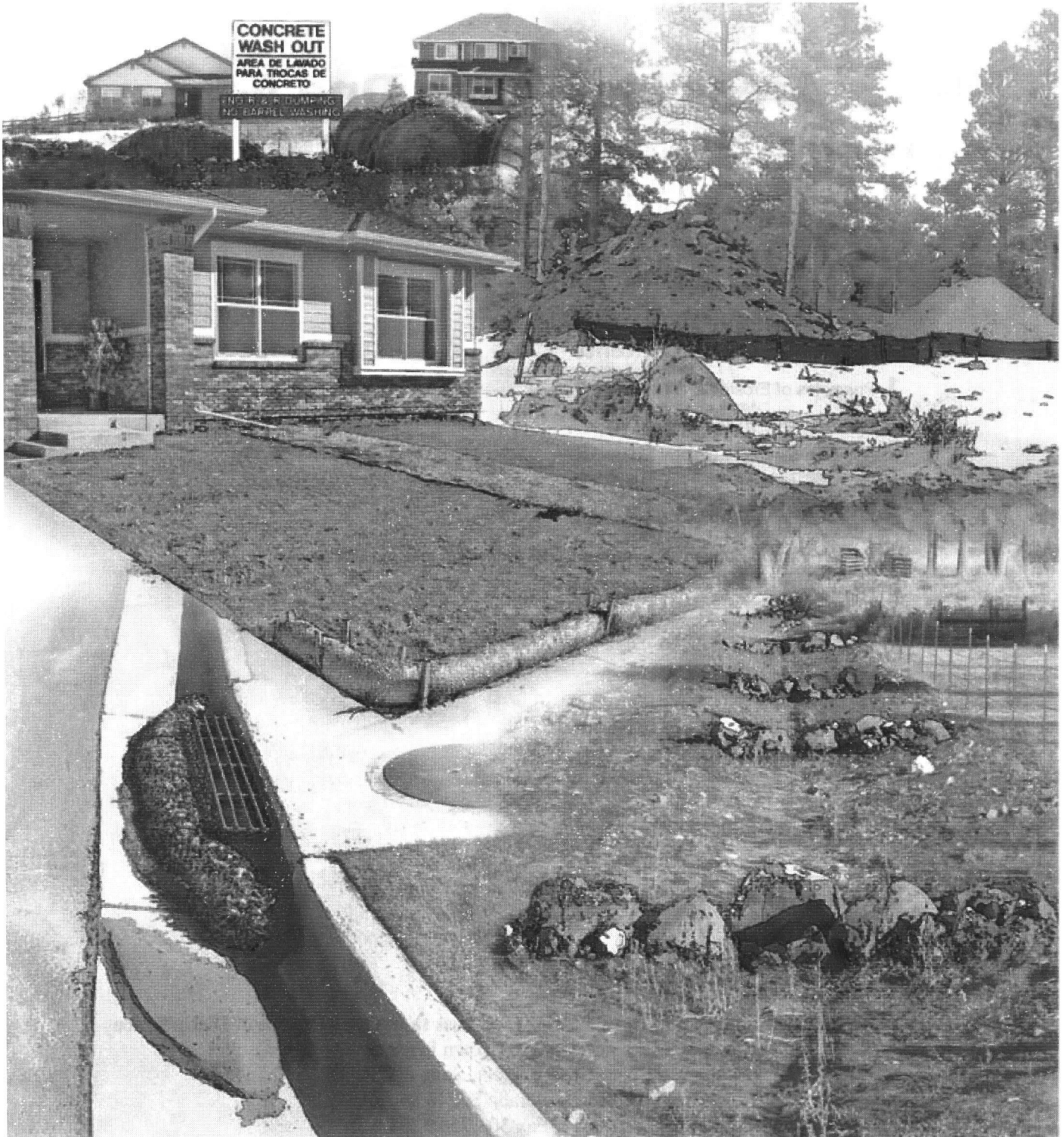


# Areas Less Than One Acre Erosion & Sediment Control Manual

AS ADOPTED FROM JEFFERSON COUNTY, COLORADO



Town of Foxfield, Colorado Series 2007, Trustee Bill No. 6

# **Areas Less Than One Acre Erosion & Sediment Control Manual**

## **Contents**

- 1** Principles of Erosion and Sediment Control
- 1** Applying Erosion Control Principles
- 2** Applying Sediment Control Measures
- 4** Waste Control
- 5** Establishing Vegetative Cover
- 7** Maintenance of Erosion and Sediment Best Management Practices
- 8** Figures

**Town of Foxfield Standards and Specifications for Less than One (1) Acre of Disturbance**

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# Principles of Erosion & Sediment Control



■ This site is in violation because sediment is not being contained on the jobsite.



