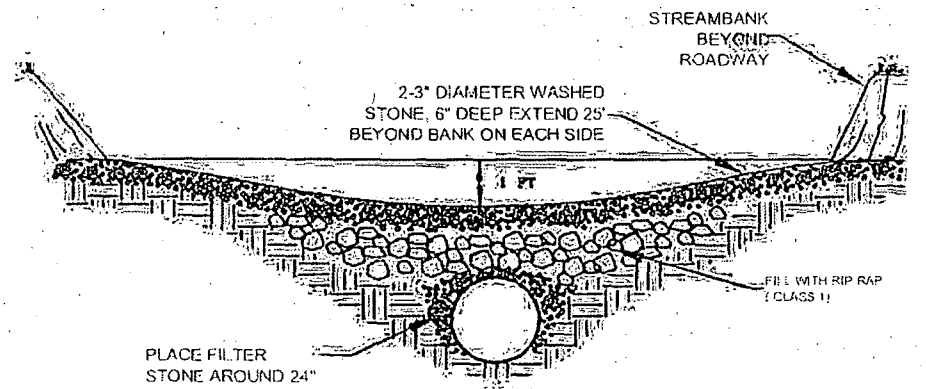
4. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIP RAP AND SOIL FOUNDATION.

5. ALL RIP RAP TO BE CLASS 1

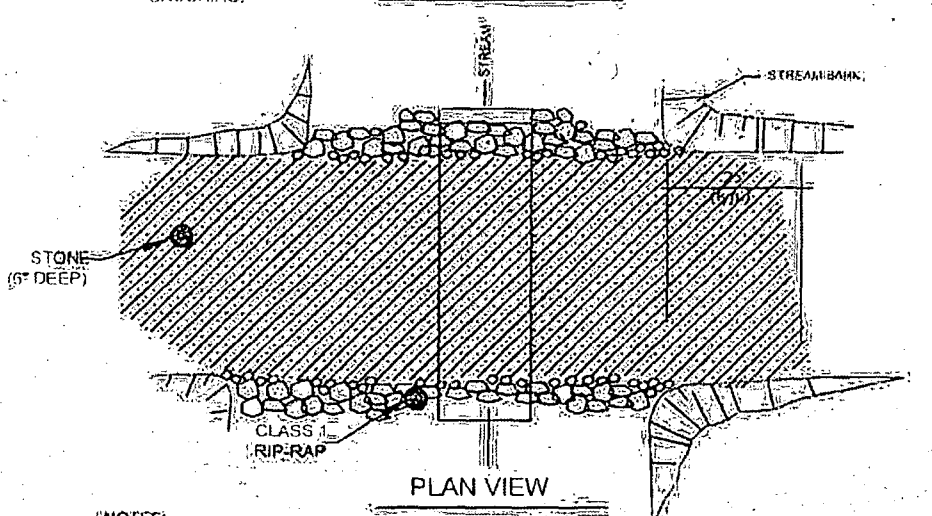
CULVERT #	SIZE (DIA)	La ft	W1 ft	W2 ft	D' in.
1	24"HDPE	6'	CHANNEL		12"
2	36"HDPE	12'	CHANNEL		12"
3	36"HDPE	12'	CHANNEL		12"
4	72"RCP	30'	CHANNEL		12"

D-3
MM

4 TEMPORARY CULVERT INSTALLATION TO BE REMOVED



SECTION VIEW



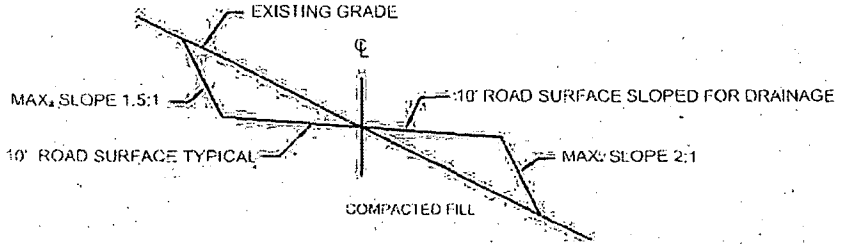
PLAN VIEW

NOTES:
1. SLOPE APPROACHES TO CROSSING 2:1 OR FLATTER.
2. SPILLWAY LENGTH= BANK TO BANK WIDTH OF STREAM OR AS SHOWN ON PLAN.
3. PIPE TO EXTEND 1' BEYOND LIMITS OF RIP-RAP.
4. CLASS 'A' RIP-RAP TO BE USED TO ARMOR BANKS.

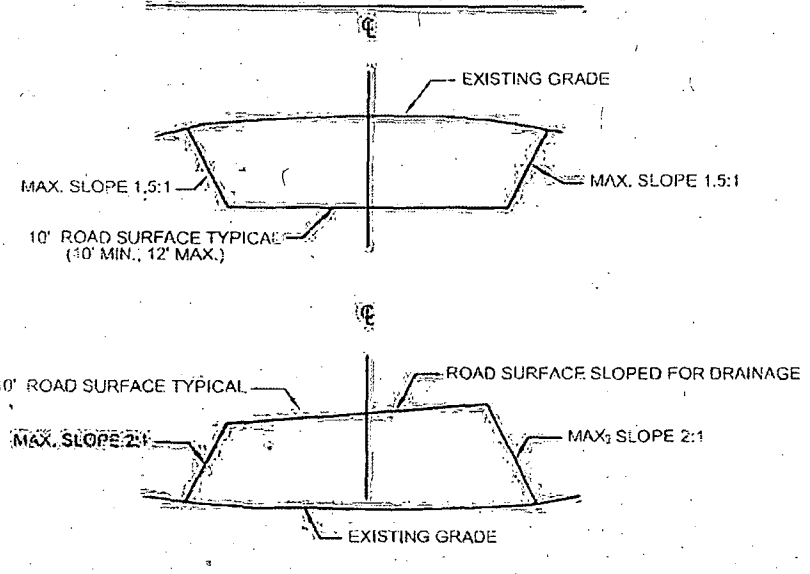
D-4
MM

5 ACCESS ROAD SECTIONS

NORMAL ROAD CROSS SECTION

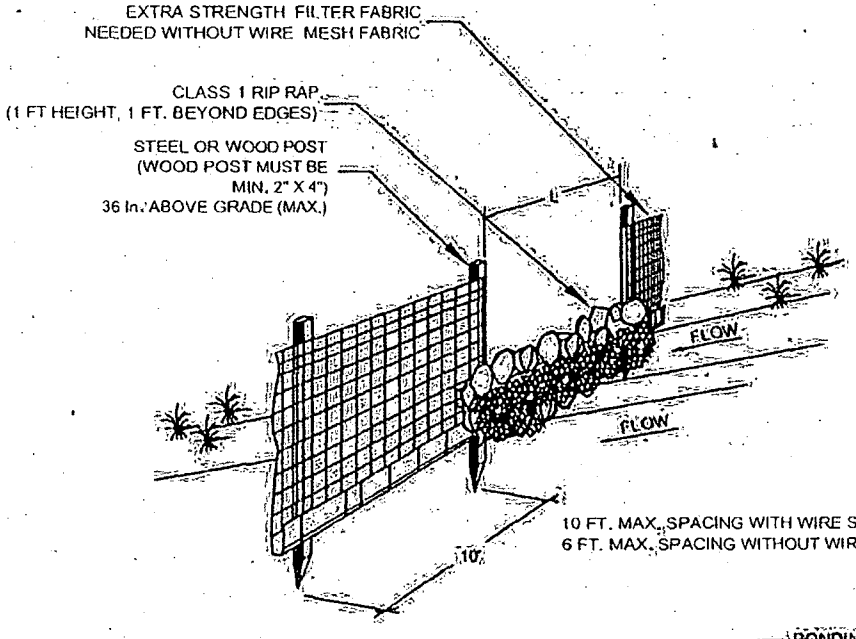


TYPICAL CUT/FILL ROAD CROSS SECTION



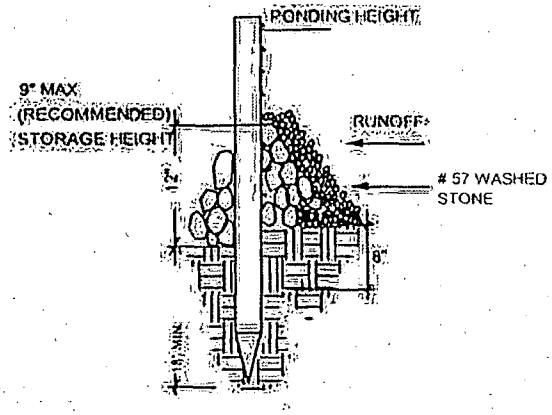
D-5
MM

6 SILT FENCE W/ ROCK OUTLET



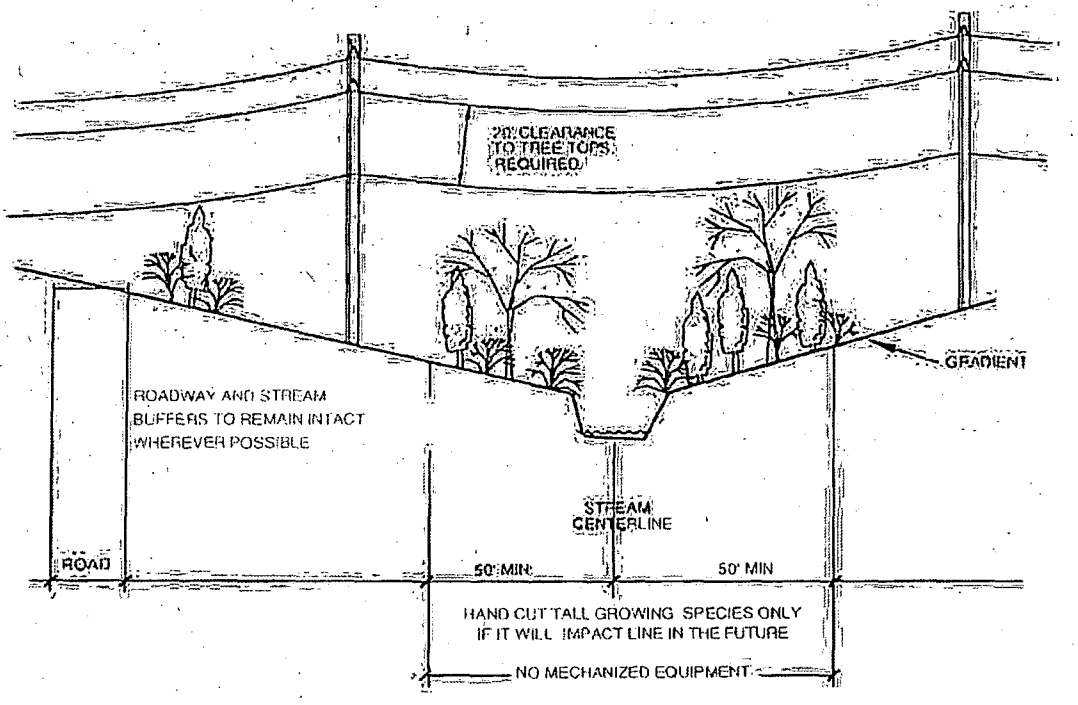
NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN DEPOSITS REACH 30% OF FENCE HEIGHT.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
4. DRAINAGE AREAS OF 1/2 ACRE OR LESS.

DESIGN TYPE	DRAINAGE AREA (APPROX.)	WEIR LENGTH (L) MIN.
1	1/2 ACRE	4.0 FT



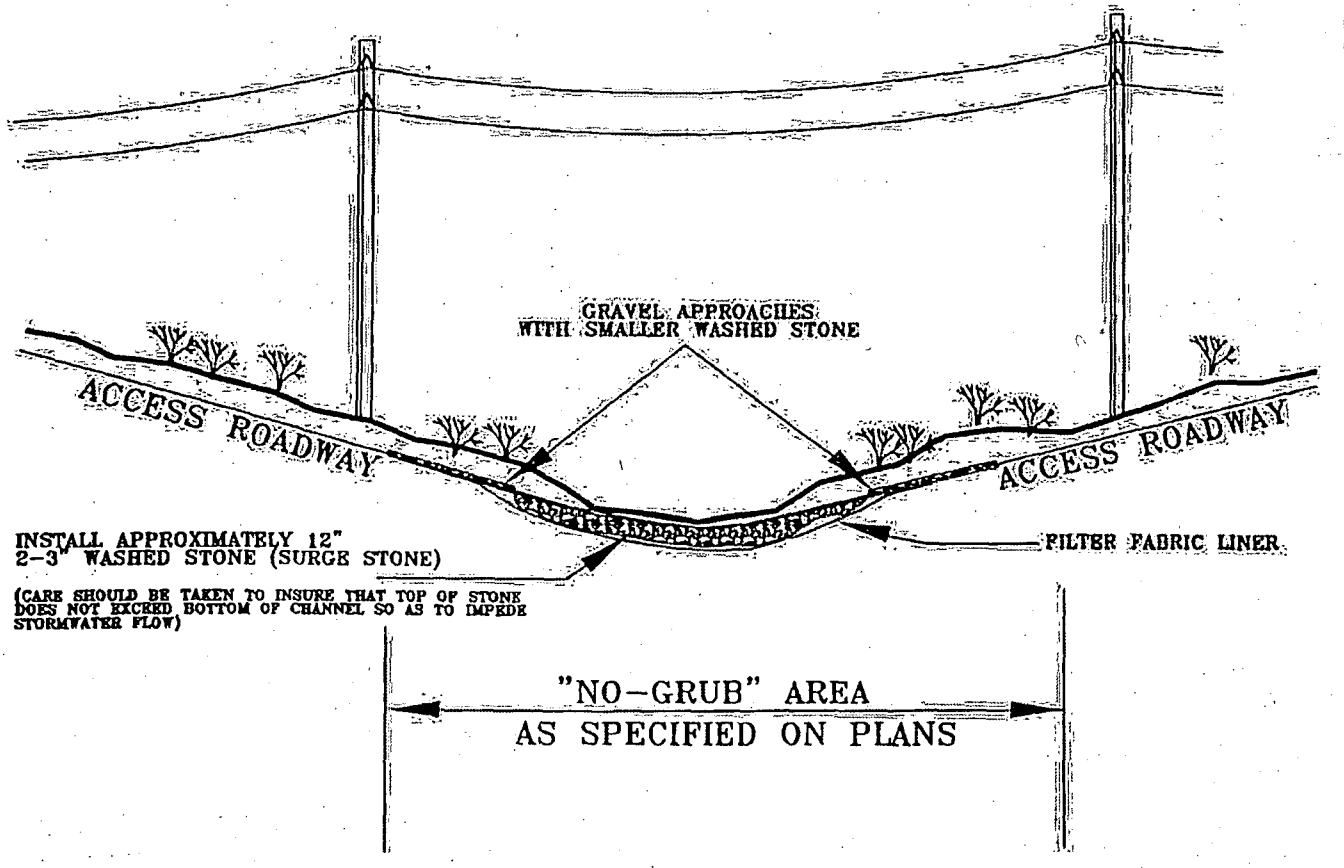
ROCK SECTION DETAIL
TRENCH WITH GRAVEL

7 STREAM BUFFERS



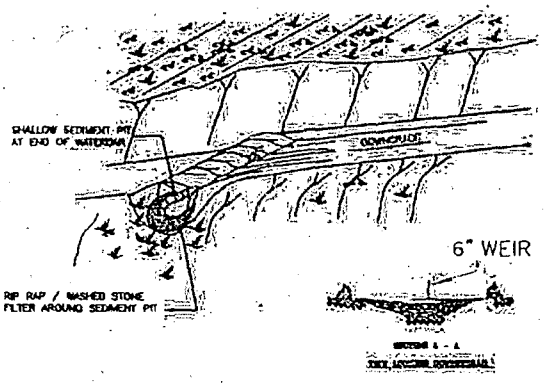
8 ROCK CROSSIING

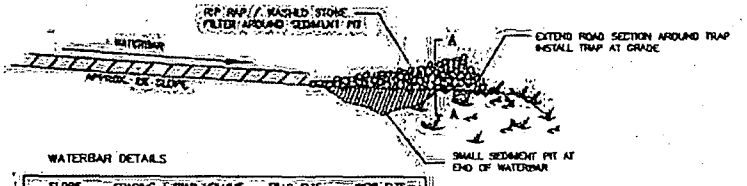
DRY WASH OR DRAW



A-8

9 WATERBAR

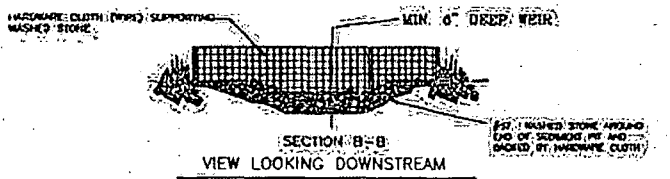




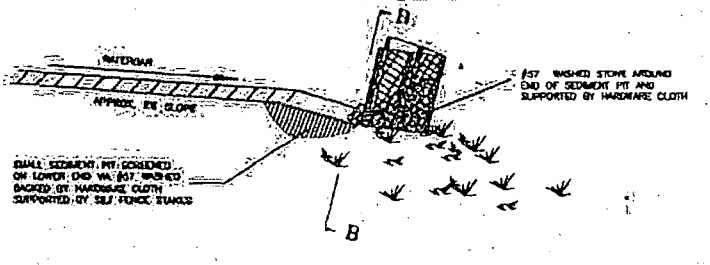
WATERBAR DETAILS

SLOPE (%)	SPACING (FT)	TRAP VOLUME (CU.FT.)	TRAP SIZE (Recommended)	WIER SIZE (Length)
<5%	125	63		
5 TO 10	100	250		
10 TO 20	75	375		
20 TO 35	50	500		
>35	25	125		

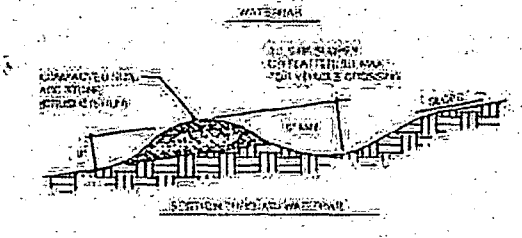
CROSS-SECTION — WATERBAR (TYPICAL INSTALLATION)



SECTION B-B
VIEW LOOKING DOWNSTREAM

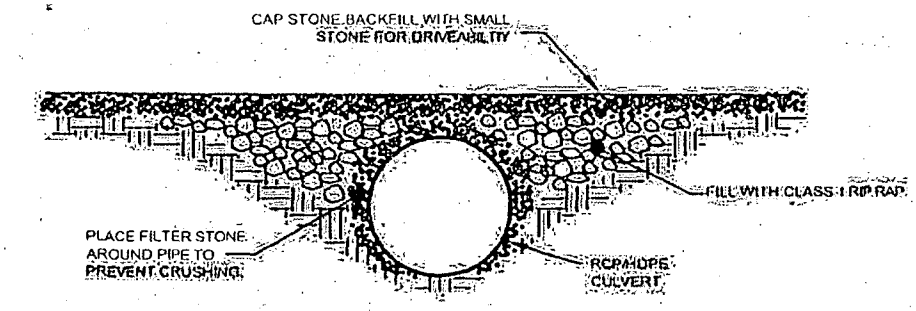


CROSS-SECTION — WATERBAR (LIMITED SPACE/STEEP EXIT SLOPE FOR OUTLET STRUCTURES)
(PRIMARILY FOR NEW AND EXISTING WATERBARS ON LOGGING ROADS)

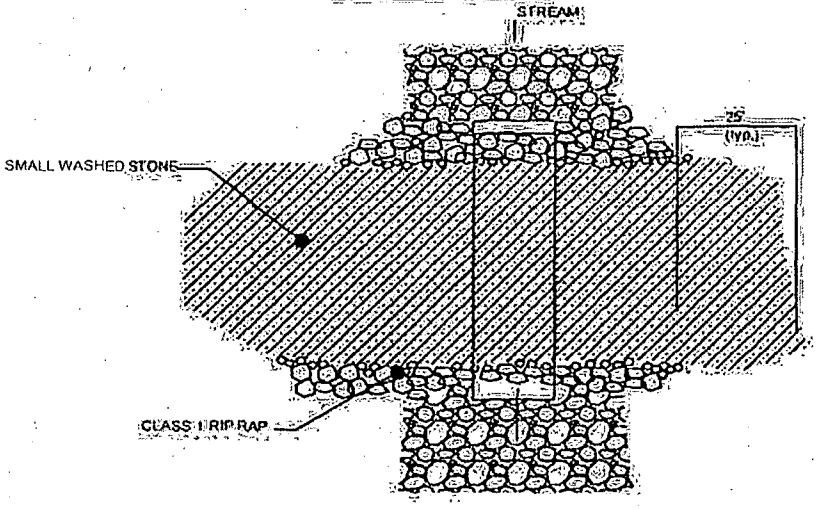


D9
MM

10 CULVERT INSTALLATION WITH ROCK BACKFILL



SECTION VIEW

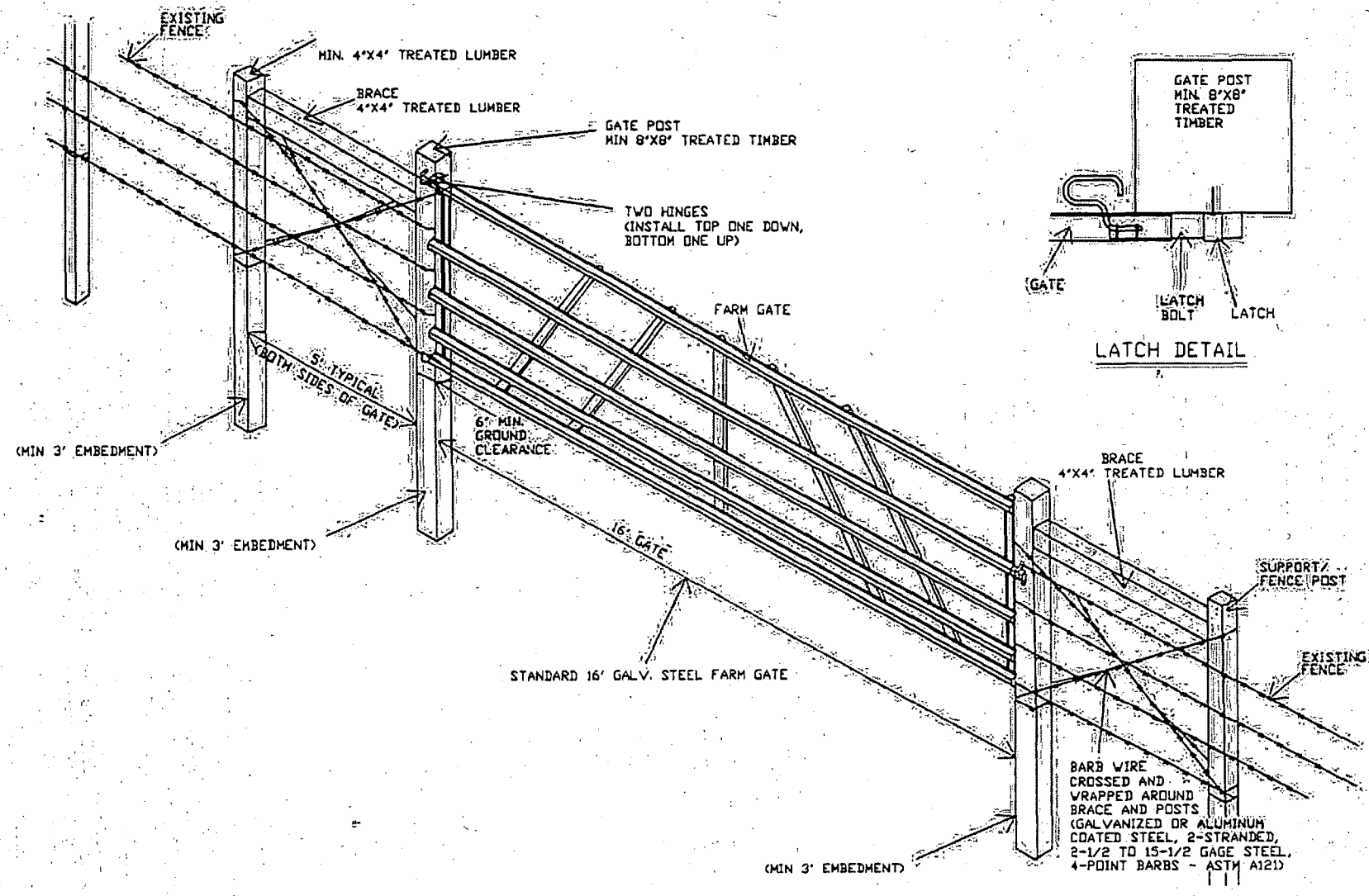


PLAN VIEW

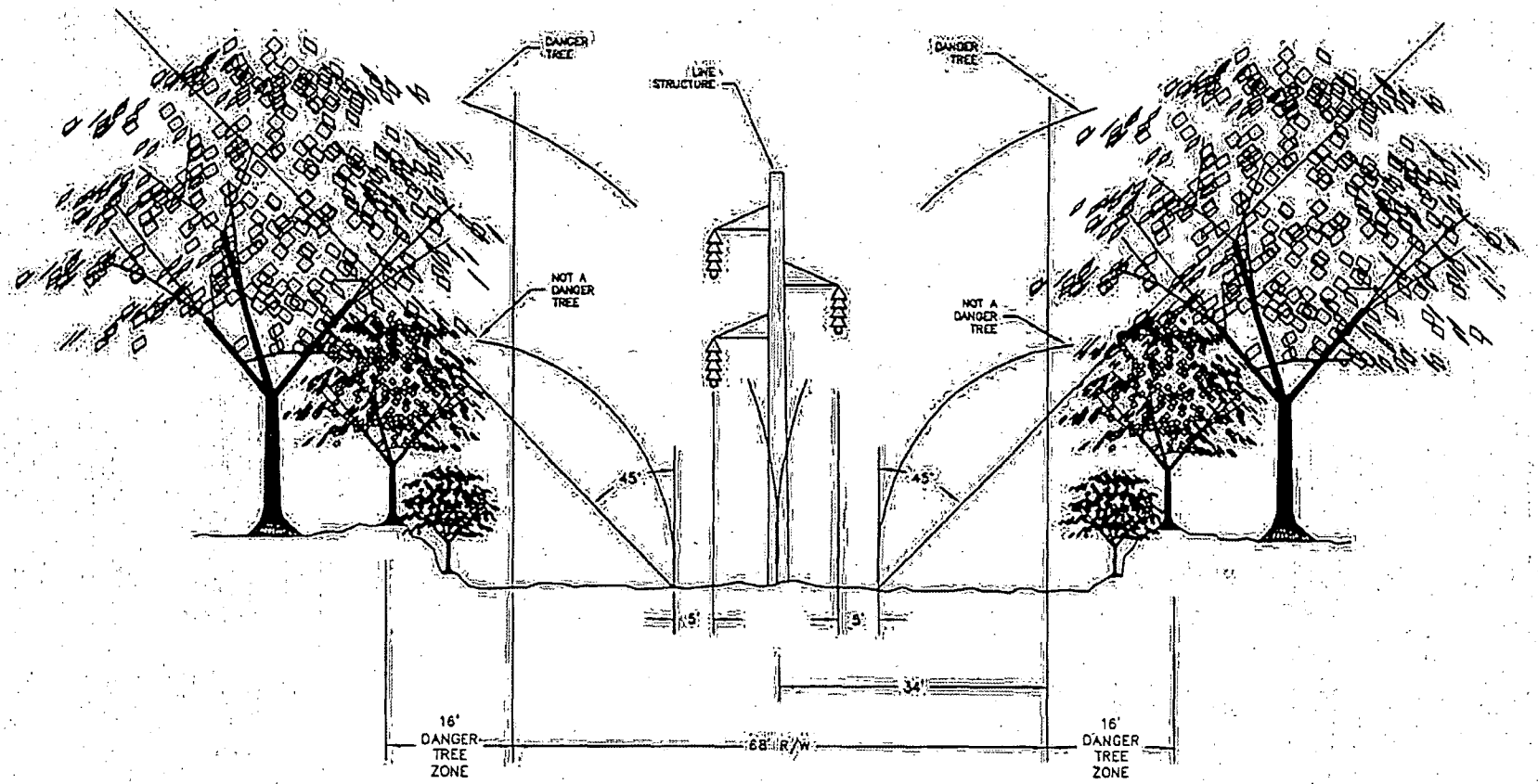
NOTES:

1. ROAD APPROACHES CROSSING 5:1 OR FLATTER.
2. PIPE TO EXTEND 1' BEYOND LIMITS OF RIP RAP.
3. CLASS 'A' RIP RAP TO BE USED TO ARMOR BANKS.

