

DEQ Certification Class Presentations

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July 2024



Module 5

Virginia Stormwater Management Handbook

Module 5 Contents

5a. Design Specifications and the Minimum Standards

5b. Structural Construction Best Management Practices

5c. Vegetative Construction Best Management Practices

Module 5a.

Design Specifications and the Minimum Standards

Technical Assistance

- Sections § 62.1-44.15:30 of VESMA and § 62.1-44.15:52.B. of the ESC law requires the Department to:
 - Provide technical assistance and advice to
 - Conduct and supervise educational programs for VESCP and VESMP authorities
- One way the Department accomplishes this is with the Virginia Stormwater Management Handbook (VSWHB)

Construction BMPs – VSWHB Ch.7

- Structural practices
 - **C-ECM** – Erosion Control Measures
 - **C-ENV** – Environmentally Sensitive Area Protection
 - **C-PCM** – Perimeter Control Measures
 - **C-SCM** – Sediment Control Measures
 - For sediment control; *second* line of defense
- Vegetative practices
 - **C-SSM** – Surface Stabilization Measures
 - For erosion control, *first* line of defense

Numbering and Nomenclature

**First letter represents
the type of BMP:**

- Construction (C)
- Post-Construction (P)

**Number represents
the specific BMP**

**C-PCM-04**

Three letters represent the primary function of the BMP:

- Erosion Control Measures (ECM)
- Perimeter Control Measures (PCM)
- Surface Stabilization Measures (SSM)
- Sediment Control Measures (SCM)
- Environmentally Sensitive Area Protection (ENV)
- Basins (BAS)
- Filtration/Infiltration (FIL)
- Conveyance (CNV)
- Support Components (SUP)

Handbook Specifications and the Minimum Standards

Soil Stabilization for Erosion Control MS-1, 2, 3, and 5

Environmentally Sensitive Area Protection (C-ENV)

C-ENV-15 Seeding, Mulching, and Soil Stabilization (Wetlands/Streams) (MS-1, 3)

Sediment Control Measures (C-SCM)

C-SCM-01 Dust Control (MS-2)

C-SCM-13 Concrete Washout Pit (MS-2)

Surface Stabilizations Measures (C-SSM)

C-SSM-01 Tree Preservation and Protection (MS-1)

C-SSM-02 Topsoiling (MS-1, 2)

C-SSM-03 Surface Roughening (MS-1, 7)

C-SSM-04 Compost Blankets (MS-1)

C-SSM-05 Soil Stabilization Blankets and Matting (MS-1, 3)

Handbook Specifications and the Minimum Standards

Soil Stabilization for Erosion Control MS-1, 2, 3, and 5 (Continued)

Surface Stabilizations Measures (C-SSM)

C-SSM-06 Sodding (MS-1, 3)

C-SSM-07 Bermudagrass and Zoysiagrass Establishment (MS-1) Note: MS-3 is not listed in the VSWHB

C-SSM-08 Trees, Shrubs, Vines, and Ground Cover (MS-1, 5, 7)

C-SSM-09 Temporary Seeding (MS-1, 2)

C-SSM-10 Permanent Seeding (MS-1, 3)

C-SSM-11 Mulching (MS-1)

Handbook Specifications and the Minimum Standards

Sediment Control MS-4 and 6

Erosion Control Measures (C-ECM)

- C-ECM-01 Straw Wattles (MS-4)
- C-ECM-02 Impermeable Diversion Fence (MS-4)
- C-ECM-04 Temporary Diversion Dike (MS-4, 8)
- C-ECM-05 Diversion (MS-4, 5, 8, 9, 19)

Environmentally Sensitive Area Protection (C-ENV)

- C-ENV-10 Trenchless Silt Fence (MS-4)
- C-ENV-11 Wetland Berm (MS-4)

- C-ENV-12 Wetland Weir Outlet (MS-4)
- C-ENV-13 Wetland Cell Sediment Trap (MS-4, 6)

Perimeter Control Measures (C-PCM)

- C-PCM-01 Safety Fence (MS-4)
- C-PCM-02 Straw Bale Barrier (MS-4)
- C-PCM-03 Brush Barrier (MS-4)
- C-PCM-04 Silt Fence (MS-4)
- C-PCM-05 Compost Filter Sock (MS-4)

Handbook Specifications and the Minimum Standards

Sediment Control MS-4 and 6 (Continued)

Sediment Control Measures (C-SCM)

C-SCM-02 Construction Road Stabilization (MS-4, 17)

C-SCM-03 Temporary Stone Construction Entrance (MS-4, 17)

C-SCM-04 Inlet Protection (MS-4) Note: MS-10 is not listed in the VSWHB

C-SCM-06 Wood Chip Filter Berm (MS-4)

C-SCM-08 Rock Filter Outlet (MS-4)

C-SCM-09 Turbidity Curtain (MS-4, 12, 14)

C-SCM-10 Dewatering Structure (MS-4, 6)

Note: MS-16 is not listed in the VSWHB

C-SCM-11 Temporary Sediment Trap (MS-4, 6)

C-SCM-12 Temporary Sediment Basin (MS-4, 6, 19)

Handbook Specifications and the Minimum Standards

Slope Protection MS-7, 8, and 9

Erosion Control Measures (C-ECM)

C-ECM-03 Slope Interruption Device (MS-7)

C-ECM-04 Temporary Diversion Dike (MS-4, 8)

C-ECM-05 Diversion (MS-4, 5, 8, 9, 19)

C-ECM-06 Temporary Fill Diversion (MS-8)

C-ECM-07 Temporary Right-of-Way Diversion (MS-8)

C-ECM-08 Waterbars and Sheet Flow Breakers (MS-8)

C-ECM-09 Stormwater Conveyance Channel (MS-8)

C-ECM-10 Subsurface Drain (MS-9, 16)

C-ECM-11 Paved Flume (MS-8, 11)

C-ECM-12 Temporary Slope Drain (MS-8)

C-ECM-14 Temporary Level Spreader (MS-8, 11)

Surface Stabilizations Measures (C-SSM)

C-SSM-03 Surface Roughening (MS-1, 7)

C-SSM-08 Trees, Shrubs, Vines, and Ground Cover (MS-1, 5, 7)

Handbook Specifications and the Minimum Standards

Channels, Culverts, and Outlets MS-10 and 11

Erosion Control Measures (C-ECM)

C-ECM-05 Diversion (MS-4, 5, 8, 9, 19)

C-ECM-11 Paved Flume (MS-8, 11)

C-ECM-13 Riprap (MS-11)

C-ECM-14 Temporary Level Spreader (MS-8, 11)

C-ECM-15 Outlet Protection (MS-11)

C-ECM-16 Flexible Transition Mat (MS-11)

Environmentally Sensitive Area Protection (C-ENV)

C-ENV-07 Gabions (MS-11, 15)

Sediment Control Measures (C-SCM)

C-SCM-04 Inlet Protection (MS-4) Note: MS-10 is not listed in the VSWHB

C-SCM-05 Culvert Inlet Protection (MS-10)

C-SCM-07 Rock Check Dams (MS-11)

Handbook Specifications and the Minimum Standards

Watercourses

MS-12, 13, 14, and 15

Environmentally Sensitive Area Protection (C-ENV)

C-ENV-01 Vegetative Streambank Stabilization (MS-15)

C-ENV-02 Structural Streambank Stabilization (MS-15)

C-ENV-03 Temporary Vehicular Stream Crossing (MS-13, 15)

C-ENV-04 Utility Stream Crossing (MS-12, 14)

C-ENV-05 Cofferdam Crossing (MS-12, 14)

C-ENV-06 Stable Wetland Crossing (MS-12, 14)

C-ENV-07 Gabions (MS-11, 15)

C-ENV-08 Pump Around Diversion (MS-12, 14)

C-ENV-09 Overnight Channel Protection (MS-12, 14)

C-ENV-14 Modified Turbidity Curtain for Streams (MS-4, 12, 14)

Sediment Control Measures (C-SCM)

C-SCM-09 Turbidity Curtain (MS-4, 12, 14)

Handbook Specifications and the Minimum Standards

Underground Utilities MS-16

Erosion Control Measures (C-ECM)

C-ECM-10 Subsurface Drain (MS-9, 16)

Sediment Control Measures (C-SCM)

C-SCM-10 Dewatering Structure (MS-4, 6)

Note: MS-16 is not listed in the VSWHB

Construction Entrances MS-17

Sediment Control Measures (C-SCM)

C-SCM-02 Construction Road Stabilization (MS-4, 17)

C-SCM-03 Temporary Stone Construction Entrance (MS-4, 17)

Handbook Specifications and the Minimum Standards

C-BMP Removal MS-18

Applicable to any temporary C-BMP that is not detailed as a permanent SWM control on the approved plan.

Stormwater Quantity MS-19

Erosion Control Measures (C-ECM)

C-ECM-05 Diversion (MS-4, 5, 8, 9, 19)

Sediment Control Measures (C-SCM)

C-SCM-12 Temporary Sediment Basin (MS-4, 6, 19)

Module 5b.

Structural Construction Best Management Practices

Structural C-BMPs

- Designed to filter sediment out of sediment-laden water
- Usually 60 –75% effective
- Will not filter out small or suspended particles
- More expensive than vegetative controls

Structural C-BMPs

- Take a look at the commonly used stone sizes listed in the PG
 - These will be referenced throughout this section
- Then go to Chapter 7 of the Handbook
 - The remainder of this module will use the specifications found in the Handbook

Note

- During this presentation, we do not cover every specification in chapter 7 due to time.
- You are highly encouraged to study the specifications we don't cover and become familiar with those as well.
- Please take notes and highlight your material.
- With ANY of the specs covered, pay attention to the “numbers” (maximum, minimum, how deep, how wide, etc.) as these are important things to remember or be able to find *quickly*.

Organization of BMP Specifications

- 1.0 Definition
- 2.0 Purpose and Applicability
- 3.0 Planning and Considerations
- 4.0 Stormwater Performance Summary
- 5.0 Design Criteria
- 6.0 Construction Specifications
- 7.0 Operations and Maintenance Considerations
- Note: Some BMPs have additional sections

Erosion Control Measures (ECM)

- Prevent sheet, rill and gully erosion
- Reduce the overland flow velocities
- Shorten the length of flow
- Divert and convey runoff safely through a site

C-ECM-01 – Straw Wattles (MS-4)



1.0 Definition

- Temporary measure of weed- and seed-free agricultural straw wrapped in biodegradable netting, tubular plastic, or similar encasing material
- Slow water and trap sediment

6.0 Construction

- Wattles may be set in a 2” trench or on bare soil

C-ECM-03 – Slope Interruption Device (MS-7)



1.0 Definition

- Three-dimensional tubular runoff and erosion control device used for sediment filtration and slope interruption

6.0 Construction

- Install on a smooth surface
- Install parallel to the contour and perpendicular to sheet flow
- Overlap adjacent device ends by at least 1'

C-ECM-04 – Temporary Diversion Dike (MS-4, 5)



1.0 Definition

- Temporary ridge of compacted soil constructed to convey clean stormwater runoff through or around a disturbed land area
- Often work as conveyance in conjunction with other C-BMPs
- NOTE: BMP C-ECM-02 (Impermeable Diversion Fence) is a similar measure

C-ECM-04 – Temporary Diversion Dike

2.0 Purpose and Applicability

- Protect work areas from upslope runoff
- Divert sediment-laden water to appropriate traps or stable outlets
- Retain sediment on site

5.0 Design Criteria

- Max drainage area = 5 acres
- Min compacted height = 18" (including freeboard)
- Minimum top width = 2'
- Side slopes of 2H:1V or flatter
- Must have positive grade to a stabilized outlet

7.0 Operations & Maintenance



- Inspect after every storm and repair the dike, flow channel, outlet, or sediment trapping facility as necessary
- Repair damage caused by construction traffic or other activity before the end of each workday

C-ECM-05 – Diversions (MS-4, 5, 7, 19)



1.0 Definition

- A channel constructed across a slope with a supporting earthen ridge on the lower side

2.0 Purpose and Applicability

- Reduce slope length
- Intercept and divert stormwater runoff to stabilized outlets
- Typically permanent

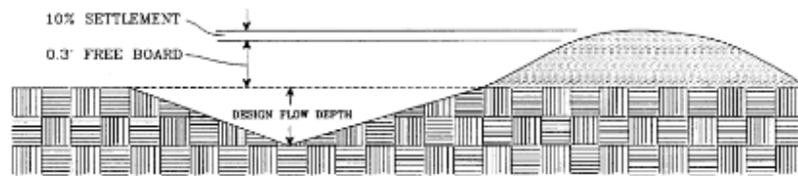
Section 5.0 Design Criteria



TYPICAL PARABOLIC DIVERSION



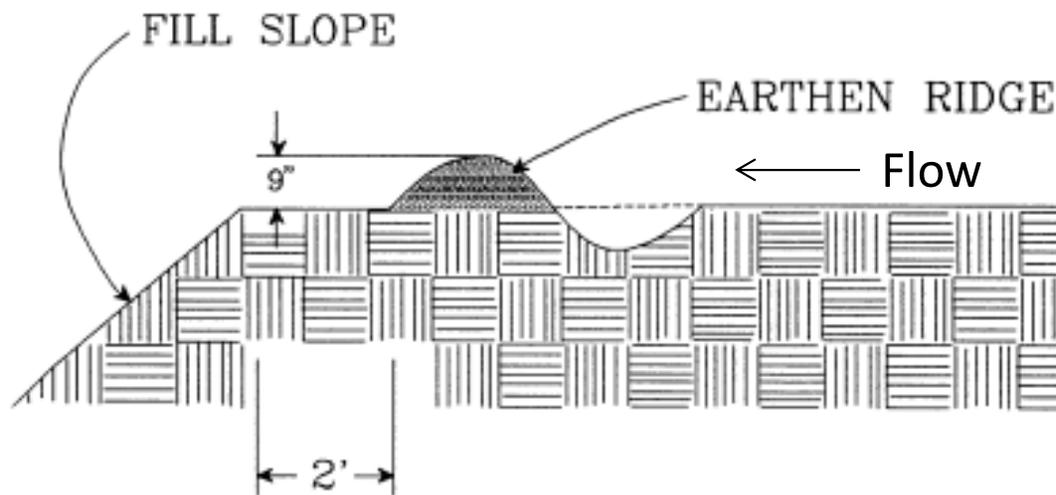
TYPICAL TRAPEZOIDAL DIVERSION



TYPICAL VEE-SHAPED DIVERSION

- Channel must carry a 10-year storm
- Three different channel shapes
- Side slopes no steeper than 2H:1V
- Minimum berm width = 4'
- Minimum freeboard = 0.3'
- Requires adequate outlet

C-ECM-06 – Temporary Fill Diversion (MS-7)



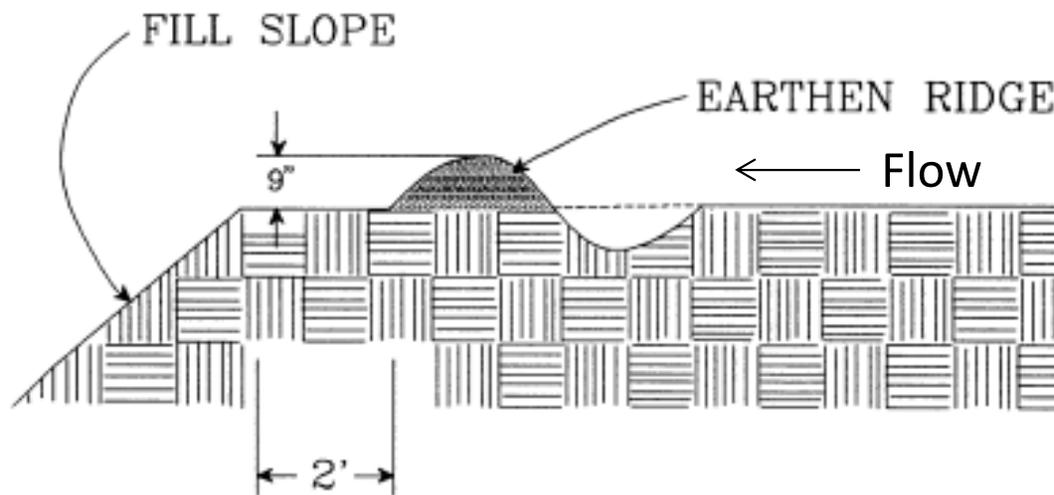
1.0 Definition

- Channel with a supporting ridge of soil on the lower side, constructed along the top of an active earth fill

2.0 Purpose & Applicability

- Diverts water away from slope to stabilized outlet or sediment trapping facility

5.0 Design Criteria



- Max. drainage area = 5 ac
- Minimum height 9"
- Must have positive grade to a stabilized outlet
- Located 2' back from top of slope

7.0 Operation & Maintenance

- If used for *more than one day*, inspect at the end of each workday and repair when needed

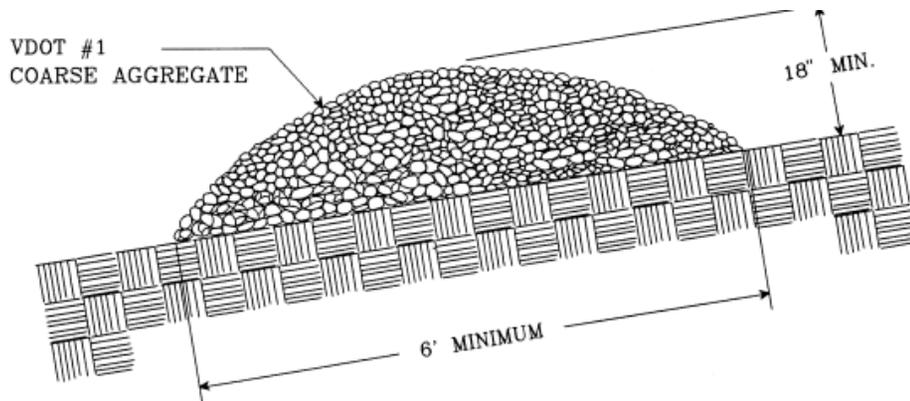
C-ECM-07 – Temporary Right-of-Way Diversion (MS-7)



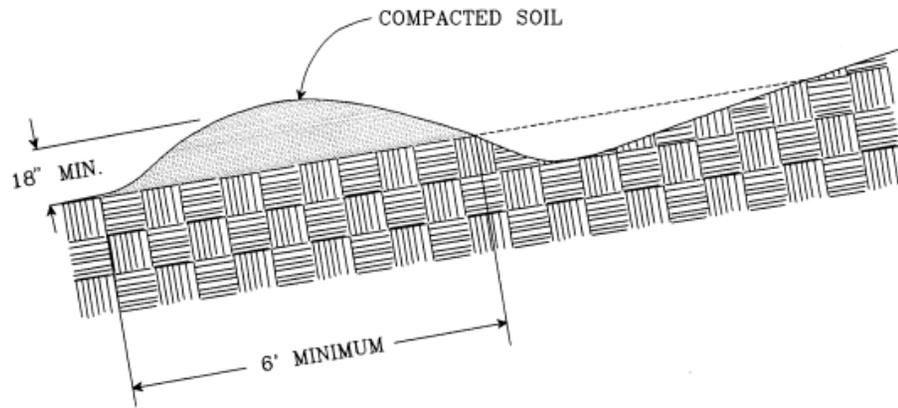
1.0 Definition

- Ridge of compacted soil, loose rock, or gravel constructed across disturbed steep slopes and similar sloping areas that is removed following construction once permanent stabilization has begun

5.0 Design Criteria



TYPICAL GRAVEL STRUCTURE

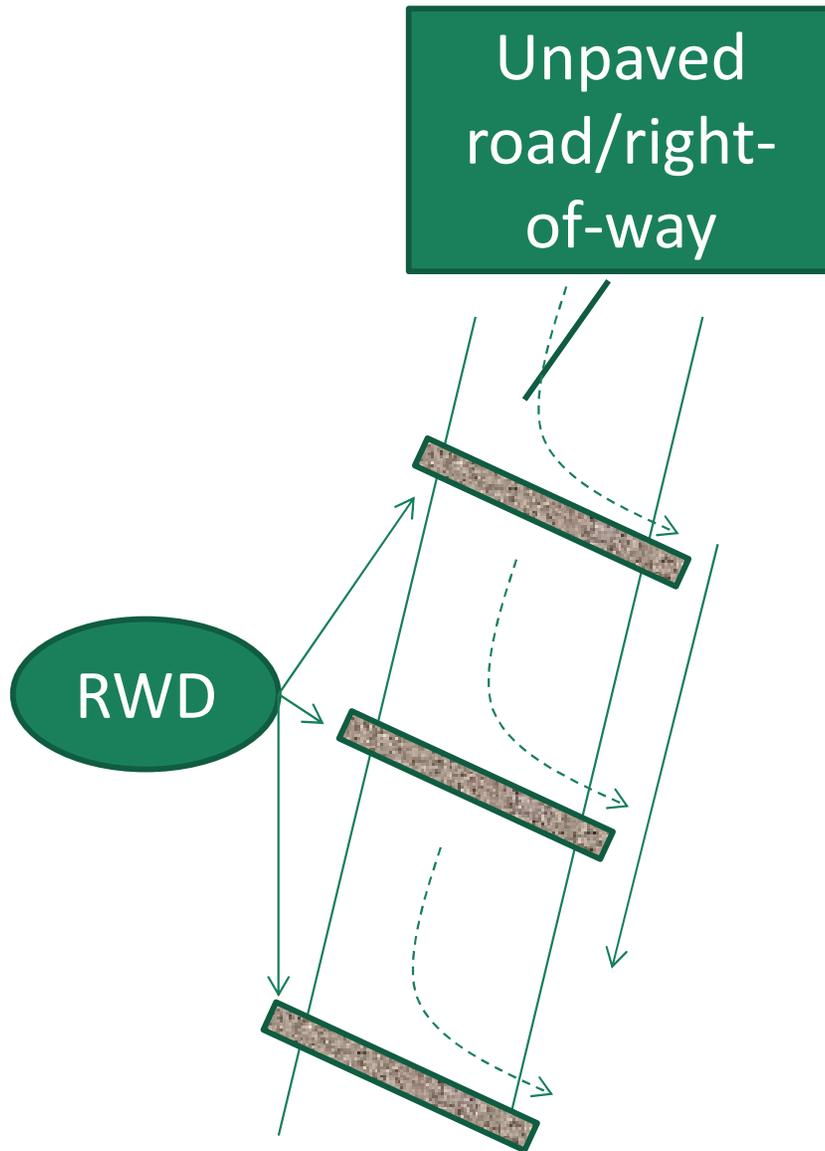


- Minimum height = 18"
- Side slopes 2:1 or flatter to allow the passage construction traffic
- Minimum base width = 6'
- Constructed completely across disturbed portion of ROW