■ Silt fence or straw wattles are effective BMPs to keep sediment on the job site and off of the sidewalk or street.

Erosion control is different from sediment control, and both are needed to stabilize a construction site. Erosion controls may consist of temporary seeding, installing erosion control blankets, and mulching. Erosion controls make physical contact with the soil to keep it in place. Sediment controls are structures such as sediment traps, check dams, silt fence and sediment control logs ('straw wattle' is a common field name) and are designed to keep eroded sediment on the property. The following are common techniques:

## **Keep Soil on the Construction Site**

The best way to minimize the risk of creating erosion and sedimentation problems is to disturb as little of the land surface as possible. When development is tailored to the natural contours of the land, little grading is necessary, and the erosion potential is consequently lower. Some methods to minimize risks are:

- Align roads along contours rather than straight up and down hills.
- Locate building pads on the flattest portions of the site.
- Keep disturbed areas small.
- Use erosion controls to prevent soil from eroding.
- Use sediment controls such as silt fence, sediment control logs, rock check dams, sediment traps, etc. where needed during construction to prevent sediment from leaving the site.

If you need assistance in determining the best control method, please contact the Town Engineer at 303-757-8513.

## **Applying Erosion Control Principles**

The primary goal is to prevent erosion from happening. Use erosion control such as trenching, seeding and installing erosion control blankets during and immediately after construction to reduce erosion.

### **Retain Existing Vegetation Wherever Feasible**

When laying out site improvements, locate buildings between existing tree clusters and build roads around trees. Avoid clearing vegetation around building pads, where construction will not be taking place. Also avoid disturbing vegetation on steep slopes or in other critical areas such as drainage ways, marshes, etc.

### **Vegetate and Mulch Disturbed Areas**

Revegetate all disturbed areas that will not be covered with buildings, gravel or pavement. Before seeding an area, make sure drainage controls are installed. Establish temporary vegetative cover on areas that will be exposed for longer than 30 days. Plant establishment will be more successful if graded slopes are roughened or scarified before seeding, as discussed in the seeding section of this document. It is cheaper to establish and remove a temporary cover than to repair the gulying and sediment damage that is likely to occur if your site is not stabilized.

### **Keep Runoff Velocities Low**

- Minimize straight flow path lengths – create meanders.
- Construct channels with gentle gradients.
- Line channels with rough surfaces, such as rock check dams or erosion control blankets; (Figure 4; see appendix)

# Applying Sediment Control Measures

Most of the Best Management Practices (BMPs) in this section are temporary measures used during construction. Some BMPs such as sediment traps and rock check dams may be used during construction, and cleaned out for the transition into a permanent post-construction stormwater BMP structure.

## Divert Runoff Away from Disturbed Areas

Do not allow runoff to cross a newly disturbed or seeded slope, except within a drainage ditch. Dikes and ditches can also be used at the base of a disturbed slope to protect downstream areas by diverting sediment-laden runoff to a sediment trap. Construct a sediment barrier or swale all the way around a disturbed area to prevent clean runoff from entering the area and also to prevent silt-laden runoff from escaping.

## Trap Sediment On-Site

Locate sediment barriers in relatively level areas or in natural depressions. Install silt fences or sediment control logs below disturbed areas so that runoff will be detained long enough for suspended sediment to settle. A flat area at the base of a slope is a good location for a silt fence, sediment control log, or sediment trap because the runoff can slow down before reaching the barrier, and the sediment has a place to settle. For hills exceeding 2:1 slopes, it is a good idea to use multiple sediment traps both for reduced flow velocities and for sediment management. On large sites in addition to a sediment trap, there should be a BMP for every 100' of flow path, and no BMP should have more than one acre of drainage area upstream.

When sediment depth reaches one-third of the structure height, remove accumulated sediment. Immediately repair any structural damage. If evidence exists that water has bypassed the structure, repair immediately.



- Sediment must be pulled away from silt fence to prevent the silt fence from failing.