11 FARM GATE


EXISTING FENCE
MIN. 4"X4" TREATED LUMBER
BRACE 4"X4" TREATED LUMBER
GATE POST MIN 8"X8" TREATED TIMBER
TWO HINGES (INSTALL TOP ONE DOWN, BOTTOM ONE UP)
FARM GATE
5' TYPICAL (BOTH SIDES OF GATE)
(MIN 3' EMBEDMENT)
6" MIN. GROUND CLEARANCE
(MIN 3' EMBEDMENT)
16' GATE
STANDARD 16' GALV. STEEL FARM GATE
BRACE 4"X4" TREATED LUMBER
SUPPORT/ FENCE POST
EXISTING FENCE
BARB WIRE CROSSED AND WRAPPED AROUND BRACE AND POSTS (GALVANIZED OR ALUMINUM COATED STEEL, 2-STRANDED, 2-1/2 TO 15-1/2 GAGE STEEL, 4-POINT BARBS - ASTM A121)
(MIN 3' EMBEDMENT)
GATE POST MIN. 8"X8" TREATED TIMBER
GATE
LATCH BOLT
LATCH
LATCH DETAIL

12 DANGER TREES

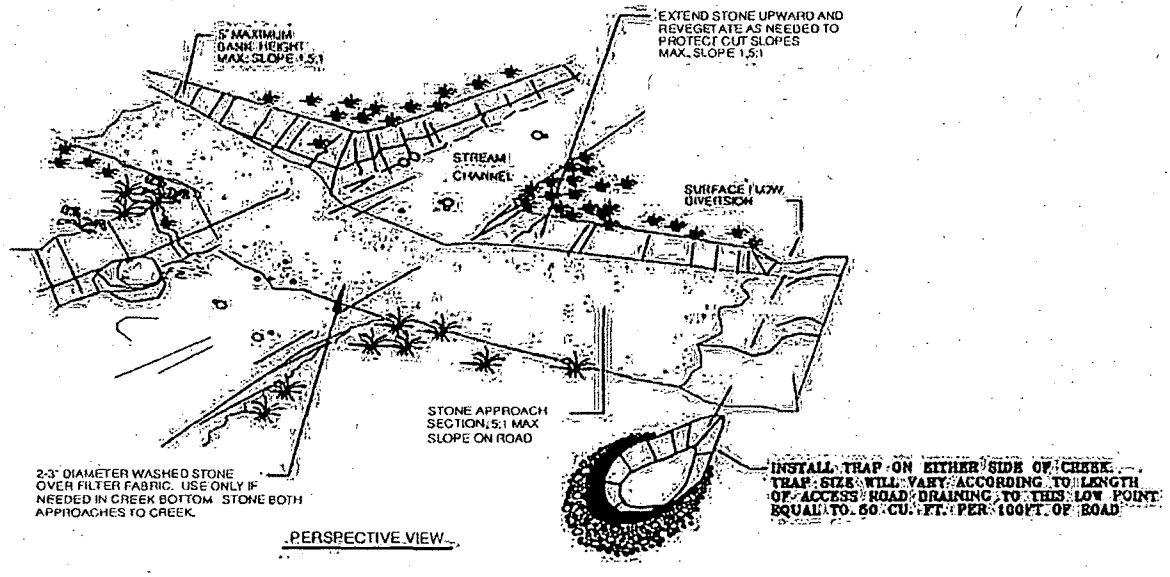


Notes:

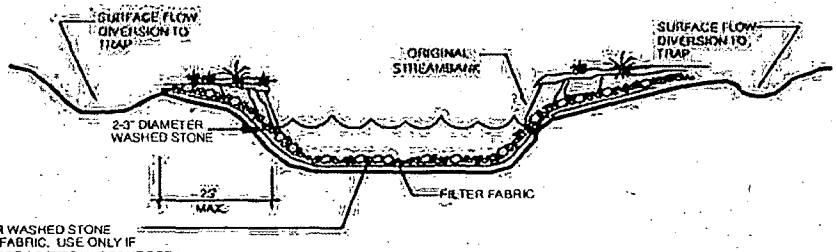
1. A "danger tree" is any tree outside the specified right-of-way (R/W) strip tall enough to contact conductors, structures or equipment should the tree fall, or be cut or blown toward the lines.
2. The danger tree maintenance cycle for a R/W is approximately every 9 years. Trees that are tall enough or will become tall enough under normal growing conditions during the maintenance cycle to hit the lines or their supporting apparatus will be cut down...subject, of course, to the provisions of the R/W agreement.
3. The approved method for determining tree height is by use of a tele-height instrument.
4. Danger trees will be identified by a Right-of-Way Specialist or an approved agent.
5. Danger trees will typically be hand-cut, with no grubbing of the root mat or low growing vegetation.

0-12

13 FORD CROSSING

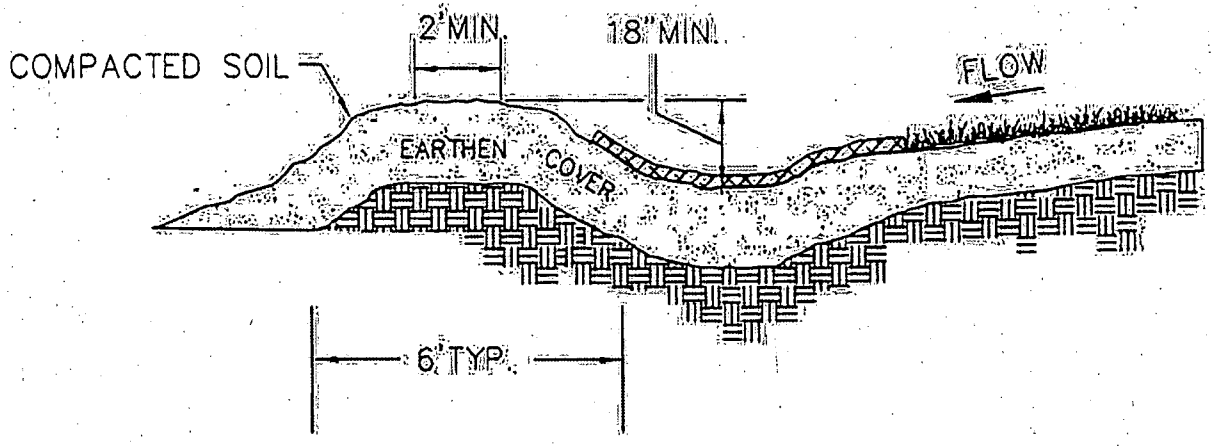


PERSPECTIVE VIEW



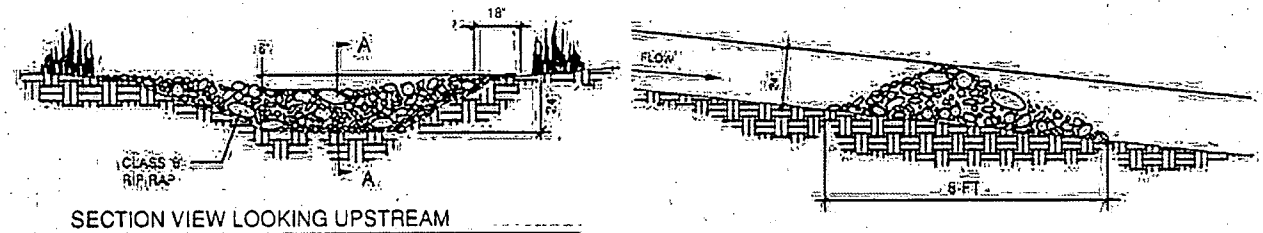
LONGITUDINAL SECTION

14 DIVERSION CHANNEL/SWALE



15 ROCK CHECK DAM

NOTE: CHECK DAMS MAY BE USED TO IMPROVE EXISTING ACCESS ROADS & WILL BE NOTED IN THE FIELD.

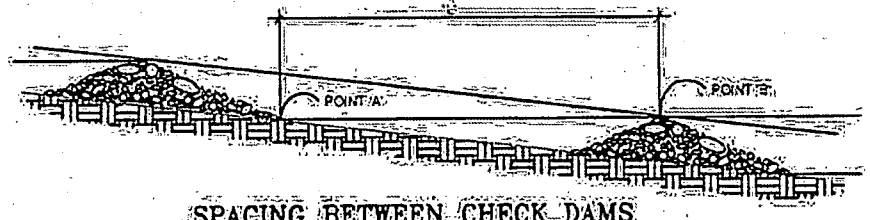


SECTION VIEW LOOKING UPSTREAM

SECTION A - A

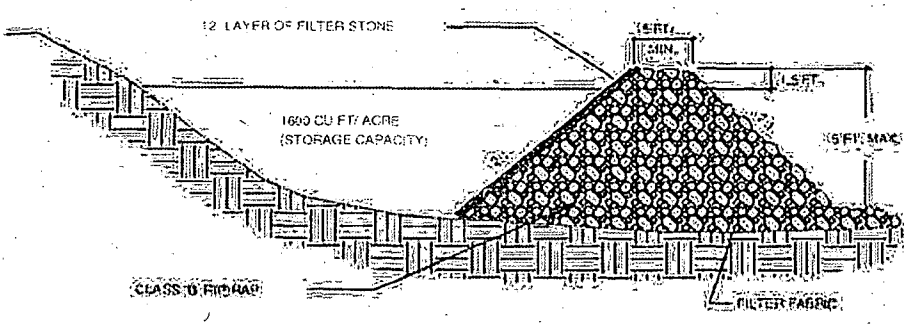
NOTE:
KEY STONE INTO THE DITCH BANKS AND EXTEND IT BEYOND THE ABUTMENTS A MINIMUM OF 18" TO PREVENT OVER FLOW AROUND DAM.

'L' = THE DISTANCE BETWEEN EQUAL ELEVATIONS AT POINTS A & B

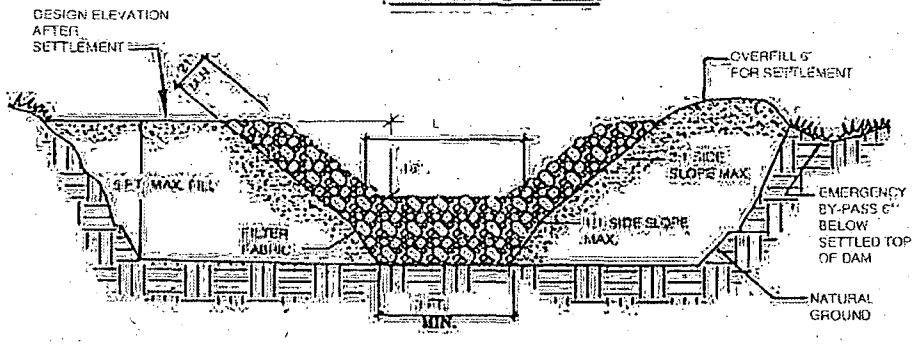


SPACING BETWEEN CHECK DAMS

16 TEMPORARY SEDIMENT TRAP



CROSS SECTION



LONGITUDINAL SECTION THROUGH TRAP

DESIGN TYPE	DRAINAGE AREA (APPROX.)	WEIR LENGTH (L) MIN.
1	1 ACRE	4.0 FT.
2	2 ACRES	6.0 FT.
3	3 ACRES	8.0 FT.
4	4 ACRES	10.0 FT.
5	5 ACRES	12.0 FT.

D-16

17 EROSION CONTROL MATTING (WOOD CURL)

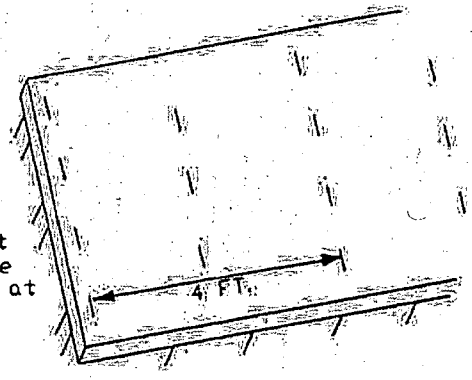
INSTALLATION:

Properly prepare, fertilize and seed area to be covered before blanket is applied. When the blanket is unrolled, netting should be on top and fibers in contact with the soil over the entire area. In ditches, apply blankets in the direction the water flows, butting them at the ends and sides and then stapling. On slopes, apply blankets either horizontally or vertically to slope, butt ends and sides and then staple.

STAPLING INSTRUCTIONS:

Use wire staples, .091" in diameter or greater, 'U' shaped with legs 6" long or longer and 1" crown. Size and gauge of staples used will vary with soil conditons. Drive staples vertically into the ground. Use four staples across at the start of each roll. For slope installation, continue to staple along the length of the roll at 6 ft. intervals. For ditch liner, staple along the length of the roll at 4 ft. intervals. Another row of staples in the center of each blanket should be alternately spaced between each side for either slope for ditch. Use a common row of staples on adjoining blankets.

Typical Stapling Pattern for High-Velocity Ditches and Slopes.



Use 4 staples across at the start of each roll and continue to staple throughout the length of the roll at 2 ft. intervals.

Noted By...

L-9

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 79-2 to RAI 79

***Duke Energy Carolinas Transmission Vegetation Management Program*, not dated.**

Duke Energy

Carolinas Transmission Vegetation Management Program

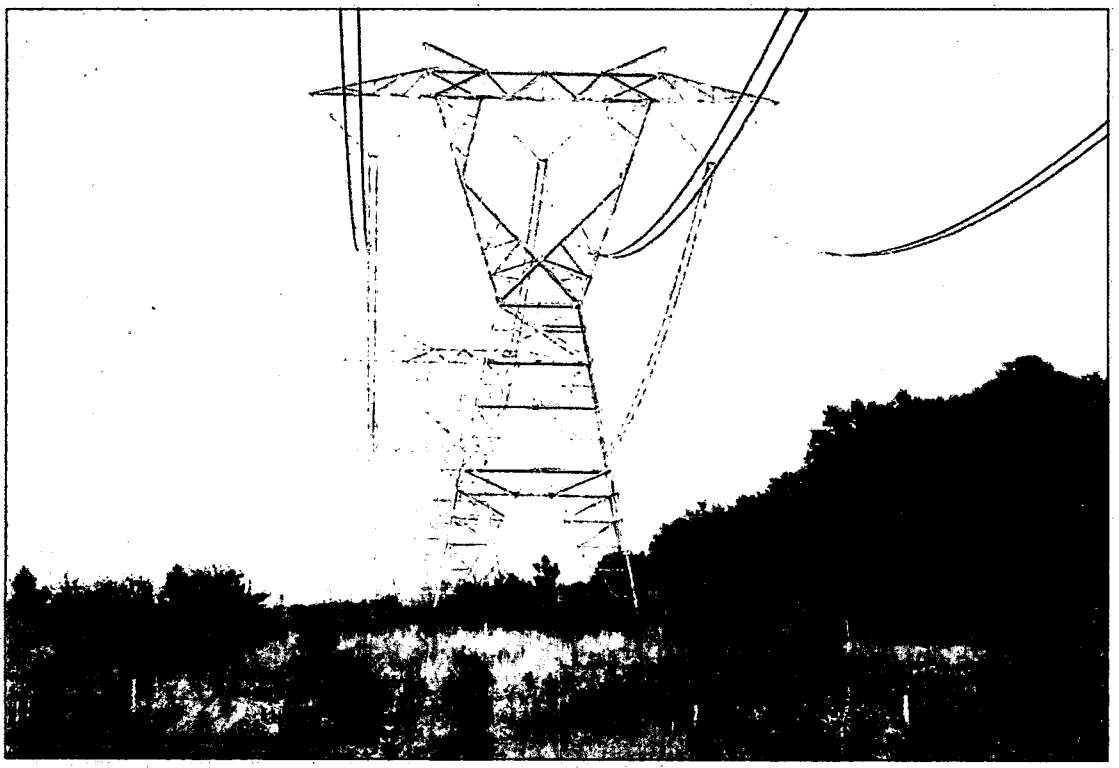


Table of Contents

Transmission Vegetation Management Program

1. Program Purpose

Duke Energy Carolinas ("Duke Carolinas Transmission") is committed to delivering high quality service to customers, ensuring the safety, reliability, and accessibility of their power system. In order to provide safe, reliable power to our customers, Duke Carolinas Transmission must continuously manage vegetation which could interfere with the transmission lines and associated facilities or create a safety hazard.

Duke Carolinas Transmission has over 13,000 circuit miles of transmission lines, ranging from 44 kV to 525 kV, in its transmission system. One of the most effective methods of protecting these lines is through right of way agreements. These are the legal documents that specify Duke Carolinas Transmission's rights to perform maintenance of its facilities inside and outside of the right of way corridors. The right of way agreement establishes the terms and conditions under which Duke Carolinas Transmission performs maintenance activities.

2. Integrated Vegetation Management Program

Duke Carolinas Transmission manages the vegetation on its rights of way through an Integrated Vegetation Management Program. This program encompasses environmental stewardship and utilizes various right of way management tools—mowing, hand cutting, removal of dead, diseased, dying or decaying trees, pruning, and the use of environmentally safe herbicides. Herbicide use keeps vegetation from posing a threat to the transmission lines and equipment while promoting power system compatible ecosystems within the right of way corridor. The Integrated Vegetation Management Program applies to two areas of maintenance: 1) inside right of way corridors and 2) outside right of way corridors.

3. Vegetation Inside Right of Way Corridors

Inside right of way corridors, in general, Duke Carolinas Transmission manages vegetation in a manner so as to establish growth that will not exceed a target height of 15 feet at maturity, and to prevent encroachments that could hamper routine and emergency work on company equipment, structures and apparatus. These activities serve to maintain the safe and reliable operation of the Duke Energy Carolinas transmission system.

Duke Carolinas Transmission will attempt to use herbicides where it is the safe and environmentally sound option in order to eliminate undesirable woody species from the rights of way while promoting lower growing vegetation that does not create a hazard to transmission lines and apparatus. Once a right of way is included in the herbicide program, Duke Carolinas Transmission will maintain this right of way with herbicides approximately every four years.

Where herbicides are not used for any reason, Duke Carolinas Transmission will utilize mechanical mowing or hand cutting. This alternate form of right of way maintenance will be performed approximately every three years. Areas designated as non-herbicide areas will be documented in Duke Energy's GIS database. The property owner should post and maintain "no spray" signs to identify these areas on the rights of way. Duke Carolinas Transmission will provide a way for the property owner to order these "no spray" signs.

When cutting down trees or brush from within the corridor by hand cutting, all stumps will be treated with herbicide to prevent sprouts from these plants, unless the site is designated as a "no-spray" area. Duke Carolinas Transmission provides an approved plant list for property owners who choose to landscape or plant vegetation on the right of way.

No Maintenance Areas

In some right of way corridors (typically in mountainous terrain), line heights are such that matured "tall-growing" species will not threaten the operation of transmission lines, apparatus or equipment, and thus is not dangerous or detrimental to safe and reliable electric service. These areas can be designated as a no maintenance area or a "leave" area. These sections of lines will still be integrated into the inspection processes.

4. Vegetation outside the Right of Way Corridors

Maintenance outside the right of way corridor typically encompasses the removal of dead, diseased, decayed or dying trees and side pruning for lateral growth. We define these trees as "danger trees". This maintenance can be triggered by an Asset Condition Report (ACR) that will be generated through our inspection processes (aerial or ground).

5. Helicopter Inspection & Reporting Process for Vegetation Management

All Duke Carolinas Transmission rights of way and lines will be aerially inspected twice a year to ensure the safety and reliability of the transmission system. At any time the observer deems necessary, he has an electronic reporting option to request a follow-up ground patrol. All aerial vegetation reports are prioritized and executed based on the Duke Carolinas Transmission work order prioritization process as outlined in the table below.

Work Order Type	Target Response Time Frame
Service Response	Address within 24 hours
As Soon as Possible	Address within 1 week
Routine Work	Address within 6 months

The Service Response mode is utilized to address immediate threats that may cause an interruption to the system. This process is the same whether the vegetation threat is identified through an aerial inspection or field personnel performing other work on the system. The response to remove the vegetation is coordinated by the vegetation management through the field operations team and the Carolina's Transmission Control Center (TCC). Actions may include temporary reduction in line rating or switching the line out of service until the threat is removed.

6. Baseline Maintenance

Periodically, as needed, Duke will schedule and perform baseline maintenance work along the edges of the easement. During this maintenance procedure the following activities will be undertaken:

1. Removal of hardwood and conifer vegetation that may have inadvertently been allowed to grow up at the right-of-way edge within the right-of-way.
2. Trees, whose trunks reside outside the right-of-way and whose limbs encroach into the right-of-way easement, will have those encroaching limbs removed.
3. Any additional "hazard" trees that may be found outside of the right-of-way easement, which have the capability of endangering the reliability of the line, will be removed.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 95-2 to RAI 95

South Carolina Department of Health and Environmental Control, *South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities*, 2003

South Carolina Department of Health
and Environmental Control

SOUTH CAROLINA

STORMWATER MANAGEMENT

AND SEDIMENT CONTROL HANDBOOK

FOR LAND DISTURBANCE ACTIVITIES

AUGUST 2003

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL QUALITY CONTROL

BUREAU OF WATER
OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT

(rev. 08/03)

EQC DISTRICT OFFICES

APPALACHIA I
Tommy Rogers, Director
2404 N. Main Street
Anderson, SC 29621
Phone: 864-260-5569 Fax:864- 260-4855
(Anderson, Oconee)

APPALACHIA II
Doug Johns, Director
301 University Ridge, Suite 5800
Greenville, SC 29601
Phone: 864-241-1090 Fax:864- 241-1092
(Greenville, Pickens)

APPALACHIA III
Barney Harmon, Director
975-C N. Church Street
Spartanburg, SC 29303
Phone: 864-596-3800 Fax: 864-596-2136
Spartanburg, Cherokee, Union)

CATAWBA
Al Williams, Director
**2475 DHEC Road
Lancaster, SC 29720
Phone: 803-285-7461 Fax: 285-5594
(Lancaster, Chester, York)

CENTRAL MIDLANDS
Lewis Bedenbaugh, Director
State Park, Bldg #5/PO Box 156
Columbia, SC 29147
Phone: 803-935-7015 Fax: 935-6724
(Richland, Lexington, Newberry, Fairfield)

LOW COUNTRY
Russell Berry, Director
104 Parker Dr.
Burton, S. C. 29906
Phone: 843-522-9097 Fax: 843-522-8463
(Beaufort, Jasper, Colleton, Hampton)

LOWER SAVANNAH
Myra Reece, Director
218 Beaufort Street, NE
Aiken, SC 29801
Phone: 803-641-7670 Fax: 641-7675
(Aiken, Orangeburg, Barnwell, Bamberg, Allendale, Calhoun)

PEE DEE
Marion Rembert, Director
145 E. Cheves Street
Florence, SC 29506
Phone: 843-661-4825 Fax: 661-4858
(Florence, Dillon, Marion, Marlboro, Darlington, Chesterfield)

TRIDENT
Wayne Fanning, Director
1362 M°Millan Ave., Suite 300
Charleston, SC 29405
Phone: 843-740-1590 Fax: 740-1195
(Charleston, Berkeley, Dorchester)

UPPER SAVANNAH
Robert Jackson, Director
613 South Main St.
Greenwood, SC 29646
Phone: 864-223-0333 Fax: 864-223-6935
(Greenwood, Abbeville, Laurens, Saluda Edgefield, McCormick)

WACCAMAW
Ron Tata, Director
1705 Oak St. Plaza/Suite #2
Myrtle Beach, SC 29577
Phone: 843-448-1902 Fax: 843-946-9390
(Horry, Georgetown, Williamsburg)

WATEREE
Ronny Rentz, Director
105 Magnolia St./PO Box 1628
Sumter, SC 29151
Phone: 803-778-1531 Fax: 773-6366
(Sumter, Kershaw, Lee, Clarendon)

TABLE OF CONTENTS

S. C. DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

STORMWATER MANAGEMENT AND SEDIMENT REDUCTION HANDBOOK

I. Synopsis:

This handbook is a compilation of existing South Carolina stormwater management regulations and supporting information that applicants will need to proceed through the land disturbance permitting process. The objective of this document is to create a comprehensive reference for individuals who will be submitting a stormwater management and sediment reduction permit application for approval to the Department of Health and Environmental Control (DHEC). This handbook summarizes the application process and sets forth the minimum standards and design specifications for land disturbing activities that require stormwater permits. The supporting information includes sediment control design aides and other useful information. This document references pertinent sections from the S. C. Stormwater Management and Sediment Reduction regulations, the NPDES General Permit for Stormwater Discharges from Construction Activities and the Coastal Zone Management Program Refinements which are included as appendices.

II. Scope:

A stormwater management plan in compliance with the requirements of existing regulations must be submitted for most land disturbing activities in South Carolina. Appendix A contains a copy of the S. C. Stormwater Management and Sediment Reduction regulations. The DHEC Office of Ocean and Coastal Resource Management (OCRM), formerly the S. C. Coastal Council, administers the stormwater management program in the following eight coastal counties: Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper. The stormwater permitting program for the rest of the state is implemented by DHEC's Bureau of Water, which now includes parts of the former Land Resources Conservation Commission.

III. Projects Requiring Permits:

All land disturbing activities in the state that will disturb greater than two (2) acres that are not specifically exempt require a stormwater management and sediment and erosion control permit prior to construction. In the eight (8) coastal counties, if the activity is within one-half (1/2) mile of a receiving waterbody, projects disturbing two (2) acres or less must also obtain a land disturbance permit (see next section). If the activity involves one (1) or more acres of land disturbance, it will also require NPDES General Permit coverage.

IV. Permit Applicability:

Specific requirements of the permit application and approval process are based on the amount of actual land disturbance and, if the activity is in the Coastal Zone, the project's proximity to a receiving waterbody. The permit application procedure is as follows:

(1) **For activities involving less than one (1) acre of actual land disturbance** and which are not part of a larger common plan of development or sale, the person responsible for the activity shall submit a simplified stormwater management and sediment control plan meeting the requirements of R.72-307H in Appendix A and the appropriate reporting form. This plan does <u>not</u> require approval by the Department of Health and Environmental Control and does <u>not</u> require preparation or certification by a registered engineer, landscape architect, or Tier B land surveyor. The DHEC staff does have the authority to conduct site inspections on these projects to insure compliance with the submitted plans.