2.0 Purpose

- Use gravel structures where vehicles will cross

5.0 Design Criteria



- Proper spacing is dependent on slope and soil erosivity
 - Table C-ECM-07-2
- Needs to outfall to stabilized area
 - Table C-ECM-07-3

7.0 Operation & Maintenance

- Repair or reshape at end of workday

C-ECM-08 – Waterbars & Sheet Flow Breakers (MS-7)



1.0 Definition

- Shorten sheet flow length, reduce velocity, and flatten slopes
- Intended to remain after permanent stabilization of the site has been achieved

5.0 Design Criteria

- Waterbar
- Open-Top Culvert
- Water Deflector
- Broad-Based Dip

6.0 Construction Specifications



- Installation occurs when site is stabilized
- Compact in 8-inch lifts
- Ensure outlet is installed at downgradient end of practice
- Stabilize with Temporary C-SSM-09 or Permanent Seeding C-SSM-10

7.0 Operation & Maintenance

- Inspect for erosive conditions and / or flooding at outlet

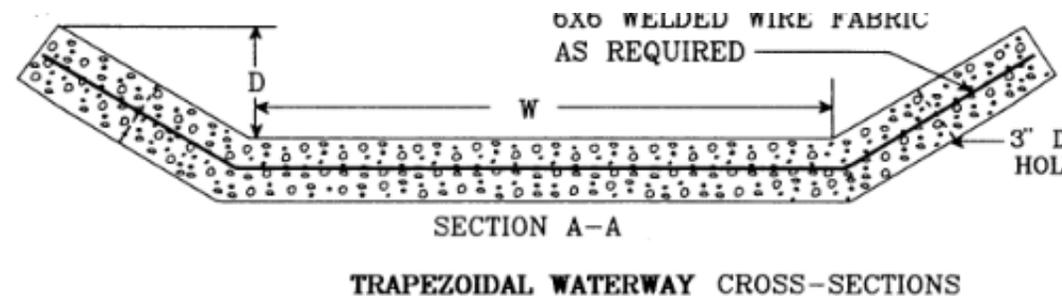
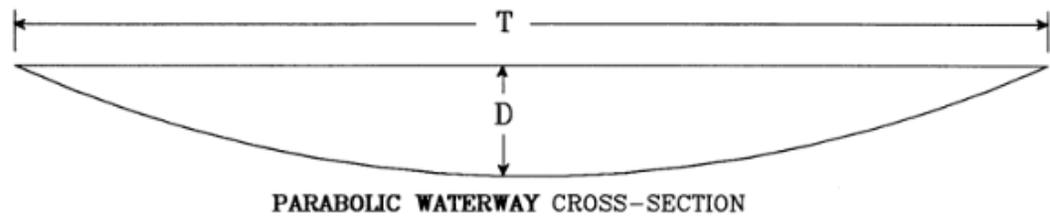
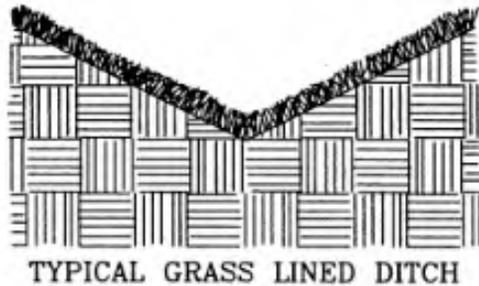
C-ECM-09 – Stormwater Conveyance Channel (MS-5, 11, 19)



1.0 Definition

- Permanent, designed waterway that is shaped, sized, and lined with appropriate vegetation or structural material to safely convey stormwater runoff within or away from a developing area

5.0 Design Criteria



- V-shaped
 - Small quantities of water in a limited-space area
- Parabolic
 - Larger quantities of water with more available space
- Trapezoidal
 - Larger quantities of water to move at high velocities

5.0 Design Criteria

- The outlet condition for all channels must be considered, inspected, and monitored
 - Energy dissipation is required (MS-11)
 - C-ECM-15 Outlet Protection
- Designed to contain the 10-year storm to meet flood protection (MS-19 man-made channel)
- See Table C-ECM-09-1 for more information

5.0 Design Criteria – Grass-lined Conveyance Channels



- Lower velocities only
- Type of vegetation dependent on site conditions
 - Table C-ECM-09-2 for maximum permissible velocity in channel
- Blankets, check dams, or sod may be needed

5.0 Design Criteria – Riprap Channels



- Installed with a filter fabric underlining
 - Keyed in 6” – 9”
- Final cross-sectional elevation of receiving channel \leq elevation of the diversion or tributary flowing into it
- Fabric and riprap in accordance with C-ECM-13

5.0 Design Criteria – Concrete-lined Channels



- Ensure all channels have outlet protection at discharge points
 - See C-ECM-15

6.0 Construction Specs

- Concrete sections should be at least 6' in length
- Expansion joints installed every 100' 90'

7.0 Operations and Maintenance

- Inspect frequently for erosion and scour or undermining of lining
- Check outlet for erosion
- If sediment is deposited in a grass-lined channel, promptly remove the sediment to prevent damage to the grass

C-ECM-12 – Temporary Slope Drain (MS-8)



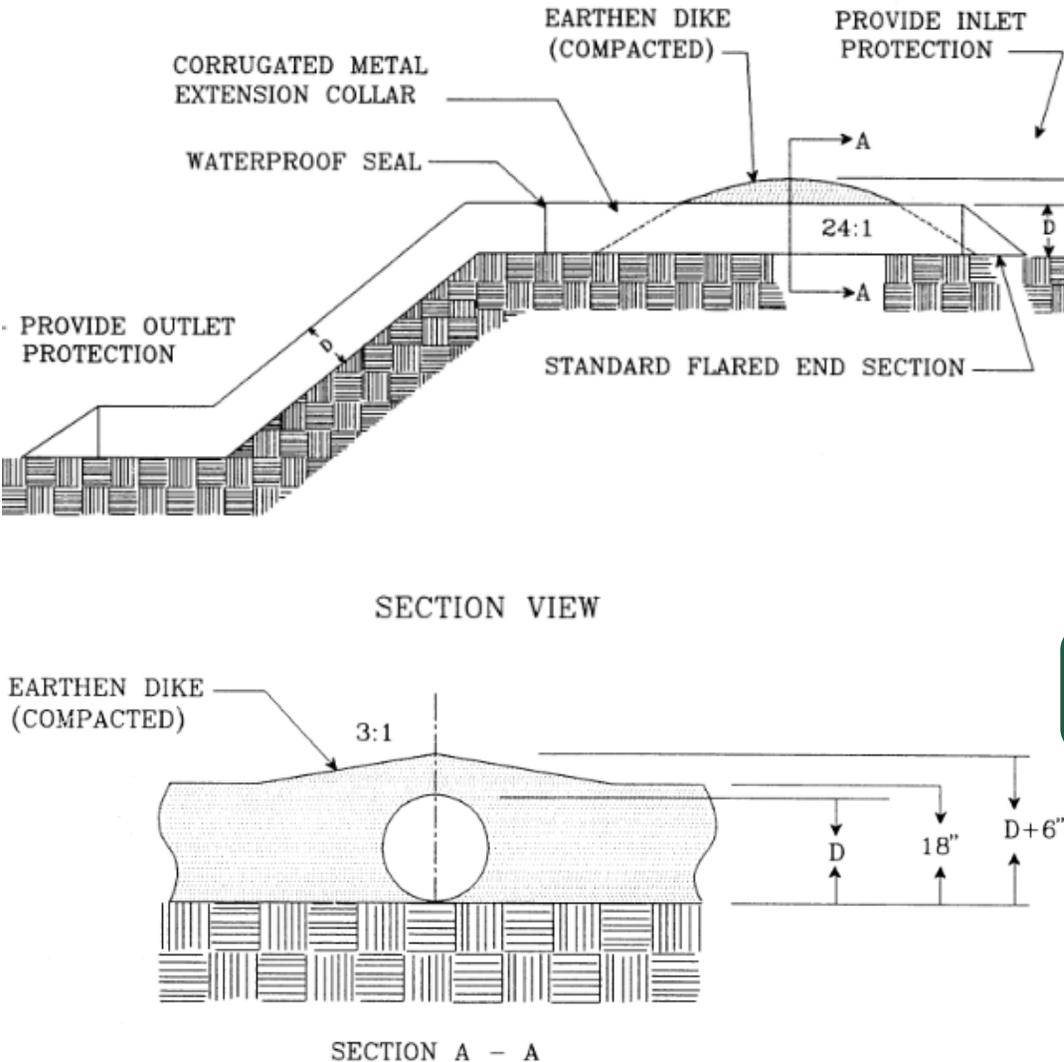
1.0 Definition

- Flexible tubing or conduit extending from the top to bottom of a cut or fill slope

3.0 Planning

- Watertight connections
- Used in conjunction with a diversion dike on a fill slope to contain concentrated runoff

5.0 Design Criteria



- Max. drainage area = 5 acres
- Support stakes spaced at 10' intervals
- Sized according to DA - Table C-ECM-12-2
- Compacted diversion dike height = pipe diameter + 6"

6.0 Construction

- Make sure proper inlet and outlet protection are installed

Temporary Slope Drain Examples



5b. | C-ECM-12 — TEMPORARY SLOPE DRAIN

C-ECM-13 – Riprap (MS – 7, 9)



1.0 Definition

- Permanent, erosion-resistant ground cover
- Large, loose, angular stone installed with filter fabric or granular underlining

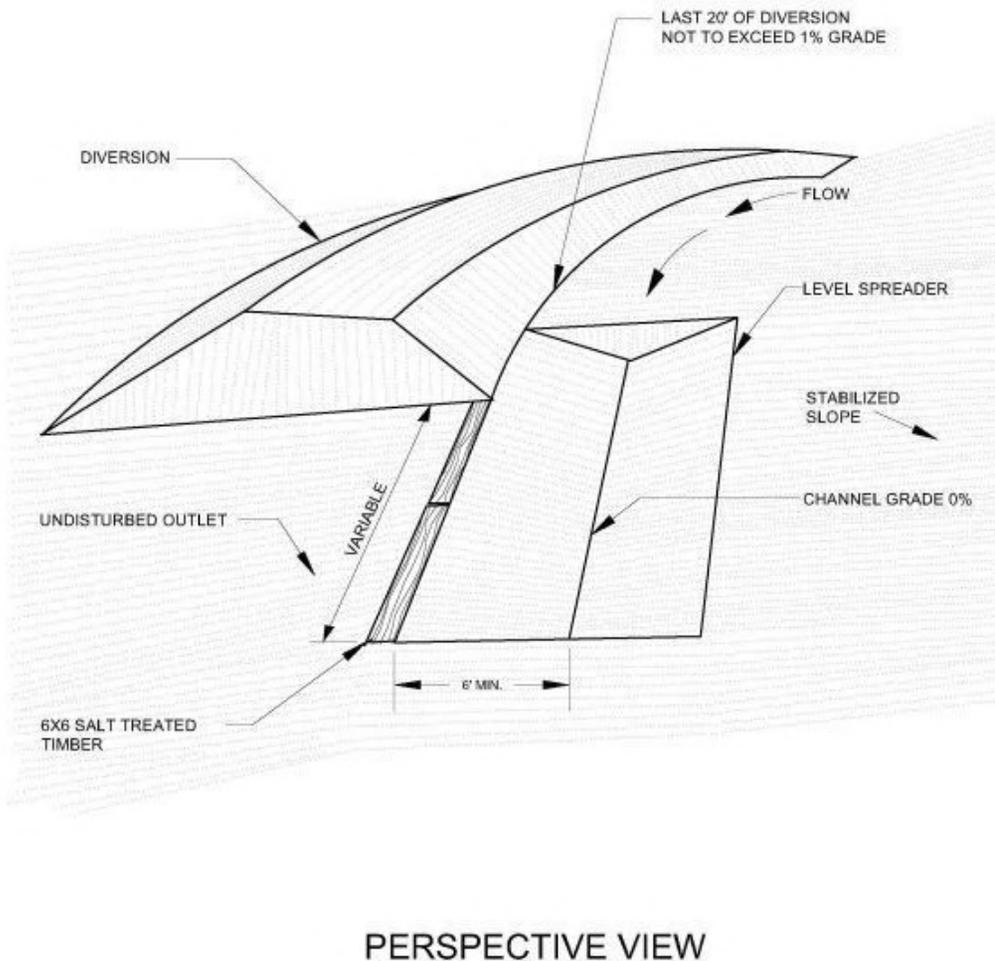
2.0 Purpose

- Purposes include:
 - Protect soil from erosion
 - Slow the velocity of runoff to enhance infiltration
 - Stabilize slopes with seepage problems

C-ECM-14 – Temporary Level Spreader (MS-11)

1.0 Definition

- Flow control measure that receives concentrated, potentially erosive inflow, and converts to sheet flow
- Discharging across a horizontal level weir onto areas of undisturbed soil that is stabilized by existing vegetation
- P-SUP-08 Permanent Level Spreader should be referenced for permanent uses



C-ECM-15 – Outlet Protection (MS-11)

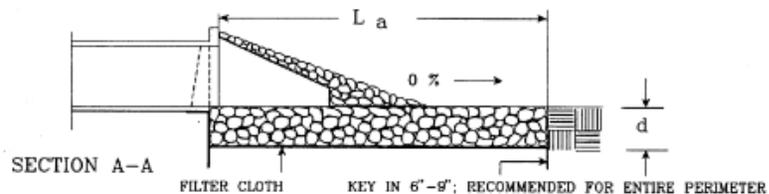
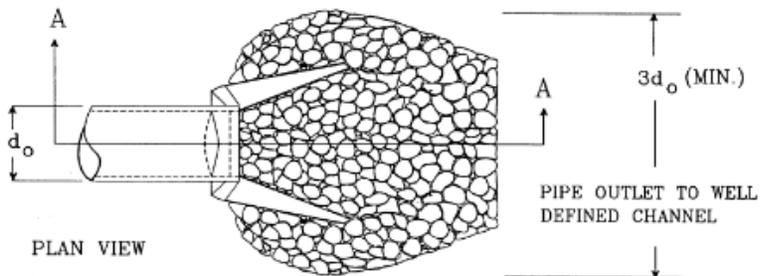
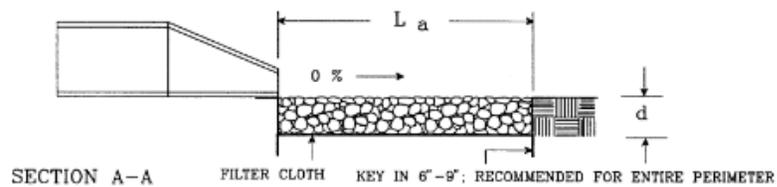
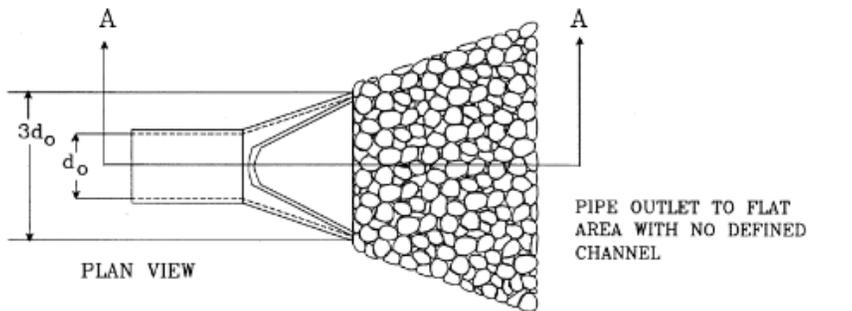
1.0 Definition

- Structurally lined aprons or other forms of energy-dissipating devices
- Placed at the outlets of pipes, curb openings, ditch turnouts, or paved channel sections
- Slow discharge velocity from the outlet to prevent an erosive condition



5.0 Design Criteria

- Design and construct the apron with a 0% grade along its length
- Ensure no bends in the horizontal alignment of the apron
- Sized based on pipe outlet flow condition
- NOTE: C-ECM-16 Flexible Transition Mat is another method of Outlet Protection
- NOTE: C-ECM-13 Riprap should be referenced for stone sizing



6.0 Construction Specifications



- Install before stormwater conveyances are made operational
- Construct the riprap and gravel filter to conform to the specified grading limits shown on the plans
- Riprap may be placed by hand or using equipment

Environmentally Sensitive Area Protection (ENV)

- Used in environmentally sensitive areas (stream corridors, wetlands, floodplains)
- Applied where disturbance in an environmentally sensitive area is necessary

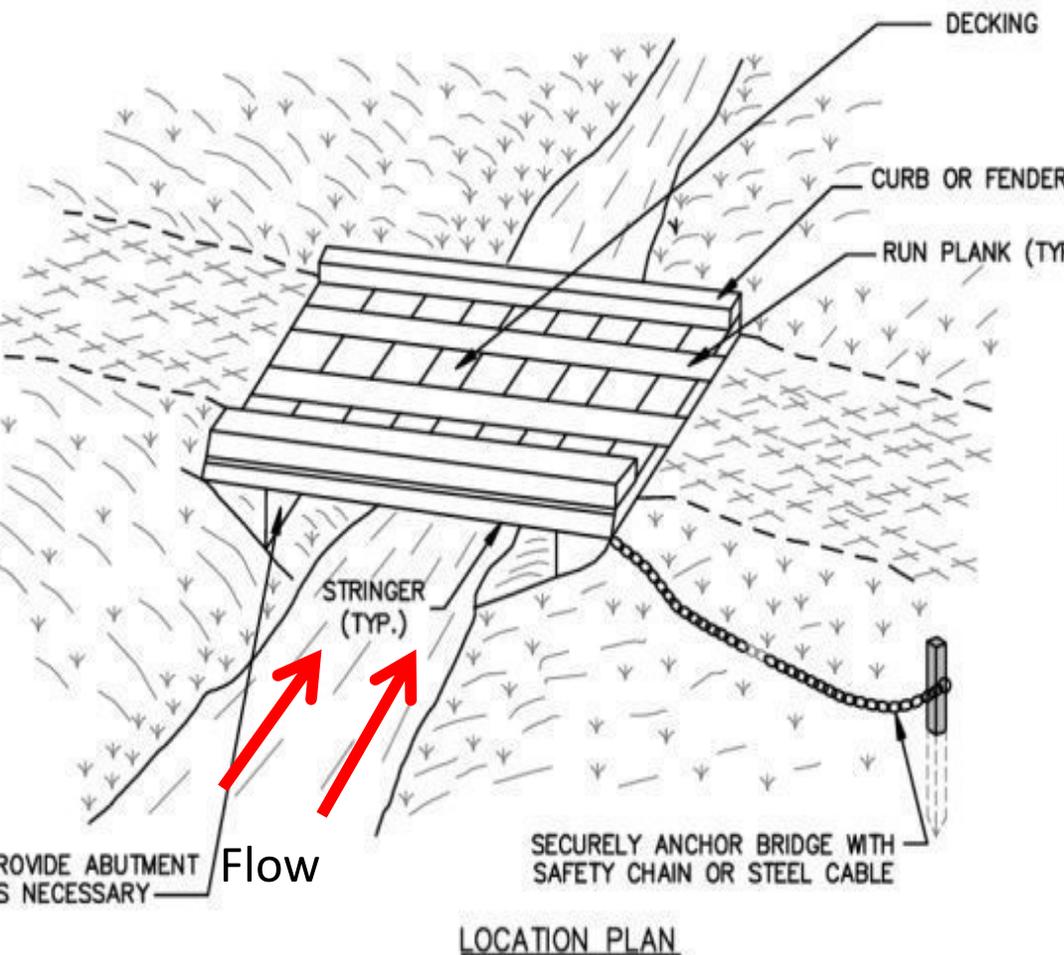
C-ENV-03 – Temporary Vehicular Stream Crossing (MS-13, 14)



1.0 Definition

- Temporary structural span installed across a flowing watercourse for use by construction traffic
- Structures used may include bridges, round pipes, pipe arches, or oval pipes

Bridge Crossing



3.0 Planning Considerations

- Preferred method for waterway crossings
 - Less disturbance
 - Remove quickly and reuse

5.0 Design Criteria

- Must be able to support construction traffic load
- Bridges must be anchored
 - Upstream is preferred

Culvert Crossing

5.0 Design Criteria

- Stone cover over the culvert = $1/2$ the diameter of the culvert or 12" (whichever is greater)
- Size culverts by DA using Table C-ENV-03-3

6.0 Construction

- Filter cloth placed on bed and banks before pipe placement



5.0 Design Criteria

- Crossing should be perpendicular to the stream, may vary up to 15°
- Centerlines of both roadway approaches continue the crossing alignment for at least 50' from each bank
- Constructed of non-erodible materials (MS-12)

2.0 Purpose and Applicability

- Drainage areas less than 1 square mile

3.0 Planning Considerations

- Prevent construction vehicles from damaging streambanks

7.0 Operations & Maintenance

- Inspect *at least* once a week and after any rainfall

C-ENV-04 – Utility Stream Crossing (MS-12, 14)



1.0 Definition

- Strategy for crossing small waterways when in-stream utility construction is involved

2.0 Purpose and Applicability

- Drainage area = no more than 1 square mile

3.0 Planning

- Multiple methods based on site conditions

5.0 Design Criteria – Diversion Channel Crossing



- Overlap upstream section at least 18”
- Side slopes overlap bottom liner at least 18”
- Entrench liner with silt fence

7.0 Operation & Maintenance

- Inspect at the end of each day for construction material stability

C-ENV-05 – Cofferdam Crossing (MS-12, 14)



1.0 Definition

- Temporary structure within a waterbody to provide a dry work area for construction and to contain disturbed soil and/or suspended sediments

7.0 Operation & Maintenance

- Do not leave unattended for more than 24 hours
- Regularly inspect for leaks or other deficiencies

C-ENV-07 – Gabions (MS-11, 15)



1.0 Definition

- Rectangular baskets fabricated from a hexagonal mesh of heavily galvanized steel wire filled with rock material

2.0 Purpose and Applicability

- Slows the velocity of concentrated runoff and stabilize slopes
- Can be used to maintain stability and to protect streambanks and beds

5.0 Design Criteria



- Placed below the expected max scour depth unless toe and flank protection is provided
- Requires filter fabric
- Need a stable base, often tilt into the soil being protected
- See Table C-ENV-07-1 for further design details

7.0 Operations and Maintenance



- Check for broken wires and repair if needed
- Remove woody vegetation
- Monitor for signs of erosion
- Monitor for signs of geotechnical failure (shifting, bulging, etc.)