## Vehicle Tracking Pad

This is also called a gravel construction entrance and is designed to remove the mud that becomes caked in truck tires and to keep it on the project site. This is required at the exit of the construction access where there is a potential to track mud off of the property; the tracking pad must be constructed as shown in Figure 1.



- Typical vehicle tracking pad provided to remove mud from tires.



- Use 3" or larger angular rock or recycled concrete in a vehicle tracking pad.

## Sediment Barriers for Sheet Flow Applications

Sediment barriers can be inexpensive, easy solutions for reducing sedimentation (Figures 2 and 3). However, they must be placed in the proper location, installed and maintained correctly. If such a barrier fails, there can be more damage than if no barrier had been installed, creating sediment problems and expensive repair costs.



■ Silt fence may be used for sheet flow or to contain small piles of dirt.

■ Silt fence can be used to keep sediment on the property.

<b>Design Criteria</b>	The area draining to the barrier is 1 acre or less.
	The maximum slope gradient behind the barrier is 2:1.
	The maximum slope length behind the barrier is 100 ft (30 m).

### Silt Fence

Do not install silt fence in a flow path, swale or ditch.

Installation Procedure (Figure 2):

- Install silt fence parallel to contours.
- Excavate a trench approximately 4 inches wide and 6 inches deep along the line of fencing, and bury bottom of fabric, with stakes every 8 feet.
- Backfill the trench over the base of the fabric, and compact the soil.

Note: In the steep, rocky portions of the county, install sediment control logs instead of fabric silt fence. Rock fall protection with steel fencing is required if there is a potential for rocks to leave the property during construction.

### Sediment control logs

May be used in a flow path, swale or ditch.

Installation Procedure (Figure 3):

- Install sediment control logs parallel to contours.
- Trench 2 to 3 inches deep by the width of the control log.
- Mesh bags stuffed with combinations of rice and straw make of the log and must be staked every four feet.

Note: Watch for water bypassing control log, and repair gaps immediately. When using control logs along a sidewalk for sediment control, stake on top of the dirt without trenching.



■ Straw wattles can be staked along the back of the sidewalk and can be left in place to provide temporary site stabilization.



■ Onsite materials such as large rock (6" diameter or greater) may be placed in flow path to reduce velocity and erosion.



■ Straw bales or rock check dams must be wider than the flow path with a low point in the middle for overflow.

### Sediment Barriers for Channeled Flow (not silt fence)

Sediment barriers such as 6 inch or larger native rock check dams, wire-reinforced check dams and sediment control logs can be used in small swales (Figure 4). The barriers reduce the velocity of flow and erosion in the swale. General guidelines are as follows:

- Check dams should be spaced so that the top of the downhill check is at the same height as the base of the uphill check dam. This reduces the distance between check dams and erosion in the swale.
- Extend the barrier across the swale so that sediment-laden runoff will NOT flow around the check dams.



■ Effective inlet protection, such as a rock barrier, keeps sediment out of storm drains.

### Storm Sewer Inlets and Culverts

Storm sewer inlets and culverts in the right-of-way and other infrastructure need protection from sediment. Install structures such as rock barriers or weighted wattles around inlets after obtaining an access permit (Figures 5 and 6).

## Waste Control

The landowner and/or contractor is responsible for controlling waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste. Additionally, spill prevention and containment BMPs for construction material, waste, and fuel must be provided.



■ Construction sites must have waste containment facilities such as dumpsters, portable toilets and concrete washout areas.



■ Provide signage so construction site workers can comply with waste control requirements.

# Establishing Vegetative Cover

Vegetation may be a temporary or permanent cover. Temporary cover is an erosion control measure used on stockpiles or to stabilize an area that may not be at final grade. Annual or native grasses are typically planted. Permanent cover with irrigation will stabilize the site in one growing season. Permanent cover with non-irrigated native grasses takes about three growing seasons to establish.



■ Erosion control blankets help stabilize slopes, retain moisture for seed germination, and reduce wind erosion.



■ Erosion control blankets can be used along a sidewalk or street edge to help grass create a stable buffer strip.

## Revegetation

Revegetation includes:

- seedbed preparation
- planting
- mulching and crimping
- follow-up maintenance

Before beginning any revegetation project, a landowner should examine the soil, landscape, and timing that will influence performance of plants and success of the project. Seeding may be temporary or permanent. Annual (living for one season) grasses are often used for temporary cover, whereas perennial grasses are used for permanent or multi-season protection.