(2) **For activities involving at least one (1) acre (and less than one (1) acre in certain cases) but two (2) acres or less of actual land disturbance** and which are not part of a larger common plan of development or sale, the person responsible for the activity shall submit a simplified stormwater management and sediment control plan meeting the requirements of R.72-307H in Appendix A and the appropriate reporting form. The applicant is also responsible for meeting the requirements of the NPDES General Permit SCR100000. This

plan does not normally require approval by the Department of Health and Environmental Control but does need to be prepared by a qualified individual. The Department has the right to require additional information on a case-by-case basis.

(3) **For activities involving two (2) acres or less of actual land disturbance which are within one-half (1/2) mile of a receiving waterbody in the Coastal Zone.** The Coastal Zone Management Program Refinements (Appendix B) state that "stormwater management and sediment reduction plan submittal and regulatory approval shall be required for those smaller projects located within 1/2 mile of a receiving waterbody." Particular emphasis shall be placed on the following projects in this category:

(a) All commercial buildings which will handle hazardous chemicals (including gasoline, kerosene, diesel fuel, nutrients, etc.).

(b) All commercial buildings and parking/runway areas with greater than one (1) acre of impervious surface (building and parking).

(c) All commercial buildings and parking/runway areas with greater than one-half (1/2) acre of impervious surface located directly adjacent to a saltwater (critical) area.

(d) All residential subdivision developments located directly adjacent to a saltwater (critical) area.

(e) All projects impacting Geographical Areas Of Particular Concern (GAPC's).

These activities (a-e) must meet the requirements of R.72-307I in Appendix A and must have the plans and specifications prepared by a registered engineer, landscape architect or Tier B land surveyor. Other activities in this category require a permit but must only meet the submittal requirements of R.72-307H which do not require preparation by a licensed professional. If an activity falls into this category and the actual land disturbance is greater than or equal to one (1) acre (or less than one (1) acre in certain cases), the requirements of the NPDES General Permit SCR100000 also apply as outlined above in item (2).

(4) **For activities involving more than two (2) acres of actual land disturbance** which are not part of a larger common plan of development or sale, the requirements of R.72-305 and R.72-307 from Appendix A and the requirements of the NPDES General Permit SCR100000 apply. Plans and specifications for these activities will be prepared by professional engineers, landscape architects or Tier B land surveyors.

Additional design requirements for certain projects in the Coastal Zone as adopted in the Coastal Zone Management Program Refinements are contained in Appendix B. These requirements address design needs for activities located in close proximity to receiving waterbodies, bridge projects, golf courses, mines and landfills.

V. Application Forms and Checklists:

All the necessary application forms must be submitted in order to complete a review of the submittal. Checklists and application forms may be found on the website at www.scdhec.net.

VI. Plan Submittal:

The responsible agent should do a preliminary analysis to determine which of the different categories a project would fall under and then submit the appropriate application form and information required on the checklist. The initial submittal package should include only one (1) paper copy of the stormwater management and sediment reduction plans and corresponding calculations. After the plans have been reviewed to determine compliance with the regulations, the DHEC plan reviewer will contact the applicant/engineer and request necessary changes or notify the individual that the plans are in compliance. When the plans have been determined to be in compliance then the applicant/engineer shall send four (4) additional paper copies for stamp approval. One copy of the plans is for the engineer/agent, one is for the owner, one is for the contractor and **must be available onsite at all times** and one copy is for the DHEC inspector.

VII. NPDES General Permit Coverage

Any construction project disturbing one (1) acre or greater (or less than one (1) acre in certain cases) must obtain either NPDES general permit coverage or an individual NPDES permit. NPDES General Permit coverage under SCR100000 can be obtained by the above referenced submittal information including application form # 3306 (9/94 or later), plans and specifications. Therefore, application form # 3306 (9/94 or later) shall serve as the Notice Of Intent (NOI) for NPDES general permit coverage for most land disturbance activities.

If a project has a disturbed acreage of one (1) acre or more and is exempt from the requirements of Title 48 Chapter 14 by Section 40 and by R.72-302 but not exempt from the requirements of 40 CFR 122 and SCR100000, then the EPA Notice of Intent (NOI) must be submitted. Filing this form guarantees that a Pollution Prevention Plan (PPP) has been developed and will be maintained on site.

The S. C. Department of Transportation (SCDOT) must comply with SCR100000 and Regulation 72-400. All Department of Transportation projects are required to file the EPA Notice of Intent (NOI) form at least 48 hours prior to start of construction. A copy of the plans developed in compliance with R.72-400 must be submitted at the time the contract is awarded.

VIII. Notification of Initiation of Land Disturbance Activity

Notification shall be sent to the appropriate DHEC plan review office with carbon copies to the local DHEC district offices prior to initiation of the land disturbing activity. A list of the DHEC District offices is included in the front of this handbook. Prior to completion of the project, a final inspection may be requested from the appropriate DHEC district or OCRM office.

IX. Design Guidelines For Sediment/Erosion Control

The stormwater management regulations require that when stormwater runoff drains to a single outlet from land disturbing activities which disturb ten (10) acres or more then a sediment basin must be designed to meet a removal efficiency of 80 percent for suspended solids or 0.5 ML/L peak settleable concentration, which ever is less. The efficiency shall be calculated for disturbed conditions for the 10-year 24-hour design event. There are computer software packages available that can be used to calculate the removal efficiencies of certain sediment control practices. In addition, Appendix C contains a report titled "Engineering Aids and Design Guidelines for Control of Sediment in South Carolina" which can be referenced when calculating sediment removal efficiencies.

Activities that have between five (5) and ten (10) acres of land disturbance area draining to a single outlet may incorporate other practices besides a sediment basin to achieve the equivalent removal efficiency of 80 percent for suspended solids or 0.5 ML/L peak settleable solids concentration. Specific site conditions and/or topography may eliminate the need for removal efficiency calculations. Construction activities that disturb less than five (5) acres do not require sediment calculations but the design of these projects must include sediment control best management practices during construction.

X. Rainfall Data for South Carolina

Appendix D contains rainfall data and rainfall-erosivity factors (R factors) for all South Carolina counties to be used in hydrology and sedimentology calculations.

XI. Fees:

A review fee of one hundred (100) dollars per disturbed acre up to a maximum of $2000 is required for all land disturbance activities over two (2) acres. There is no review fee charged for government activities (local, state, and federal) or for projects that disturb two (2) acres or less. An application for a waiver or a

variance must include a $100 fee. In order to estimate the area of land disturbance for subdivisions without exact build out plans, use the following formula:

Amount of Disturbance = 2[Max Restricted Building Size][Number of Lots] + ROW areas

Right of Way (ROW) areas include clearing for roads, utilities, easements etc.

There is an additional $125 fee for all projects that will disturb one (1) acre or more and must therefore obtain NPDES general permit coverage. There are no exemptions from this fee so local governments, schools and other entities that are exempt from the $100/disturbed acre review fee must submit this fee as part of their land disturbance package. If coverages are no longer necessary (i.e. site is stabilized), a Notice of Termination (NOT) must be filed to stop the coverage. All coverages under the General Permit SCR100000 must pay the $125 to begin coverage.

XII. Inspections:

The DHEC staff will conduct periodic site inspections on all land disturbing activities. The person responsible for the land disturbing activity shall notify the appropriate inspection agency before initiation of construction and upon project completion when a final inspection will be conducted to ensure compliance with the approved stormwater management and sediment control plan. DHEC or any other responsible inspection agency shall, for inspection purposes, do all of the following items:

(1) Ensure that the approved stormwater management and sediment control plans are on the project site and are complied with;

(2) Ensure that every active site is inspected for compliance with the approved plan on a regular basis;

(3) Provide the person responsible for the land disturbing activity a written report after every inspection.

(4) Notify the person responsible for the land disturbing activity in writing when violations are observed, describing the:

(a) Nature of the violation;

(b) Required corrective action; and

(c) Time period for violation correction.

XIII. Violations and Enforcement:

Violations of the stormwater regulations will occur when (a) a site with an approved stormwater permit is not in compliance with the issued permit or (b) a land disturbing activity is underway and the agent has not acquired the necessary permit. Enforcement procedures will vary according to the severity of the violation but might include imposing fines or issuing cease and desist orders. Violations of the S. C. Pollution Control Act as prescribed by SCR100000 may subject the applicant to a civil penalty of up to $10,000 per violation per day. Additional information on enforcement procedures is contained in Section 72-312 of Appendix A.

XIV. Best Management Practices (BMPs):

Appendix E contains a table of some of the stormwater management and sediment reduction best management practices (BMPs) used in South Carolina. The existing conditions determined from site surveys will aid in selecting the most effective BMPs to use when designing a plan for permit submittal. Additional methods of stormwater management and sediment control can be found in "A Guide to Site Development and Best Management Practices for Stormwater Management and Sediment Control" distributed by the Department.

APPENDIX A

S. C. STORMWATER MANAGEMENT AND

SEDIMENT REDUCTION REGULATIONS

FINAL REGULATIONS

LAND RESOURCES CONSERVATION COMMISSION

CHAPTER 72

Statutory Authority: 1976 Code, Title 48, Chapter 14

72-300 Standards for Stormwater Management and Sediment Reduction

Synopsis:

These proposed regulations pursuant to the Stormwater Management and Sediment Reduction Act of 1991 establish the procedure and minimum standards for a statewide uniform program for stormwater management and sediment reduction with the option of being operated locally. The regulations establish the procedure for local governments or conservation districts to apply for program component delegation. They also establish the criteria to be met for delegation. Minimum standards and specifications are established for land disturbing activities that require a permit.

The proposed regulations encourage management of stormwater and sediment on a watershed basis. Criteria and procedures are established for designating watersheds and creating stormwater utilities.

When the law becomes effective, it will be implemented in a phased approach as listed in the regulations.

Instructions:

New regulations added.

Text:

72-300. Scope.

A. Stormwater runoff is a source of pollution of waters of the State, and may add to existing flooding problems. The implementation of a statewide stormwater management and sediment control program will help prevent additional water quantity and quality problems and may reduce existing problems.

B. Stormwater management and sediment control plan approvals are necessary prior to engaging in any land disturbing activity related to residential, commercial, industrial or institutional land use which are not specifically exempted or waived by these regulations.

C. To the extent possible, the Commission intends to delegate the provisions of these regulations to local governments. Those program provisions which are subject to delegation include stormwater management and sediment control plan approval, construction and maintenance inspections, enforcement, and education and training.

D. The Commission encourages the implementation of the Stormwater Management and Sediment Reduction Act on a watershed basis by local governments. The Commission recognizes that all jurisdictions may not have the resources available to implement this type of program immediately. However, the comprehensive approach of implementing the program on the watershed basis will allow for planned, orderly development in a watershed.

E. The implementation of a stormwater utility represents a comprehensive approach to program funding and implementation. The activities which may be undertaken by a stormwater utility include not only assessment, collection, and funding activities, but also carrying out provisions of adopted stormwater management plans. These provisions may include contracting for such services as project construction, project maintenance, project inspection, and enforcement of installation and maintenance requirements imposed with respect to approved land disturbing activities.

72-301. Definitions.

As used in these regulations, the following terms shall have the meanings indicated below:

1. "Adverse Impact" means a significant negative impact to land, water and associated resources resulting from a land disturbing activity. The negative impact includes increased risk of flooding; degradation of water quality; increased sedimentation; reduced groundwater recharge; negative impacts on aquatic organisms; negative impacts on wildlife and other resources; and threatened public health.

2. "Applicant" means a person, firm, or governmental agency who executes the necessary forms to obtain approval or a permit for a land disturbing activity.

3. "Appropriate Plan Approval Agency" means the Commission, Local Government, or Conservation District that is responsible in a jurisdiction for review and approval of stormwater management and sediment control plans.

4. "As-Built Plans or Record Documents" means a set of engineering or site drawings that delineate the specific permitted stormwater management facility as actually constructed.

5. "Best Management Practices" means a wide range of management procedures, schedules of activities, prohibitions on practices and other management practices which have been demonstrated to effectively control the quality and/or quantity of stormwater runoff and which are compatible with the planned land use.

6. "Certified Construction Inspector" means a person with the responsibility for conducting inspections during construction and maintenance inspections after the land disturbing activity is completed as certified by the Commission.

7. "Certified Plan Reviewer" means a person with the responsibility for reviewing stormwater management and sediment control plans for an appropriate plan approval agency as certified by the Commission.

8. "Commission" means the South Carolina Land Resources Conservation Commission.

9. "Delegation" means the acceptance of responsibility by a Local Government or Conservation District for the implementation of one or more elements of the statewide stormwater management and sediment control program.

10. "Designated Watershed" means a watershed designated by a local government and approved by the Commission, Department of Health and Environmental Control and the South Carolina Water Resources Commission and identified as having an existing or potential stormwater, sediment control, or nonpoint source pollution problem.

11. "Detention Structure" means a permanent stormwater management structure whose primary purpose is to temporarily store stormwater runoff and release the stored runoff at controlled rates.

12. "Develop Land" means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, or institutional construction or alteration.

13. "Developer" means a person undertaking, or for whose benefit, activities covered by these regulations are commenced and/or carried out.

14. "District" means any soil and water conservation district created pursuant to Chapter 9, Title 48, S.C. Code of Laws.

15. "Drainage Area" means that area contributing runoff to a single point.

16. "Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.

17. "Erosion" means the wearing away of land surface by the action of wind, water, gravity, ice, or any combination of those forces.

18. "Erosion and Sediment Control" means the control of solid material, both mineral and organic, during a land disturbing activity to prevent its transport out of the disturbed area by means of air, water, gravity, or ice.

19. "Exemption" means those land disturbing activities that are not subject to the sediment and stormwater requirements contained in these regulations.

20. "Grading" means excavating, filling (including hydraulic fill) or stockpiling of earth material, or any combination thereof, including the land in its excavated or filled condition.

21. "Implementing Agency" means the Commission, local government, or conservation district with the responsibility for receiving stormwater management and sediment control plans for review and approval, reviewing plans, issuing permits for land disturbing activities, or conducting inspections and enforcement actions in a specified jurisdiction.

22. "Infiltration" means the passage or movement of water through the soil profile.

23. "Land Disturbing Activity" means any use of the land by any person that results in a change in the natural cover or topography that may cause erosion and contribute to sediment and alter the quality and quantity of stormwater runoff.

24. "Natural Waterways" means waterways that are part of the natural topography. They usually maintain a continuous or seasonal flow during the year and are characterized as being irregular in cross-section with a meandering course. Construction channels such as drainage ditches shall not be considered natural waterways.

25. "Nonerodible" means a material, e.g., natural rock, riprap, concrete, plastic, etc., that will not experience surface wear due to natural forces of wind, water, ice, gravity or a combination of those forces.

26. "Local Government" means any county, municipality, or any combination of counties or

municipalities, acting through a joint program pursuant to the provisions of this chapter.

27. "Nonpoint Source Pollution" means pollution contained in stormwater runoff from ill-defined, diffuse sources.

28. "One Hundred Year Frequency Storm" means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in 100 years. It also may be expressed as an exceedence probability with a 1 percent chance of being equaled or exceeded in any given year.

29. "Person" means any State or federal agency, individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, municipality or other political subdivision of this State, any interstate body or any other legal entity.

30. "Person Responsible for the Land Disturbing Activity" means
    (a) the person who has or represents having financial or operational control over the land disturbing activity; and/or
    (b) the landowner or person in possession or control of the land who directly or indirectly allowed the land disturbing activity or has benefitted from it or who has failed to comply with any provision of the act, these regulations, or any order or local ordinance adopted pursuant to this act as imposes a duty upon him.

31. "Post-Development" means the conditions which exist following the completion of the land disturbing activity in terms of topography, vegetation, land use and rate, volume or direction stormwater runoff.

32. "Pre-Development" means the conditions which existed prior to the initiation of the land disturbing activity in terms of topography, vegetation, land use and rate, volume or direction of stormwater runoff.

33. "Redevelopment" means a land disturbance activity that alters the current use of the land but does not necessarily alter the pre-development runoff characteristics.

34. "Responsible Personnel" means any foreman, superintendent, or similar individual who is the on-site person in charge of land disturbing activities.

35. "Retention Structure" means a permanent structure whose primary purpose is to permanently store a given volume of stormwater runoff. Release of the given volume is by infiltration and/or evaporation.

36. "Sediment" means solid particulate matter, both mineral and organic, that has been or is being transported by water, air, ice, or gravity from its site of origin.

37. "Single Family Residence-Separately Built" means a noncommercial dwelling that is occupied exclusively by one family and not part of a residential subdivision development.

38. "Stabilization" means the installation of vegetative or structural measures to establish a soil cover to reduce soil erosion by stormwater runoff, wind, ice and gravity.

39. "Stop Work Order" means an order directing the person responsible for the land disturbing activity to cease and desist all or any portion of the work which violates the provisions of this act.

40. "Stormwater Management" means, for:
    (a) quantitative control, a system of vegetative or structural measures, or both, that control the increased volume and rate of stormwater runoff caused by manmade changes to the land;
    (b) qualitative control, a system of vegetative, structural, or other measures that reduce or eliminate pollutants that might otherwise be carried by stormwater runoff.

41. "Stormwater Management and Sediment Control Plan" means a set of drawings, other documents, and supporting calculations submitted by a person as a prerequisite to obtaining a permit to undertake a land disturbing activity, which contains all of the information and specifications required by an implementing agency.

42. "Stormwater Runoff" means direct response of a watershed to precipitation and includes the surface

and subsurface runoff that enters a ditch, stream, storm sewer or other concentrated flow during and following the precipitation.

43. "Stormwater Utility" means an administrative organization that has been created for the purposes of planning, designing, constructing, and maintaining stormwater management, sediment control and flood control programs and projects.

44. "Subdivision", unless otherwise defined in an ordinance adopted by a local government pursuant to Section 6-7-1010, means all divisions of a tract or parcel of land into two or more lots, building sites, or other divisions, or parcels less than five acres, for the purpose, whether immediate or future, of sale, legacy, or building development, or includes all division of land involving a new street or a change in existing streets, and includes resubdivision and, where appropriate, in the context, shall relate to the process of subdividing or to the land or area subdivided.

45. "Swale" means a structural measure with a lining of grass, riprap or other materials which can function as a detention structure and convey stormwater runoff without causing erosion.

46. "Ten-Year Frequency Storm" means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in 10 years. It may also be expressed as an exceedence probability with a 10 percent chance of being equaled or exceeded in any given year.

47. "Twenty-Five Year Frequency Storm" means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in 25 years. It also may be expressed as an exceedence probability with a 4 percent chance of being equaled or exceeded in any given year.

48. "Two-Year Frequency Storm" means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in two years. It may also be expressed as an exceedence probability with a 50 percent chance of being equaled or exceeded in any given year.

49. "Variance" means the modification of the minimum sediment and stormwater management requirements for specific circumstances where strict adherence of the requirements would result in unnecessary hardship and not fulfill the intent of these regulations.

50. "Waiver" means the relinquishment from sediment and stormwater management requirements by the appropriate plan approval authority for a specific land disturbing activity on a case-by-case review basis.

51. "Water Quality" means those characteristics of stormwater runoff from a land disturbing activity that relate to the physical, chemical, biological, or radiological integrity of water.

52. "Water Quantity" means those characteristics of stormwater runoff that relate to the rate and volume of the stormwater runoff to downstream areas resulting from land disturbing activities.

53. "Watershed" means the drainage area contributing stormwater runoff to a single point.

54. "Watershed Master Plan" means a plan for a designated watershed that analyzes the impact of existing and future land uses and land disturbing activities in the entire watershed and includes strategies to reduce nonpoint source pollution, to manage stormwater runoff and control flooding. The plan must be developed for the entire watershed, regardless of political boundaries, and must include appropriate physical, institutional, economic and administrative data needed to justify the plan.

72-302. Exemptions, Waivers, and Variances From Law.

A. The following activities are exempt from both the sediment control and stormwater management requirements established by these regulations:

(1) Land disturbing activities on agricultural land for production of plants and animals useful to man, including but not limited to: forages and sod crops, grains and feed crops, tobacco, cotton, and peanuts; dairy animals and dairy products; poultry and poultry products; livestock, including beef

cattle, sheep, swine, horses, ponies, mules, or goats, including the breeding and grazing of these animals; bees; fur animals and aquaculture, except that the construction of an agricultural structure of one or more acres, such as broiler houses, machine sheds, repair shops and other major buildings and which require the issuance of a building permit shall require the submittal and approval of a stormwater management and sediment control plan prior to the start of the land disturbing activity.

(2) Land disturbing activities undertaken on forest land for the production and harvesting of timber and timber products.

(3) Activities undertaken by persons who are otherwise regulated by the provisions of Chapter 20 of Title 48, the South Carolina Mining Act.

(4) Construction or improvement of single family residences or their accessory buildings which are separately built and not part of multiple construction in a subdivision development.

(5) Land disturbing activities, other than activities identified in R.72-302A(6), that are conducted under another state or federal environmental permitting, licensing, or certification program where the state or federal environmental permit, license, or certification is conditioned on compliance with the minimum standards and criteria developed under this act.

(6) Any of the following land disturbing activities undertaken by any person who provides gas, electrification, or communications services, subject to the jurisdiction of the South Carolina Public Service Commission, or corporations organized and operating pursuant to Section 33-49-10 et seq.:

   (a) land disturbing activities conducted pursuant to a certificate of environmental compatibility and public convenience and necessity issued pursuant to Title 58, Chapter 33, of the South Carolina Code, or land disturbing activities conducted pursuant to any other certification or authorization issued by the Public Service Commission;

   (b) land disturbing activities conducted pursuant to a federal environmental permit, including Section 404 of the Federal Clean Water Act, and including permits issued by the Federal Energy Regulatory Commission;

   (c) land disturbing activities associated with emergency maintenance or construction of electric, gas, or communications facilities, when necessary to restore service or when the Governor declares the area to have sustained a disaster and the actions are undertaken to protect the public from a threat to health or safety;

   (d) land disturbing activities associated with routine maintenance and/or repair of electric, gas, or communications lines;

   (e) land disturbing activities associated with the placement of poles for overhead distribution or transmission of electric energy or of communications services;

   (f) land disturbing activities associated with placement of underground lines for distribution or transmission of electric energy or of gas or communications services; or

   (g) land disturbing activities conducted by a person filing environmental reports, assessments or impact statements with the United States Department of Agriculture, Rural Electrification Administration in regard to a project.

Any person, other than a person identified in R.72-302A(6)(g) who undertakes land disturbing activities described in R.72-302A(6)(d,e,f) must file with the South Carolina Public Service Commission, in a Policy and Procedures Manual, the procedures it will follow in conducting such activities. Any person, other than a person identified in R.72-302A(6)(g), who conducts land disturbing activities described in R.72-302A(6)(b), must address the procedures it will follow in conducting the activities in the Policy and Procedures Manual filed with the South Carolina Public Service Commission to the extent that the land disturbing activities are not specifically addressed in the federal permit or permitting process. If any person, other than a person identified in R.72-302A(6)(g), does not have a Policy and Procedures Manual on file with the Public Service Commission, such manual must be filed with the Public Service Commission not later than six months after the effective date of Chapter 14, Title 48 of the 1976 Code of Laws, South Carolina.

Any person who undertakes land disturbing activities described in R.72-302A(6)(g) of this subsection shall give the same written notice to the commission as given to agencies whose permits are required for project approval by the regulations of the United States Department of Agriculture, Rural Electrification Administration.

(7) Activities relating to the routine maintenance and/or repair or rebuilding of the tracks, rights-of-way, bridges, communication facilities and other related structures and facilities of a railroad company.
(8) Activities undertaken on state-owned or managed lands that are otherwise regulated by the provisions of Chapter 18 of this title, the Erosion and Sediment Reduction Act.
(9) Activities undertaken by local governments or special purpose or public service districts relating to the repair and maintenance of existing facilities and structures.

B. Implementing agencies with responsibility for plan review and approval may grant waivers from the stormwater management requirements of these regulations for individual land disturbing activities provided that a written request is submitted by the applicant containing descriptions, drawings, and any other information that is necessary to evaluate the proposed land disturbing activity. A separate written waiver request shall be required if there are subsequent additions, extensions, or modifications which would alter the approved stormwater runoff characteristics to a land disturbing activity receiving a waiver.

(1) A project may be eligible for a waiver of stormwater management for both quantitative and qualitative control if the applicant can demonstrate that the proposed project will return the disturbed area to a pre-development runoff condition and the pre-development land use is unchanged at the conclusion of the project.
(2) A project may be eligible for a waiver or variance of stormwater management for water quantity control if the applicant can demonstrate that:
(a) The proposed project will have no significant adverse impact on the receiving natural waterway or downstream properties; or
(b) The imposition of peak control requirements for rates of stormwater runoff would aggravate downstream flooding.
(3) The implementing agency will conduct its review of the request for waiver within 10 working days. Failure of the implementing agency to act by end of the tenth working day will result in the automatic approval of the waiver.

C. The implementing agency with responsibility for plan review and approval may grant a written variance from any requirement of these regulations if there are exceptional circumstances applicable to the site such that strict adherence to the provisions of these regulations will result in unnecessary hardship and not fulfill the intent of these regulations. A written request for variance shall be provided to the plan approval agency and shall state the specific variances sought and the reasons with supporting data for their granting. The plan approval agency shall not grant a variance unless and until sufficient specific reasons justifying the variance are provided by the applicant. The implementing agency will conduct its review of the request for variance within 10 working days. Failure of the implementing agency to act by the end of the tenth working day will result in the automatic approval of the variance.

72-303. Commission Responsibilities.

A. The Commission is responsible for the implementation and supervision of the stormwater management and sediment control program which is established by Chapter 14, Title 48, S.C. Code.

B. The schedule for implementing the Stormwater Management and Sediment Control Act (48-14-10, et. seq.) has been established by the Commission as follows:

(1) These regulations are effective and applicable to all land disturbing activities of five acres and greater on October 1, 1992 regardless of program status at the local level. Local governments with existing local programs as of this date shall require that persons responsible for land disturbing activities on sites with disturbed areas of five acres or greater comply with these regulations. Local governments may request assistance from the Commission to implement these regulations on these sites. If a local government does not have a local program on October 1,

1992, the Commission and others shall function as the implementing agencies.

(2) FY 1992-1993:
Greenville, Charleston, Richland, Spartanburg, Lexington, Anderson, Horry, York, Berkeley, Aiken, Florence, Sumter, Pickens, Beaufort, Orangeburg

(3) FY 1993-1994:
Dorchester, Darlington, Greenwood, Laurens, Oconee, Lancaster, Georgetown, Cherokee, Kershaw, Chesterfield, Williamsburg, Colleton, Marion, Newberry, Chester, Union

(4) FY 1994-1995:
Marlboro, Dillon, Clarendon, Abbeville, Fairfield, Barnwell, Lee, Edgefield, Hampton, Bamberg, Saluda, Jasper, Calhoun, Allendale, McCormick

C. This schedule may be modified by the Commission due to requests from local governments to develop and implement a program prior to the scheduled implementation date. The Commission may also modify this schedule due to personnel or financial resource limitations.

D. Local governments which adopted stormwater management and/or sediment control programs prior to the effective date of these regulations may continue to administer the existing program until the scheduled implementation date for the local government.

72-304. Criteria for Delegation/Revocation of Program Elements.

A. The Commission may delegate the following components of stormwater management and sediment control programs to local governments or conservation districts as follows:

(1) Stormwater management and sediment control plan review and approval/disapproval.
(2) Inspections during construction and maintenance inspections.
(3) Enforcement.
(4) Education and training.

B. The Commission shall grant delegation of one or more program elements to any local government or conservation district seeking delegation that is found capable and meets all of the criteria set forth herein for delegation to comply with Chapter 48, Title 14, 1976 Code and these regulations.

C. Request for delegation of more than one program element may be accomplished by the submission of one request for all the elements requested. A rejection by the Commission of one element will not jeopardize delegation of other requested program elements.