Gabions Problem



5b. | C-ENV-07 — GABIONS

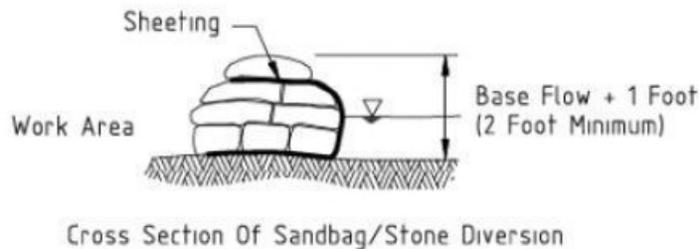
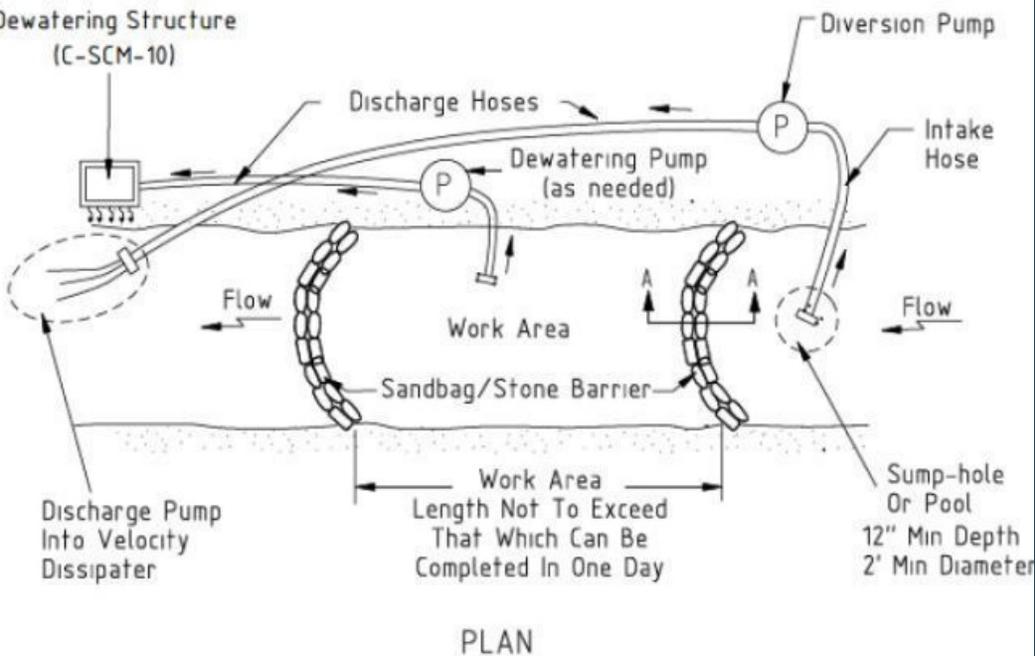
C-ENV-08 – Pump Around Diversion (MS - 12, 14)



1.0 Definition

- Dewatering practice used for temporarily pumping flow around segments of a stream channel during construction
- Involves installing a temporary pump-around system and instream barriers to divert flow around sections or reaches of the stream

7.0 Operations and Maintenance



- Filled sandbags should be monitored daily for leakage
- Check that water level does not overflow the top of the barricade
- Intake protection should be kept clear of large debris
- Check the discharge point for erosion

3.0 Planning Consideration

- Work area to not exceed amount that can be completed and stabilized in one workday

Perimeter Control Measures (PCM)

- Intercept sheet flow from slopes
- Remove sediment and other contaminants through:
 - Ponding
 - Settling
 - Physical filtration
- Prevent contaminants from leaving the site

C-PCM-01 – Safety Fence (MS-4)



1.0 Definition

- Protective barrier installed to prevent access to a land-disturbing activity or erosion control measure

2.0 Purpose and Applicability

- Also used to delineate limits of environmentally sensitive areas to be undisturbed or protected

5.0 Design Criteria



- Minimum height:
 - Plastic fencing = 5'
 - Metal fencing = 6'

7.0 Operation & Maintenance

- Any necessary repairs must be made immediately
- NOTE: C-ENV-10 (Trenchless Silt Fence) may be used in many similar instances, particularly Tree Protection

C-PCM-02 – Straw Bale Barrier (MS-4) 1.0 Definition

Temporary barrier made of anchored straw, used to intercept sediment-laden runoff from small drainage areas



C-PCM-04 Silt Fence (MS-4)

1.0 Definition

- Temporary sediment barrier consisting of a synthetic filter fabric entrenched and stretched across and attached to supporting posts



2.0 Purpose and Applicability



- Intercepts and detains small amounts of sediment
- Decreases the velocity of sheet flows and low-to-moderate level channel flows

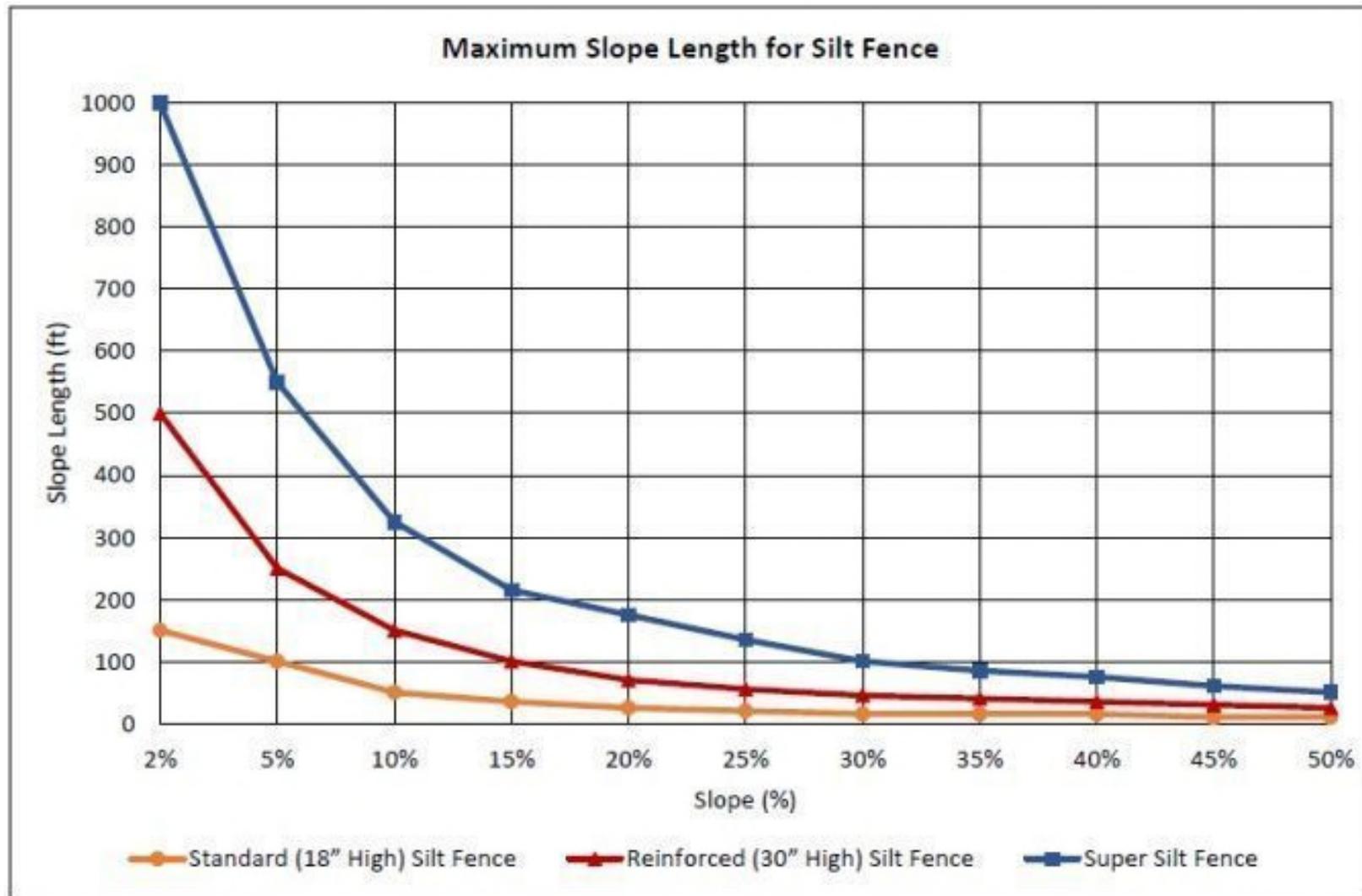
5.0 Design Criteria



- Place 5'-7' beyond the base of a slope of 7% or greater
- Check max. slope lengths above the SF in Table C-PCM-04-2

5.0 Design Criteria

Table C-PCM-04-1



5.0 Design Criteria

Table C-PCM-04-2 Maximum Slope Length (feet) Above Fence

Slope (%)	Standard (18 inches High) Silt Fence	Reinforced (30 inches High) Silt Fence	Super (33 inches High) Silt Fence
2 (or less)	100	500	1000
5	100	250	550
10	50	150	325
15	35	100	215
20	25	70	175
25	20	55	135
30	15	45	100
35	15	40	85
40	15	35	75
45	10	30	60
50	10	25	50

5.0 Design Criteria

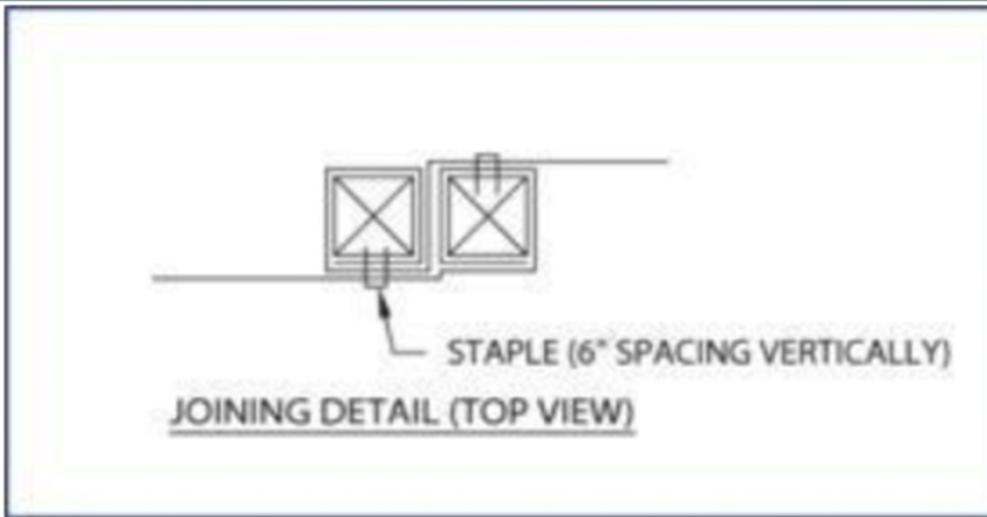


Super Silt Fence:

- Install 2.5-inch-diameter galvanized or aluminum poles
- Maximum spacing = 10'
- Poles must extend at least 24" below the ground surface and 33" above ground

6.0 Construction Specifications

Figure C-PCM-04-1 Silt Fence Fabric Joining Detail



Source: Tahoe Regional Planning Agency 2014

- Height above ground:
 - 18" minimum
 - 34" maximum
- At fabric ends, wrap both ends around the support stake and staple (see Figure C-PCM-04-1).
- Make sure there is no place where water can by-pass the post and fabric

6.0 Construction Specifications

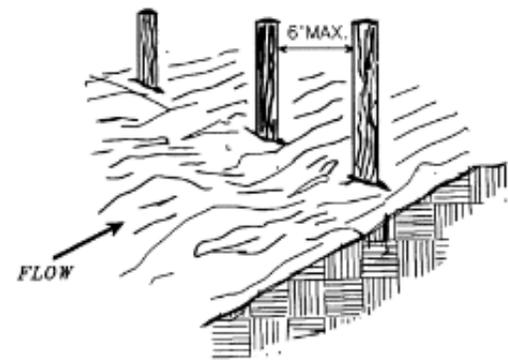


- Height above ground:
 - 18” minimum
 - 34” maximum
- At fabric ends, wrap both ends around the support stake and staple (see Figure C-PCM-04-1).
- Make sure there is no place where water can by-pass the post and fabric

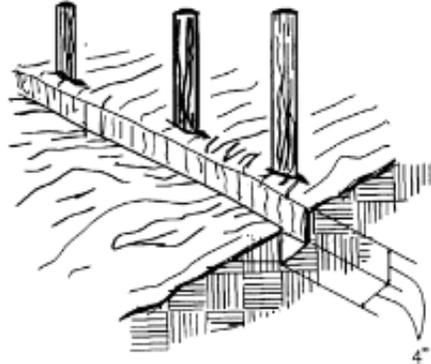
6.0 Construction Specifications

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

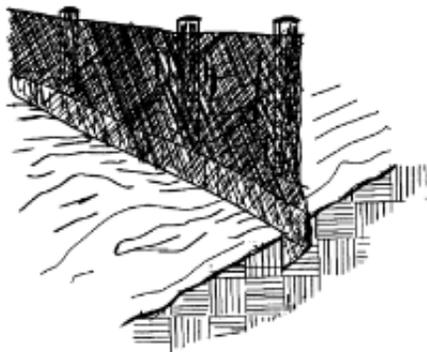
1. SET THE STAKES.



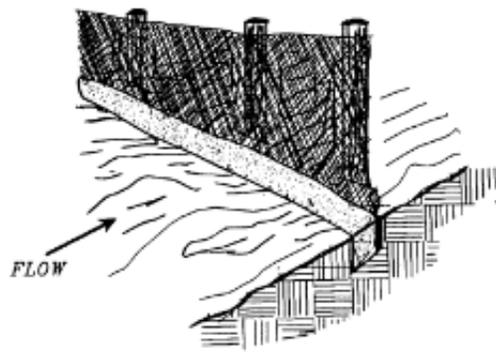
2. EXCAVATE A 4" X 4" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



- 4" deep and 4" wide trench on upslope side (8" of fabric in trench)
- Fabric installed on the upslope side of the stakes
- Fabric not to be stapled to trees
- Backfill trench and compact

7.0 Operations and Maintenance



- Inspect after rainfall events
- Pay attention to the repair of damaged areas (end runs or undercutting)
- Remove trash, floatables, and large sediment deposits after each storm event
- Cleanout ($\frac{1}{2}$ barrier height)

Silt Fence Problems



5b. | C-PCM-04 — SILT FENCE

Silt Fence Problems



5b. | C-PCM-04 — SILT FENCE

C-PCM-05 – Compost Filter Sock (MS-4)



1.0 Definition

- Temporary sediment control practice
- Made of a biodegradable or photodegradable mesh tube filled with a coarse compost media
- Filters sediment and other pollutants to prevent their migration offsite

C-PCM-05 – Compost Filter Sock



5.0 Design Criteria

- Place parallel to the contour with ends extending 8' at a 45° angle

7.0 Operation & Maintenance

- Do not place where traffic may cross
- Remove sediment when it 1/2 the height of the sock
- Replace per manufacturer's frequency recommendations

Sediment Control Measures (SCM)

- Prevent sediment from leaving the site
- Capture or filter sediment particles

C-SCM-01 – Dust Control



1.0 Definition

- Reduction of movement of dust on the ground surface and in the air during land disturbance, demolition, and construction

3.0 Planning Consideration

- Limit amount of soil disturbance at any one time
- During drought, use other control methods than water

C-SCM-01 – Dust Control

6.0 Construction Specifications

- Dust control measures:
 - *Vegetative cover* - areas of no construction traffic
 - *Mulch* - fast & effective; not in traffic areas - use binders to tack
 - *Tillage* - emergency measure to bring clods to surface
 - *Irrigation* - keep surface wet
 - *Spray-on adhesives* - organics - derivatives of pine tar and vegetable gum

7.0 Operation & Maintenance

- Maintain dust control through dry weather conditions
- Requires frequent monitoring to remain effective

C-SCM-02 – Construction Road Stabilization (MS-1, 4, 17)



1.0 Definition

- Stabilization of temporary construction access routes, onsite vehicle transportation routes, and construction parking areas

2.0 Purpose and Applicability

- Temporary stabilization of access roads, subdivision roads, parking areas, etc.
- Reduces erosion between initial grading and final stabilization

C-SCM-02 – Construction Road Stabilization



5.0 Design Criteria

- 14' = 1 way; 20' = 2 way
- 6" of VDOT #1 coarse aggregate

7.0 Operation & Maintenance

- May require periodic top dressing with new gravel
- Inspect for sediment accumulation on stone

C-SCM-03 – Construction Entrance (MS-4, 17)



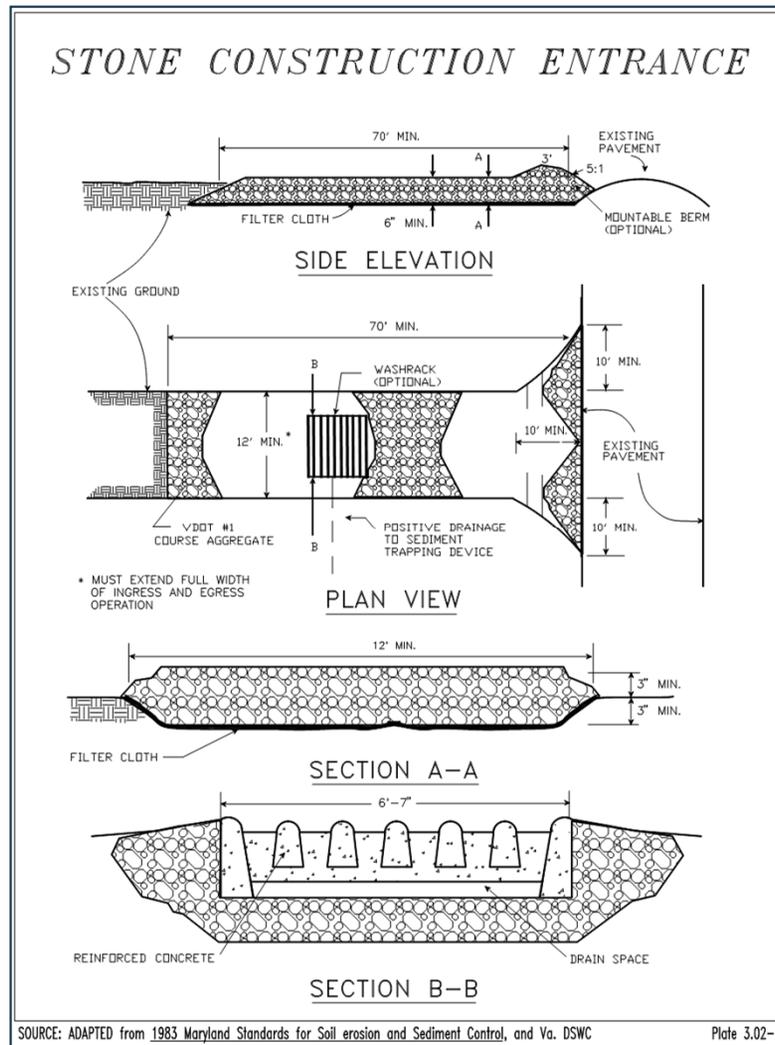
1.0 Definition

- Pad with a fabric filter liner underneath the stone located at points of vehicular ingress and egress on a construction site