D. To be considered capable of providing compliance with Chapter 14 and these regulations, applications for delegation of program elements shall contain the following requisite items:

(1) Requests for delegation of stormwater management and sediment control plan review and approval responsibility shall include the following information:
(a) Copy of enacted ordinance or program information detailing the plan approval process,
(b) Plan review check lists and plan submission requirements,
(c) Stormwater management and sediment control criteria, including waiver and variance procedures, that meet minimum standards established by these regulations,
(d) Description of personnel allocations including qualifications and experience of personnel, description of computer hardware and software resources and expected time frames for plan review which meet the requirements of R.72-305B(2) and R.72-305M, and
(e) Name of the Certified Plan Reviewer.

(2) Requests for delegation of inspection during construction and of maintenance inspection responsibility shall include the following information:
(a) Inspection and referral procedures,
(b) Time frames for inspection of active land disturbing activities,
(c) Time frames for inspection of completed stormwater management structures,
(d) Inspection forms,
(e) Description of adequate personnel allocations including qualifications and experience of

personnel,

(f) Name of Certified Construction Inspector, and

(g) Procedures and time frames for processing complaints.

(3) Request for delegation of enforcement responsibility shall include the following information:

(a) Procedure for processing violations.

(b) Description of personnel allocations involved in enforcement actions including qualifications and experience of personnel.

(c) Description of citizen complaint process.

(d) Description of applicant appeal process.

(4) Requests for delegation of education and training responsibility shall include the following information:

(a) Types of educational and training activities to be accomplished,

(b) Frequency of activities,

(c) Names and backgrounds of those individuals conducting the training, and

(d) Procedures and timetables to notify the Commission of educational programs.

E. Requests for delegation of program elements must be submitted by local governments or conservation districts within six months of the effective date of these regulations, and by January first of subsequent years if delegation is desired at a future date. The Commission shall approve, approve with modification, or deny such a request on or before April first of the year for which delegation is sought.

F. The S.C. Coastal Council shall assist the Commission in reviewing all requests for delegation of program elements from local governments in the counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Jasper and Horry to ensure that the delegated program elements are consistent with the Coastal Zone Management Program.

The S.C. Coastal Council, in coordination with the Commission, will serve as the implementing agency for these regulations in the jurisdictions of the local governments which do not seek delegation of program elements in the counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry and Jasper.

G. If the Commission denies a request for delegation, the local government or conservation district may appeal the decision of the Commission by requesting an administrative hearing within 30 days after receipt of written notification as described in R.72-313.

H. Delegation of authority for one or more program elements may be granted for a maximum time frame of three years. After three years a new application to the Commission must be made. Over the time frame for which delegation has been granted, the Commission will evaluate delegation implementation, coordinate review findings with the delegated authority, and determine if the new delegation should be granted.

I. A delegated authority may sub-delegate program elements, with Commission concurrence, to a conservation district, regional council of government or other responsible entity or agency.

J. The Commission shall maintain, and make available upon request, a listing of the current status of delegation for all jurisdictions within the State.

K. Any local government that has adopted a stormwater management and/or sediment control program prior to the effective date of these regulations may request approval of any, or all, components of its existing program within six months of the effective date of these regulations. The Commission shall give priority to the approval, approval with modification or disapproval of these requests. The local government shall continue to administer the existing program during the review process by the Commission. Efficiency and effectiveness of the existing program shall be considered in the review process.

(1) The Commission shall approve a delegation request upon determining that the implementation of the existing program by the local government equal or exceed the requirements, criteria, standards and specifications of these regulations.

(2) If the request for delegation of program components are disapproved, the local government may

appeal the decision of the Commission by requesting an administrative hearing within 30 days after receiving written notification of the disapproval as described in R.72-313.

L. If the Commission determines that a delegated program falls below acceptable standards established by these regulations, delegation may be suspended. During a period of suspension, the Commission shall be responsible for implementation of the program element. The Commission shall collect fees based on R.72-306 for use when the delegation is suspended.

The following actions may be cause for suspension if they represent a continuing pattern of action or in-action:

(1) Failure of implementing agency with the responsibility for enforcement to issue a violation in the event of off-site sediment or stormwater damage resulting from non-compliance with the approved plan.
(2) Failure of the implementing agency to assess a fine when a violation has not been corrected within the specified time frame.
(3) Failure of the implementing agency to stop work when a violation has resulted in off-site damages.
(4) Failure of the implementing agency to force compliance with an approved plan.
(5) Failure of the delegated program to comply with the provisions of its application for delegation.

M. Upon suspension of the delegation, the implementing agency has the right to file an appeal within 30 days of the notification of the suspension following procedures listed in R.72-313. The Commission shall administer the program during the appeal process.

72-305. Permit Application and Approval Process.

A. After the effective date of these regulations, unless a particular activity is exempted by these regulations, a person may not undertake a land disturbing activity without an approved stormwater management and sediment control plan from the appropriate plan approval agency that is consistent with the following items:

(1) Chapter 14, Title 48, South Carolina Code, relating to erosion and sediment control and stormwater management, and
(2) These regulations, or duly adopted county or municipal ordinances or programs that are adopted as a part of the delegation process and set minimum standards equivalent to these regulations.

B. Specific requirements of the permit application and approval process are generally based on the extent of the land disturbing activity. The permit application and approval procedure is as follows:

(1) For land disturbing activities involving two (2) acres or less of actual land disturbance which are not part of a larger common plan of development or sale, the person responsible for the land disturbing activity shall submit a simplified stormwater management and sediment control plan meeting the requirements of R.72-307H. This plan does not require approval by the implementing agency and does not require preparation or certification by the designers specified in R.72-305H and R.72-305I.
(2) For land disturbing activities involving more than two (2) acres and less than five (5) acres of actual land disturbance which are not part of a larger common plan of development or sale, a simplified permitting and approval process will be used meeting the requirements of R.72-307I. These activities are required to utilize Best Management Practices (BMP's) to control erosion and sediment and to utilize appropriate measures to control the quantity of stormwater runoff. Plans and specifications for these activities will be prepared by the designers cited in R.72-305H and R.72-305I. The implementing agency will review these submissions within a ten working day period. If action is not taken by the end of the review period, the plan will be considered approved.
(3) For land disturbing activities disturbing five (5) acres or greater, the requirements of R.72-305 and R.72-307 will apply. However, the use of measures other than ponds to achieve water quality

improvement are recommended on sites containing less than ten (10) disturbed acres. Plans and specifications for these activities will be prepared by the designers specified in R.72-305H or R.72-305I.

(4) These requirements may be modified on a case-by-case basis to address specific stormwater quantity or quality problems or to meet S.C. Coastal Council or other regulatory requirements. Requests for waivers or variances from these requirements will be made in accordance with the provisions of R.72-302.

(5) When the land disturbing activity consists of the construction of a pond, lake or reservoir which is singly built and not part of a permitted land disturbing activity, the following procedures will apply:

(a) A stormwater management and sediment control plan will not be required if the pond, lake or reservoir is permitted under the S.C. Dams and Reservoirs Safety Act or has received a Certificate of Exemption from the S.C. Dams and Reservoirs Safety Act. Best management practices should be used to minimize the impact of erosion and sediment.

(b) A stormwater management and sediment control plan will be required for the construction of all ponds, lakes or reservoirs not meeting the conditions in R.72-305B(5)(a) that otherwise meet the size requirements for stormwater management and sediment control plan approval.

C. A stormwater management and sediment control plan or an application for a waiver shall be submitted to the appropriate plan approval agency by the person responsible for the land disturbing activity for review and approval for a land disturbing activity, unless otherwise exempted. The stormwater management and sediment control plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire land disturbing activity. The appropriate plan approval agency shall review the plan to determine compliance with the requirements of these regulations prior to approval. The approved stormwater management and sediment control plan shall serve as the basis for water quantity and water quality control on all subsequent construction.

D. All stormwater management and sediment control plans submitted for approval shall contain certification by the person responsible for the land disturbing activity that the land disturbing activity will be accomplished pursuant to the approved plan and that responsible personnel will be assigned to the project.

E. All stormwater management and sediment control plans shall contain certification by the person responsible for the land disturbing activity of the right of the Commission or implementing agency to conduct on-site inspections.

F. The stormwater and sediment management plan shall not be considered approved without the inclusion of an approval stamp with a signature and date on the plans by the appropriate plan approval agency. The stamp of approval on the plans is solely an acknowledgement of satisfactory compliance with the requirements of these regulations. The approval stamp does not constitute a representation or warranty to the applicant or any other person concerning the safety, appropriateness of effectiveness of any provision, or omission from the stormwater and sediment plan.

G. When the local conservation district is not the plan approval agency, the conservation district may request to review and comment on stormwater management and sediment control plans. Failure of the conservation district to provide comments by the date specified by the local implementing agency will not delay the approval of the stormwater management and sediment control plans by the implementing agency.

H. All stormwater management and sediment control plans submitted to the appropriate plan approval agency for approval shall be certified by the designer. The following disciplines may certify and stamp/seal plans as allowed by their respective licensing act and regulations:

(1) Registered professional engineers as described in Title 40, Chapter 22.

(2) Registered landscape architects as described in Title 40, Chapter 28, Section 10, item (b).

(3) Tier B land surveyors as described in Title 40, Chapter 22.

I. Pursuant to Title 40, Chapter 22, Section 460, stormwater management and sediment control plans may be prepared by employees of the federal government and submitted by the person responsible for the land disturbing activity to the appropriate plan approval agency for approval.

J. These regulations do not prohibit other disciplines or Certified Professionals, including, but not limited to, Certified Professional Erosion and Sediment Control Specialists, which have appropriate background and experience from taking active roles in the preparation of the plan and design process. All plans and specifications submitted to the appropriate plan approval agency for approval shall be stamped/sealed by those listed in R.72-305H or prepared by employees of the federal government under R.72-305I.

K. Approved plans remain valid for 5 years from the date of an approval. Extensions or renewals of the plan approvals will be granted by the plan approval agency upon written request by the person responsible for the land disturbing activity.

L. Approvals of land disturbing activities which were approved prior to the effective date of these regulations shall remain in effect for the original term of the approval. For land disturbing activities which were not initiated during the original term of approval, the person responsible for the land disturbing activity shall resubmit the stormwater management and sediment control plan to the appropriate plan approval agency for review and approval subject to the requirements of these regulations.

M. Upon receipt of a completed application for sediment and stormwater management, the appropriate plan approval agency shall accomplish its review and have either the approval or review comments transmitted to the applicant within 20 working days. If notice is not given to the applicant or if action is not taken by the end of the 20 working day period, the applicants plan will be considered approved.

N. One year after the effective date of Chapter 14, Title 48 of the Code of Laws of South Carolina, a federal agency or facility may not undertake a land disturbing activity unless the agency has submitted a stormwater management and sediment control plan for the specific activity to the Commission and the plan has been approved.

In lieu of submitting individual plans for approval, the federal agency or facility may submit an application for a general permit to the Commission for approval.

O. A local government or special purpose or public service district may request a general permit for its regulated activities from the Commission. If a local government's or special purpose or public service district's request is approved, individual stormwater management and sediment control plans for regulated land disturbing activities will not be required.

72-306. Fees.

A. The fees associated with the plan review and approval process inspection and enforcement shall be set by the implementing agency. If permit fees are established, they shall be established in accordance with the following items:

(1) Delegation of program elements will depend, to a large extent, on funding and personnel commitments. If the delegated jurisdiction has a source of funding that is provided through local revenues, then the implementation of the delegated component will not necessitate the imposition of a permit fee to cover the cost of the delegated program component.

(2) In the event that one component of an overall stormwater management and sediment control program is not funded through the use of general or special funds, a non-refundable permit fee may be collected at the time that the stormwater management and sediment control plan or application for waiver or variance is submitted or approved. The permit fee will provide for the unfunded costs of plan review, administration and management of the permitting office, construction review, maintenance inspection, and education and training. The plan review or permit approval agency shall be responsible for the collection of the permit fee. Unless all program elements in a county or municipality have been delegated to a single agency, the funds

collected not supporting the plan review function shall be distributed to the appropriate agencies.

(3) The number of needed personnel and the direct and indirect expenses associated with those personnel shall be developed by the agencies requesting delegation in a specific jurisdiction. Those expenses will then form the basis for determining unit plan approval costs by the local government.

B. Where the Commission is the implementing agency, the Commission may assess a fee not to exceed $100.00 per disturbed acre up to a maximum of $2000.00. No fee will be charged for land disturbing activities which disturb two acres or less. The Commission may also charge a fee not to exceed $100.00 to review an application for a waiver or variance from the requirements of these regulations. No fee will be charged for extensions or renewal of plan approval unless there are significant changes to the plans.

C. A maintenance fee may be required on approvals granted for stormwater management structures that will be maintained by a local government.

72-307. Specific Design Criteria, Minimum Standards and Specifications.

A. General submission requirements for all projects requiring stormwater management and sediment control plan approval will include the following information as applicable:

(1) A standard application form,

(2) A vicinity map indicating north arrow, scale, and other information necessary to locate the property or tax parcel,

(3) A plan at an appropriate scale accompanied by a design report and indicating at least:

(a) The location of the land disturbing activity shown on a USGS 7.5 minute topographic map or copy.

(b) The existing and proposed topography, overlayed on a current plat showing existing and proposed contours as required by the implementing agency. The plat and topographic map should conform to provisions of Article 4, Regulations 400-490.

(c) The proposed grading and earth disturbance including:

1. Surface area involved; and
2. Limits of grading including limitation of mass clearing and grading whenever possible.

(d) Stormwater management and stormwater drainage computations, including:

1. Pre- and post-development velocities, peak rates of discharge, and inflow and outflow hydrographs of stormwater runoff at all existing and proposed points of discharge from the site,
2. Site conditions around points of all surface water discharge including vegetation and method of flow conveyance from the land disturbing activity, and
3. Design details for structural controls.

(e) Erosion and sediment control provisions, including:

1. Provisions to preserve top soil and limit disturbance;
2. Details of site grading; and
3. Design details for structural controls which includes diversions and swales.

(4) Federal Emergency Management Agency flood maps and federal and State wetland maps, where appropriate.

(5) The appropriate plan approval agency shall require that plans and design reports be sealed by a qualified design professional that the plans have been designed in accordance with approved sediment and stormwater ordinances and programs, regulations, standards and criteria.

(6) Additional information necessary for a complete project review may be required by the appropriate plan approval agency as deemed appropriate. This additional information may include items such as public sewers, water lines, septic fields, wells, etc.

B. Specific requirements for the erosion and sediment control portion of the stormwater management and sediment control plan approval process include, but are not limited to, the following items. The appropriate plan approval agency may modify the following items for a specific project or type of

project.

(1) All plans shall include details and descriptions of temporary and permanent erosion and sediment control measures and other protective measures shown on the stormwater and sediment management plan. Procedures in a stormwater and sediment management plan shall provide that all sediment and erosion controls are inspected at least once every seven calendar day and after any storm event of greater than 0.5 inches of precipitation during any 24-hour period.

(2) Specifications for a sequence of construction operations shall be contained on all plans describing the relationship between the implementation and maintenance of sediment controls, including permanent and temporary stabilization and the various stages or phases of earth disturbance and construction. The specifications for the sequence of construction shall, at a minimum, include the following activities:

(a) Clearing and grubbing for those areas necessary for installation of perimeter controls;
(b) Installation of sediment basins and traps;
(c) Construction or perimeter controls;
(d) Remaining clearing and grubbing;
(e) Road grading;
(f) Grading for the remainder of the site;
(g) Utility installation and whether stormdrains will be used or blocked until after completion of construction;
(h) Final grading, landscaping, or stabilization; and
(i) Removal of sediment controls.

Changes to the sequence of construction operations may be modified by the person conducting the land disturbing activity or their representative and do not constitute a violation unless measures to control stormwater runoff and sediment are not utilized.

(3) The plans shall contain a description of the predominant soil types on the site, as described by the appropriate soil survey information available through the Commission or the local Conservation District.

(4) When work in a live waterway is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction.

(5) Vehicle tracking of sediments from land disturbing activities onto paved public roads carrying significant amounts of traffic (ADT of 25 vehicles/day or greater) shall be minimized.

C. Specific requirements for the permanent stormwater management portion of the stormwater management and sediment control plan approval process include, but are not limited to, the following items. The appropriate plan approval agency may modify the following items for a specific project or type or project.

(1) It is the overall goal of the Commission to address stormwater management on a watershed basis to provide a cost effective water quantity and water quality solution to the specific watershed problems. These regulations will provide general design requirements that must be adhered to in the absence of Designated Watershed specific criteria.

(2) All hydrologic computations shall be accomplished using a volume based hydrograph method acceptable to the Commission. The storm duration for computational purposes for this method shall be the 24-hour rainfall event, SCS distribution with a 0.1 hour burst duration time increment. The rational and/or modified rational methods are acceptable for sizing individual culverts or stormdrains that are not part of a pipe network or system and do not have a contributing drainage area greater than 20 AC. The storm duration for computational purposes for this method shall be equal to the time of concentration of the contributing drainage area or a minimum of 0.1 hours, whichever is less.

(3) Stormwater management requirements for a specific project shall be based on the entire area to be developed, or if phased, the initial submittal shall control that area proposed in the initial phase and establish a procedure and obligation for total site control.

(4) Water quantity control is an integral component of overall stormwater management. The following design criteria for flow control is established for water quantity control purposes, unless

a waiver is granted based on a case-by-case basis:

(a) Post-development peak discharge rates shall not exceed pre-development discharge rates for the 2- and 10- year frequency 24-hour duration storm event. Implementing agencies may utilize a less frequent storm event (e.g. 25-year, 24-hour) to address existing or future stormwater quantity or quality problems.

(b) Discharge velocities shall be reduced to provide a nonerosive velocity flow from a structure, channel, or other control measure or the velocity of the 10-year, 24-hour storm runoff in the receiving waterway prior to the land disturbing activity, whichever is greater.

(c) Watersheds, other than Designated Watersheds, that have well documented water quantity problems may have more stringent, or modified, design criteria determined by the local government that is responsive to the specific needs of that watershed.

(5) Water quality control is also an integral component of stormwater management. The following design criteria is established for water quality protection unless a waiver or variance is granted on a case-by-case basis.

(a) When ponds are used for water quality protection, the ponds shall be designed as both quantity and quality control structures. Sediment storage volume shall be calculated considering the clean out and maintenance schedules specified by the designer during the land disturbing activity. Sediment storage volumes may be predicted by the Universal Soil Loss Equation or methods acceptable to the Commission.

(b) Stormwater runoff that drains to a single outlet from land disturbing activities which disturb ten acres or more shall be controlled during the land disturbing activity by a sediment basin where sufficient space and other factors allow these controls to be used until the final inspection. The sediment basin shall be designed and constructed to accommodate the anticipated sediment loading from the land-disturbing activity and meet a removal efficiency of 80 percent suspended solids or 0.5 ML/L peak settleable solids concentration, whichever is less. The outfall device or system design shall take into account the total drainage area flowing through the disturbed area to be served by the basin.

(c) Other practices may be acceptable to the appropriate plan approval agency if they achieve an equivalent removal efficiency of 80 percent for suspended solids or 0.5 ML/L peak settleable solids concentration, which ever is less. The efficiency shall be calculated for disturbed conditions for the 10-year 24-hour design event.

(d) Permanent water quality ponds having a permanent pool shall be designed to store and release the first ½ inch of runoff from the site over a 24 hour period. The storage volume shall be designed to accommodate, at least, ½ inch of runoff from the entire site.

(e) Permanent water quality ponds, not having a permanent pool, shall be designed to release the first inch of runoff from the site over a 24-hour period.

(f) Permanent infiltration practices, when used, shall be designed to accept, at a minimum, the first inch of runoff from all impervious areas.

(g) For activities in the eight coastal counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Jasper and Horry, additional water quality requirements may be imposed to comply with the S.C. Coastal Council Stormwater Management Guidelines. If conflicting requirements exist for activities in the eight coastal counties, the S.C. Coastal Council guidelines will apply.

(6) Where ponds are the proposed method of control, the person responsible for the land disturbing activity shall submit to the approving agency, when required, an analysis of the impacts of stormwater flows downstream in the watershed for the 10- and 100-year frequency storm event. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed land disturbing activity, with and without the pond. The results of the analysis will determine the need to modify the pond design or to eliminate the pond requirement. Lacking a clearly defined downstream point of constriction, the downstream impacts shall be established, with the concurrence of the implementing agency.

(7) Where existing wetlands are intended as a component of an overall stormwater management system, the approved stormwater management and sediment control plan shall not be implemented until all necessary federal and state permits have been obtained.

(8) Designs shall be in accordance with standards developed or approved by the Commission.
(9) Ease of maintenance must be considered as a site design component. Access to the stormwater management structure must be provided.
(10) A clear statement of defined maintenance responsibility shall be established during the plan review and approval process.
(11) Infiltration practices have certain limitations on their use on certain sites. These limitations include the following items:
  (a) Areas draining to these practices must be stabilized and vegetative filters established prior to runoff entering the system. Infiltration practices shall not be used if a suspended solids filter system does not accompany the practice. If vegetation is the intended filter, there shall be, at least a 20 foot length of vegetative filter prior to stormwater runoff entering the infiltration practice;
  (b) The bottom of the infiltration practice shall be at least 0.5 feet above the seasonal high water table, whether perched or regional, determined by direct piezometer measurements which can be demonstrated to be representative of the maximum height of the water table on an annual basis during years of normal precipitation, or by the depth in the soil at which mottling first occurs;
  (c) The infiltration practice shall be designed to completely drain of water within 72 hours;
  (d) Soils must have adequate permeability to allow water to infiltrate. Infiltration practices are limited to soils having an infiltration rate of least 0.30 inches per hour. Initial consideration will be based on a review of the appropriate soil survey, and the survey may serve as a basis for rejection. On-site soil borings and textural classifications must be accomplished to verify the actual site and seasonal high water table conditions when infiltration is to be utilized;
  (e) Infiltration practices greater than three feet deep shall be located at least 10 feet from basement walls;
  (f) Infiltration practices designed to handle runoff from impervious parking areas shall be a minimum of 150 feet from any public or private water supply well;
  (g) The design of an infiltration practice shall provide an overflow system with measures to provide a non-erosive velocity of flow along its length and at the outfall;
  (h) The slope of the bottom of the infiltration practice shall not exceed five percent. Also, the practice shall not be installed in fill material as piping along the fill/natural ground interface may cause slope failure;
  (i) An infiltration practice shall not be installed on or atop a slope whose natural angle of incline exceeds 20 percent.
  (j) Clean outs will be provided at a minimum, every 100 feet along the infiltration practice to allow for access and maintenance.
(12) A regional approach to stormwater management is an acceptable alternative to site specific requirements and is encouraged.

D. All stormwater management and sediment control practices shall be designed, constructed and maintained with consideration for the proper control of mosquitoes and other vectors. Practices may include, but are not limited to:

(1) The bottom of retention and detention ponds should be graded and have a slope not less than 0.5 percent.
(2) There should be no depressions in a normally dry detention facility where water might pocket when the water level is receding.
(3) Normally dry detention systems and swales should be designed to drain within three (3) days.
(4) An aquatic weed control program should be utilized in permanently wet structures to prevent an overgrowth of vegetation in the pond. Manual harvesting is preferred.
(5) Fish may be stocked in permanently wet retention and detention ponds.
(6) Normally dry swales and detention pond bottoms should be constructed with a gravel blanket or other measure to minimize the creation of tire ruts during maintenance activities.

E. A stormwater management and sediment control plan shall be filed for a residential development and the buildings constructed within, regardless of the phasing of construction.

(1) In applying the stormwater management and sediment control criteria, in R.72-307, individual lots in a residential subdivision development shall not be considered to be separate land disturbing activities and shall not require individual permits. Instead, the residential subdivision development, as a whole, shall be considered to be a single land disturbing activity. Hydrologic parameters that reflect the ultimate subdivision development shall be used in all engineering calculations.

(2) If individual lots or sections in a residential subdivision are being developed by different property owners, all land-disturbing activities related to the residential subdivision shall be covered by the approved stormwater management and sediment control plan for the residential subdivision. Individual lot owners or developers may sign a certificate of compliance that all activities on that lot will be carried out in accordance with the approved stormwater management and sediment control plan for the residential subdivision. Failure to provide this certification will result in owners or developers of individual lots developing a stormwater management and sediment control plan meeting the requirements of R.72-307.

(3) Residential subdivisions which were approved prior to the effective date of these regulations are exempt from these requirements. Development of new phases of existing subdivisions which were not previously approved shall comply with the provisions of these regulations.

F. Risk analysis may be used to justify a design storm event other than prescribed or to show that rate and volume control is detrimental to the hydrologic response of the basin and therefore, should not be required for a particular site.

(1) A complete watershed hydrologic/hydraulic analysis must be done using a complete model/procedure acceptable to the implementing agency. The level of detail of data required is as follows:

(a) Watershed designation on the 7.5 minute topo map exploded to a minimum of 1" = 400'.

(b) Inclusion of design and performance data to evaluate the effects of any structures which effect discharge. Examples may be ponds or lakes, road crossings acting as attenuation structures and there may be others which must be taken into account.

(c) Land use data shall be taken from the most recent aerial photograph and field checked and updated.

(d) The water surface profile shall be plotted for the conditions of pre- and post-development for the 10-, and 100-year 24-hour storm.

(e) Elevations of any structure potentially damaged by resultant flow shall also be shown.

(2) Based on the results of this type of evaluation, the certified plan reviewer representing the implementing agency shall review and evaluate the proposed regulation waiver or change.

G. The general permit application for use by federal, local governments, or special purpose or public service districts shall contain, as a minimum, standard plans and specifications for stormwater management and erosion and sediment control; methods used to calculate stormwater runoff, soil loss and control method performance; staff assigned to monitor land disturbing activities and procedures to handle complaints for off-site property owners and jurisdictions.

This general permit will be valid for a period of three years and will be subject to the same review criteria by the Commission as that of the delegated program elements.

The use of the general permit classification does not relinquish a land disturbing activity from the requirements of these Regulations. Rather, the general permit precludes that activity from the necessity of a specific plan review for each individual project.

Approval of a general permit does not relieve any agency from the conditions that are part of the general permit approval regarding the implementation of control practices as required by the general permit. Failure to implement control practices pursuant to conditions included in the general permit may result in the revocation of the general permit and the requirement of the submission of individual plans for each activity.

H. The stormwater management and sediment control plan required for land disturbing activities of two (2) acres or less which are not part of a larger common plan of development or sale shall contain the

following information, as applicable:

(1) An anticipated starting and completion date of the various stages of land disturbing activities and the expected date the final stabilization will be completed;
(2) A narrative description of the stormwater management and sediment control plan to be used during land disturbing activities;
(3) General description of topographic and soil conditions of the tract from the local soil and water conservation district;
(4) A general description of adjacent property and a description of existing structures, buildings, and other fixed improvements located on surrounding properties;
(5) A sketched plan (engineer's, Tier B surveyor's or landscape architect's seal not required) to accompany the narrative which shall contain:
   (a) A site location drawing of the proposed project, indicating the location of the proposed project in relation to roadways, jurisdictional boundaries, streams and rivers;
   (b) The boundary lines of the site on which the work is to be performed;
   (c) A topographic map of the site if required by the implementing agency;
   (d) The location of temporary and permanent vegetative and structural stormwater management and sediment control measures.
(6) Stormwater management and sediment control plans shall contain certification by the person responsible for the land disturbing activity that the land disturbing activity will be accomplished pursuant to the plan.
(7) All stormwater management and sediment control plans shall contain certification by the person responsible for the land disturbing activity of the right of the Commission or implementing agency to conduct on-site inspections.

The requirements contained above may be indicated on one plan sheet.

I. The stormwater management and sediment control plan for land disturbing activities of greater than two (2) acres but less than five (5) acres which are not part of a larger common plan of development or sale shall contain the following information, as applicable:

(1) An abbreviated application form;
(2) A vicinity map sufficient to locate the site and to show the relationship of the site to its general surroundings at a scale of not smaller than one (1) inch to one (1) mile.
(3) The site drawn to a scale of not smaller than one (1) inch to 200 feet, showing:
   (a) The boundary lines of the site on which the work is to be performed, including the approximate acreage of the site;
   (b) Existing contours and proposed contours as required by the implementing agency;
   (c) Proposed physical improvements on the site, including present development and future utilization if future development is planned;
   (d) A plan for temporary and permanent vegetative and structural erosion and sediment control measures which specify the erosion and sediment control measures to be used during all phases of the land disturbing activity and a description of their proposed operation;
   (e) Provisions for stormwater runoff control during the land disturbing activity and during the life of the facility, including a time schedule and sequence of operations indicating the anticipated starting and completion dates of each phase and meeting the following requirements:
      1. Post-development peak discharge rates shall not exceed pre-development discharge rates for the 2- and 10- year frequency 24-hour duration storm event. Implementing agencies may utilize a less frequent storm event (e.g. 25-year, 24-hour) to address existing or future stormwater quantity or quality problems.
      2. Discharge velocities shall be reduced to provide a nonerosive velocity flow from a structure, channel, or other control measure or the velocity of the 10-year, 24-hour storm runoff in the receiving waterway prior to the land disturbing activity, whichever is greater.
   (f) A complete and adequate grading plan for borrow pits and material processing facilities where applicable, including restoration and revegetation measures;

(g) A general description of the predominant soil types on the site;
(h) A description of the maintenance program for stormwater management and sediment control facilities including inspection programs.

(4) All stormwater management and sediment control plans submitted for approval shall contain certification by the person responsible for the land disturbing activity that the land disturbing activity will be accomplished pursuant to the approved plan.

(5) All stormwater management and sediment control plans shall contain certification by the person responsible for the land disturbing activity of the right of the Commission or implementing agency to conduct on-site inspections.

(6) All stormwater management and sediment control plans submitted to the appropriate plan approval agency for approval shall be certified by the designer. The following disciplines may certify and stamp/seal plans as allowed by their respective licensing act and regulations:
(a) Registered professional engineers as described in Title 40, Chapter 22.
(b) Registered landscape architects as describe in Title 40, Chapter 28, Section 10, item (b).
(c) Tier B land surveyors as described in Title 40, Chapter 22.

(7) Pursuant to Title 40, Chapter 22, Section 460, stormwater management and sediment control plans may be prepared by employees of the federal government and submitted by the person responsible for the land disturbing activity to the appropriate plan approval agency for approval.

72-308. Maintenance Requirements and Off-Site Damage Correction.

A. The Commission will provide technical assistance to local governments who choose to assume the maintenance responsibility for stormwater management structures on, at least, residential lands.

B. The person responsible for maintenance shall perform or cause to be performed preventive maintenance of all completed stormwater management practices to ensure proper functioning. The responsible inspection agency shall ensure preventive maintenance through inspection of all stormwater management practices.

C. Inspection reports shall be maintained by the responsible inspection agency on all detention and retention structures and shall include the following items (as applicable):

(1) The date of inspection;
(2) The name of the inspector;
(3) The condition of (if applicable):
(a) Vegetation,
(b) Fences,
(c) Spillways,
(d) Embankments,
(e) Reservoir area,
(f) Outlet channels,
(g) Underground drainage,
(h) Sediment load, or
(i) Other items which could effect the proper function of the structure.
(4) Description of needed maintenance.

D. Responsible inspection agencies shall provide procedures to ensure that deficiencies indicated by inspections are rectified. The procedures shall include the following:

(1) Notification to the person responsible for maintenance of deficiencies including a time frame for repairs;
(2) Subsequent inspection to ensure completion of repairs; and
(3) Effective enforcement procedures or procedures to refer projects to the Commission if repairs are not undertaken or are not done properly.

E. The following criteria shall be used by the appropriate implementing agency in evaluating and for correcting off-site damages resulting from the land disturbing activity:

(1) Determine the extent of damage by sediment resulting from non-compliance with the approved stormwater management and sediment control plan,
(2) Determine the classification of the impaired waterbody, if any,
(3) Determine the impact and severity of the damage resulting from non-compliance with the approved stormwater management and sediment control plan,
(4) Develop an agreement with landowners for cleanup and corrections, including a schedule of implementation.
(5) Evaluate the alternatives for correction of the damage and prevention of future damage, and
(6) Failure to implement the agreement in the required schedule will constitute a violation of these regulations.

72-309. Criteria For Designated Watersheds.

The concept of designated watersheds is intended, not only to prevent existing water quantity and water quality problems from getting worse, but also to reduce existing flooding problems and to improve existing water quality or meet State Water Quality Standards through a reduction of the impacts of NPS pollution in selected watersheds. Further, the designation of watersheds under this section may also be used to protect watersheds which do not currently have significant water quality or quantity problems, but which require protection in order to avoid or mitigate the occurrence of future problems which might impair current or protected multiple water uses or important water resources within the watershed. Criteria is established for designated watersheds and these criteria will depend on whether the specific problems of the watershed are water quantity or water quality oriented. Water quantity and water quality concerns will be considered in all designated watersheds, but the overall emphasis for each designated watershed will depend on its existing and future water quality and quantity issues as well as consideration of the multiple offstream and instream water uses within the watershed.

A. To initiate consideration of a watershed for Designated Watershed status, a watershed shall be recommended by a local government or combinations of local governments through the passage of a local ordinance to the Commission. Upon recommendation to the Commission, the Commission shall publish the request in the State Register and contact all involved agencies at the local and state level within 30 days after receipt of the designation request and their input received prior to any consideration of the designation is made.

B. Included with the recommendation of a watershed for Designated Watershed status to the Commission shall be an identification of the specific problems that exist in the watershed so that the pursuit of a watershed study is warranted. Designation as a Designated Watershed requires approval by the Commission, the South Carolina Water Resources Commission and the South Carolina Department of Health and Environmental Control. A significant water quantity or water quality problem must exist that would support this designation. Also, inclusion of a watershed as a Designated Watershed will necessitate a public hearing process. The process of designating a watershed shall be based on the following information:

(1) An estimate of the potential for land disturbing activities to be initiated in the basin which would be regulated under this regulation. This estimate could utilize historical and projected population growth, land use data, and other such appropriate measures to estimate the nonpoint source pollution contribution or stormwater runoff which could be reduced or avoided,
(2) An inventory of the offstream and instream water uses in the watershed to quantify and characterize the benefits associated with reducing current or avoiding future water resources problems in the watershed. These could include water supply intakes, State navigable waters, recreational resources, fisheries resources, wetlands, or other such important uses,
(3) Water quality data, collected through either the statewide water quality inventory, or other special studies inclusive of benthic macroinvertebrate data,
(4) Historical and estimated flood damage and/or estimated flood protection benefits to both private and public property in the watershed,
(5) Status of current or description of proposed State and Federal flood protection and flood plain management program(s) and activities in the watershed, and

(6) Dangers to public health and welfare.

C. Following an adequate review of the recommendation, staff of the Commission, South Carolina Water Resources Commission, and the South Carolina Department of Health and Environmental Control shall meet to review and discuss their decision regarding designation. The staff shall prepare a statement in support of, or objection to, the proposed designation within 120 days following receipt of the recommendation by the Commission. The statement shall be voted upon by the appointed commissioners of each respective agency. Ex-officio members of the South Carolina Water Resources Commission representing the Land Resources Conservation Commission and the South Carolina Department of Health and Environmental Control shall abstain from voting regarding designation at the meeting of the South Carolina Water Resources Commission. Approval by each of the three agencies shall constitute designation.

D. Upon approval of designation, a Watershed Advisory Committee shall be established to advise and provide guidance in the development and conduct of the watershed master plan. The Commission, South Carolina Water Resources Commission, and the South Carolina Department of Health and Environmental Control will appoint the Watershed Advisory Committee which shall include State, District, local government representatives, and also representatives of the regulated community within the watershed and other persons which may be affected by the plan.

E. The general components contained in the actual watershed study shall be the following items:

(1) Stormwater quantity or water quality problem identification,
(2) The overall needs of the watershed including the additional impacts of new land disturbing activities,
(3) Alternative approaches to address the existing and future problems,
(4) A selected approach that includes the overall costs and benefits,
(5) An economic impact analysis of the selected approach,
(6) Schedule for implementation,
(7) Funding sources that are available for the actual implementation of study recommendations, and
(8) A public hearing prior to final Commission, S.C. Water Resources Commission and S.C. Department of Health and Environmental Control approval of the watershed study.

F. The following goals are to be obtained through the implementation of the Designated Watershed program:

(1) Reduction of existing flooding or water quality impacts,
(2) Prevention of future flooding or water quality impacts, and
(3) Minimization of economic and social losses.

G. Specific plan components of a watershed study shall include, but not be limited to, the following items:

(1) The limits of the watershed.
(2) An inventory of existing water quality data.
(3) An inventory of areas having significant natural resource value as defined in existing State or local studies as they may be impacted by the construction of location of stormwater control structures.
(4) An inventory of areas of historical and archaeological value identified in existing State or local studies as they may be impacted by the construction or location of stormwater control structures,
(5) A map or series of maps of the watershed showing the following information:
  (a) Watershed topography,
  (b) Significant geologic formations,
  (c) Soils information,
  (d) Existing land use based on existing zoning,
  (e) Proposed land use based on expected zoning or comprehensive plans,
  (f) Locations where water quality data were obtained.
  (g) Locations of existing flooding problems including floor and corner elevations of structures already impacted, and

(h) 100-year floodplain delineations, water surface profiles, and storm hydrographs at selected watershed location.

(6) An inventory of the existing natural and constructed stormwater management system.

(7) An inventory of historic flood damage sites, including frequency and damage estimates,

72-310. Criteria For Implementation of a Stormwater Utility.

The implementation of a stormwater utility will necessitate the development of a local utility ordinance or special taxing assessment prior to its implementation, pursuant to Chapter 9, Title 4, 1976 Code of Laws as amended by Act 114 1991. There are essential components that an ordinance must contain to function as a funding mechanism for stormwater management and those components shall include, but not be limited to, the following items:

A. The financing of a stormwater utility with a user charge system must be reasonable and equitable so that each user of the stormwater system pays to the extent to which the user contributes to the need for the stormwater system, and that the charges bear a substantial relationship to the cost of the service. The use of county and municipal taxpayer rolls and accounting systems are allowed for the assessment and collection of fees.

B. The intent of the utility must be clearly defined regarding program components that are to be funded through the utility. Those components may include but not be limited to the following activities:

(1) Preparation of comprehensive watershed master plans for stormwater management,

(2) Annual inspections of all stormwater management facilities, both public and private,

(3) Undertaking regular maintenance, through contracting or other means, of stormwater management structures that have been accepted for maintenance.

(4) Plan review and inspection of sediment control and stormwater management plans and practices, and

(5) Retrofitting designated watersheds, through contracting or other means, to reduce existing flooding problems or to improve water quality.

C. The authority for the creation of the stormwater utility and the imposition of charges to finance sediment and stormwater activities is conferred in Chapter 14, Title 48, South Carolina Code. The application of a stormwater utility by means of a local ordinance or other means shall not be deemed a limitation or repeal of any other powers granted by State statute.

D. The creation of a stormwater utility shall include the following components:

(1) The boundaries of the utility, such as watersheds or jurisdictional boundaries as identified by the local governing body,

(2) The creation of a management entity,

(3) Identification of stormwater problems,

(4) Method for determining utility charges,

(5) Procedures for investment and reinvestment of funds collected, and

(6) An appeals or petition process.

E. As established by local ordinance or special election or petition, the local government shall have responsibility for implementing all aspects of the utility including long range planning, plan implementation, capital improvements, maintenance of stormwater facilities, determination of charges, billing, and hearing of appeals and petitions. The local government also will have responsibility for providing staff support for utility implementation.

F. With the respect to new stormwater management facilities constructed by private developers, the local government shall develop criteria for use in determining whether these will be maintained by the utility or by the facility owner. Such criteria may include whether the facility has been designed primarily to serve residential users and whether it has been designed primarily for purposes of stormwater management. In situations where it is determined that public maintenance is not preferable, standards shall be developed to ensure that inspection of facilities occurs annually and that facilities are

maintained as needed.

G. The use of charges is limited to those purposes for which the utility has been established, including but not limited to: planning; acquisition of interests in land including easements; design and construction of facilities; maintenance of the stormwater system; billing and administration; and water quantity and water quality management, including monitoring, surveillance, private maintenance inspection, construction inspection, and other activities which are reasonably required.

72-311. Plan Review and Inspector Certification Programs.

A. The Commission shall require that local governments which request delegation of stormwater management and sediment control plan review and approval/disapproval shall have a Certified Plan Reviewer representing the implementing agency. Certified Plan Reviewers shall obtain certification from the Commission by successfully completing a Commission sponsored or approved training program. Exceptions to this requirement are limited to Registered Professional Engineers, Registered Landscape Architects and Registered Tier B Land Surveyors who can receive initial certification by demonstrating to the Commission a minimum of three (3) years experience in stormwater management and sediment control planning and design. For a period of one year after the effective date of these regulations, local governments may receive interim certification for plan reviewers during the period before attendance at a Commission sponsored or approved training course by submitting an enrollment form to the Commission. Interim certification shall be valid until the scheduled date of attendance.

B. The Commission shall require that local governments which request delegation of the construction and maintenance inspection component of the stormwater management and sediment control program shall have a Certified Construction Inspector representing the implementing agency. Certified Construction Inspectors shall obtain certification from the Commission by successfully completing a Commission sponsored or approved training program. For a period of one year after the effective date of these regulations, local governments may receive interim certification for construction inspectors during the period before attendance at a Commission sponsored or approved training course by submitting an enrollment form to the Commission. Interim certification shall be valid until the scheduled date of attendance.

C. Initial certification as a Certified Plan Reviewer or Certified Construction Inspector is good for a period of five years. Recertification is contingent on attending and successfully completing a Commission sponsored or approved recertification program. This continuing education requirement applies to all Certified Plan Reviewers, including, Registered Engineers, Landscape Architects, Tier B Land Surveyors and Construction Inspectors.

72-312. Review and Enforcement Requirements.

A. Items listed in this section are activities by the Commission in the event the Commission serves as the implementing agency. When the Commission is requested to assist the implementing agency, these are suggestions the Commission may submit to the implementing agency.

B. The person responsible for the land disturbing activity shall notify the appropriate inspection agency before initiation of construction and upon project completion when a final inspection will be conducted to ensure compliance with the approved stormwater management and sediment control plan.

C. The person responsible for the land disturbing activity shall, if required by the implementing agency during the plan approval process, submit "As Built or Record Document" plans. In addition, the person responsible for the land disturbing activity may be required to submit written certification from the professional engineer, landscape architect, or Tier B land surveyor responsible for the field supervision of the land disturbing activity that the land disturbing activity was accomplished according to the approved stormwater management and sediment control plan or approved changes.

D. The responsible inspection agency shall, for inspection purposes, do all of the following items:

(1) Ensure that the approved stormwater management and sediment control plans are on the project site and are complied with;
(2) Ensure that every active site is inspected for compliance with the approved plan on a regular basis;
(3) Provide the person responsible for the land disturbing activity, a written report after every inspection that describes:
  (a) The date and location of the site inspection;
  (b) Whether the approved plan has been properly implemented and maintained;
  (c) Approved plan or practice deficiencies; and
  (d) The action taken.
(4) Notification of the person responsible for the land disturbing activity in writing when violations are observed, describing the:
  (a) Nature of the violation;
  (b) Required corrective action; and
  (c) Time period for violation correction.

E. The Commission may investigate complaints or refer any complaint received to the local inspection agency if the activity is located in a jurisdiction that has received delegation of inspections during construction and maintenance inspections. In conjunction with a referral, the Commission may also initiate an on-site investigation after notification of the local inspection agency in order to properly evaluate the complaint. The Commission shall make recommendations on enforcement action when appropriate, and notify the local implementing agency in a timely manner of any recommendations.

F. The Commission, at its discretion and upon notification to the person responsible for the land disturbing activity may visit any site to determine the adequacy of stormwater management and sediment control practices. In the event that the Commission conducts site inspection, the appropriate inspection agency shall be notified of the inspection. The appropriate inspection agency shall establish a time frame to obtain site compliance. This notification shall, in no way limit the right to the Commission to take action subsequent to any provision of these regulations or Chapter. Formal procedures for interaction between the Commission and the appropriate inspection agency on-site inspection and referral will be developed on an individual basis.

G. The appropriate plan approval agency may require a revision to the approved plans as necessary due to differing site conditions. The appropriate plan approval agency shall establish guidelines to facilitate the processing of revised plans where field conditions necessitate plan modification. Where changes to the approved plan are necessary those changes shall be in accordance to the following:

(1) Major changes to approved stormwater management and sediment control plans, such as the addition or deletion of a sediment basin, shall be submitted by the applicant to the appropriate plan approval agency for review and approval.
(2) Minor changes to stormwater management and sediment control plans may be made in the field review report. The appropriate inspection agency shall develop a list of allowable field modifications for use by the construction inspector.

H. Stormwater management construction shall have inspections accomplished as needed.

I. The agency responsible for construction inspection may, in addition to local enforcement options, refer a site violation to the Commission for review.

J. Referral of a site violation to the Commission may initiate a Commission construction inspection of the site to verify site conditions. That construction inspection may result in the following actions:

(1) Notification through appropriate means to the person engaged in a land disturbing activity to comply with the approved plan within a specified time frame; and
(2) Notification of plan inadequacy, with a time frame for the person engaged in a land disturbing activity to submit a revised sediment and stormwater plan to the appropriate plan approval agency and to receive its approval with respect thereto.

. The Commission shall notify the local inspection agency within five working days of what

recommendation for enforcement action should be taken on the site.

K. Failure of the person engaged in the land disturbing activity contractor to comply with Commission requirements may result in the following actions in addition to other penalties as provided in Chapter 14.

(1) The Commission shall have the power to request the implementing agency to order any person violating any provision of Chapter 14 and these regulations to cease and desist from any site work activity other than those actions necessary to achieve compliance with any administrative order.
(2) The Commission may request that the appropriate plan approval agency refrain from issuing any further building or grading permits to the person having outstanding violations until those violations have been remedied.
(3) The Commission may recommend fines to be levied by the implementing agency.

L. If the Commission or the implementing agency utilizes "stop work orders" as a part of its inspection and enforcement program, the following procedure shall be followed:

(1) The implementing agency may issue a stop work order if it is found that a land disturbing activity is being conducted in violation of this Act or of any regulation adopted or order issued pursuant to this Act, that the violation is knowing and willful, and that either:
(a) Off-site sedimentation resulting from non-compliance with the approved stormwater management and sediment control plan has eliminated or severely degraded a use in a lake or natural waterway or that such degradation is imminent.
(b) Off-site sedimentation resulting from non-compliance with the approved stormwater management and sediment control plan has caused severe damage to adjacent land.
(c) The land disturbing activity which requires an approved plan under these regulations and is being conducted without the required approved plan.
(2) The stop work order shall be in writing and shall state what work is to be stopped and what measures are required to abate the violation. The order shall include a statement of the findings made by the implementing agency pursuant to (1) of this section and shall list the conditions under which work that has been stopped by the order may be resumed. The delivery of equipment and materials which does not contribute to the violation may continue while the stop work order is in effect. A copy of this section shall be attached to the order.
(3) The stop work order shall be served by the sheriff of the county in which the land disturbing activity is being conducted or by some other person duly authorized by law to serve process, and shall be served on the person at the site of the land disturbing activity who is in operational control of the land disturbing activity. The sheriff or other person duly authorized by law to serve process shall post a copy of the stop work order in a conspicuous place at the site of the land-disturbing activity. The implementing agency shall also deliver a copy of the stop work order to any person that the implementing agency has reason to believe may be responsible for the violation.
(4) The directives of a stop work order become effective upon service of the order. Thereafter, any person notified of the stop work order who violates any of the directives set out in the order may be assessed a civil penalty as provided in R.72-315. A stop work order issued pursuant to this section may be issued for a period not to exceed three calendar days.
(5) The implementing agency shall designate an employee to monitor compliance with the stop work order. The name of the employee so designated shall be included in the stop work order. The employee so designated shall rescind the stop work order if all the violations for which the stop work order are issued are corrected, no other violations have occurred, and all measures necessary to abate the violations have been taken. The implementing agency shall rescind a stop work order that is issued in error.
(6) The issuance of a stop work order shall be a final agency decision subject to judicial review in the same manner as an order in a contested case pursuant to Title 1, Chapter 23, Section 380 of the Code of Laws of South Carolina, 1976. The petition for judicial review shall be filed in the circuit court of the county in which the land-disturbing activity is being conducted.
(7) The Commission shall file a cause of action to abate the violations which resulted in the issuance

of a stop work order within three calendar days of the service of the stop work order. The cause of action shall include a motion for an ex parte temporary restraining order to abate the violation and to effect necessary remedial measures. The resident circuit court judge, or any judge assigned to hear the motion for the temporary restraining order, shall hear and determine the motion within two days of the filing of the complaint. The clerk of circuit court shall accept complaints filed pursuant to this section without the payment of fining fees. Filing fees shall be paid to the clerk of circuit court within 30 days of the fining of the complaint.

72-313. Hearings and Hearing Procedures.

A. An administrative hearing is available, following a timely request, to determine the propriety of:
   (1) The denial of delegation of a program component.
   (2) A revocation of a delegated program component.
   (3) A denial or revocation of a permit for stormwater management and sediment control.
   (4) A citizen complaint concerning program operation.
   (5) The requirements imposed by the implementing agency for approval of the stormwater management and sediment reduction plan.
   (6) The issuance of a notice of violation or non-compliance with the approved stormwater management and sediment reduction plan.
   (7) The issuance of fines by an implementing agency.
   (8) The issuance of a stop work order by an implementing agency.

B. Requests for administrative hearings and appeals may be made to local governments when program elements are delegated by the Commission or to the Commission when the Commission functions as the implementing agency. In addition, administrative hearings and appeals may be held by the Commission regarding decisions or actions of local implementing agencies. Procedures for acting on appeals and conducting administrative hearings by local implementing agencies will be specified in their request for delegation of program element. The Commission procedures for conducting administrative hearings is specified in R.72-313C through R.72-313Q.

C. A hearing may be requested by any person. If an adverse action is involved, the hearing may be requested provided that the written request is received within thirty (30) days after the notice is given to the person.

D. All hearings shall be initiated via correspondence approved by the Commission which shall give notice to all parties of the hearing.

   (1) All parties must receive notice of the hearing of not less than thirty (30) days;
   (2) The notice shall be sent by the designated hearing officer(s);
   (3) The notice shall include:
      (a) A statement of the time, place, and nature of the hearing;
      (b) A statement of the legal authority and jurisdiction under which the hearing is to be held;
      (c) A reference to the particular sections of the statutes and rules involved;
      (d) A short and plain statement of the matters asserted. If the hearing officer(s) is/are unable to state the matters in detail at the time the notice is served, the initial notice may be limited to a statement of the issues involved. Thereafter, upon application, a more definite and detailed statement shall be furnished.

E. All hearings shall be conducted by a hearing officer(s) appointed by the Commission.

F. All hearings shall be conducted in accordance with Section 1-23-10 et. seq. of the 1976 South Carolina Code of Laws.

G. The hearing officer(s) shall issue a proposal for decision which shall be mailed to the parties.

H. Within twenty (20) days after mailing of the proposal for decision, any party may file exceptions to the hearing officer's proposal for decision.

(1) Such exceptions shall be in written form, addressed to the Chairman of the Commission, and served upon all adverse parties;
(2) The exceptions shall list all the grounds upon which the exceptions are based.

I. If no exceptions are received by the Commission within the twenty (20) day period following the mailing of the proposal for decision, the Commission shall issue a final decision.

J. If timely exceptions are received, the Commission shall send notice to the parties that the appealing party(s) has thirty (30) days to submit a brief. Following the service of the appealing party's brief, or upon the expiration of the thirty (30) day period, whichever shall occur first, the other party shall have thirty (30) days to submit a brief. All briefs must be served on the opposing parties and filed with the Commission.

K. Following receipt of all briefs, the Commission shall schedule an oral argument if requested to do so by either party.

L. The request for an oral argument must be in writing, addressed to the Chairman of the Commission, and submitted with that party's brief.

M. The oral argument shall be scheduled for the next regular Commission meeting following the filing of the last brief.

N. The oral argument shall be heard by the members of the Commission present at the Commission meeting and shall be held in accordance with the following format:

(1) The appealing party shall be given twenty minutes to present his case;
(2) The opposing party shall be given twenty minutes to present his case;
(3) The appealing party shall be given a rebuttal period of five minutes.

O. The parties by written stipulation may agree that the hearing officer's decision shall be final and binding upon the parties.

P. The final order shall be issued by the Commission, and the decision of the Commission shall represent the view of a majority of the Commission members voting on the appeal.

Q. The final order shall be written and shall comply with the provisions of Section 1-23-10 et. seq. of the 1976 South Carolina Code of Laws.

72-314. Citizen Complaint Procedure on Delegated Program Components and Individual Sites.

A. Persons may become aggrieved by land disturbing activities and program implementation. The following describes the procedure for a person to complain concerning program operation:

(1) If the program component in question has been delegated to a local implementing agency, the complaint shall be registered first in writing with that agency. An attempt to resolve the problem shall be made with the local implementing agency.
(2) In the event a solution can not be reached, the citizen may forward the complaint to the Commission for review. The Commission shall attempt to resolve the problem with the implementing agency and notify the citizen of the outcome of these efforts.
(3) If the Commission determines, based on complaints indicating a continuing pattern, that implementation of delegated program elements falls below the acceptable standards established by these regulations, the Commission may suspend or revoke the delegation in accordance with R.72-304L.
(4) All complaints filed with the Commission shall be held for a period of three years and will be considered when delegation renewal is requested by the local government.

B. Persons may complain about individual site problems or damages. The procedure is as follows:

(1) The complaint will be registered in writing with the appropriate implementing agency.
(2) If the implementing agency is not the Commission and a solution can not be reached with the local

implementing agency, the complaint should be filed with the Commission. The Commission will follow procedures listed in R.72-312E.

72-315. Penalties.

A. Any person who violates any provision of this chapter or any ordinance or regulation promulgated, enacted, adopted, or issued pursuant to this chapter by the Commission or other implementing agency, or who initiates or continues a land disturbing activity for which a stormwater management and sediment control plan is required except in accordance with the terms, conditions, and provisions of an approved plan, is subject to a civil penalty of not more than one thousand dollars. No penalty may be assessed until the person alleged to be in violation has been notified of the violation. Each day of a violation constitutes a separate violation.

B. The implementing agency shall determine the amount of the civil penalty to be assessed under this section for violations under its jurisdiction. It shall make written demand for payment upon the person responsible for the violation and set forth in detail the violation for which the penalty has been invoked. If payment is not received or equitable settlement reached within thirty days after demand for payment is made, a civil action may be filed in the circuit court in the county in which the violation is alleged to have occurred to recover the amount of the penalty. If the implementing agency is the commission, the action must be brought in the name of the State. Local governments shall refer the matters under their jurisdiction to their respective attorneys for the institution of a civil action in the name of the local government in the circuit court in the county in which the violation is alleged to have occurred for recovery of the penalty.