2.0 Purpose and Applicability

- Removal of mud from construction vehicle tires before entering a public/paved road

5.0 Design Criteria



- VDOT #1, #2, OR #3 coarse aggregate (1.5"-3.5" stone)
- At least 6" of aggregate
- Excavated 3"
- Filter cloth (geotextile) liner
- Minimum 12' wide & 70' long

5.0 Design Criteria



- If a wash rack is used, wash water must drain to a settling area or sediment removal device
- *NOTE: C-SCM-02 Construction Road Stabilization is a similar BMP that is beneficial for use throughout a site especially larger sites*

7.0 Operations and Maintenance



- Mud shall be removed from paved areas at the end of each day
- Cleaning of pavement shall be done by shoveling and sweeping
- Wash pavement only after shoveling and sweeping

Construction Entrance Problems



5b. | C-SCM-03 — CONSTRUCTION ENTRANCE

C-SCM-04 – Inlet Protection (MS-4, 10)



1.0 Definition

- Sediment filter or an excavated impounding area around a storm drain inlet or curb inlet

2.0 Purpose and Applicability

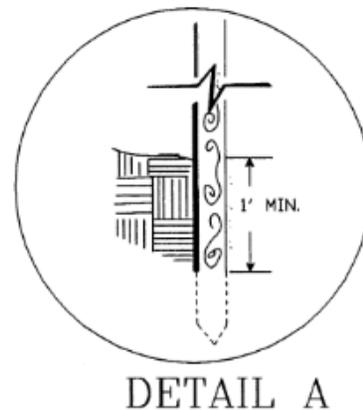
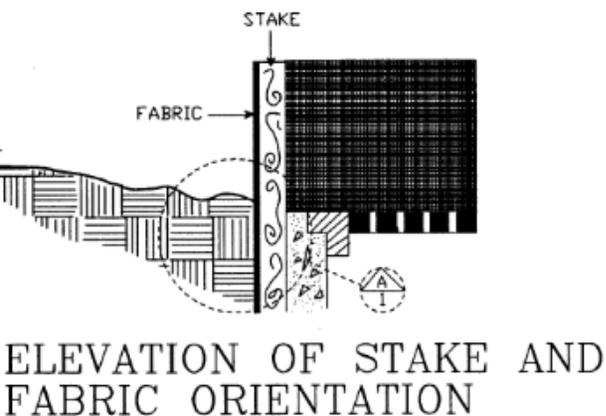
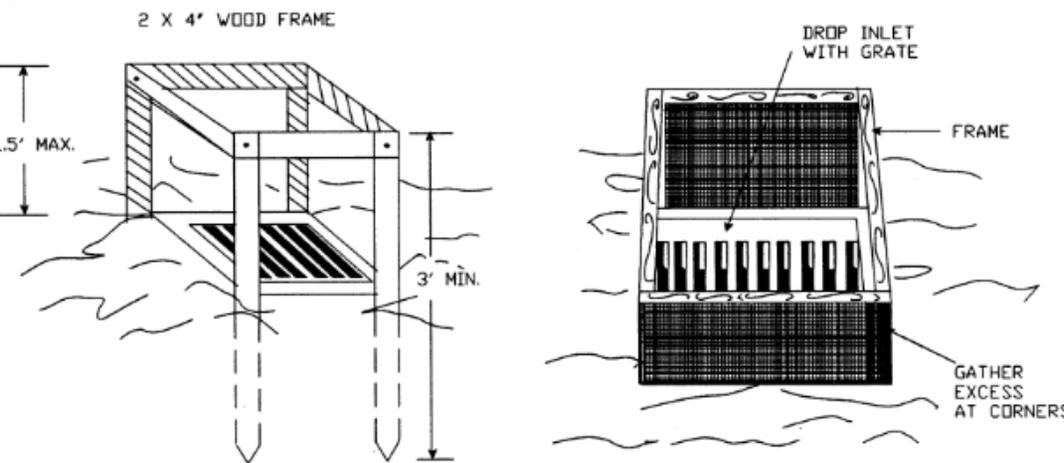
- Prevents sediment from entering storm drain system prior to permanent stabilization

5.0 Design Criteria



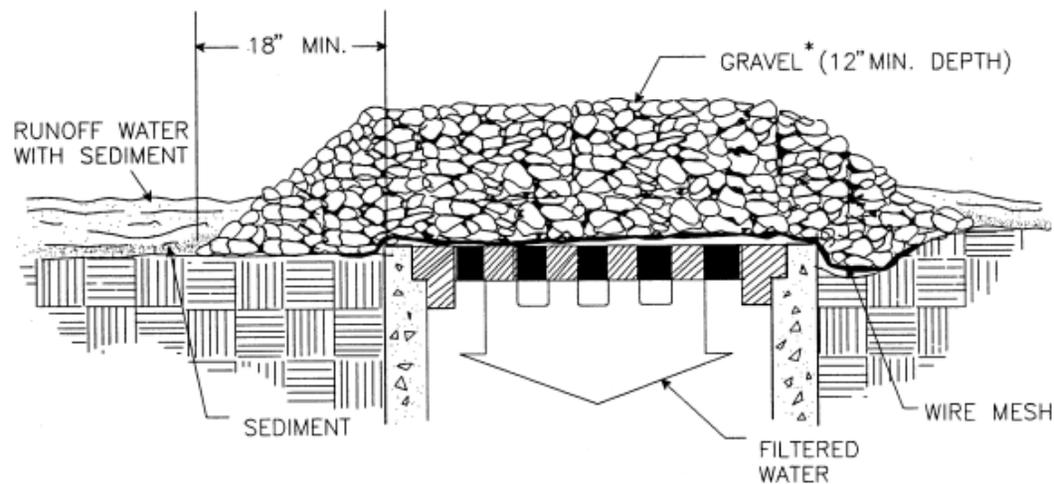
- Max. drainage area = 1 acre
- Should not create excessive ponding on the site
- Filter fabric can be used with larger, coarse aggregate, but the fabric may clog quickly, requiring more maintenance

Silt Fence Drop Inlet Protection



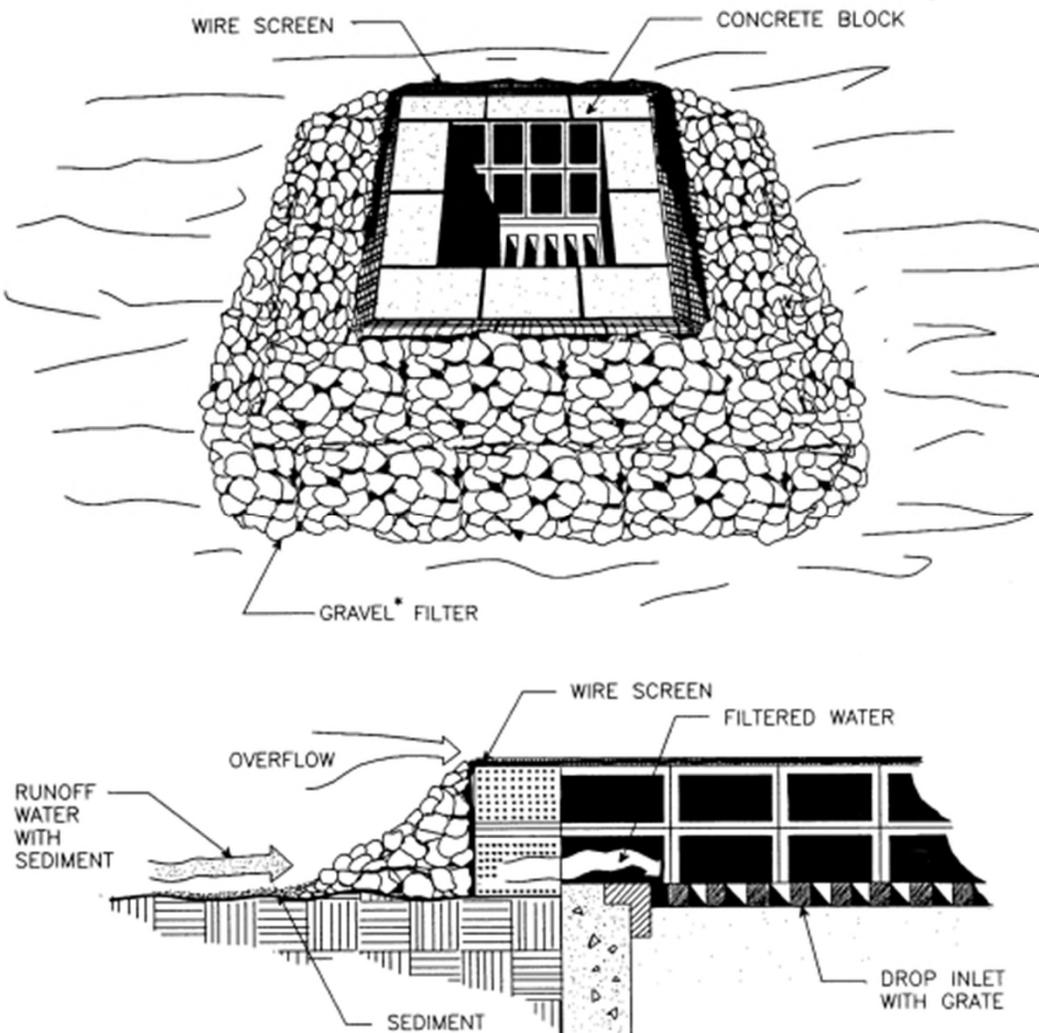
- Use 2"x4" stakes for vertical and horizontal
- Space vertical 2"x4"s 3 feet apart
- Entrench fabric 12 inches around inlet
- Overlap fabric to next stake
- Backfill and compact

Gravel and Wire Mesh Drop Inlet Protection



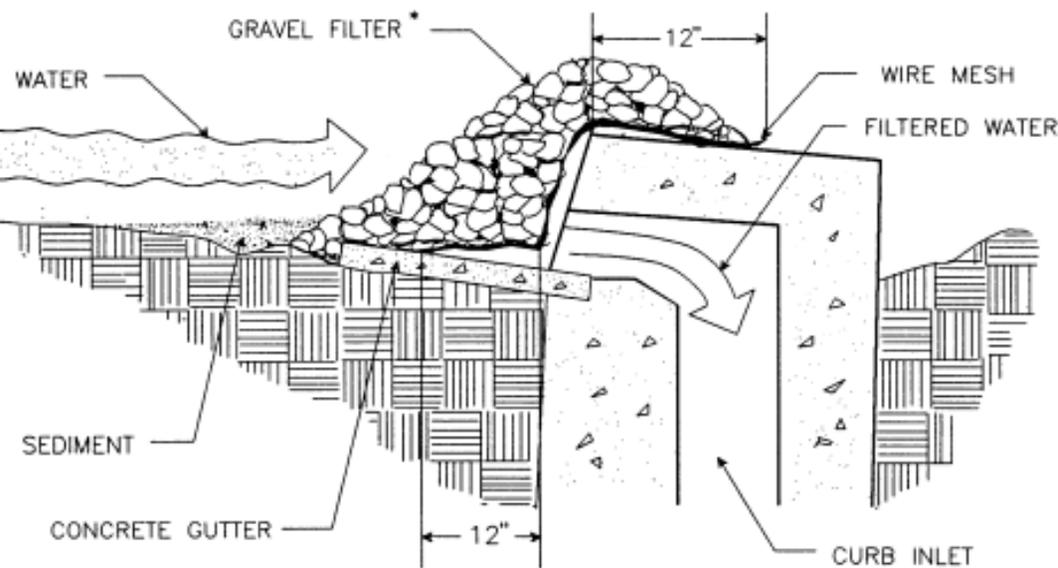
- ½" wire mesh over inlet, minimum 1' beyond each side of inlet
- Coarse aggregate placed over the wire
- Depth of stone shall be at least 12", extend 18" on all sides

Block & Gravel Drop Inlet Protection



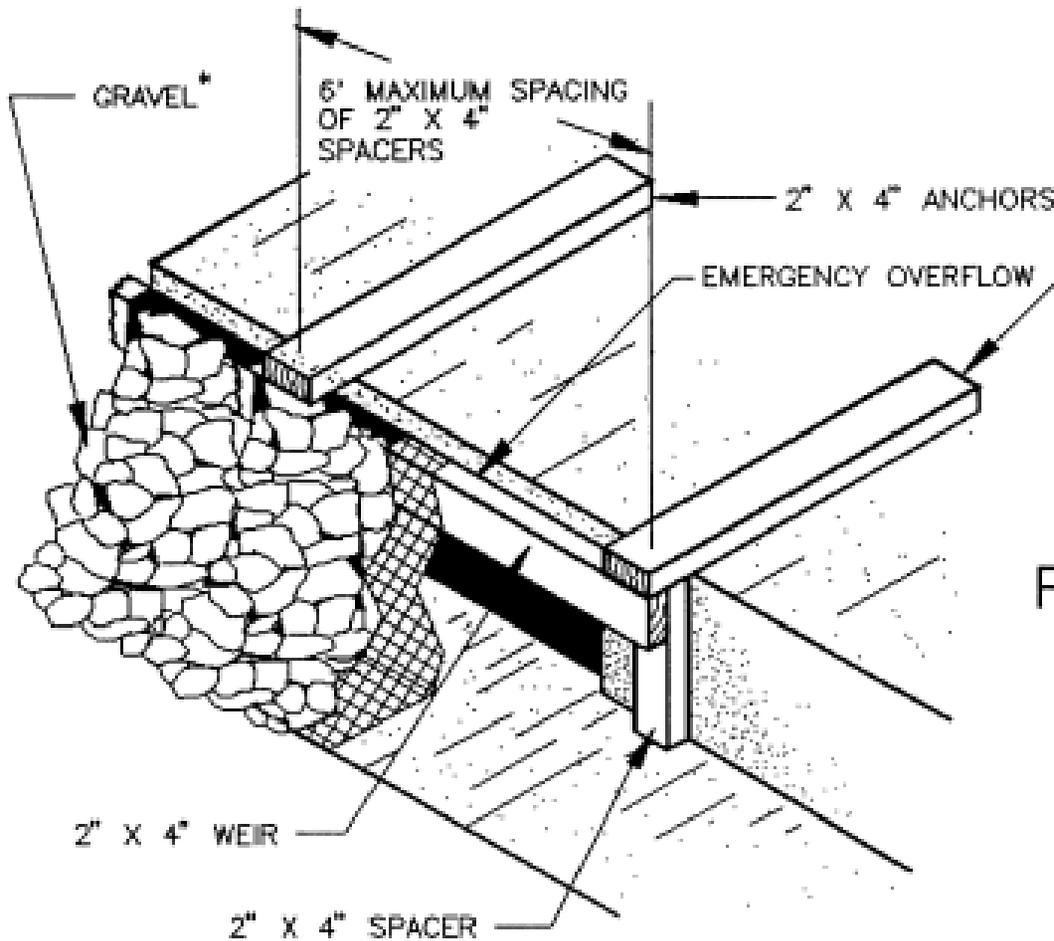
- 4", 8", or 12" concrete blocks placed on sides
- Minimum 12" high, maximum 24" high
- ½" wire mesh between concrete blocks and #3, 357, or 5 stone

Gravel Curb Inlet Protection



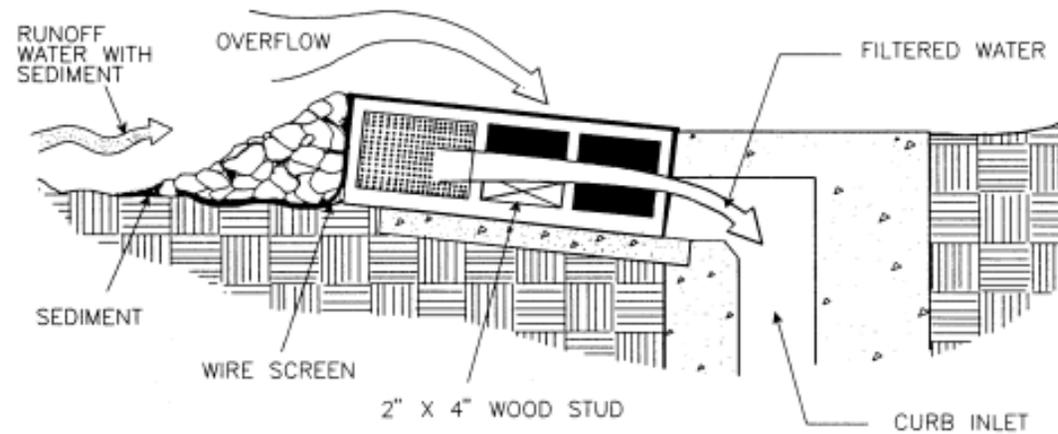
- $\frac{1}{2}$ " wire mesh
 - Extend 12" over top
 - 12" in gutter pan
- Pile stone against wire to cover inlet opening
 - #3, 357, or 5 stone
- Move and replace stone once clogged

Wooden Weir Curb Inlet Protection



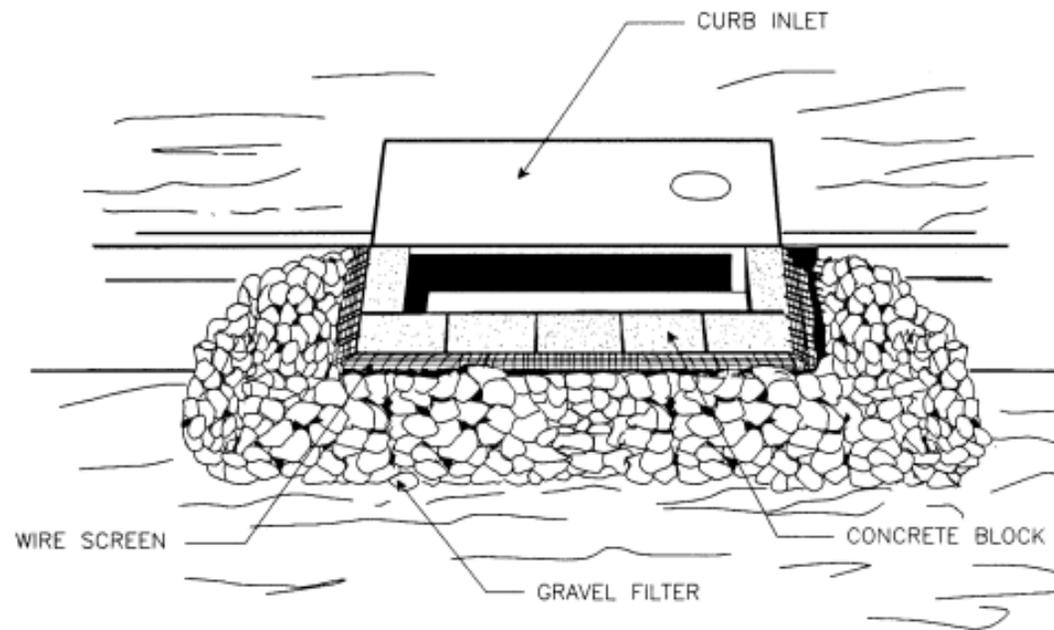
- Attach wire mesh to 2"x4" wooden weir
 - 30" deep
 - Inlet opening plus 4'
- Use 2"x4" anchors and spacers
- Place 2"x4" across inlet and nail together
- Weighted support on top of inlet

Block and Gravel Curb Inlet Protection



- 2 concrete blocks placed on sides against the curb at either side of the inlet opening
- 2"x4" placed flat through outer holes of each spacer block to keep front blocks in place

Block and Gravel Curb Inlet Protection



- Concrete blocks placed on sides across front of inlet and against the spacer blocks
- ½" wire mesh placed over outside of blocks
- Wire covered with #3, 357, or 5 stone

Other Inlet Protection Devices

If these types of IP devices are used, what should the inspector make sure of?