72-316. Severability.

If any section, subsection, sentence, clause, phrase, or portion of these regulations are for any reason held invalid or unconstitutional by any court or competent jurisdiction, such provision and such holding shall not affect the validity of the remaining portions of these regulations.

Fiscal Impact Statement:

The South Carolina Land Resources Commission estimates that two additional staff engineers will be required to operate the program.

APPENDIX B

COASTAL ZONE MANAGEMENT PROGRAM REFINEMENTS

FOR STORMWATER MANAGEMENT REGULATIONS

Chapter III Management of Coastal Resources

C. Uses of Management Concern

3. Resource Policies

XIII. Stormwater Management Guidelines (Page III-74)

Most land disturbing activities in South Carolina must comply with the requirements and applicable regulations of the Erosion and Sediment Reduction Act of 1983 (48-18-10, et. seq.), or the Stormwater Management and Sediment Reduction Act of 1991 (48-14-10, et. seq.). The final regulations, effective on June 26, 1992, pursuant to the Stormwater Management and Sediment Reduction Act of 1991, establish the procedure and minimum standards for a statewide stormwater program. Section R.72-304F of the regulations states that "the S.C. Coastal Council (now known as the Office of Ocean and Coastal Resource Management (OCRM)), in coordination with the Commission, will serve as the implementing agency for these regulations in the jurisdictions of the local governments which do not seek delegation of program elements in the counties of Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry and Jasper." In addition, Section R.72-307C(5)(g) states that "For activities in the eight coastal counties, additional water quality requirements may be imposed to comply with the S.C. Coastal Council (OCRM) Stormwater Management Guidelines. If conflicting requirements exist for activities in the eight coastal counties, the S.C. Coastal Council (OCRM) guidelines will apply."

Pursuant to the Coastal Zone Management Act, the Coastal Council (OCRM) is responsible for protecting the environmentally sensitive areas of our coast. While the regulations of the Stormwater Management and Sediment Reduction Act adequately address most nonpoint source pollution problems, the need exists for establishing additional criteria to protect sensitive coastal waters.

A. Stormwater Runoff Storage Requirements

The regulations of the Stormwater Management and Sediment Reduction Act require that "permanent water quality ponds having a permanent pool shall be designed to store and release the first 1/2 inch of runoff from the site over a 24-hour period. The storage volume shall be designed to accommodate, at least, 1/2 inch of runoff from the entire site." For all projects, regardless of size, which are located within one-half (1/2) mile of a receiving waterbody in the coastal zone, this criteria shall be storage of the first 1/2 inch of runoff from the entire site or storage of the first one (1) inch of runoff from the built-upon portion of the property, whichever is greater. Storage may be accomplished through retention, detention or infiltration systems, as appropriate for the specific site. In addition, for those projects which are located within 1,000 (one thousand) feet of shellfish beds, the first one and one half (1 1/2) inches of runoff from the built-upon portion of the property must be retained on site.

Receiving waterbodies include all regularly tidally influenced salt and freshwater marsh areas, all lakes or ponds which are used primarily for public recreation or a public drinking water supply, and other water bodies within the coastal zone, excluding wetlands, swamps, ditches and stormwater management ponds which are not contiguous via an outfall or similar structure with a tidal water body.

B. Project Size Requiring Stormwater Management Permits

Section R.72-305B(1) states that "for land disturbing activities involving two (2) acres or less of actual land disturbance which are not part of a larger common plan of development or sale, the person responsible for the land disturbing activity shall submit a simplified stormwater management and sediment control plan meeting the requirements of R.72-307H. This plan does not require preparation or certification by the designers specified in R.72-305H and R.72-305I." Due to the potentially damaging effect of certain projects of less than two (2) acres of land disturbance, stormwater management and sediment reduction plan submittal and regulatory approval shall be required for those smaller projects located within 1/2 mile of a receiving waterbody. Single family homes that are not part of a subdivision development are exempt from this requirement.

C. Stormwater Management Requirements for Bridge Runoff

The following is the criteria used to address stormwater management for bridges traversing saltwater and/or critical areas.

(1) No treatment is necessary for runoff from bridge surfaces spanning SB or SA waters. This runoff can be discharged through scupper drains directly into surface waters. However, the use of scupper drains should be limited as much as feasibly possible.

(2) If the receiving water is either ORW or SFH then the stormwater management requirements shall be based on projected traffic volumes and the presence of any nearby shellfish beds. The following matrix lists the necessary treatment practices over the different classes of receiving waters.

(3) The Average Daily Traffic Volume (ADT) is based upon the design carrying capacity of the bridge.

Water Quality Class	Average Daily Traffic Volume (ADT)	
	0-30,000	G.T. 30,000
ORW (within 1000 ft of shellfish beds)	***	***
ORW (not within 1000 ft of shellfish beds)	**	**
SFH (within 1000 ft of shellfish beds)	**	***
SFH (not within 1000 ft of shellfish beds)	**	**
SA	*	*
SB	*	*

***The first one (1) inch of runoff from the bridge surface must be collected and routed to an appropriate stormwater management system or routed so that maximum overland flow occurs encouraging exfiltration before reaching the receiving body. Periodic vacuuming of the bridge surface should be considered.

** A stormwater management plan must be implemented which may require the overtreatment of runoff from associated roadways to compensate for the lack of direct treatment of runoff from the bridge surface itself. Periodic vacuuming should be considered. The use of scupper drains should be limited as much as feasibly possible.

* No treatment is required. The use of scupper drains should be limited as much as feasibly possible.

D. Golf Courses Adjacent to Receiving Waterbodies

Golf course construction and maintenance practices result in the potential for significant negative impacts from the runoff of sediments, pesticides, herbicides and other pollutants. For this reason, when golf courses are constructed adjacent to receiving waterbodies then the following practices are to be incorporated.

(1) Minimum setbacks from the receiving waterbody of 20 feet for all manicured portions of the golf course (fairways, greens and tees) are required unless other acceptable management techniques are approved and implemented to mitigate any adverse impacts.

(2) All drainage from greens and tees must be routed to interior lagoons or an equivalent stormwater management system.

(3) To prevent the conversion of the stormwater system to critical area and to maintain positive drainage at high tides, all outfalls from the lagoon system must be located at an elevation above the critical area (if the discharge is to critical area) AND above the normal water elevation a distance to allow for storage of the first one inch of runoff. The volume which must be stored shall be calculated by multiplying the area of all the greens and tees by one inch. (Previously constructed stormwater management systems which meet all current and future storage requirements will not be required to modify outfalls.)

(4) No greens or tees shall be located on marsh hummocks or islands unless all drainage can be conveyed to the interior lagoon system or to an equivalent onsite stormwater management system.

(5) Stormwater impacts to freshwater wetlands shall be limited by providing minimum 20 foot buffers, or an accepted alternative, between manicured areas (fairways, greens and tees) and the wetlands. This minimum buffer must be increased if land application of treated effluent is utilized in the area.

(6) An integrated pest management system designed in accordance with current best technology practices must be employed on the course to limit the application of chemicals which, if over applied, may leach into the ground and adjacent surface waters.

(7) In accordance with S.C. Department of Health and Environmental Control requirements, a two (2) foot separation must be maintained between the surface of the golf course and the ground water table where spray effluent is applied.

(8) The normal ground water elevation must be established by a registered engineer or soil scientist.

(9) All projects which are within 1000 feet of shellfish beds must retain the first 1 1/2 inches of runoff as otherwise described in item A above.

(10) If spray effluent or chemicals are applied to the turf via the irrigation system, all spray heads must be located and set so as to prevent any aerosols from reaching adjacent critical areas.

E. Mines and Landfills

Due to the significant amount of land disturbance involved in the construction of mines and landfills, these types of operations need to strictly adhere to sediment/erosion control requirements particularly when they are located near coastal waterways. When mining or landfill projects are located within 1/2 mile of receiving waterbodies, pumping of ground water from sediment basins must be done with floating intakes only. Pumping of these basins must cease whenever the water levels come to within two (2) feet of the pond bottom. In addition, landfill planning must be designed on a comprehensive site basis for stormwater management and sediment/erosion control to include management practices for each separate cell as it is phased into the landfill.

F. Notice of Approval

All notice of approval must be in written form.

APPENDIX C

ENGINEERING AIDS AND DESIGN GUIDELINES

FOR CONTROL OF SEDIMENT

IN

SOUTH CAROLINA

REPORT

ENGINEERING AIDS AND DESIGN GUIDELINES FOR CONTROL OF SEDIMENT in SOUTH CAROLINA

Prepared by

JOHN C. HAYES AND ASSOCIATES
John C. Hayes, PE
Billy J. Barfield
110 Valley View Drive
Clemson, SC 29631

Prepared for

South Carolina Land Resources Commission
South Carolina Department of Highways and Public Transportation
Columbia, SC
South Carolina Coastal Council
Charleston, SC

8/31/94
Revised 7/18/95

ENGINEERING AIDS AND DESIGN GUIDELINES FOR CONTROL OF SEDIMENT IN SOUTH CAROLINA[1]

John C. Hayes and Billy J. Barfield

Introduction

Simulations using a modified version of SEDIMOT II estimated the effectiveness of structures for sediment control in four different physiographic regions of South Carolina. For the purposes of this work, we separated the state into four (4) major land resource areas - piedmont, sand hills, coastal plain, and tidal area. Treatments also included multiple watershed sizes, land uses, and soil textures in each land resource area. The evaluation included a wide range of slope lengths, slopes, pond dimensions, watershed shapes, as well as other factors that are required for specific structures. Impacts of various controls on downstream sediment load were evaluated using generated hydrographs and sedimentgraphs from watersheds. Design aids in the form of graphs were developed to simplify design for typical conditions and avoid simple rule-of-thumb design estimates. These design aids are a compromise between detailed simulations and simple rules-of-thumb.

Background

Recently regulations have been instituted that require control of stormwater runoff and sediment discharge. Standard techniques are recommended for runoff, but methods for designing structures for sediment control are lacking.

The described work includes estimation of performance of sediment detention ponds, filter fences, and rock ditch checks. The performance of each control was simulated using a modified version of SEDIMOT II with South Carolina's specific conditions and compared with existing regulations in the state. From these simulations, design aids were developed that are consistent with the sediment performance standards required by the state regulations.

Effectiveness of control is commonly determined by either a water quality design standard or a performance standard. For sediment control, a water quality performance standard dictates a maximum acceptable level of sediment in the effluent. The control is designed such that this concentration is not exceeded. On the other hand, a water quality design standard establishes a standard pond design based on a given drainage area or similar criterion. There are obvious benefits associated with each method. Performance standards offer site specific water quality control, but require considerable on-site collection of information for design purposes and are more difficult to review. Structures designed for performance standards have a higher design cost than structures designed for water quality design standards since estimation of effluent concentration is difficult and requires complex calculations. However construction costs tend to be considerably less, since design standards are inherently conservative. Design standards, on the other hand, are more easily employed and complied with. A preferable alternative to these methods is to provide a design procedure that meets a performance criteria without requiring excessive design costs. To achieve this, the design is typically expected to be slightly conservative, but considerably less conservative than if developed from a design standard.

A typical approach under the performance philosophy is to size a control to meet a water quality standard such as a total suspended solids (TSS) or settleable solids (SS) standard. Trapping efficiency can also be used, but this fails to account for incoming sediment concentration. Specific requirements for permanent stormwater management and sediment control plan approval shown in the S.C. Stormwater Management and Sediment Reduction Regulations include discharge rates and hydrographs for stormwater runoff. Additionally, sediment basins or other practices must be designed to meet a removal efficiency of 80 percent suspended solids or 0.5

---

[1] The Design Aids are provided "As Is" without warranty of any kind, either expressed or implied. In no event shall the authors or John C. Hayes and Associates be liable for any damages (incidental, consequential, or other), lost profits, or lost savings arising from the use or inability to use the methods presented.

The contents of the report reflect the views of the consultant who is responsible for the accuracy of the data presented herein. The contents of this report do not necessarily reflect the official views or policies of any governmental agency. This report does not constitute a standard, specification, or regulation.

ml/l peak settleable solids concentration from a 10-yr, 24-hr design storm.

Potential Benefits

The intent of this work was to develop area specific design methods that give reasonable assurance that effluent meets desired sediment performance standards without the lengthy design process typically associated with designs developed to meet a performance standard. This approach benefits regulatory agencies and developers because the time required for design of controls for "typical" situations would be straightforward and minimized. Plan reviewers do not have to labor through detailed calculations. The use of area specific design methods provides a means of achieving sediment control without the steep learning curve associated with simulation techniques. This allows engineers to gradually gain experience and expertise in design of sediment controls. As reviewers and planners become more experienced with the procedures, they may move to modeling techniques or other methods. (For large scale developments or in sensitive areas, it is still anticipated that site specific data and other procedures such as modeling be used for detailed evaluation of sediment controls.) Adoption of area specific design techniques among state and local agencies helps to standardize use of the practices, reduce confusion, and promote adoption of design techniques.

Methodology

The project began with site visits at numerous locations in each of the land resource areas of the state in order to see innovative methods, as well as areas needing improvement. Evaluation of existing modeling capabilities led to major revisions in the SEDIMOT II model to allow evaluation of a wide range of sediment control technologies in a seamless manner. These modifications present South Carolina with the opportunity to have a major new tool in the analysis and design of stormwater and sediment control structures. Input data bases were generated for all major land resource regions and results from almost half a million runs of the model were used to develop the simple design aids.

The tour of South Carolina construction sites revealed that channel erosion was a significant problem in many watersheds, indicating a need for adding a channel erosion component to the model. The existing routine in SEDIMOT II allows only for deposition in channels, no erosion.

The tour of South Carolina also showed that filter fences were often not put on the contour, but were placed to allow flow to move along the fence to a low spot. This flow frequently caused significant erosion along the fence and undercutting of the fence, making the fence ineffective. It was postulated that a saw tooth type arrangement on the fence would prevent this erosion, but no method was available to predict the effectiveness of the fence under this condition. This required that a method be developed to determine the location of points where flow would move through the fence.

After investigating possibilities for modifying the existing routines in SEDIMOT II, it was determined that the inaccuracies in hydraulic routing when the pond routine is used for small structures and the lack of adequate sedimentation routines in the check dam routine meant that a major program modification was necessary. Because of the availability of a new hydraulic routine that is accurate over a wide range of structural sizes and types, it seemed prudent to make such a modification. The process used was to:

- Develop a common model for reservoir routing which utilizes continuous functions for discharge and stage storage rather than discrete stage points.
- Develop physically based and tested methodologies for predicting stage discharge relationships for commonly used sediment control structures.
- Combine these routines with the CSTRS routines used in SEDIMOT II.
- Modify the model to include channel erosion.
- Evaluate the effects of a saw tooth arrangement on filter fence effectiveness.

Each of these tasks has been accomplished and the results are a series of graphs that can be used as an aid for designing sediment control structures. It should be recognized that aids such as these are developed for typical conditions. Other methods should be used if the situation is environmentally sensitive or hazardous. In all cases, good engineering judgement should be considered as an essential ingredient in design.

Design Aids

Each of the design aids will be briefly described and then examples will be used to demonstrate their use in realistic problems. The first aid (Figure 1) plots particle settling velocity as a function of eroded particle diameter. Each of the structures requires use of a reference settling velocity. The diameter that is referred to as D_{15} was chosen for the reference diameter. This diameter corresponds to a point on the eroded particle size distribution curve such that 15% of the particles (by weight) are equal to or smaller than this size. Personnel from the former S.C. Land Resources Commission have previously developed estimated eroded size distributions for South Carolina soils. The procedure used the primary particle size information reported by the Soil Conservation Service as part of county soil surveys. The information is now available from S. C. Department of Health and Environmental Control. By plotting "fraction finer than" versus "diameter," D_{15} can be read. Once D_{15} is found, settling velocity can be read directly from Figure 1. Figure 2 plots the ratio q_{po}/AV_{15} versus percentage of trapping efficiency. For ponds, the ratio is defined by

$$\text{Ratio} = \frac{q_{po}}{AV_{15}} \qquad (1)$$

where q_{po} is peak outflow rate from the pond in cfs, A is the surface area of the pond at the riser crest in acres, and V_{15} is settling velocity, in fps, of the characteristic eroded particle corresponding to D_{15}. Upper limits on site conditions for ponds are included with Figure 2.

Two curves are presented. The curve shown as Figure 2a is for soils including Piedmont, Sandhill, Coastal, and Tidal area soils, except as noted subsequently. For the Piedmont, Coastal, and Tidal areas, soils are classed as either coarse (sandy loam), medium (silt loam), or fine (clay loam). Sandhill soils include coarse (sand), medium (sandy loam), and fine (silt loam) because of the prevalent textures in this region. These classifications are summarized in Table 1. The line shown as Figure 2b is for tidal soils (sands and sandy loams that are classified in hydrologic soil group D because of high water table). The ratio should be less than or equal to the curve value at any given trapping efficiency. For example at 80% trapping efficiency, the ratio is equal to $2.2E5^5$ for most soils as shown in Figure 2a. If the ratio q_{po}/AV_{15} intersects the curve at a point having a trapping efficiency less than the desired value, the design is inadequate and must be revised. **Ratios above the design curves are not recommended for any of the design aids.**

The next design aid (Figure 3) is for rock ditch checks. Again there is a ratio plotted versus trapping efficiency. For rock ditch checks the ratio is calculated as

$$\text{Ratio} = \frac{Sq^{(1-b)}}{aV_{15}} \qquad (2)$$

where S is the channel slope in percent, q is flow through the check in cfs/ft, V_{15} is the settling velocity, in fps, of the eroded D_{15} size particle in mm, and a and b are coefficients. Figure 3 also contains upper limits for site conditions appropriate for the design aid.

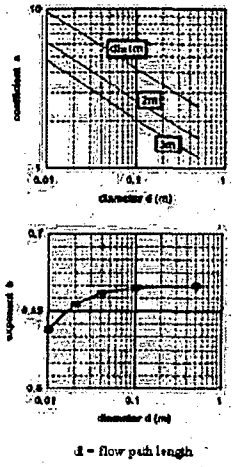


Table 1 Soil Groupings for Design Aids			
Land Resource Region	**Coarse**	**Medium**	**Fine**
Piedmont, Coastal and Tidal	Sandy Loam	Silt Loam	Clay Loam
Sand Hills	Sand	Sandy Loam	Silt Loam
Tidal (High Water Table)	Sandy Loam	Silt Loam	Clay Loam

The ratio is calculated using the curves developed in Haan et al. (1994)[2] to obtain the coefficients a and b. The three plots shown as Figure 3a, 3b, and 3c correspond to fine, medium, and coarse textures, respectively. Please refer to Table 1 for determination of which line to use for a particular soil. As indicated by the note in the gray area above the lines, values of the ratio in Figure 3 should be equal to or less than the curve values.

The design aid shown as Figure 4 corresponds to silt fence placed in an area downslope from a disturbed area where it serves to retard flow and cause settling. Two conditions must be met in order to have a satisfactory design.

1. Trapping efficiency must meet the desired level of control.
2. Overtopping of the structure must not occur, since failure is likely if it does occur.

As with any structure, the designer should recognize that longterm maintenance is necessary. The fence design aid contains a single line that is appropriate for all soil textures as shown in Figure 4. Again the ratio is plotted versus trapping efficiency. For the silt fence, the ratio is calculated as

$$\text{Ratio} = \frac{q_{po}}{V_{15}P_{area}} \qquad (3)$$

where q_{po} is peak outflow through the fence in cfs, V_{15} is settling velocity, in fps, of the eroded D_{15} size particle, and P_{area} is the potential ponding area upslope of the fence in ft^2. Figure 4 includes a listing of upper limits for the site conditions for the fence design aid.

The ponded area can be estimated by reducing the height of the fence by 1.0 ft (to allow for burying 0.5 ft and 0.5 ft for freeboard). Use the remaining height to find the distance of a horizontal line extending from the fence top to its intersection with the ground surface up slope of the fence (should be equal to the ground slope times the fence height). Multiply this distance by the available width for ponding to obtain the potential ponding area. As for other structures, the final filter fence ratio value should be less than or equal to the line value for a specified trapping efficiency.

Estimating V_{15}

A common feature of each of the design aids is that a characteristic settling velocity for the eroded soil must be obtained. For these design aids, the characteristic settling velocity required corresponds to an eroded size such that 15% of the sediment has particles smaller than the size specified. A diskette containing acceptable eroded size distributions for South Carolina soils is available from the South Carolina Department of Health and Environmental Control. The user should recognize that eroded size distributions used in sediment control design are frequently quite different from primary size distributions that are often determined for other construction purposes. The user should note that D_{15} is often smaller for coarse textured (more sandy) because of the reduced clay content and the lack of aggregation.

Example Problems

The example problems serve to illustrate the use of the design aids for calculation of trapping efficiency for

---

[2] Haan, C.T., B.J. Barfield, and J.C. Hayes. 1994. *Hydrology and Sedimentology of Small Catchments*. Academic Press. San Diego, CA.

various types of structures. Basic soils, hydrologic, and hydraulic information are combined. Methods as required by Standards for Stormwater Management and Sediment Reduction (72-300) may be used to estimate the peak flows. Site specific soils information can generally be found from county soil surveys. Hydraulic information is obtained by combining site and structural information.

In all cases, a ratio is calculated. The ratio is used to locate the point on a turning line for the specified conditions and structure. Trapping efficiency is then found by turning to the x-axis and estimating trapping efficiency. The design aids are intended to be slightly conservative, but use of the design aids should not override use of good engineering judgement. Questionable results should be investigated by the engineer. In addition, the engineer should consider installation and maintenance of all structures. For example, it may be appropriate to add baffling to a pond in order to prevent short circuiting between the inflow and outflow locations.

The user should recognize that the intent of the design aids is to provide an estimate of trapping efficiencies for "typical" structures. Extreme or critical situations necessitate that more detailed analyses be conducted. For example, sensitive areas in steep terrain would be an example of an extreme situation. Additionally, it is not the intent of this document to present detailed descriptions of hydrologic or hydraulic methods.

Design techniques can best be illustrated by following the steps shown in the following examples.

Example Problem 1 - Sediment Pond.

A sediment pond is to be constructed on a 30-acre commercial site in Richland County, SC. The following information is available for the site based on soil, hydrologic, and hydraulic conditions.

The eroded size distribution is for a coarse soil (Pelion and Fuquay mix) with D_{15} equal to 0.024 mm.

Peak outflow from the pond cannot exceed 11.2 cfs.

Allowable surface area of the pond at the riser crest is 1.67 ac.

Determine whether the sediment pond is adequately sized for satisfactory trapping.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.024 mm and determine settling velocity V_{15} = 0.001 fps.
2. Calculate the ratio q_{po}/AV_{15}= 11.2/(1.67)(0.001) = 6700 = 6.7E3
3. Enter Figure 2a on y-axis with ratio = 6.7E3, go to line and turn to x-axis to read trapping efficiency.
4. Trapping efficiency is approximately equal to 92%, therefore okay.

Example Problem 2 - Sediment Pond.

A sediment pond is to be constructed in a tidal area having a high water table. The following information is available for the site near the coast.

The eroded size distribution is for a coarse soil with D_{15} equal to 0.05 mm.

Peak outflow from the pond is 10 cfs.

Allowable surface area of the pond is 0.25 ac.

Determine whether the structure will provide at least 80% trapping.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.05 mm and determine settling velocity V_{15} = 0.004 fps.
2. Calculate the ratio q_{po}/AV_{15}= 10/(0.25)(0.004) = 10,000 = 1.0E4
3. Enter Figure 2b (since high water table) on y-axis with ratio = 1.0E4, go to line and turn to x-axis to read trapping efficiency.
4. Trapping efficiency is approximately equal to 77%, therefore a larger pond is required if it is desired to have a trapping efficiency of at least 80%.
5. Assume that surface area can be increased to 0.67 ac, calculate the ratio
   q_{po}/AV_{15}= 10/(0.67)(0.004) = 3700 = 3.7E3.

6. Reading the trapping efficiency from Figure 2b using this value yields a trapping efficiency of 81%, which is okay. (Note: If there had been no high water table, Figure 2a would be used, and the smaller pond area would be sufficient.)

Example Problem 3 - Rock Ditch Check.

Estimate the trapping efficiency of a rock ditch check to be installed in a Piedmont channel draining a clay loam soil. The following information is available based on soil, hydrologic, and hydraulic conditions.

The eroded size distribution is for a fine soil with D_{15} equal to 0.0042 mm.

Peak outflow from the ditch check is 0.211 cfs with an average width (perpendicular to flow) of 7.4 ft and a flow length through the check of 9 ft (refer to Haan et al., 1994, page 151 for procedures to calculate flow through a ditch check).

Rock diameter is 0.10 ft.

Slope of the channel is 0.5%.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.0042 mm and determine settling velocity V_{15} = 3E-5 fps.
2. Before proceeding further, the flow rate must be converted to a flow per foot width. Thus divide 0.211 cfs by the width of 7.4 ft to obtain a q = 0.028 cfs/ft.
   Appropriate values of the coefficients a and b can be obtained from Haan, et al. (1994) based on the rock diameter and the average flow length through the check. For this example, the appropriate values can be read using the rock diameter equal to 0.03 m and flow length equal to 9 ft to obtain a = 3.05 and b = 0.66.
   Substitute all values and calculate the ratio
   $$Sq^{(1-b)}/aV_{15} = (0.5)(0.028^{(1-0.66)})/(3.05)(3E\text{-}5) = 1620 = 1.62E3$$
3. Enter Figure 3a (fine texture) on y-axis with ratio = 1.6E3, go to line and turn to x-axis to read trapping efficiency.
4. Trapping efficiency is greater than 95%, therefore okay.

Example Problem 4 - Rock Ditch Check.

A rock ditch check is to be installed at a Coastal Plains site having a sandy loam soil. For comparison, hydrologic and hydraulic conditions as used in Example Problem 3 will be used.

The eroded size distribution is for a coarse soil with D_{15} equal to 0.04 mm.

Peak outflow from the ditch check is 0.211 cfs with an average width (perpendicular to flow) of 7.4 ft and a flow length through the check of 9 ft.

Rock diameter is 0.10 ft.

Slope of the channel is 0.5%.

Determine whether the ditch check will exceed 80% trapping efficiency for the conditions indicated.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.04 mm and determine settling velocity V_{15} = 2.8E-3 fps.
2. Before proceeding further, the flow rate must be converted to a flow per foot width. Thus divide 0.211 cfs by the width of 7.4 ft to obtain a q = 0.028 cfs/ft.
   Since the same conditions were used, values of the coefficients a and b are as found in Example Problem 3 so that a = 3.05 and b = 0.66.
   Substitute all values and calculate the ratio
   $$Sq^{(1-b)}/aV_{15} = (0.5)(0.028^{(1-0.66)})/(3.05)(2.8E\text{-}3) = 17$$
3. Enter Figure 3c (coarse texture) on y-axis with ratio = 17 and go to line. Note that since the value falls BELOW the line, the trapping efficiency exceeds 95%.
4. Trapping efficiency is greater than 95%, therefore okay.

Example Problem 5 - Rock Ditch Check.

A rock ditch check is to be installed in a channel draining highway construction on a sandy loam soil in the Coastal Plains. The following information is available based on soil, hydrologic, and hydraulic conditions.

The eroded size distribution is for a coarse soil with D_{15} equal to 0.04 mm.

Peak outflow from the ditch check is 2.0 cfs with an average width (perpendicular to flow) of 4.4 ft and a flow length through the check of 9 ft.

Rock diameter is 0.10 ft.

Slope of the channel is 4.0%.

Determine the trapping efficiency under the specified conditions.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.04 mm and determine settling velocity V_{15} = 2.8E-3 fps.
2. Before proceeding further, the flow rate must be converted to a flow per foot width. Thus divide 2.0 cfs by the width of 4.4 ft to obtain a q = 0.45 cfs/ft.
   Appropriate values of the coefficients a and b can be obtained from Haan, et al. (1994) based on the rock diameter and the average flow length through the check. For this example, the appropriate values can be read using the rock diameter equal to 0.03 m and flow length equal to 9 ft to obtain a = 3.05 and b = 0.66. Substitute all values and calculate the ratio
   $$Sq^{(1-b)}/aV_{15} = (4.0)(0.45^{(1-0.66)})/(3.05)(2.8E\text{-}3) = 360$$
3. Enter Figure 3c on y-axis with ratio = 360, go to line and turn to x-axis to read trapping efficiency.
4. Trapping efficiency is approximately 94%, therefore okay.

Example Problem 6 - Filter Fence at Toe of Slope.

A wire-backed silt fence is to be built from fabric which is 3 ft wide. The installation is to be at the toe of a slope which drains highway construction in the Piedmont. The following information is available based on soil, hydrologic, and hydraulic conditions at the site.

The eroded size distribution is for a fine soil with D_{15} equal to 0.0042 mm.

Peak outflow from the up slope area is 1.9 cfs.

The potential area for impoundment up slope of the fence is 0.116 ac. (5050 ft^2).

Freeboard allowance and installation will reduce the usable height of the fence from 3 ft to 2 ft.

The potential length of filter fence along the toe of the slope is 60 ft.

Determine whether the fence will carry this flow with a trapping efficiency of at least 80% without overtopping.

Solution:

Steps

1. Go to Figure 1 with D_{15} = 0.0042 mm and determine settling velocity V_{15} = 3E-5 fps.
2. Calculate the ratio q_{po}/V_sP_{area} = 1.9/(3E-5)(5050) = 12.5.
3. Reading the trapping efficiency from Figure 4 with the ratio equal to 12.5 finds that the trapping efficiency is approximately 55% -- hence the fence is inadequate.

Example Problem 7 - Filter Fence at Toe of Slope.

Reconsider the situation described in example problem 6 with the only difference being that the D_{15} is 0.04 mm. Determine whether the fence will carry this flow with a trapping efficiency of at least 80% without overtopping.

Solution:

Steps

1. As seen previously, V_{15} equals 2.8E-3 fps for this size particle.

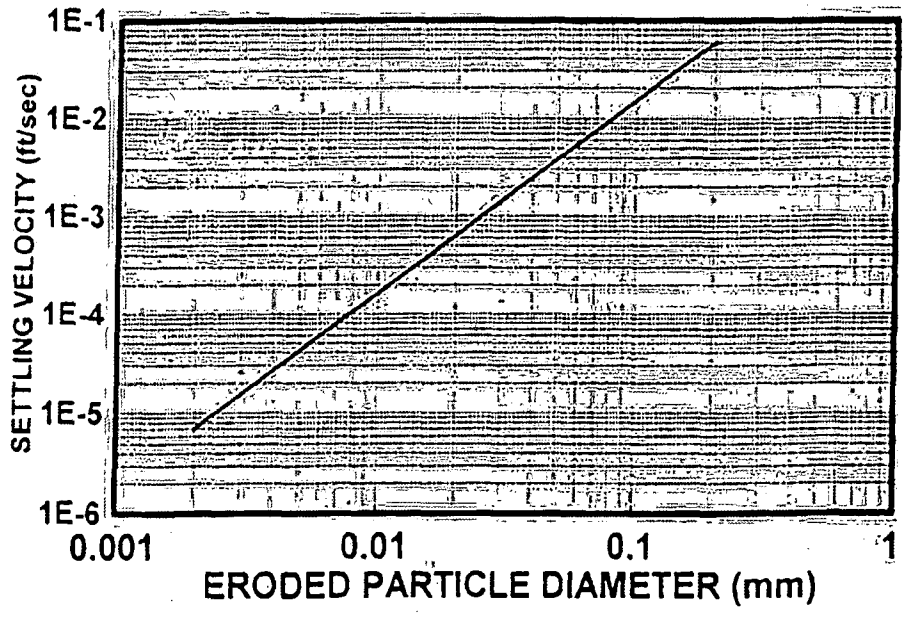
2. Calculate the ratio $q_{po}/V_s P_{area}$ = 1.9/(2.8E-3)(5050) = 0.13
3. Reading the trapping efficiency from Figure 4 with the ratio equal to 0.13 finds that the trapping efficiency is approximately 82%,-- hence the fence is adequate from the standpoint of trapping efficiency.
4. The length of fence required to pass the peak flow without overtopping can be found by comparing the peak flow per foot width with the slurry flow rate of the fabric. Haan, et al. (1994, Table 9.11 and 9.12) contains slurry flow rates for a variety of fabrics. A reasonable value for filter fence is 10 gpm/ft^2.
5. Convert the peak flow to gpm so that

   q_{po} = (1.9 ft^3/sec)(7.48 gal/ft^3)(60 sec/min) = 853 gpm
6. The required length of fabric to carry this flow can now be found by dividing the peak flow rate by the effective height (2 ft since 1 ft is lost because of installation) and the slurry flow rate. Hence, the length of fence required to carry the peak flow without overtopping is

   L = 853/(2)(10) = 43 ft

Since 43 ft is less than the 60 ft available, the fence will perform adequately.

Figure 1. Settling velocity as a function of eroded particle diameter.



LIMITS ON VALUES FOR PONDS
watershed area ≤ 30 acres
overland slope ≤ 20%
outlet diameter ≤ 6 ft

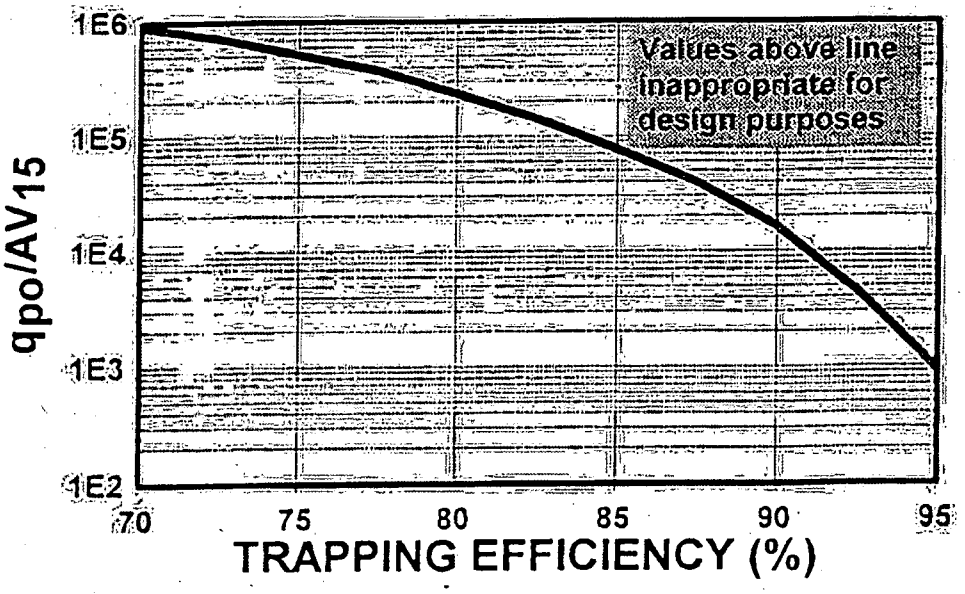


Figure 2a. Design aid for trapping efficiency of ponds not located in low-lying areas with high water tables.

LIMITS ON VALUES FOR PONDS
watershed area ≤ 30 acres
overland slope ≤ 20%
outlet diameter ≤ 6 ft

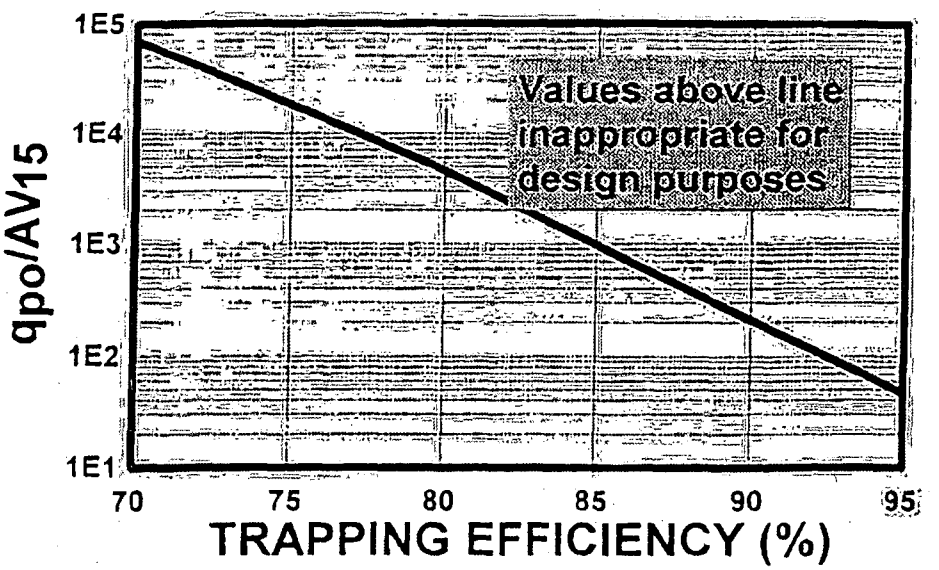


Figure 2b. Design aid for estimating trapping efficiency of ponds located in low-lying areas having high water tables.

LIMITS ON VALUES FOR CHECKS
watershed areas ≤ 5 acres
overland flow length ≤ 500 ft
overland slope ≤ 15%
maximum depth ≤ 6 ft

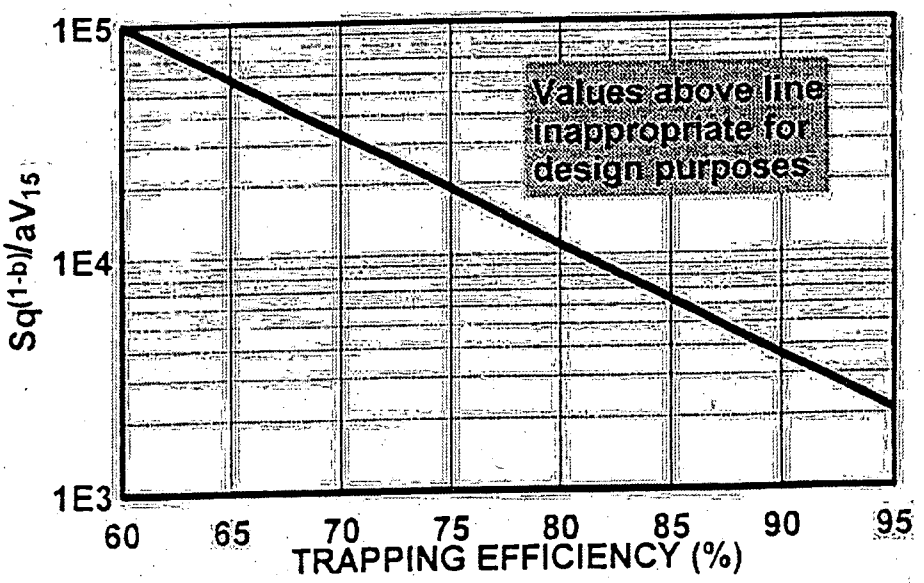


Figure 3a. Design aid for estimating trapping efficiency of rock ditch checks with fine texture soils.

LIMITS ON VALUES FOR CHECKS
watershed areas ≤ 5 acres
overland flow length ≤ 500 ft
overland slope ≤ 15%
maximum depth ≤ 6 ft

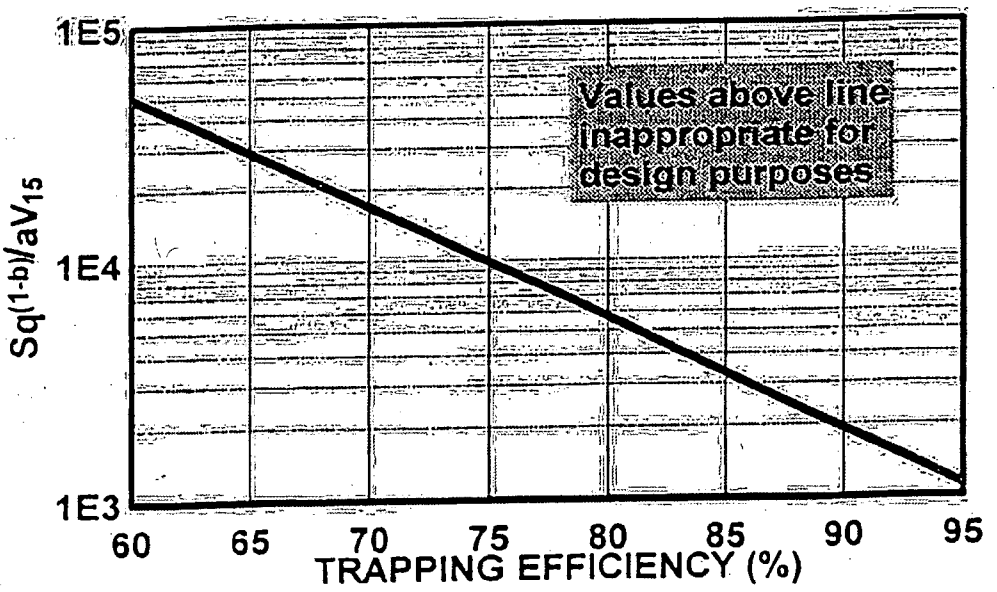


Figure 3b. Design aid for estimating trapping efficiency of rock ditch checks with medium texture soils.

LIMITS ON VALUES FOR CHECKS
watershed areas ≤ 5 acres
overland flow length ≤ 500 ft
overland slope ≤ 15%
maximum depth ≤ 6 ft

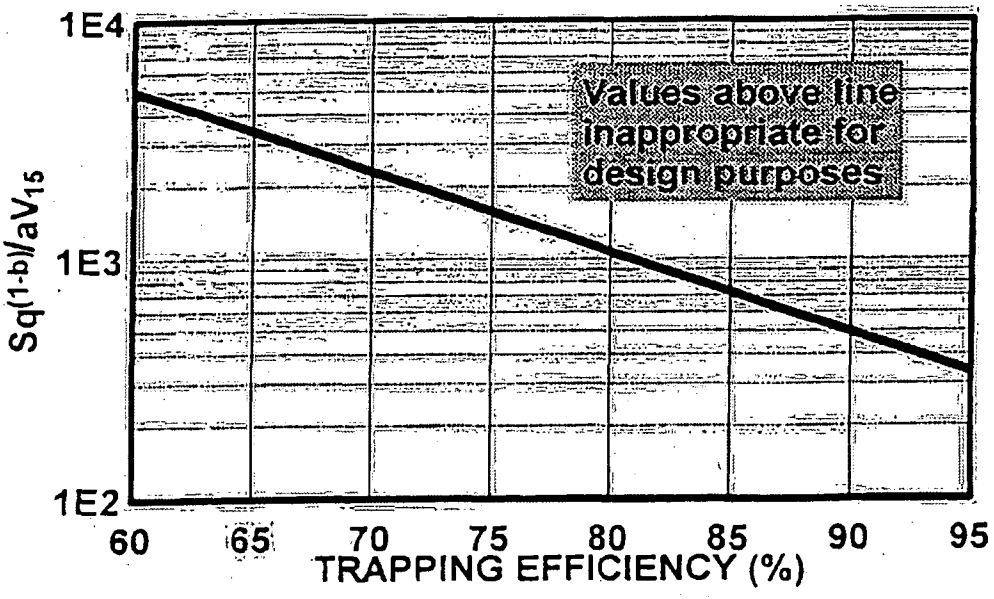


Figure 3c. Design aid for estimating trapping efficiency of rock ditch checks with coarse texture soils.

LIMITS ON VALUES FOR FENCE
watershed area ≤ 5 acres
overland flow length ≤ 500 ft
overland slope ≤ 6%
slurry flow rate ≤ 10 gpm/ft^2
maximum height ≤ 3 ft

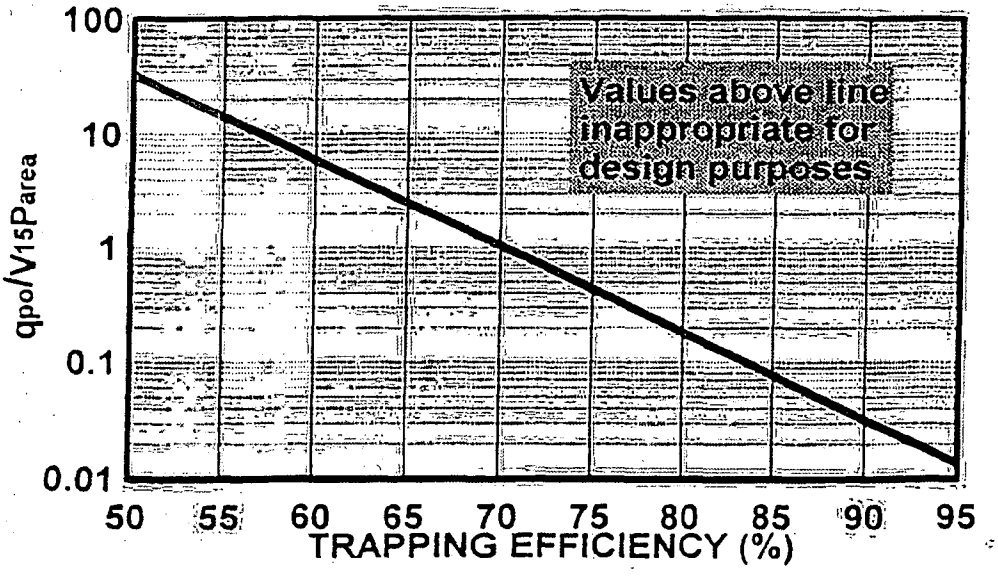


Figure 4. Design aid for estimating trapping efficiency of silt fence.

APPENDIX D

RAINFALL DATA FOR SOUTH CAROLINA

South Carolina Rainfall Data

COUNTY NAME	RETURN PERIOD 24 HOUR STORM EVENT (INCHES)							
	1	2	5	10	25	50	100	R Factors
Abbeville	3.2	3.7	4.8	5.7	6.5	7.0	8.0	250
Aiken	3.2	3.7	4.9	5.8	6.7	7.3	8.0	250
Allendale	3.4	3.9	5.1	6.0	6.9	7.8	8.5	300
Anderson	3.3	4.0	5.2	5.9	6.7	7.5	8.0	275
Bamberg	3.4	3.9	5.2	6.0	6.9	7.8	8.5	300
Barnwell	3.3	3.9	5.1	5.9	6.9	7.7	8.2	275
Beaufort	3.7	4.5	5.9	6.8	7.8	8.8	10.0	400
Berkeley (North)	3.5	4.2	5.5	6.4	7.3	8.2	9.3	350
Berkeley (South)	3.6	4.4	5.7	6.7	7.6	8.5	9.8	350
Calhoun	3.3	3.8	5.0	5.9	6.7	7.5	8.2	275
Charleston	3.8	4.6	5.9	6.8	7.8	8.8	10.0	400
Cherokee	3.0	3.5	4.5	5.0	6.0	6.7	7.0	275
Chester	2.9	3.5	4.5	5.1	6.0	6.8	7.3	250
Chesterfield	3.1	3.7	4.8	5.5	6.3	7.2	7.9	275
Clarendon	3.4	4.0	5.1	6.0	6.9	7.8	8.7	300
Colleton (North)	3.5	4.2	5.4	6.3	7.2	8.0	9.1	350
Colleton (South)	3.6	4.4	5.7	6.7	7.7	8.5	9.6	350
Darlington	3.2	3.8	5.0	5.7	6.5	7.5	8.3	300
Dillon	3.3	3.9	5.2	5.9	6.8	7.8	8.6	325
Dorchester (North)	3.4	4.2	5.4	6.3	7.2	8.0	9.1	325
Dorchester (South)	3.6	4.4	5.7	6.7	7.6	8.5	9.6	325
Edgefield	3.2	3.7	4.7	5.7	6.5	7.1	7.9	250
Fairfield	3.0	3.5	4.5	5.3	6.1	6.9	7.6	250
Florence	3.3	4.0	5.2	6.0	6.8	7.8	8.8	325
Georgetown	3.6	4.5	5.7	6.7	7.7	8.7	9.8	350
Greenville (North)	4.0	5.0	5.8	6.1	7.3	8.2	8.8	300
Greenville (South)	3.4	4.0	5.0	5.7	6.6	7.3	8.0	300
Greenwood	3.1	3.7	4.7	5.6	6.4	7.0	7.8	250
Hampton	3.4	4.1	5.4	6.3	7.2	8.0	8.9	325
Horry (North)	3.4	4.0	5.4	6.3	7.3	8.2	9.3	350
Horry (South)	3.6	4.5	5.6	6.7	7.6	8.6	9.7	350
Jasper	3.5	4.3	5.7	6.7	7.6	8.3	9.3	350
Kershaw	3.1	3.7	4.7	5.5	6.3	7.2	7.9	275
Lancaster	3.0	3.6	4.6	5.3	6.1	7.0	7.6	250
Laurens	3.1	3.7	4.7	5.5	6.2	7.0	7.7	250
Lee	3.2	3.8	5.0	5.7	6.5	7.5	8.3	275
Lexington	3.1	3.7	4.8	5.6	6.5	7.2	7.9	250
Marion (North)	3.3	3.9	5.3	6.0	6.9	7.8	8.8	325
Marion (South)	3.4	4.2	5.4	6.3	7.2	8.2	9.2	325
Marlboro	3.2	3.8	4.9	5.7	6.6	7.6	8.2	300
McCormick	3.2	3.7	4.8	5.7	6.5	7.0	7.5	250
Newberry	3.0	3.6	4.5	5.4	6.1	7.0	7.5	250
Oconee (North)	4.5	5.3	7.0	8.0	9.1	9.8	11.0	300
Oconee (South)	3.5	4.6	5.8	6.5	7.5	8.0	9.0	300
Orangeburg	3.3	3.9	5.2	6.0	6.8	7.7	8.5	275
Pickens (North)	4.2	5.3	6.8	7.2	8.7	9.0	10.4	300
Pickens (South)	3.7	4.7	5.8	6.3	7.5	8.3	9.2	300
Richland	3.1	3.7	4.8	5.7	6.4	7.3	7.9	275
Saluda	3.1	3.7	4.7	5.7	6.4	7.3	7.9	250
Spartanburg NE	**Suggest use of National Weather Bureau**							
Spartanburg NW	**Publication Technical Paper 40.**							
Spartanburg SE	**Rainfall data in this area must be**							
Spartanburg SW	**predicted carefully.**							
Sumter	3.2	3.8	5.0	5.8	6.6	7.6	8.3	275
Union	3.0	3.5	4.5	5.1	6.0	6.8	7.4	250
Williamsburg	3.4	3.5	5.4	6.3	7.2	8.1	9.2	325
York	2.8	3.5	4.5	5.0	6.0	6.7	7.0	250

APPENDIX E

SAMPLE STORMWATER MANAGEMENT AND

SEDIMENT REDUCTION BEST MANAGEMENT PRACTICES

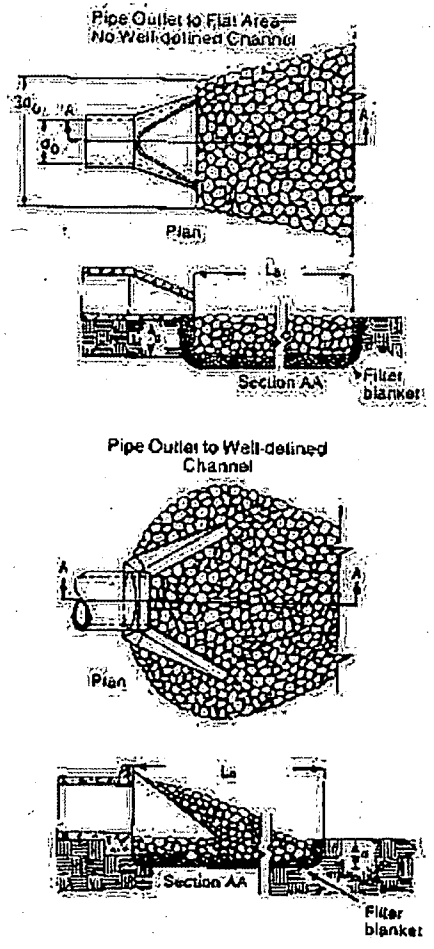
BMP	DEFINITION	PURPOSE	WHERE APPLICABLE	PLANNING CONSIDERATION
SEDIMENT CONTROL PRACTICES				
Mulching	Use of a protective blanket of straw, residue, gravel or synthetic material on soil surface	To protect soil surface from forces of raindrop impacts, overland or sheet water flow	May be used on beds for temporary or permanent seeding and on areas of bare soil when seeding or planting must be delayed	Avoid organic mulch that may contain weed seeds Choice of mulch should be based season, type of vegetation, soil condition, and size of area
Temporary Seeding	Planting fast-growing vegetation to provide temporary erosion control	To provide stabilization of bare soil areas that will not be brought to final grade for a period of more than 30 working days	May be used on cleared, unvegetated areas where temporary erosion control is needed	Selection of appropriate plant species, use of quality seed, and proper bed preparation are important
Permanent Seeding	Control of runoff and erosion with permanent vegetation	To economically control erosion and sedimentation	May be used in fine-graded areas	Planting should occur within 30 working days or 120 calendar days of final grade Same as for temporary seeding
Sodding	Use of grass sod to permanently stabilize an area	To rapidly prevent erosion and sedimentation	May be used in areas requiring immediate and permanent vegetative cover	More costly than seeding, but can be established during times of year when grass seed may fail

BMP	DEFINITION	PURPOSE	WHERE APPLICABLE	PLANNING CONSIDERATION
Outlet Stabilization Structure Figure 1	Structure designed to control erosion at the outlet of a channel or conduit	To prevent erosion by reducing water velocity from the outlet of a channel or conduit	May be used at locations where water velocity from a conduit, channel, pipe, diversion, etc. exceeds permissible velocity of the receiving channel or disposal area	Riprap aprons are relatively low cost and easy to install. Riprap stilling basins or plunge pools are used where overfalls exit the ends of pipes or where high flow would require excessive apron lengths.
Excavated Drop Inlet Protection (Temporary) Figure 2	An excavated area in the approach to a storm drain drop inlet or curb inlet	To trap sediment at the approach to a storm water drainage system	May be used where relatively heavy storm water flows are expected and overflow capability is needed	Frequent maintenance is required. Temporary flooding of the excavated area is expected
Fabric Drop Inlet Protection (Temporary) Figure 3	Temporary fabric barrier placed around a drop inlet	To prevent sediment from entering the storm drain during construction activities; allows early use of storm drain	May be used where storm drains inlets are to be operational before permanent stabilization of the drainage area occurs. This method is used where inlet drains a nearly level area with slopes less than 5%	This method must not be used near the edge of fill material and must not divert water over cut or fill slopes
Temporary Graveled Construction Site Entrance/Exit Figure 4	A gravel driveway or pad located at a point where vehicles enter and exit a construction site	Provides a suitable location for vehicles to drop mud and sediment before entering public roads; controls erosion from surface runoff and to help control dust	May be used wherever traffic leaves a construction site and enters a public road or other paved areas	Construction plans should limit traffic to properly constructed entrances to the site