7.0 Operation and Maintenance



- Replace clogged aggregate or fabric immediately
- Sediment must be removed, and stones replaced or washed when practice creates excessive ponding
- Look for damage or fabric tears from large flows

C-SCM-05 – Culvert Inlet Protection (MS-10)



1.0 Definition

- Sediment filter located at the inlets of culverts

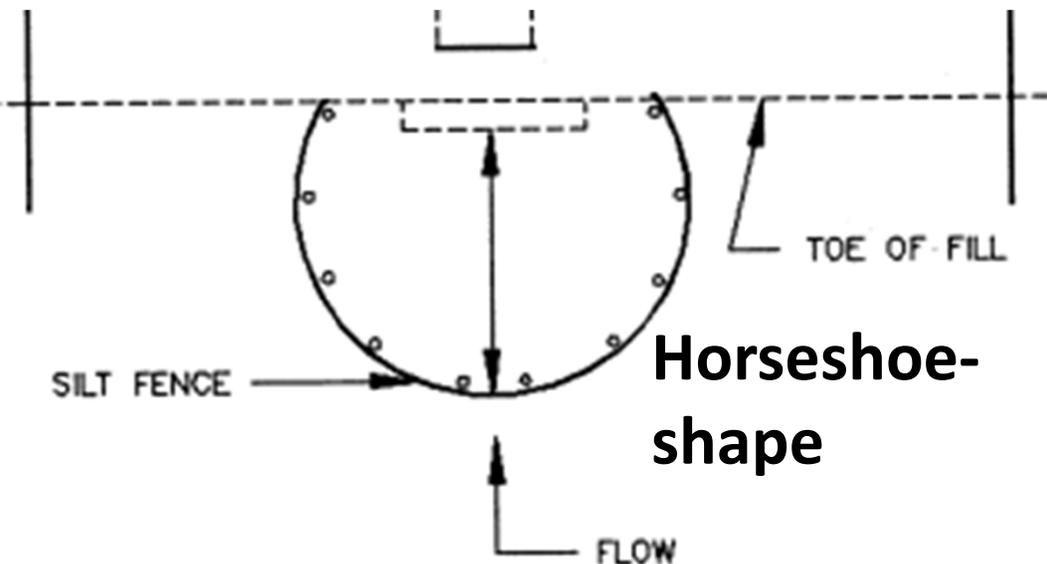
2.0 Purpose and Applicability

- Prevents sediment from disturbed area above the culvert from entering, accumulating in, and being transported by a drainage system

Silt Fence Culvert Inlet Protection

5.0 Design Criteria

- Expected useful life span is 3 months
- No more than 1 acre of drainage
- Minimum of 16"–18" high
- Maximum of 34" high
- Stakes spaced 3' apart
- Fence placed 6' away from culvert opening



Silt Fence Culvert Inlet Protection

6.0 Construction Spec.

- If silt fence cannot be installed properly or high velocity is expected, use a stone combination
 - #3, 357, or 5 stone
 - Backed by riprap
- Compost filter sock or straw wattles may be used in lieu of a silt fence

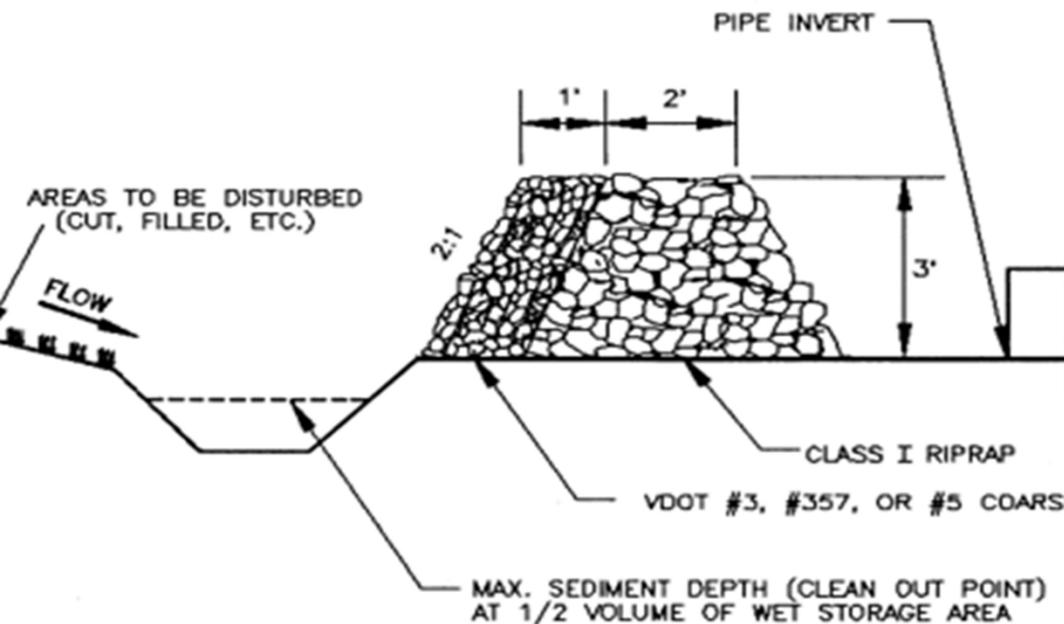


Culvert Inlet Protection Example



- Is the silt fence sufficient and installed properly?

Sediment Trap Culvert Inlet Protection



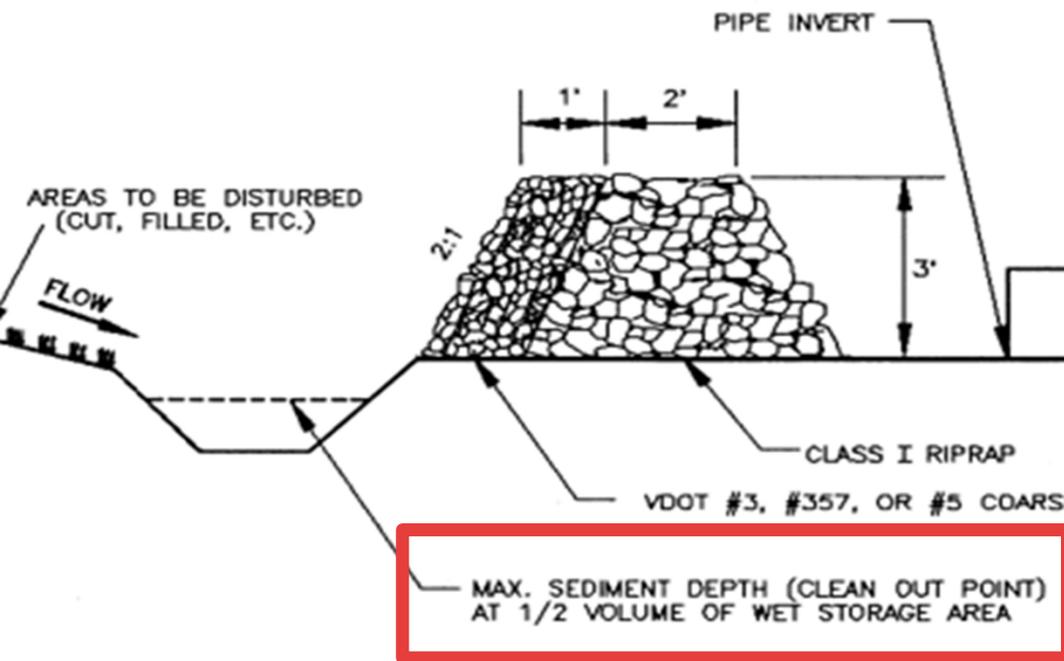
5.0 Design Criteria

- Lifespan = 18 months
- Less than 3 acres drainage

6.0 Construction Specifications

- Horseshoe-shape around the inlet
- Toe of riprap no closer than 24" from opening

7.0 Operations and Maintenance



- Silt fence
 - Clean out when $\frac{1}{2}$ height of fence
- Sediment trap
 - Clean out when $\frac{1}{2}$ wet storage is full

C-SCM-07 – Rock Check Dams (MS-11)



1.0 Definition

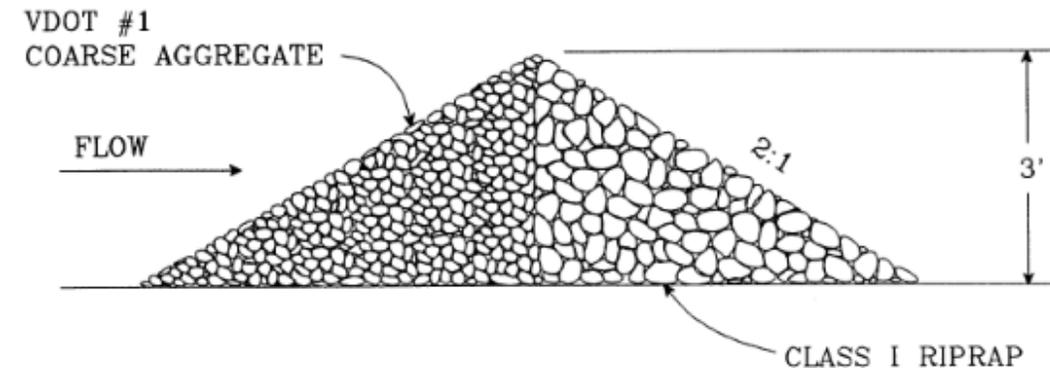
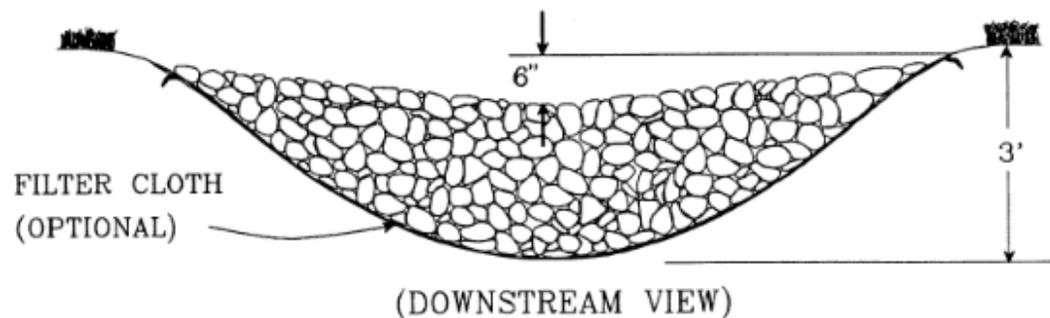
- Small temporary stone dams constructed across a swale, channel, or drainage ditch

2.0 Purpose and Applicability

- Minimize erosion by reducing velocity in a ditch or swale
- Traps sediment by ponding stormwater runoff
- Can be used while grass lining is being established

5.0 Design Criteria

2-10 ACRES OF DRAINAGE AREA:



- Two stone sizes, depending on drainage area
 - Up to 2 acres – #1 stone
 - 2-10 acres – #1 backed by riprap
- Max. height = 2' at the center of channel/swale
- Center must be at least 6" lower than outer edges

7.0 Operations and Maintenance



- Remove when no longer useful
- Remove accumulated sediment when it exceeds half the height of the check dam

C-SCM-08 – Rock Filter Outlet (MS-4)



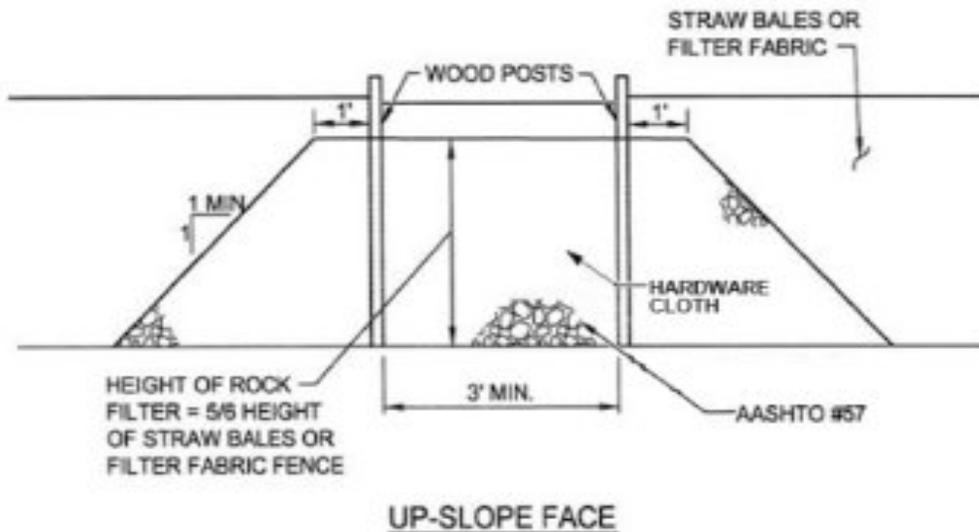
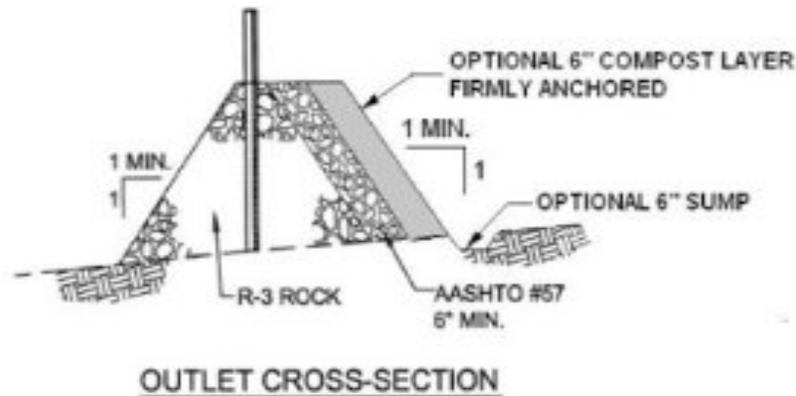
1.0 Definition

- A berm constructed of riprap and stone aggregate where unanticipated concentrated flow to a perimeter control has caused the perimeter control to fail

2.0 Purpose and Applicability

- Only use where a sediment trap may not be warranted

5.0 Design Criteria



- Ensure coarse aggregate layer is installed on the *upslope side* of the riprap
- Provide 1' of rock on either side of the opening in the fabric before tapering down
- Minimum top width is 1'
- Max drainage area of 1/4 acre

7.0 Operations and Maintenance



- Inspect after each rainfall and repair immediately
- Remove sediment when accumulations reach 1/3 outlet height
- Replace clogged or displaced stones immediately

C-SCM-09 – Turbidity Curtain (MS-4, 12, 14)



1.0 Definition

- Floating geotextile material that minimizes sediment transport from a disturbed area adjacent to or within a body of water

2.0 Purpose and Applicability

- Used to provide sediment protection when working along the edge of water
- Can be used in tidal and non-tidal water
- *NOTE:* C-ENV-14 (Modified Turbidity Curtain for Streams)

6.0 Construction Specifications



5.0 Design Criteria

- Three configurations based on current

6.0 Construction

- Must be securely anchored into the shoreline
- Attach anchor lines to flotation device, not bottom of curtain

7.0 Operation & Maintenance

- Repair the curtain as needed using repair kits available from the manufacturer

C-SCM-10 – Dewatering Structure (MS-16)

1.0 Definition

- A temporary settling and filtering device used to process water discharged from dewatering activities

2.0 Purpose and Applicability

- Provide settling and filtering of sediment-laden water for discharging

5.0 Design Criteria

- Must be sized and operated correctly
- Storage capacity (cu. ft.) should = 16 x pump discharge capacity (GPM)



Sediment Tank

Straw Bale/Silt Fence Pit

5.0 Design and 6.0 Construction



- Ensure settlement of at least 6 hours
- Effluent pumped:
 - Across at least 75' of a well-vegetated area
 - Through silt fence
 - Compost filter sock

Pumped Water Filter Bag



- Replace filter bags when half-full of sediment
- Locate in a well-vegetated area and discharge to stable, erosion-resistant areas
- Do not place bags on slopes greater than 5%
- *NOTE:* Other dewatering structures include Portable Sediment Tanks, Filter Boxes, and Sump Pits

7.0 Operation and Maintenance



- Inspect frequently
- Once sediment build-up prevents proper functioning, repair or replace
- Spread sediment on site and stabilize or properly dispose

C-SCM-11 – Temporary Sediment Trap (MS-4, 6)



1.0 Definition

- Temporary ponding basin formed by constructing an embankment, often earthen or composed of compost filter sock, with a stone outlet

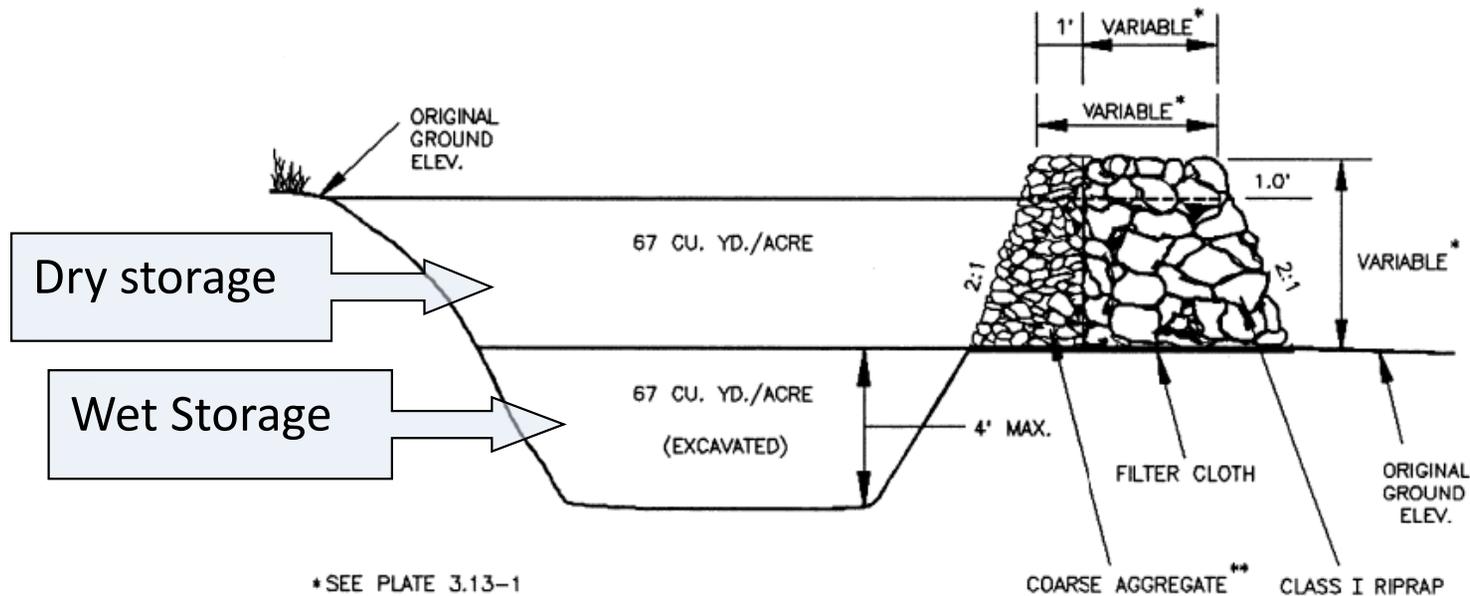
2.0 Purpose

- Drainage areas less than 3 ac
- Sediment settles out in pond
- Max. lifespan = 18 months

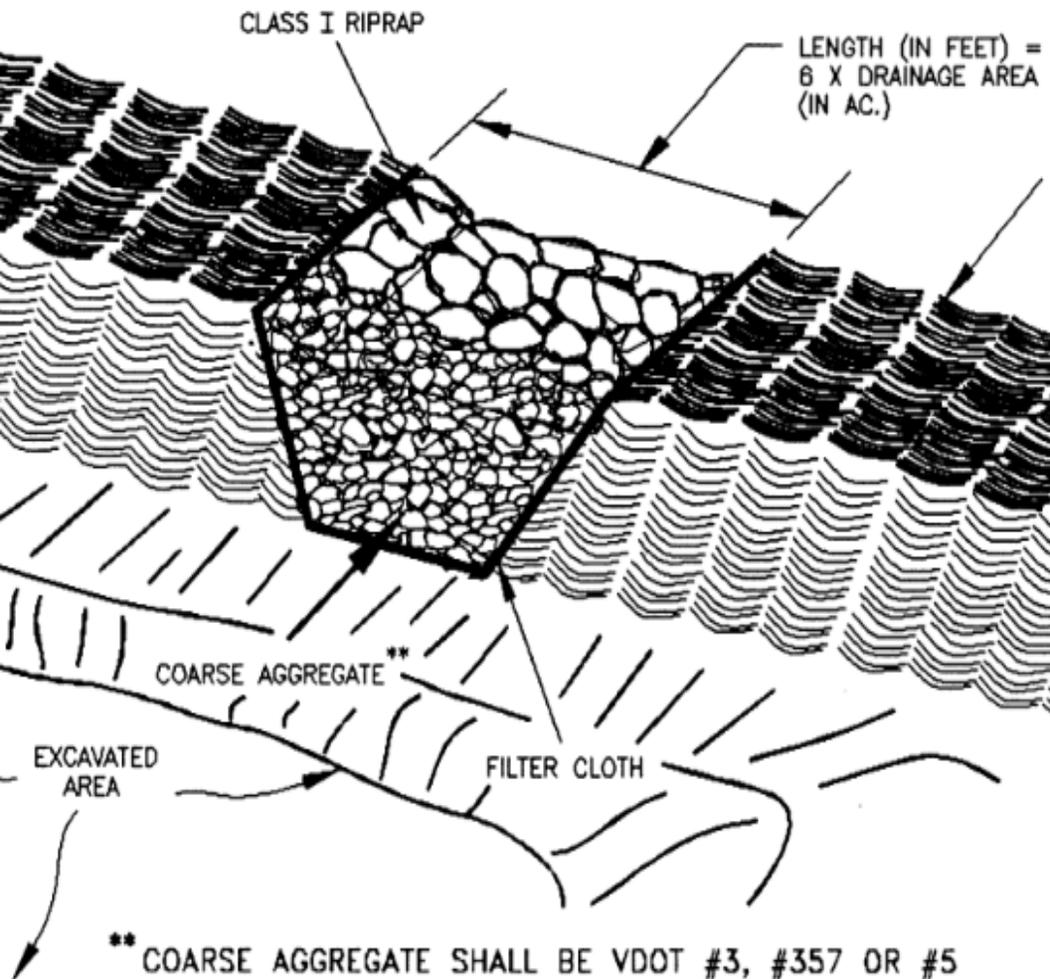
5.0 Design Criteria

- Must have a storage capacity of 134 cubic yards per acre of drainage area
- Storage volume = 50% wet; 50% dry

TEMPORARY SEDIMENT TRAP



5.0 Design Criteria



- Excavation:
 - Side slopes no steeper than 1:1
 - Max excavated depth of wet storage = 4 feet
- Reference Table C-SSM-11-1 for more design information

5.0 Design Criteria

- Embankment:

- Max height = 5' from base of stone outlet

Table C-SCM-11-2 Minimum Top Width Required for Sediment Trap Embankments According to Height of Embankment

Embankment Height (ft)	Outlet Crest Height (ft)	Minimum Embankment Top Width (ft)
1.5	0.5	2.0
2.0	1.0	2.0
2.5	1.5	2.5
3.0	2.0	2.5
3.5	2.5	3.0
4.0	3.0	3.0
4.5	3.5	4.0
5.0	4.0	4.5