BMP	DEFINITION	PURPOSE	WHERE APPLICABLE	PLANNING CONSIDERATION
Silt Fence (Sediment Fence) Figure 5 and 6	Temporary sediment barrier consisting of filter fabric or burlap stretched across supporting posts and entrenched	To catch and hold small amounts of sediment from disturbed areas by reducing the velocity of sheet flow to allow sediment deposition	May be used below small disturbed areas less than ¼ acre per 100' of fence, and where runoff can be stored behind the fence without damaging the fence or the area behind the fence	Sediment or silt fences should be located in areas where only shallow pools can form behind them. Sediment deposition should be periodically removed and properly disposed of.
Straw Bale Dike Figure 7	Temporary sediment barrier constructed from a row of entrenched and anchored straw bales	To catch and retain sediment on the construction site and prevent sedimentation	May be used below disturbed areas subject to sheet and rill erosion where temporary sedimentation control is needed	Straw bale dikes should never be built in live streams, swales, or drainage ways
Check Dam Figure 8	Small, temporary stone dam constructed across a drainageway	To reduce erosion of the channel by restricting the velocity of flow in the channel	May be used as a temporary or emergency measure to limit erosion by reducing flow in a small, open channel	Check dams should not be used in live streams Check dams installed in grass-lined channels may kill the vegetative lining if submergence after rain is too long or sedimentation is too heavy
Temporary Sediment Trap Figure 9	A small temporary ponding basin formed by excavation or by an embankment	To detain sediment-laden runoff and to trap the sediment; to protect receiving lakes, streams, rivers, and other water bodies from sedimentation	May be used at the outlets of drains, diversions, channels, and other runoff conveyances; may be installed during early site development	Access to the basin must be maintained to periodically remove sediment for proper disposal Structure life limited to 2 years

BMP	DEFINITION	PURPOSE	WHERE APPLICABLE	PLANNING CONSIDERATION	DESIGN CRITERIA
Sediment Basin	A suitably located earthen embankment designed to capture sediment	To retain sediment on the construction site and to prevent sedimentation of offsite waterbodies	May be used where erosion control measures are not adequate to prevent offsite sedimentation	This practice applies to structures 15' or less in height, and whose failure would not jeopardize property or lives Basin life limited to 3 years unless it is designed as a permanent structure	Drainage area: less than 100 acres; flow length to basin width ratio should be greater than 2:1 to improve trapping efficiency
STORM WATER MANAGEMENT SYSTEMS					
Grass-Lined Channels (Grassed Swale)	A channel with vegetative lining for conveyance of storm water runoff	To convey and infiltrate concentrated surface runoff without damage from flooding, deposition or erosion	May be used as roadside ditches, channels along property boundaries, outlets for diversion, and as drainage for low level areas	Should be located to conform with and use the natural drainage system Avoid crossing ridges or watershed Avoid sharp changes in grade or direction of channel	Peak capacity minimum of 10 year storm without eroding. Velocity: No more than 2 ft./sec without a channel liner Side slopes: 3:1 or flatter
Wet Extended Detention Pond	A permanent pool system containing a forebay near the inlet to trap sediments and a deep pool for storage	To provide temporary storage of storm water runoff before it is discharged downstream; protects the downstream channel from erosion and sedimentation; functions as a sediment trap and pollution filter	Most effective in large, intensely developed sites, usually greater than 10 acres This is generally the most cost effective practice for urban/coastal areas	Pond should be designed to hold post-development peak storm water runoff 24 hours or more for 90% particulate-form or suspended solid pollutant removal	Maximum Depth: 6' to 8' for permanent pool Littoral Shelf: Extend side slopes out 2' to 3' with slope of 6:1 or flatter Inlet structures designed to dissipate energy of water entering the pool
Wet Pond	A pond with all of its storage as a permanent pool	To provide a high level of urban pollutant removal through biological uptake of aquatic wetland vegetation	May be used in areas where a combination of water quality treatment, streambank erosion protection, and flood protection is needed	Shallow areas around the pond should be designed to encourage growth of emergent wetland vegetation, which functions as a biological filter and sediment trap	Surface Area and Volume: Minimum of 1.5% of the contributing catchment area; Geometry: Length-to-width ratio of 3:1 or 5:1

BMP	DEFINITION	PURPOSE	WHERE APPLICABLE	PLANNING CONSIDERATION	DESIGN CRITERIA
Dry Extended Detention Pond Figure 10	An open pond system that temporarily stores excess runoff from the site prior to gradual release after the peak of storm water inflow has passed	To temporarily store excess storm water runoff from a site before gradual release into a receiving water body; provides removal of sediments through settling	May be used on large development sites where water quality treatment and flood control are needed	Generally, the completed pond should be planned to provide safety for people, protection of property, improved storm water runoff control and provide wildlife habitats	Requires a minimum of 40 hours detention time for settling of urban pollutants and sediment from a 2 year, 24 hour storm Pond depth and geometry same as for a wet pond
Grass Filter Strip	A grassed surface area designed to accept overland sheet flow	Used to remove sediment, organic materials, and trace metals from storm water runoff	May be used to protect surface infiltration trenches from clogging with sediment, parking lot perimeters, on sides of roadways, etc.	To be effective, the depth of storm water during treatment should not exceed the height of the grass Runoff should be a uniform sheet flow	Grade should be uniform, even, with a relatively low slope A shallow stone trench along the top of the grassed filter strip may serves as a level spreader
Infiltration Trench	A shallow, excavated trench back-filled with stone to form an underground reservoir to infiltrate storm water runoff into the subsoil or drain into pipes and be diverted to a suitable collection point	To provide control of storm water runoff, preserve on-site ground water and remove sediments and pollutants	May be used for residential lots, commercial areas, parking lots, and open areas	If infiltration is desired, soils and depth to the ground water table must be suitable	Drainage Area: 5 to 10 acres Trench Depth: 3′ to 8′ Stone fill material shall consist of washed aggregate 1.5" to 3" in diameter
Fertilizer/Pesticide Control	Proper use of fertilizers and pesticides to avoid water quality impacts	To reduce nutrient loading and toxic chemical loading of storm water runoff	Developed and developing sites	Developments adjacent to sensitive water bodies should provide lawn care services, and carefully monitor and time applications to avoid polluted runoff entering receiving waters	Fertilizers and pesticides should be stored in sheds and away from water sources (streams, lakes, etc.) and pervious soil



Notes

1. L_a is the length of the riprap apron.
2. d = 1.5 times the maximum stone diameter but not less than 6".
3. In a well-defined channel extend the apron up the channel banks to an elevation of 6" above the maximum tailwater depth or to the top of the bank, whichever is less.
4. A filter blanket or filter fabric should be installed between the riprap and soil foundation.

Figure 1: Outlet Stabilization Structure
Source: North Carolina Erosion and Sediment Control Planning and Design Manual. 1988.

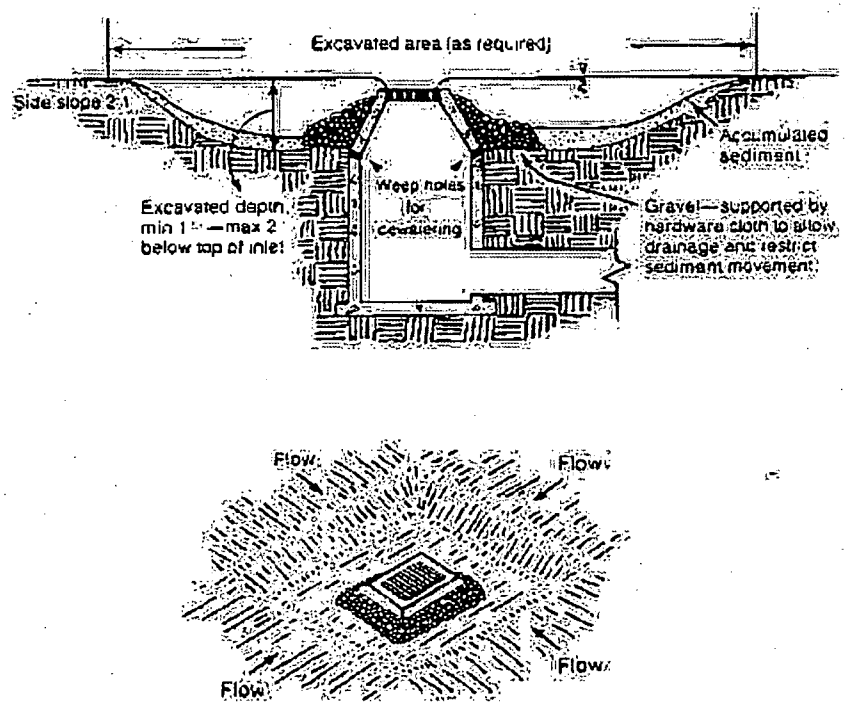


Figure 2. Excavated Drop Inlet Protection (Temporary)
Source: North Carolina Erosion and Sediment Control Planning and Design Manual - 1988

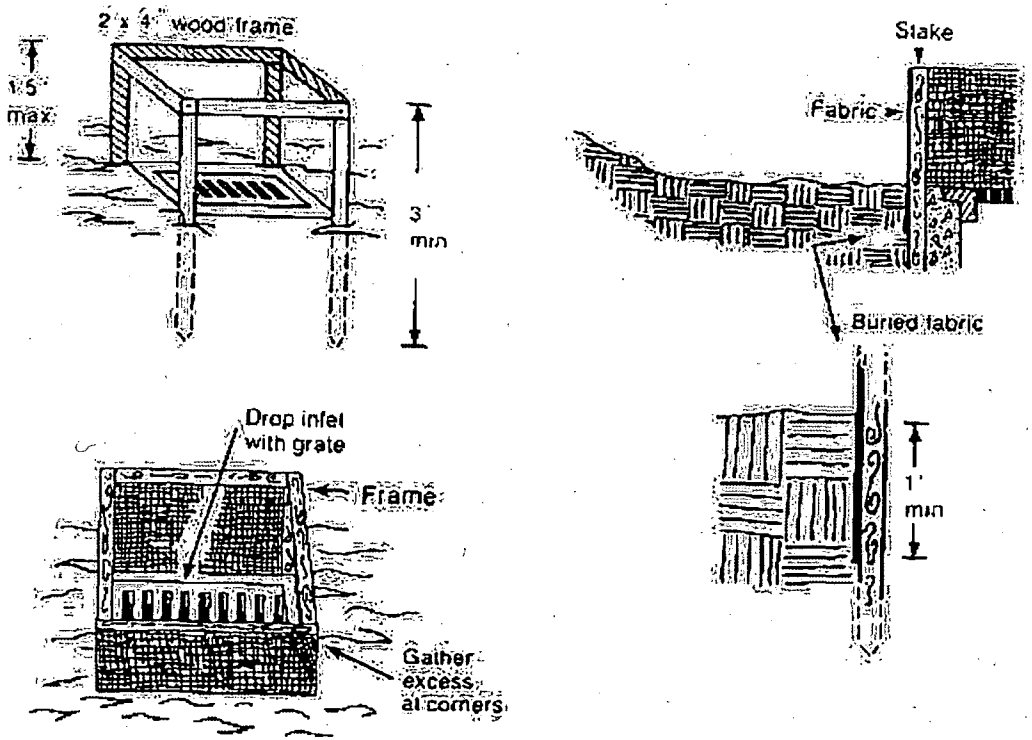


Figure 3. Fabric Drop Inlet Protection (Temporary)
Source: North Carolina Erosion and Sediment Control Planning and Design Manual 1988

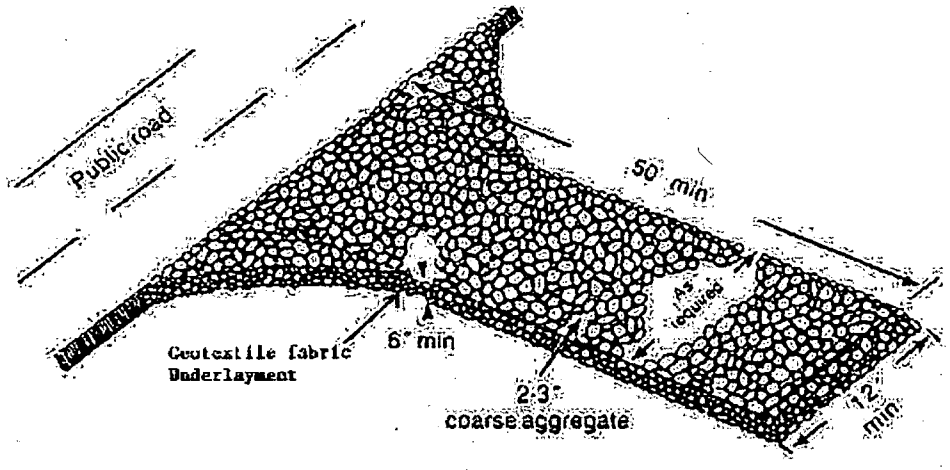


Figure 4. Temporary Graveled Construction Site Entrance/Exit
Source: North Carolina Erosion and Sediment Control Planning and Design Manual 1988

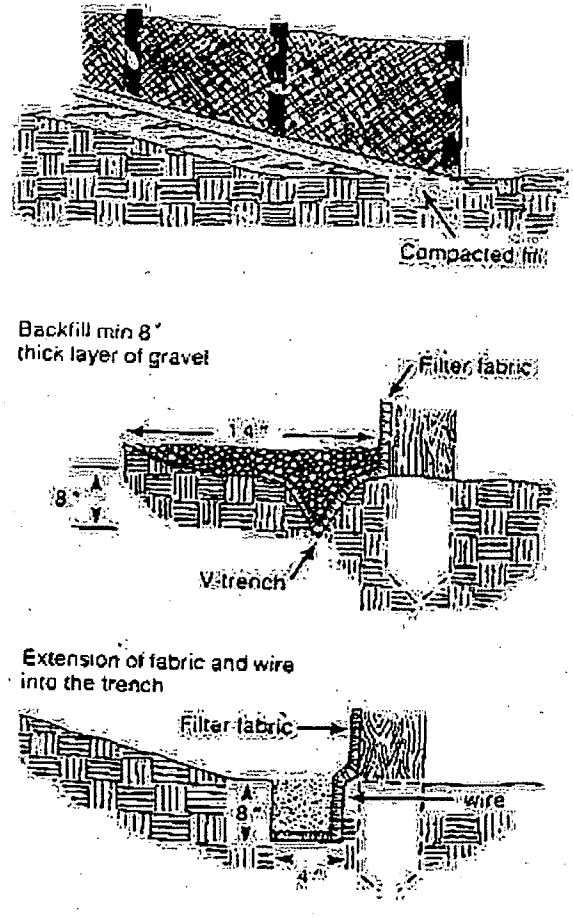


Figure 5: Silt Fence (Sediment Fence)
Source: North Carolina Erosion and Sediment Control Planning and Design Manual 1988.

Note:
Silt fence to be installed by lot owner prior to construction and to be maintained until lot is graded and turf is established.

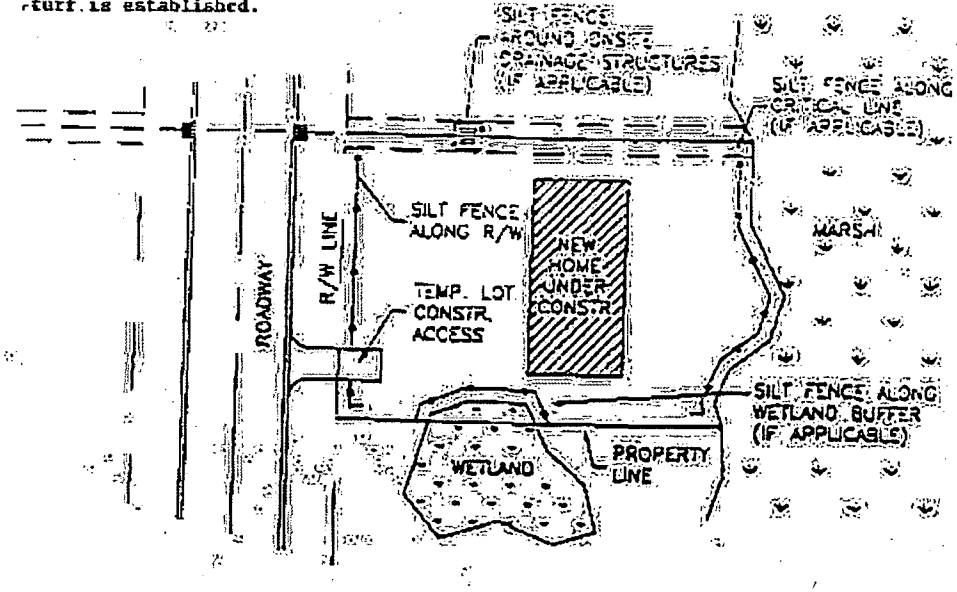


Figure 6 Lot Silt Fence Plan
Source: North Carolina Erosion and Sediment Control Planning and Design Manual 1988

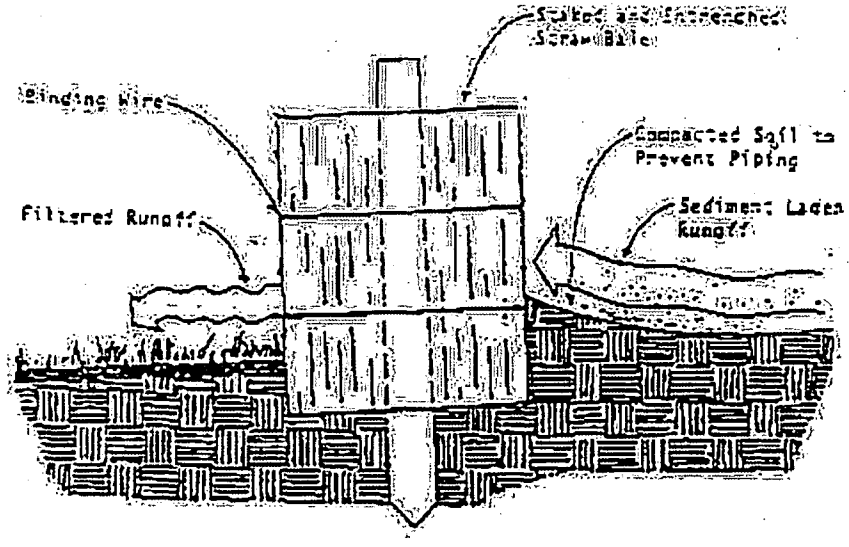


Figure 7 Straw Bale Dike
Source: Storm Water and Erosion and Sediment Control Best Management Practices for Developing Areas, Florida

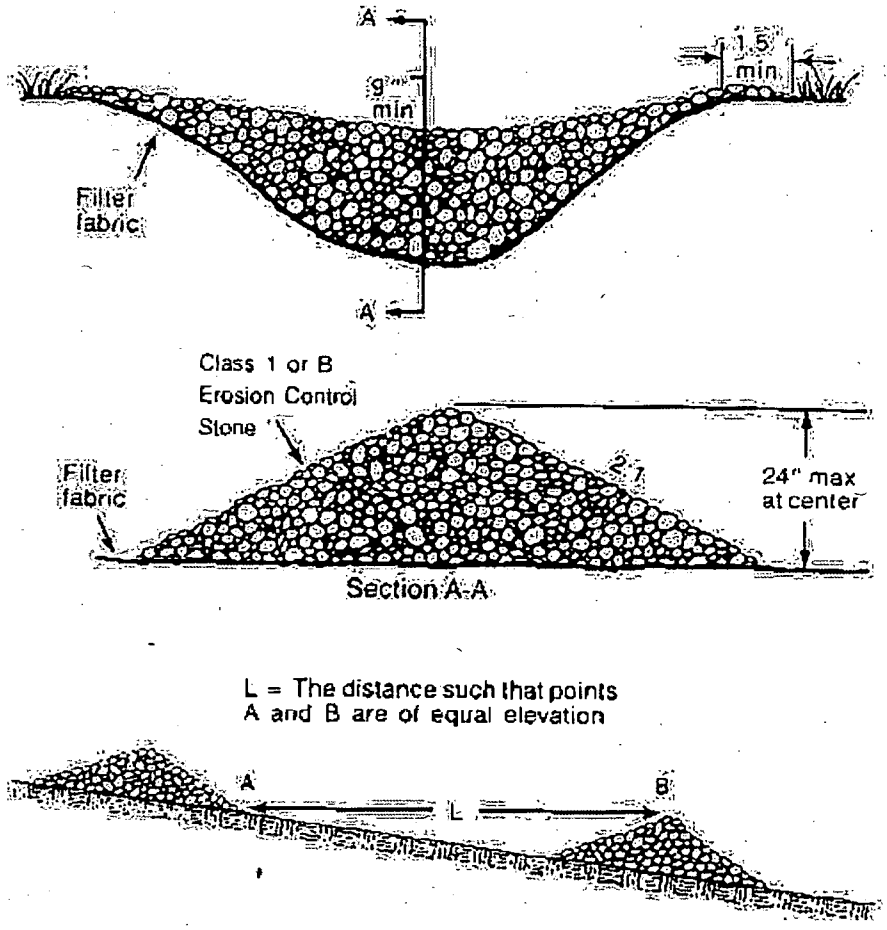


Figure 8: Stone Check Dam
Source: North Carolina Erosion and Sediment Control Planning and Design Manual - 1988

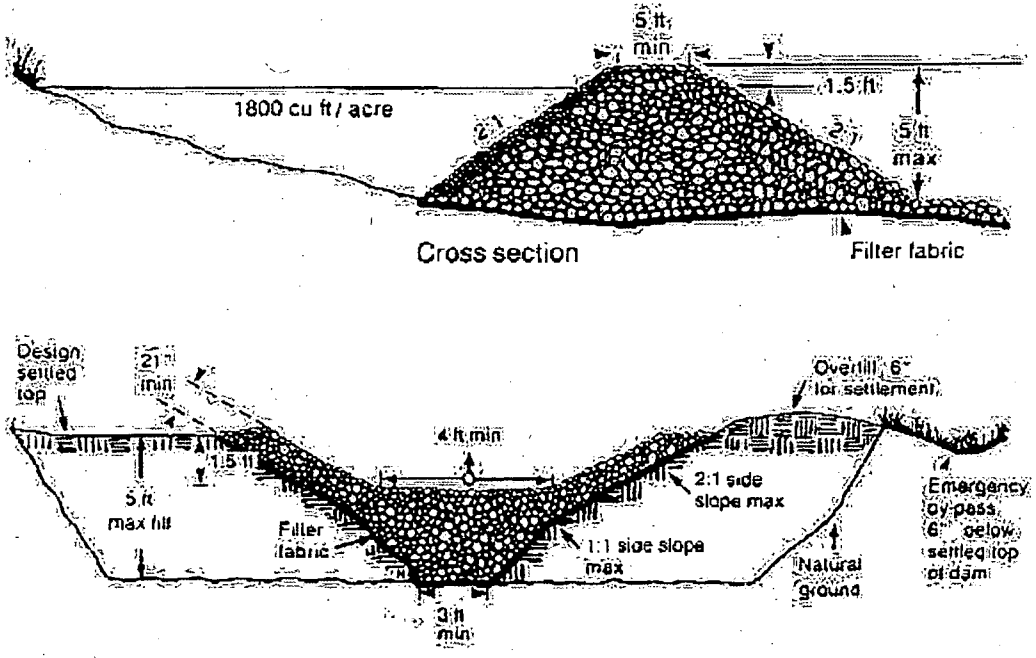


Figure 9: Temporary Sediment Trap
Source North Carolina Erosion and Sediment Control Planning and Design Manual, 1988

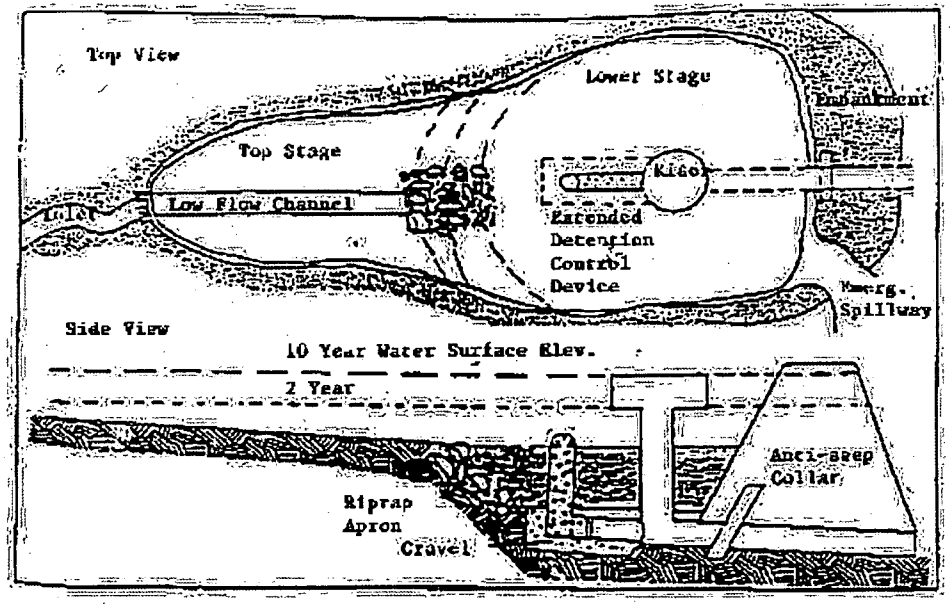
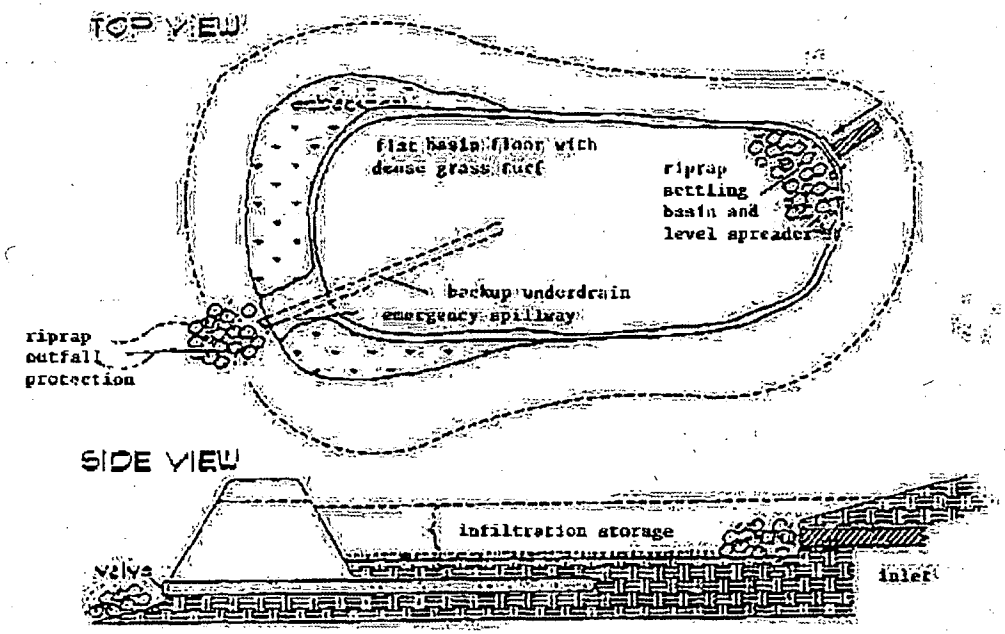


Figure 10: Dry Extended Detention Pond
Source: Schueler 1987



backup underdrain pipe in case of standing water problems

Figure 11: Infiltration Basin
Source: Schueler – 1987