5.0 Design Criteria

Three types of outlet designs:

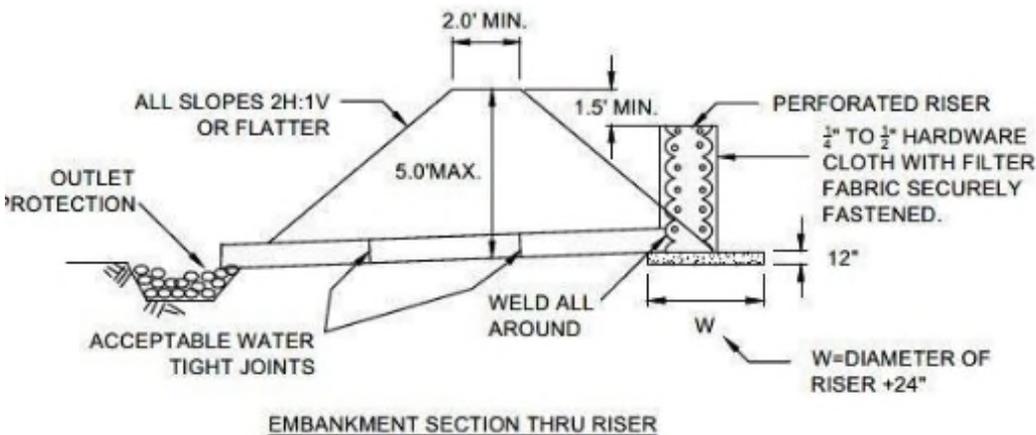


- Stone outlet
 - Low point in basin
 - 1' below embankment
 - Smaller stone used to provide filtering
 - Larger stone (rip-rap) used to provide outlet stability
 - Filter cloth under stones
 - Length = 6 x drainage area

5.0 Design Criteria

Three types of outlet designs:

- Pipe outlet
 - Riser at least 1.5' below top of the embankment
 - No holes or perforations within 6" of the top of the pipe
 - Ensure riser is wrapped in cloth



5.0 Design Criteria

Three types of outlet designs:

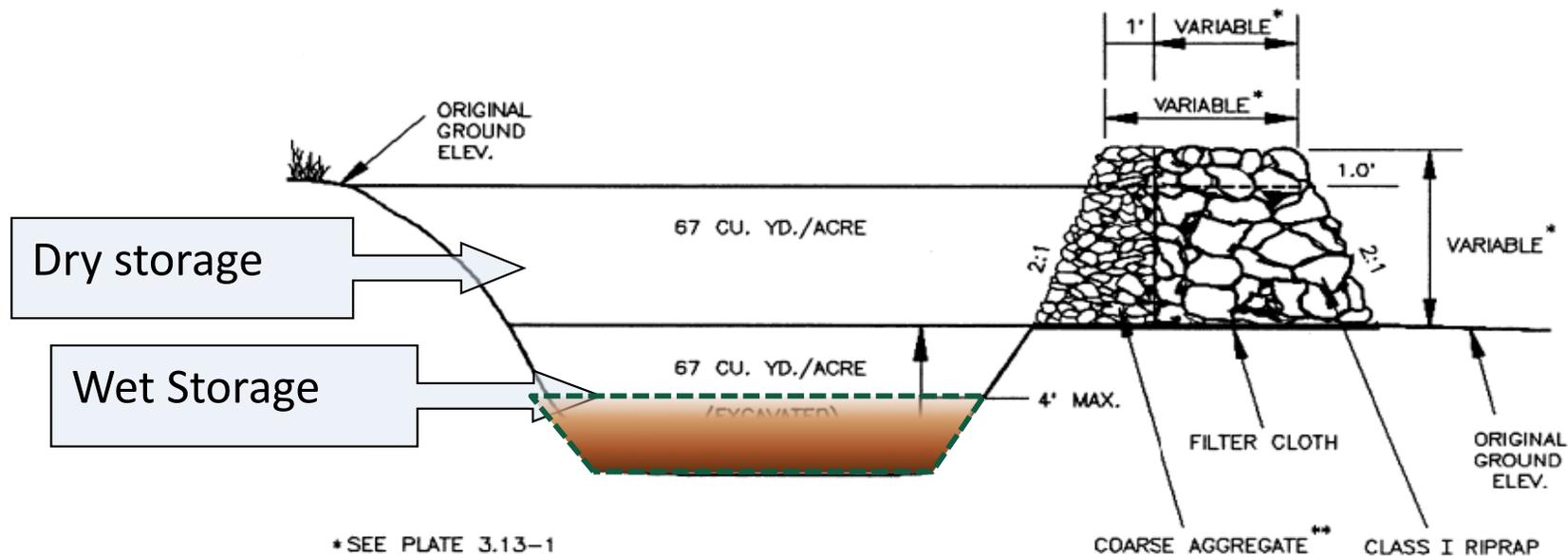


- Compost Filter Sock outlet
 - Large filter socks (18", 24", 32") stacked above smaller socks (8", 12", 18") to form a berm
 - Min height = 3'

7.0 Operations and Maintenance

- Must be cleaned out when sediment reaches half of the wet storage volume
- Make sure outlet is not clogged or damaged

TEMPORARY SEDIMENT TRAP



C-SCM-12 – Temporary Sediment Basin (MS-4, 6, 19)



1.0 Definition

- Temporary barrier or dam with a controlled stormwater release structure formed by constructing an embankment of compacted soil across a drainageway

2.0 Purpose and Applicability

- Drainage area = up to 100 acres
- Max lifespan = 18 months

5.0 Design Criteria

- Must maintain permanent pool of water
- Storage capacity of at least 134 cubic yards per acre of total contributing drainage area
 - Half of the design volume (67 cu yds) will be dry storage, half wet storage
- Must not dewater in less than 24 hours, nor take longer than 120 hours
- Sediment Cleanout Level = 34 cubic yards/acre ($\frac{1}{2}$ the wet storage volume)

5.0 Design Criteria

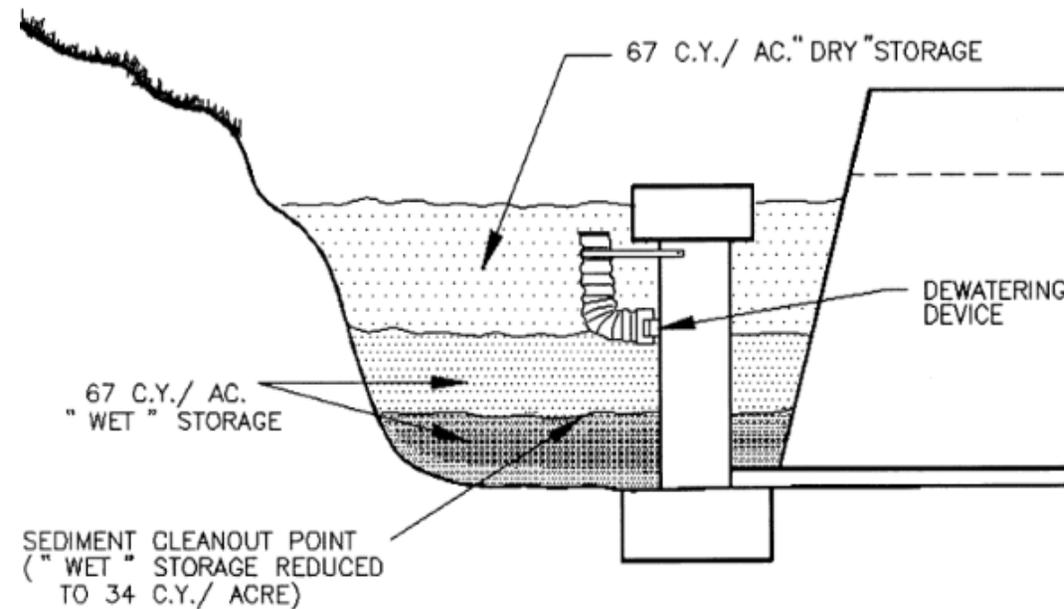
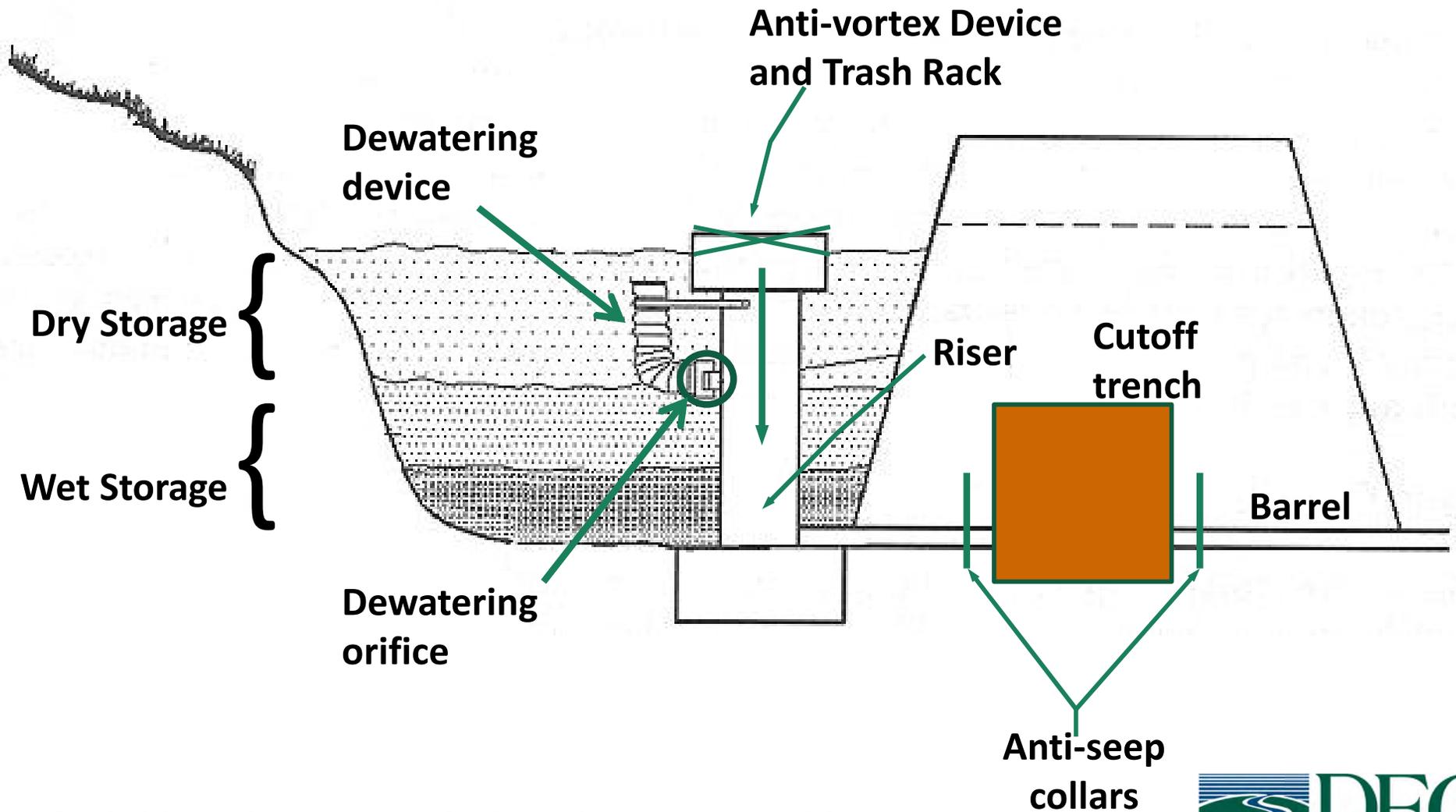


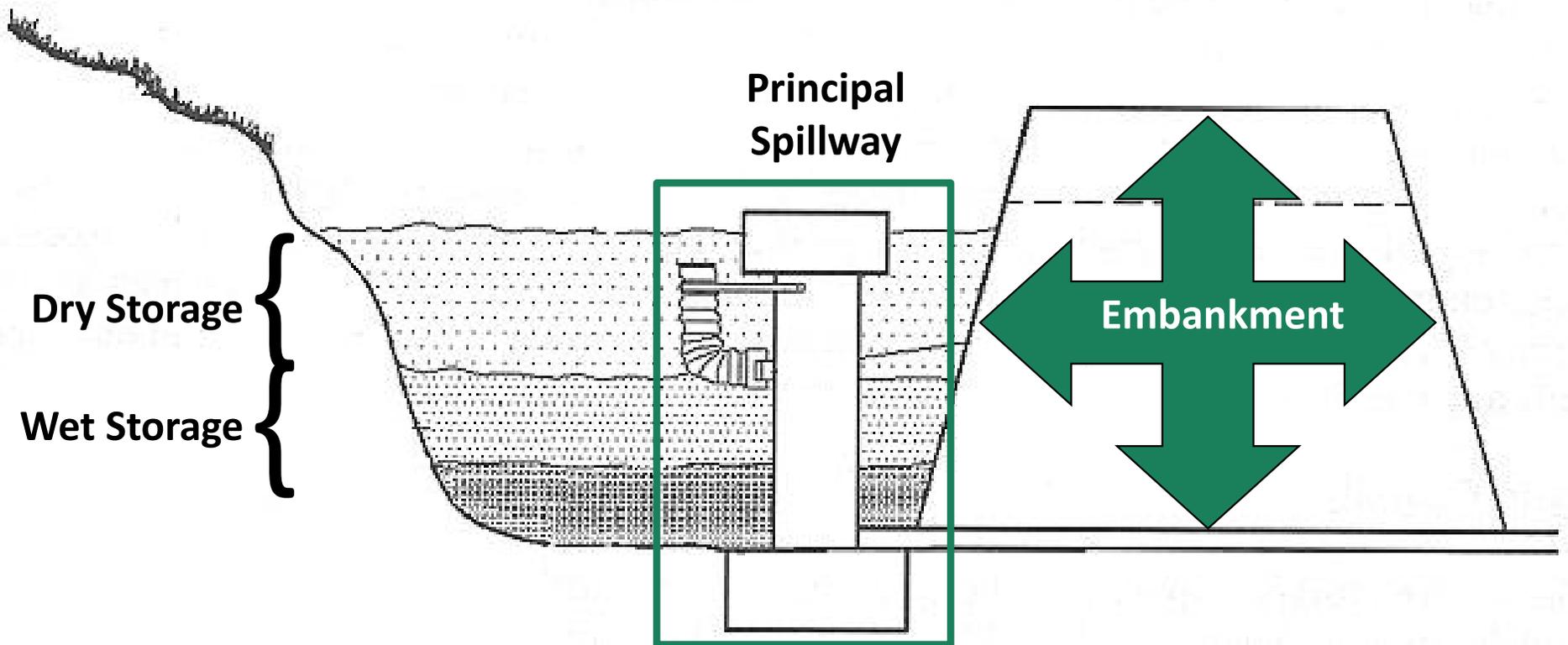
Figure C-SCM-12-1

- Clearly mark cleanout level on riser
 - Cleanout level must be at least 1' below bottom of dewatering device
- Flow length = 2 x width (may require a baffle to achieve this)
- See Table C-SCM-12-1 for more design information

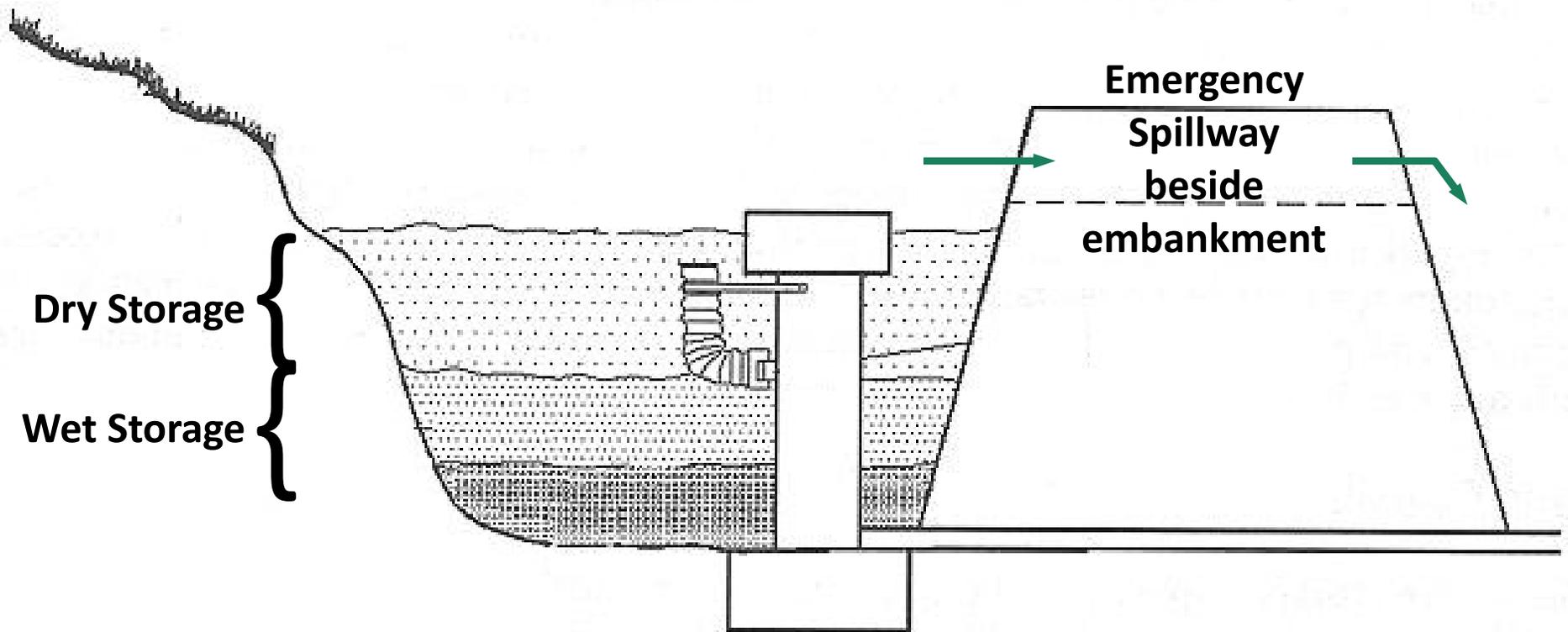
Basin Cross-Section



Basin Cross-Section



Basin Cross-Section



5.0 Design Criteria

Principal Spillway

- Minimum diameter of riser = 15”
- Must be a minimum 1’ below the emergency spillway
- Anti-vortex device and trash rack attached to top
- Dewatering device attached to riser
 - Dewater to remove cleaner water at top of wet storage
 - Use of a floating skimmer may be encouraged to improve water quality of effluent

5.0 Design Criteria

Principal Spillway

- The base of the riser shall be anchored by either concrete or steel plate (see approved plan for details)
- The barrel shall have a watertight connection to the riser and shall have outlet protection
- See Table C-SCM-12-1 for additional design information

Sediment Basin Examples

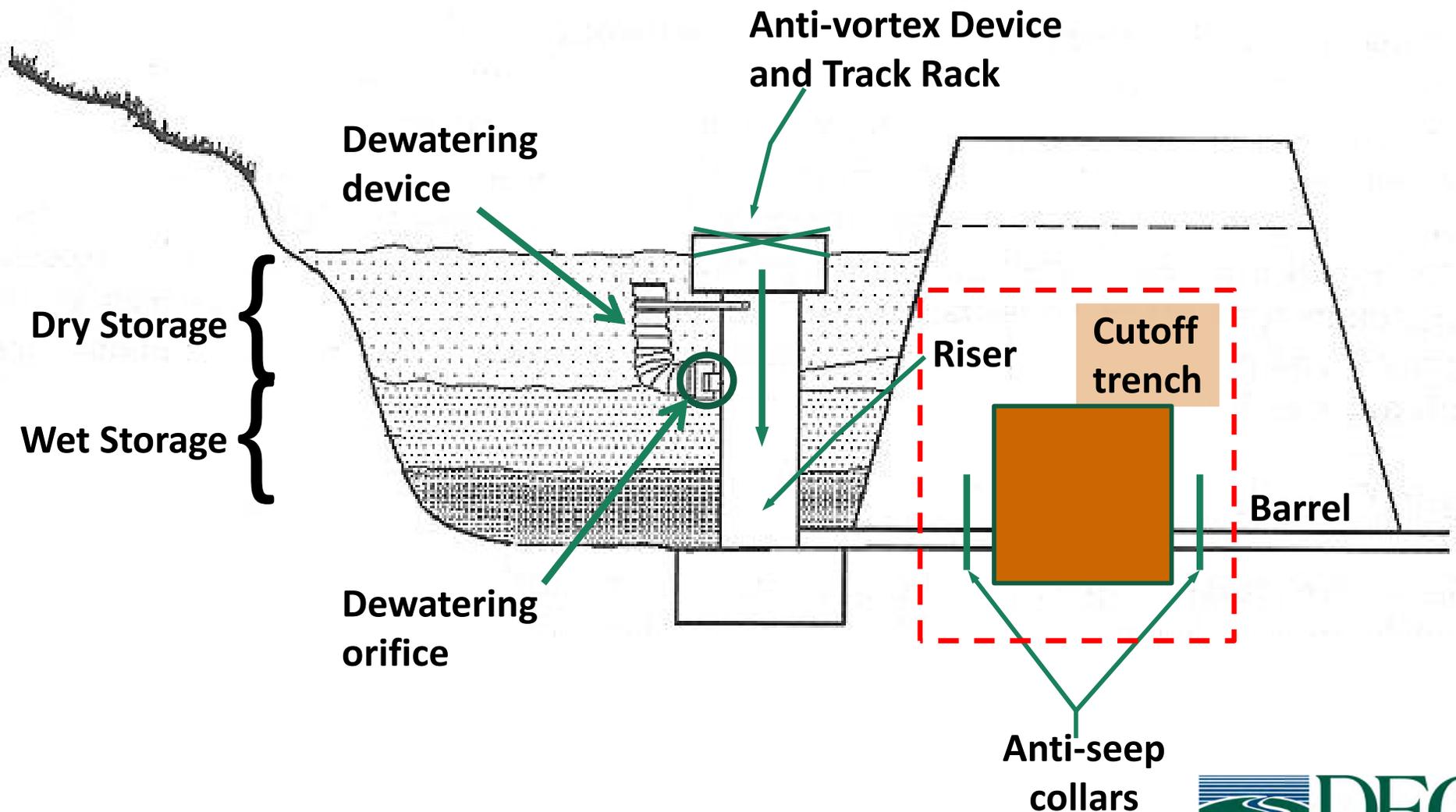


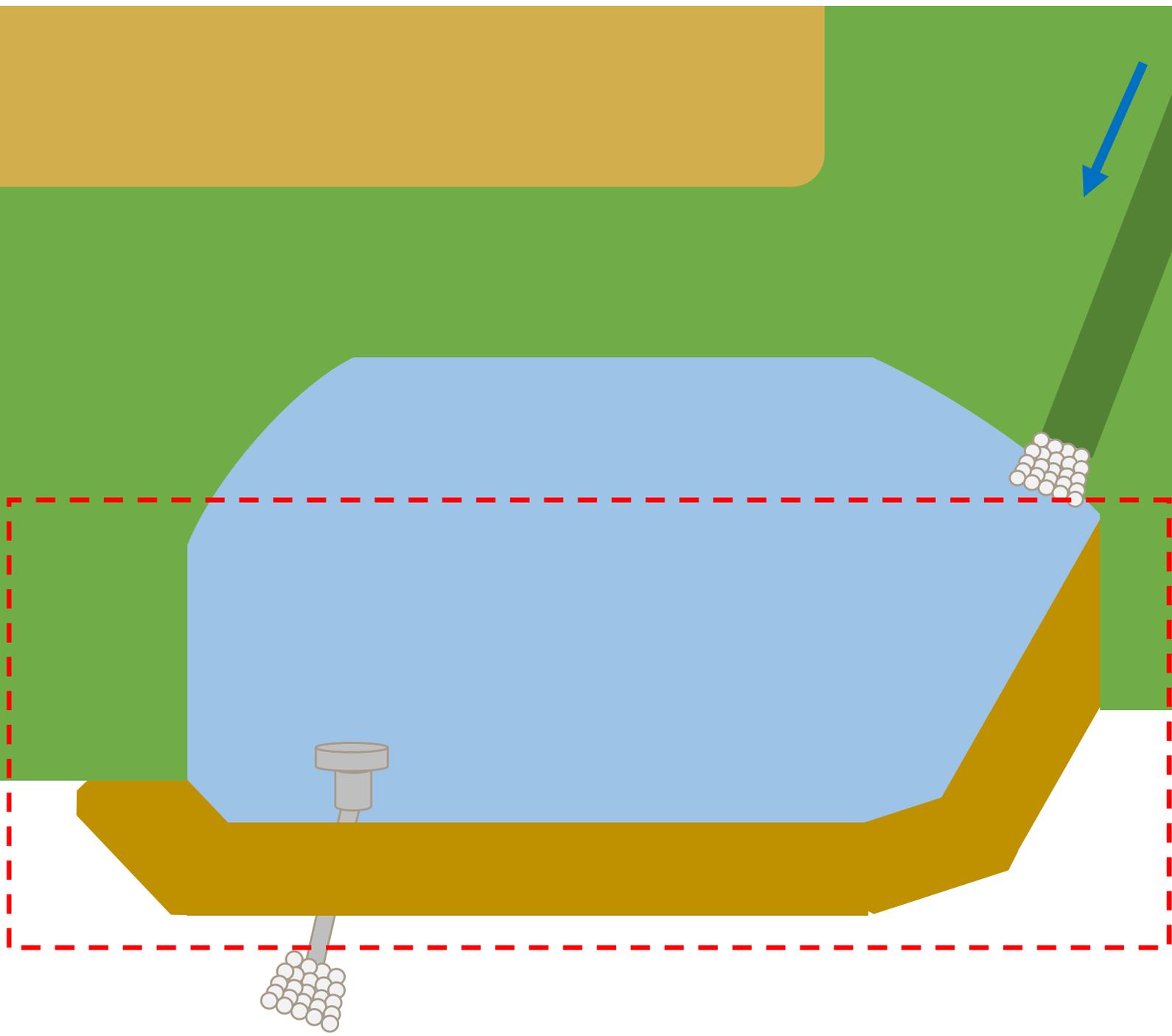
5.0 Design Criteria

Anti-Seep Collars

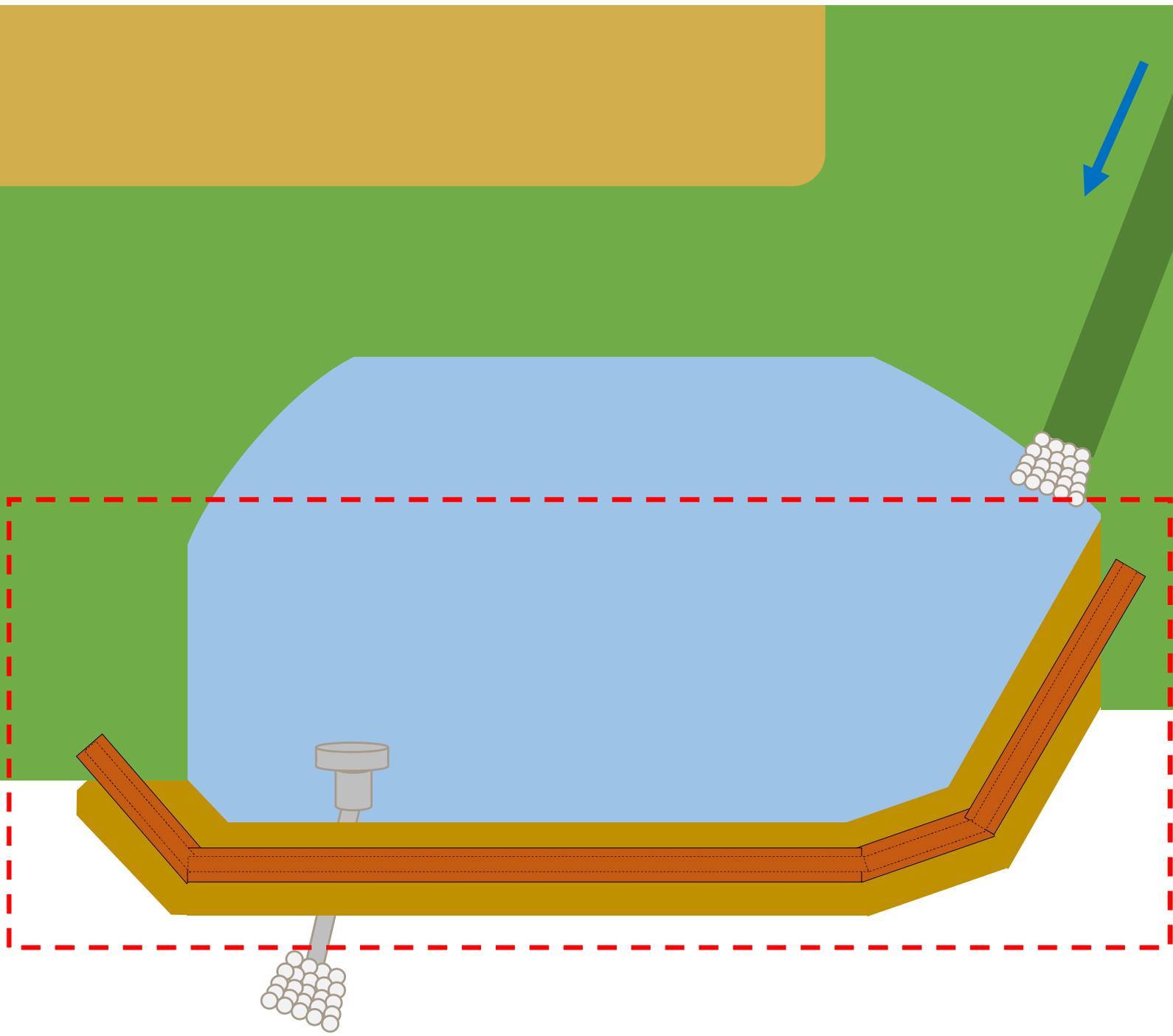
- Control seepage along the barrel pipe
 - May or may not be required. Check approved plan.
 - Compaction around these are critical (95%)
 - Shall be watertight
- See Table C-SCM-12-1 for more information on design parameters

Basin Cross-Section

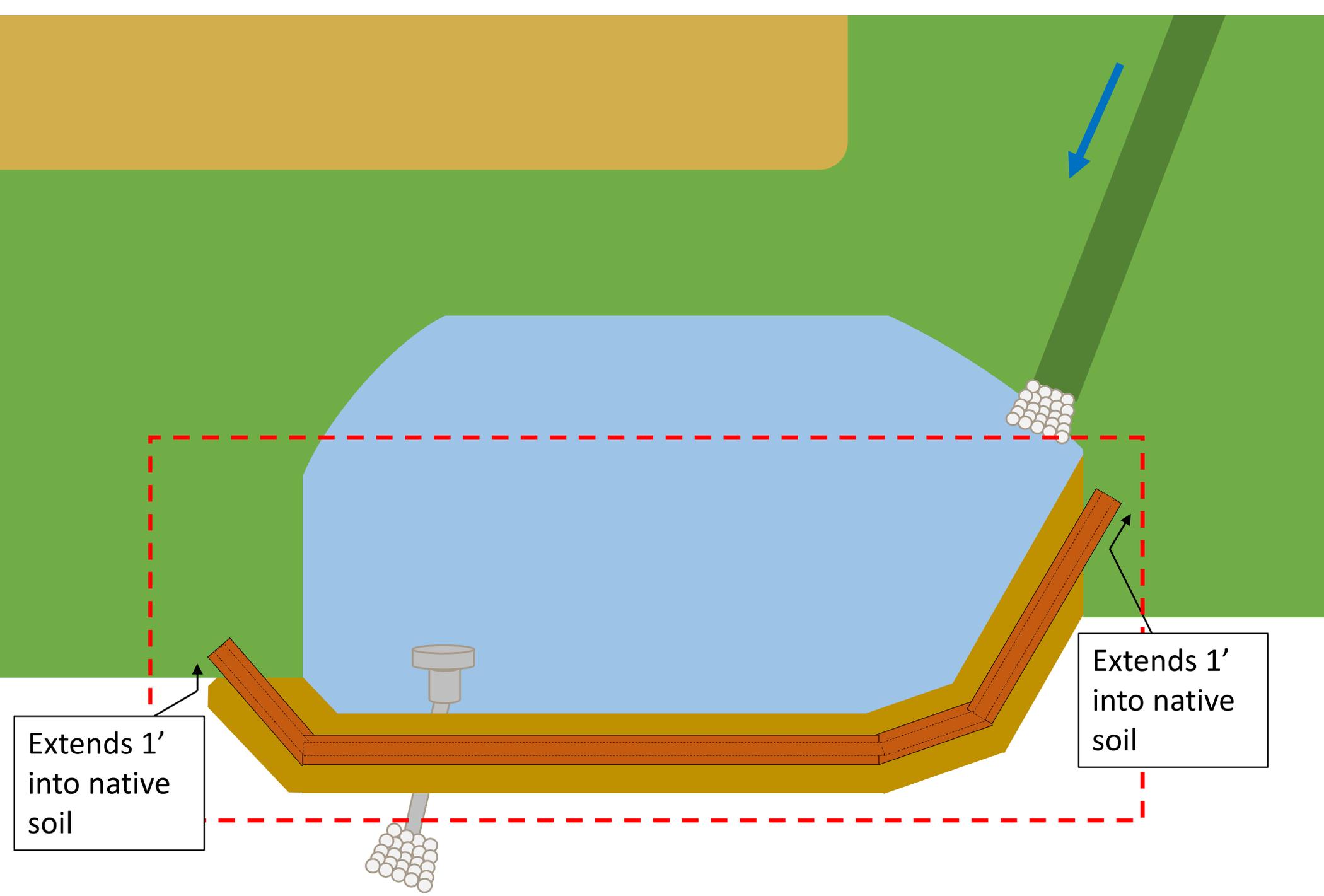




5b. | C-SCM-12 — TEMPORARY SEDIMENT BASIN



5b. | C-SCM-12 — TEMPORARY SEDIMENT BASIN



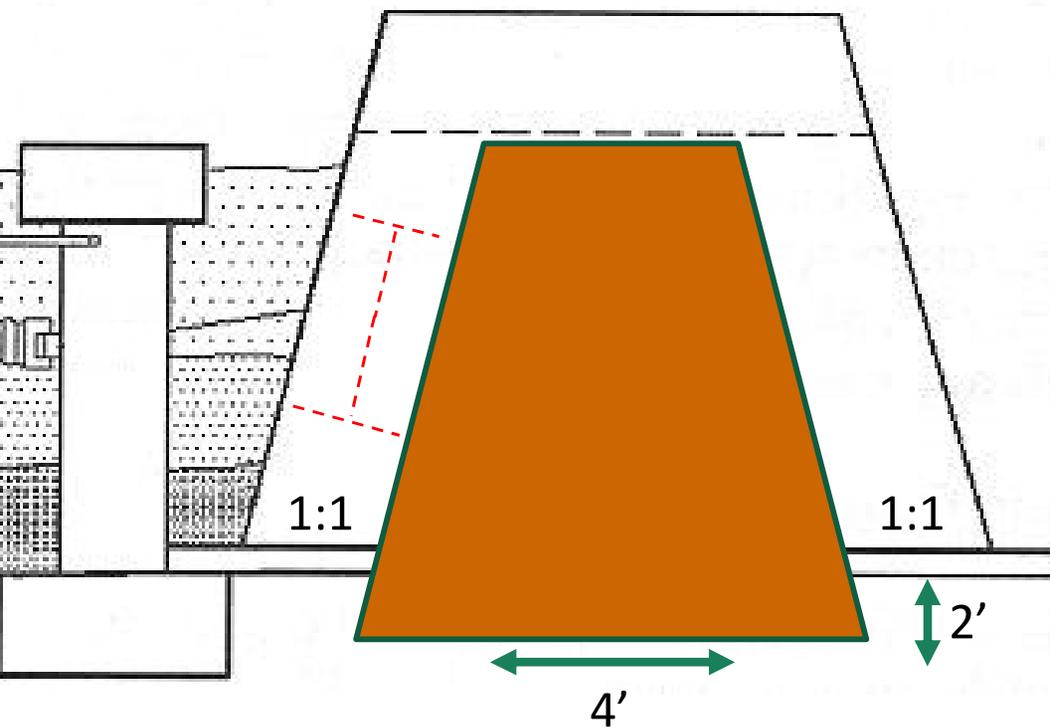
Extends 1'
into native
soil

Extends 1'
into native
soil

5b. | C-SCM-12 — TEMPORARY SEDIMENT BASIN



6.0 Construction Specifications



- Shall extend 1' into stable soil and up both abutments to the riser crest elevation
- Minimum depth 2' into native soil
- Minimum 4' bottom width
- Maximum side slopes = 1:1
- See Table C-SCM-12-3 for additional info on the "Cutoff Trench"

6.0 Construction Specifications

- Cross-sections (width, height, slope) must be in accordance with the approved plan
- Fill material needs to be clean and approved
 - Free of roots, rocks, and other objectionable materials
 - Achieve a compaction of 95%
 - Placed in 6” layers/lifts over the entire length
- See Table C-SCM-12-3 for additional info on an "Embankment"

6.0 Construction Specifications



- Above barrel pipe, fill material shall be placed in 4" layers/lifts and compacted by hand to 95%
- Min. 2' of material over the barrel before equipment can cross
- See Table C-SCM-12-3 for additional info on a "Principal Spillway"

C-SCM-13 – Concrete Washout Pit

1.0 Definition



- Temporary excavated or above-ground lined constructed pit or a prefabricated or fabricated container
- Concrete truck mixers and equipment can be washed after their loads have been discharged
- Prevent highly alkaline runoff from entering storm drainage systems or leaching into soil

7.0 Operations and Maintenance



- Deactivate, remove, and replace damaged or leaking facilities
- Remove hardened material at 75% storage capacity
- Pump excess wash into a vessel and dispose off-site
- Replace plastic liner when cleaning of the facility

Module 5c.

Vegetative Construction Best Management Practices

Surface Stabilization Measures (SSM)

- Protect disturbed soil from surface runoff
- Both temporary covering and permanent vegetative cover
- Often part of the final landscape

Planting Guidance – Appendix G

Plant Type – Divided into the following categories:

- Canopy Trees
- Understory Trees
- Shrubs
- Flowering Perennials
- Grasses and Groundcovers
- Green Roof Plants

Canopy Trees

										Shallow roots can inhibit other plant growth. Prioritize cultivars.		
<i>Acer rubrum</i> Red Maple										Early Winter		
3 to 9	60' x 40'		1	2	3	4	5	6	March-April	April-July		

C-SSM-01 – Tree Preservation & Protection (MS-4)

1.0 Definition

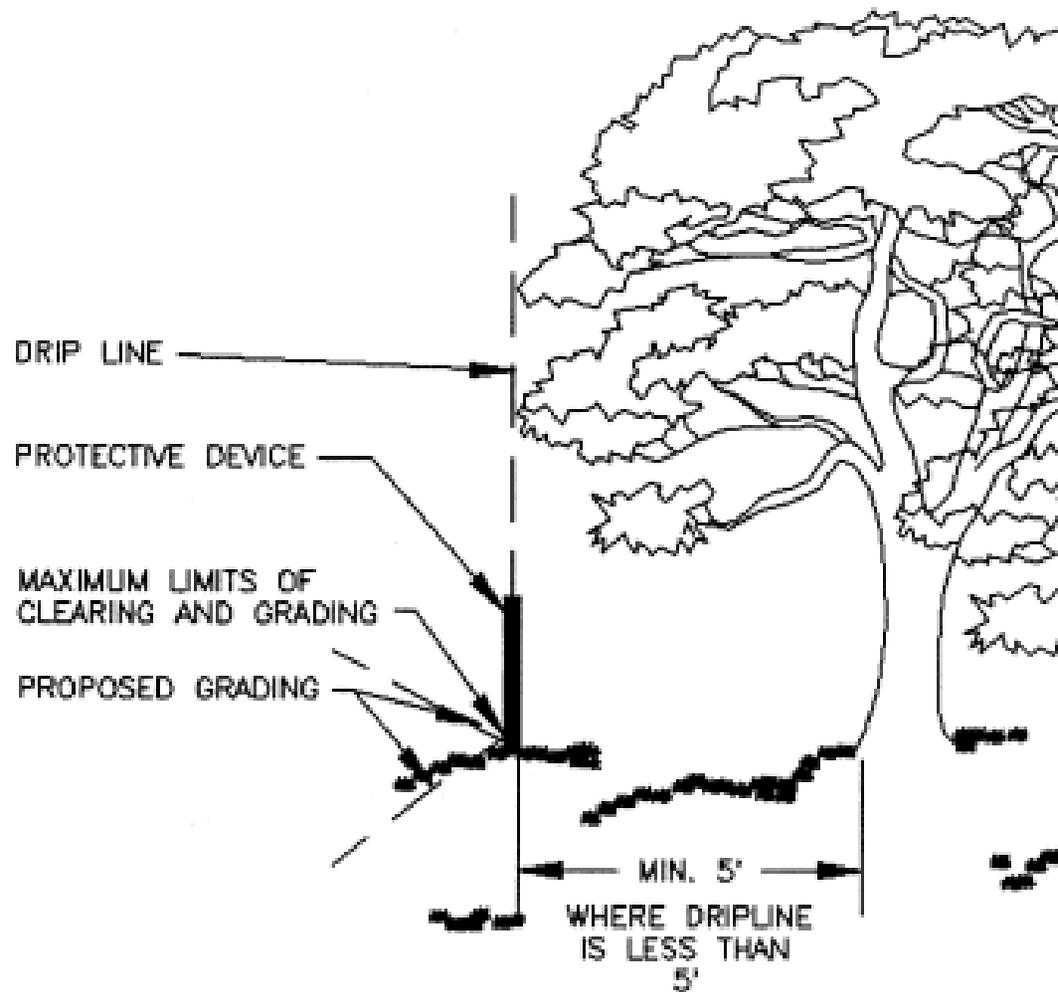
- The protection of desirable trees from mechanical and other types of injury during land disturbance and construction

2.0 Purpose and Applicability

- Ensure the survival of desirable trees and their root zones



6.0 Construction Specifications



- Material storage and vehicle parking must be located away from trees
- Install at edge of drip line but no closer than 5'
- NOTE: At inspections, check for infringements, and make sure the fencing is not damaged

What is wrong with this example?



5c. | C-SSM-01 — TREE PRESERVATION & PROTECTION

C-SSM-02 – Topsoiling (MS-1, 2)

1.0 Definition

- Preserving and using the surface layer of undisturbed soil, often enriched in organic matter, to obtain a more desirable planting and growth medium and enhance final site stabilization



6.0 Construction Specifications

- Avoid when soil is frozen or wet
- Make sure perimeter controls are in place prior to stripping
- Select the stockpile location to avoid slopes, natural drainageways, and traffic routes
- Where the pH of the subsoil is 6.0 or lower, utilize agricultural limestone to raise pH to 6.0-7.5
- Once areas to be topsoiled are at grade, subgrade should be loosened by discing or scarifying at least 2" deep before applying topsoil

6.0 Construction Specifications



- 6.3 - Verify topsoil is spread to a minimum depth of 2" on 3:1 or steeper slopes and 4" on flatter slopes
- 6.4 - Correct surface irregularities to prevent the formation of depressions and ponding
- Avoid compaction

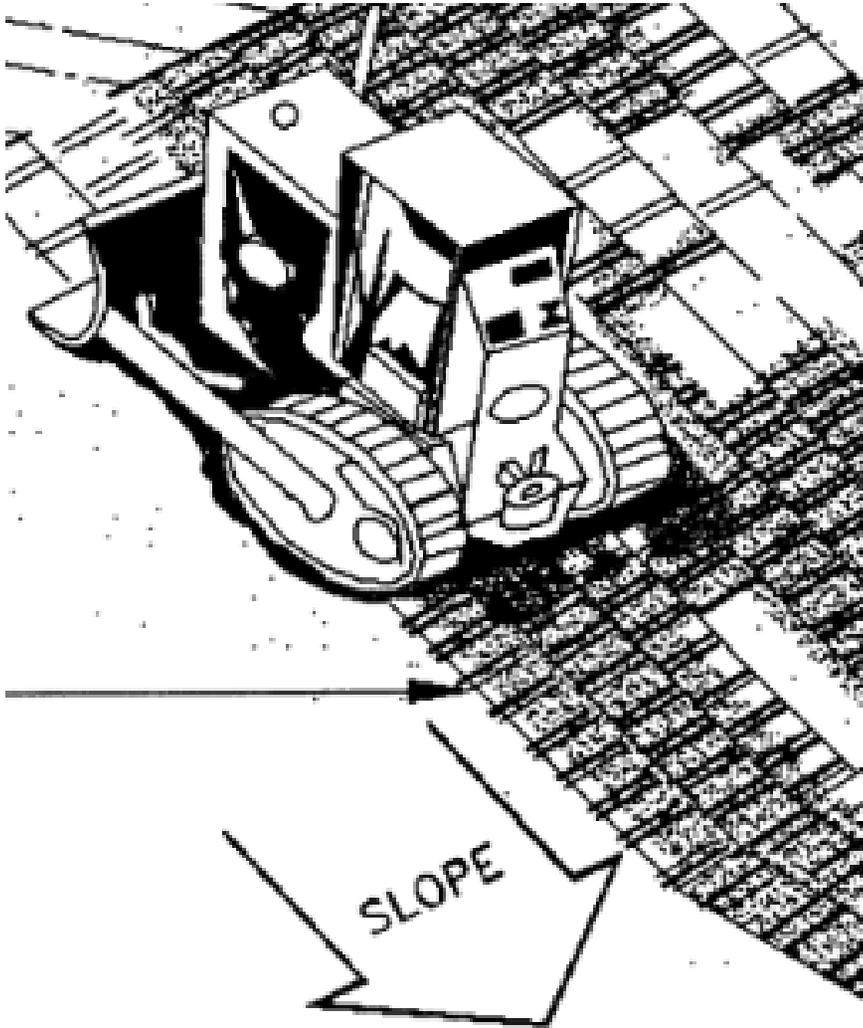
C-SSM-03 – Surface Roughening (MS-1, 7)



1.0 Definition

- Practice of providing a rough soil surface with *horizontal* depressions to reduce runoff velocity, increase infiltration, aid the establishment of vegetation, and reduce erosion
- Methods include stair stepping, grooving, and tracking

7.0 Operation and Maintenance



- Periodically check the seeded slopes for rills and washes
- Fill rills slightly above the original grade, then reseed and mulch as soon as possible

Slope Roughening Examples



Which grooves are oriented correctly?
Which MSs apply?

C-SSM-04 – Compost Blankets (MS-1)



1.0 Definition

- Layer of loosely applied composted material placed on disturbed areas to reduce runoff and erosion

6.0 Construction Spec.

- Ensure all large rocks, stumps, roots, and obstructions are clear
- Should be installed with:
 - 10' overlap into vegetated area
 - >3' over shoulder of slope

C-SSM-05 – Blankets & Matting (MS-1, 3)



1.0 Definition

- Protective blanket or soil stabilization matting on a prepared planting area of a slope, channel, or shoreline

2.0 Purpose and Applicability

- Provide a microclimate that protects young vegetation and promotes its establishment
- Raise the maximum permissible velocity of grass in channelized areas

Treatment 1 - Protective Blanket

1.0 Definition

- Degradable soil stabilization blanket; includes “combination” blankets with
 - Plastic netting (which covers and intertwines with a natural organic or man-made mulch)
 - Jute mesh (which is typically homogeneous in design and can act alone as a soil stabilization blanket)
- Should not have flow velocities greater than 4 feet per second



Treatment 2 - Stabilization Matting

1.0 Definition

- Soil stabilization matting that consists of a non-degradable, three-dimensional plastic structure that can be filled with soil prior to planting
- Should not have flow velocities greater than 10 feet per second



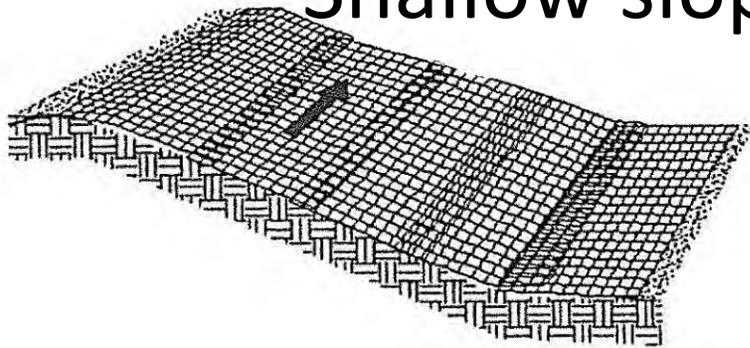
6.0 Construction Specifications



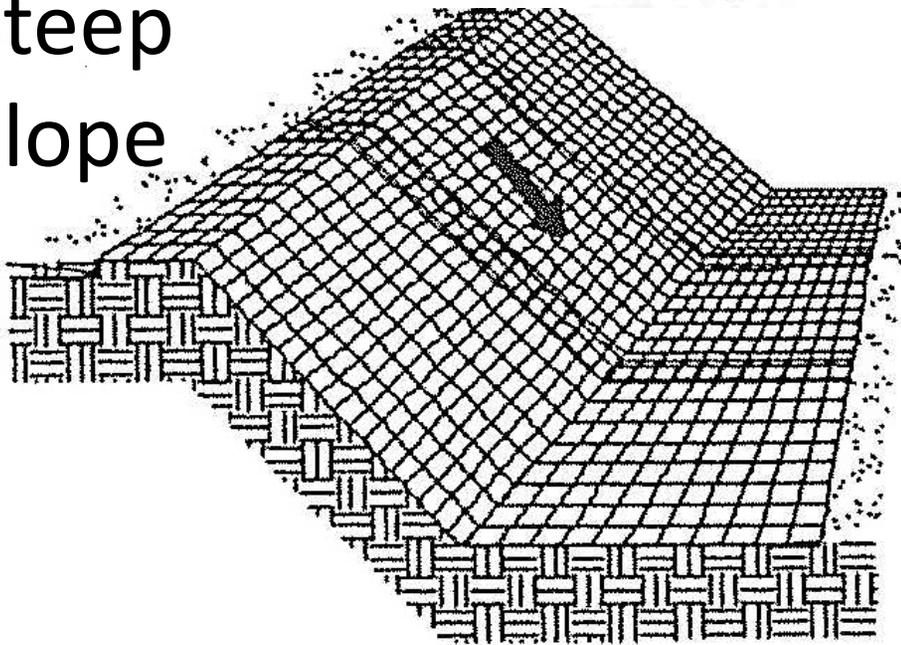
- Relatively smooth soil with no clods, rock, or rills
- Lay loosely on the soil
- Bury upslope ends at least 6" deep
- Staple at least every 3'
- Overlap side-by-side rolls at least 2"
- Check slots every 50'

6.0 Construction Specifications

Shallow slope



Steep slope



- To begin a new roll when the previous one runs out:
 - Anchor new roll
 - Overlap end of original roll at least 12"
 - Staple across every 12"
- Ending a roll:
 - Fold 4" under
 - Staple across every 12"

7.0 Operations and Maintenance



- Inspect for undermining and undercutting until permanently vegetated and stabilized
- If washout occurs, repair damage then reinstall matting

C-SSM-06 – Sodding (MS-1, 3)

1.0 Definition

- Permanent stabilization of areas by laying a continuous cover of grass sod over exposed soils

2.0 Purpose and Applicability

- Sodding is used to:
 - Prevent erosion and damage from sediment and runoff by stabilizing the soil surface
 - Reduce the production of dust and mud associated with bare soil surfaces
 - Stabilize drainageways where concentrated overland flow will occur
 - Serve as a filtering device for sediments before achieving permanent stabilization
 - Establish permanent turf immediately

5.0 Design Criteria



- Consider site location and intended purpose when selecting type of sod to use
- Reference Table C-SSM-06-2 for info on types of sod available in Virginia and their recommended uses

6.0 Construction Specifications



- Installed within 36 hours of harvesting
- Should not be installed on excessively wet, dry, or frozen soil surfaces
- Soil should be lightly irrigated if sodding occurs during very dry weather
- Laid in staggered rows
- Ends should be placed tightly together

7.0 Operations and Maintenance



- During the establishment stage, water as necessary to maintain adequate root zone moisture
- No more than 1/3 should be cut when mowing (maintain height of 2" - 3")
- Once established, follow Table C-SSM-06-3 for fertilization requirements

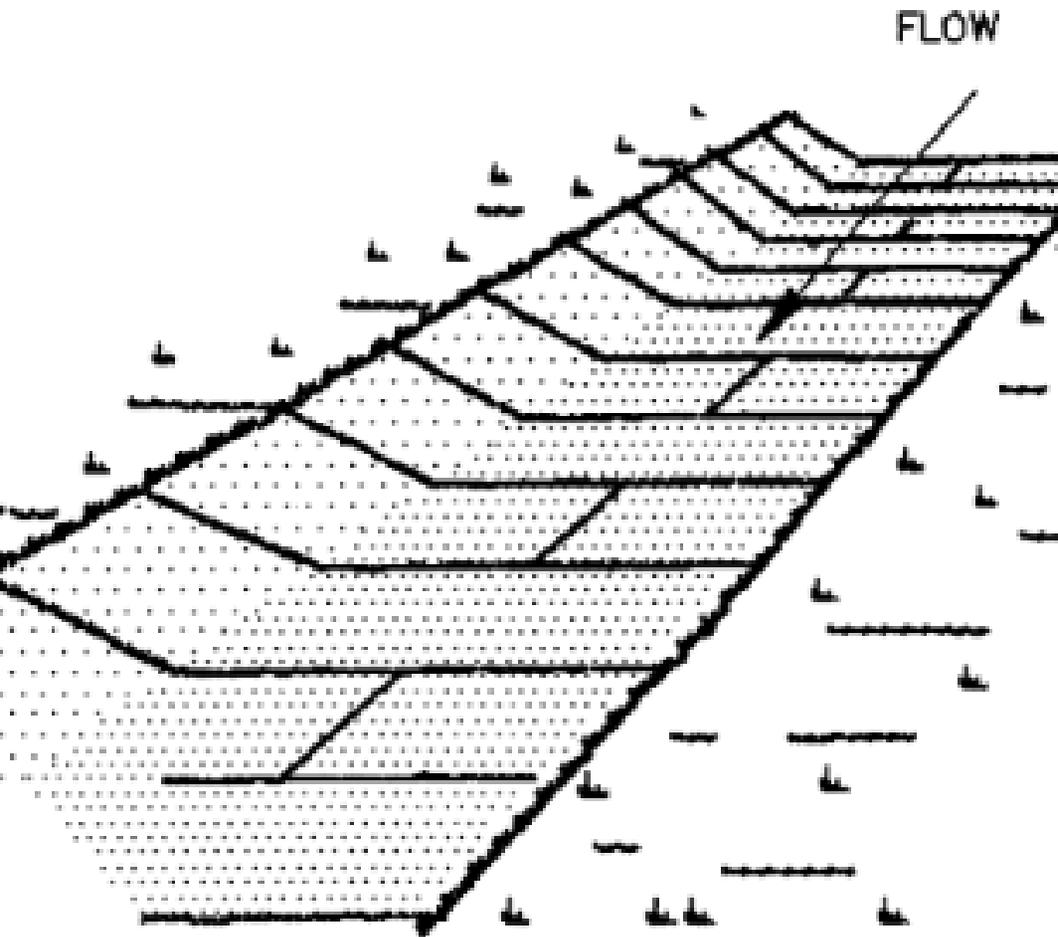
Is the Sod Installation Correct?



5c. | C-SSM-06 — SODDING



6.3 Sodded Waterways



- Sod strips in waterways should be laid perpendicular to the flow
- Join ends tightly
- Peg or staple after rolling

C-SSM-09 – Temporary Seeding (MS-1, 2)



1.0 Definition

- The establishment of a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing annual plants

2.0 Purpose and Applicability

- Stabilize disturbed areas that will not be brought to final grade for over 14 days
- Reduce damage downstream and protect bare soils while permanent vegetation (or other erosion control measures) can be established

6.0 Construction Specifications



- Make sure the seed used is appropriate for the time of year
 - Tables C-SSM-09-3 (Plant Material for Temporary Seeding) and C-SSM-09-4 (Temporary Seeding Applications)

7.0 Operations and Maintenance

- Make sure the area is mulched after seeding

C-SSM-10 – Permanent Seeding (MS-1, 3)

1.0 Definition

- Permanent seeding is the establishment of perennial vegetative cover on disturbed areas by planting seed
- NOTE: Spec C-SSM-07 (Bermuda and Zoysia Grass Establishment) can be applied under this specification



3.0 Planning and Considerations

3.0 Planning and Considerations

Plant selection depends on:

- Physiographic region
- Soils
- Land use
- Planting season

Figure C-SSM-10-1 Physiographic Provinces of Virginia

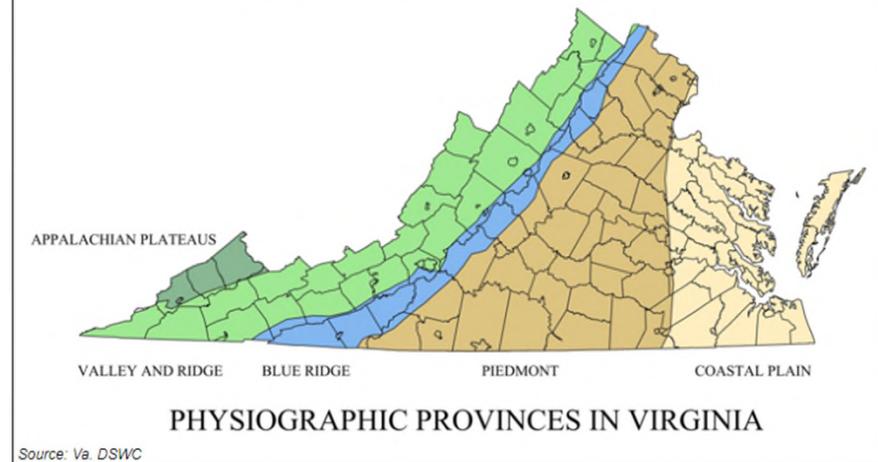
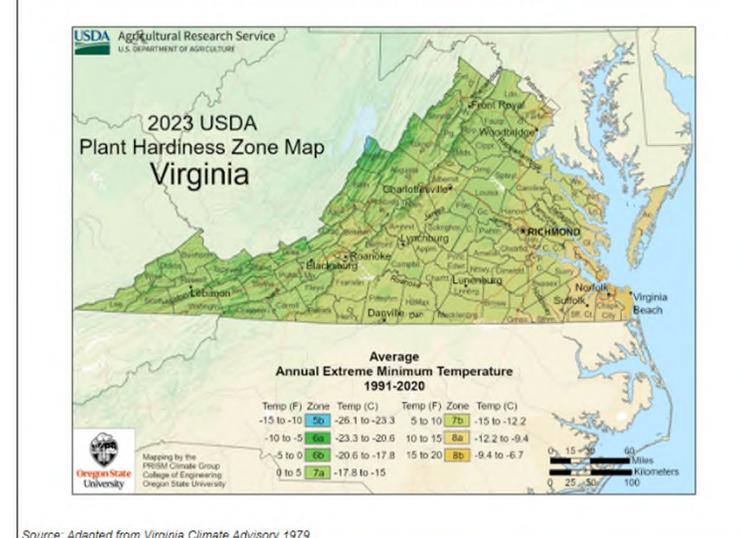


Figure C-SSM-10-2 Plant Hardiness Zones in Virginia



3.0 Planning and Considerations

Non-Native, Invasive & Pollinator Friendly Plant Considerations – Table C-SSM-10-1

What is a Native Species?

Naturally occur in the region in which they evolved

What Are Invasive Non-Native Species and Why Are They of Concern?

- May escape cultivation, displace native plant species, reduce wildlife habitats, and alter ecosystem processes
- Easily and rapidly disperse across the landscape

Should Invasive Plants Be Avoided?

DEQ strongly discourages the use of numerous highly invasive, non-native species - See ESC Insp PG, Mod. 5c, p. 10-12

6.0 Construction Specifications



- Soil depth shall be at least 12" to bedrock or other impermeable layer
- Check for a soil test and if recommendations for the pH and nutrient content have been made
- Make sure the soil does not contain large amounts of rocks, woody materials, or construction debris

7.0 Operations and Maintenance



- Plant information and uses Table C-SSM-10-4
- Recommendations for seed mixtures (Tables C-SSM-10-6 through C-SSM-10-8) – (See next PPT for an example.)

7.0 Operations and Maintenance

Table C-SSM-10-7 Site-Specific Seeding Mixtures for Piedmont Area			
Site Condition	Seed Mix	Application Rate (pounds per acre)	
Minimum-Care Lawn Commercial or Residential	Turf-Type Tall Fescue	95-100%	150 – 200
	Improved Perennial Ryegrass	0-5%	
	Kentucky Bluegrass	0-5%	
High-Maintenance Lawn	Improved (VCIA) Turf-Type Tall Fescue	100%	150 – 200
General Slope (3H:1V or less)	Tall Fescue***		50 – 75
	Red Top or Red/Hard Fescue		10 – 20
	White Clover and/or Birdsfoot Trefoil**		10 – 20
	Seasonal Nurse Crop*		30 – 40
Low-Maintenance Slope (> 3:1) or Inaccessible Area***	Tall Fescue		50 – 75
	Red Top and/or Hard Fescue		5 – 10
	White Clover and/or Birdsfoot Trefoil**		15 – 20
	Annual Lespedeza**		10 – 15
	Seasonal Nurse/Cover Crop		20-30

Permanent Seeding Examples

Which of these areas would comply with MS-3?



C-SSM-11 – Mulching (MS-1)



1.0 Definition

- Mulching is the application of a protective blanket of straw or other plant residues/materials to the soil surface during the establishment of temporary and permanent seeding.
- Similar applications to C-SSM-04 Compost Blanket

2.0 Purpose and Applicability



- Protect the soil from raindrop impact, thus reducing erosion
- Helps provide a favorable microclimate for seed germination and plant establishment

6.0 Construction Specifications



- #1 choice of mulch with seeding applications is straw – applied at 1.5 – 2 tons/acre
 - Must be anchored
- Other organic mulches: Table C-SSM-11-1
- Crimper
- Fiber mulch – applied at 500 – 750 pounds per acre
- Netting
- Peg and twine

Q&A



Any Questions?

Picture references

Water truck: <https://ecobase.com.sg/equipment/water-truck-with-spray-bar/>

Wash rack: <http://kcinow.com/track-on-dont-track-off/>

SF outlet:

<https://www.txdot.gov/business/resources/environmental/stormwater/bmp-resources/erosion-control.html>

Concrete washout:

<https://www.google.com/url?sa=i&url=http%3A%2F%2Fwww.schuylerswcd.com%2Fconcrete-washout-area.html&psig=AOvVaw1uR0Y2w1zi5ugsdsIPDx-6&ust=1721235478758000&source=images&cd=vfe&opi=89978449&ved=0CAMQjB1qFwoTCID8k4GErIcDFQAAAAAdAAAAABAZ>

Filter sock sediment trap: <http://filtrex.com>

QuickPoll

QuickPoll

How far apart can stakes be when using wire re-enforcement?

- a. 3 ft.
- b. 4 ft.
- c. 6 ft.
- d. 10 ft.

QuickPoll

What size stakes are used for the vertical and horizontal frame in silt fence drop inlet protection?

- a. 2x2"
- b. 2x4"
- c. 4x4"
- d. 4x6"

QuickPoll

What is the maximum drainage area in acres for a diversion dike?

- a. 3
- b. 4
- c. 5
- d. 6

QuickPoll

What practice can be used to address compliance with MS-1 – areas not at final grade?

- a. Silt fence
- b. Temporary seeding
- c. Permanent seeding
- d. Mulching