Native grasses should be used in revegetation projects.

## Slope Influences on Revegetation

Slope	Success
<5:1 (20% grade)	Very Good
4:1 (25% grade)	Good
3:1 (33% grade)	Fair
>2:1 (50% grade)	Poor

## Seedbed Preparation

Stockpile topsoil that was removed during grading. Direct concentrated water flow away from the stockpile. Protect the topsoil from erosion, and reapply it when preparing the seedbed. Ripping or chiseling to a depth of 12 inches or more should be performed to break up any compacted layers that may restrict root or water penetration. The surface should be free of rills and gullies. Control noxious weeds by mowing at least three times during the growing season. Weeds need to be less than 12 inches in height.

Add organic matter (compost) to the soil. Applying fertilizer to native seedling is not recommended when planting into natural soils because fertilizer tends to encourage weed growth, rather than enhance early grass development.

## Planting Window

Grass seed should be planted in a weed-free seedbed during the “planting window” for the project area. Planting may be done anytime within the window as long as the soil is not frozen or wet. Plant winter wheat or rye as temporary cover when out of the window. The “planting windows” for perennial grasses in Jefferson County are:

	<b>Mountains</b>	<b>Plains</b>
<b>Non-irrigated Plantings</b>	October 1 - April 30	October 1 - April 30
<b>Irrigated Plantings</b>	April 1 - June 30	March 15 - July 15

Erosion blankets or crimped mulch are required for ground stabilization outside the planting windows.

## Planting Techniques

Broadcast seeding may be accomplished with hand-held or vehicle-mounted spreaders. Seed is broadcast onto a prepared, roughened seedbed, followed by raking or dragging the surface to cover as much of the seed as possible with about 1/4” to 3/8” of soil. Some of the seed will remain visible and will not germinate. Specified seeding rates have accounted for some seed not germinating.

## Mulching

After seeding, a mulch of long-stemmed, weed- and seed-free grass hay should be crimped into the ground with a disker to protect the site. Apply 1.5 to 2 tons per acre. This is approximately one standard rectangular bale per 650 square feet, and will allow precipitation to infiltrate.

On areas with slopes  $\geq 30\%$  or in windy areas, anchor erosion control netting over the mulch to help keep the mulch in place. Use netting that is photo degradable so that it will disappear on its own after a few years.

## Weeds

Weeds will usually appear before grass seedlings. There are countless seeds in the soil waiting for an opportunity to grow. Most of the weeds will be annuals or biennials. While they may seem to be smothering the grass, they will not likely be able to compete with the grass in the second and third years. In fact, sometimes the weeds may even be beneficial, cooling the soil, conserving soil moisture, and protecting against erosion. It is recommended to mow at least three times during the growing season to help prevent weeds from developing seeds. If wild flowers and/or shrubs are planted with the grasses, then no herbicides should be used.

## Time

It takes at least two or three growing seasons (for non-irrigated plantings) before revegetation success can be evaluated. If soil conditions are suitable (unrestricted rooting depth, no erosion, adequate surface topsoil replacement), weeds are under control, good seed has been planted correctly, AND the weather is “normal”, then seedlings should be established by the second growing season. Native species have a reputation of being picky about soil moisture and temperature conditions and may take longer to establish.

## Site Specific Recommendations

USDA-Natural Resources Conservation Service can offer site-specific recommendations. Their phone number is 720.544.2809. Some of the more commonly used introduced species are listed in tables A-L. Reference the tables to determine what seed mixes are appropriate for your site location.



■ Crimp mulch perpendicular to slope.

# Maintenance of Erosion & Sediment Control Best Management Practices

## Maintenance and Inspection

Construction sites with a State Stormwater Discharge Permit must be inspected by the permittee or designated party. The condition of the structural Best Management Practices (BMPs) must be documented every 14 days or within 48 hours of a stormwater runoff event. Some maintenance examples are illustrated below:



■ Remove sediment and reinstall collapsed silt fence as needed. Provide additional erosion control BMPs if the sediment control is not effective.



■ Straw wattles flattened by construction traffic are not effective and must be replaced.



■ Move straw wattles when accessing the site or choose a different BMP to avoid damaging the BMP.



■ Replace or add more rock if mud is tracked through a vehicle tracking pad and onto the street.

## **Figures**

Figure 1 - Vehicle Tracking Control

Figure 2 - Silt Fence Barrier

Figure 3 - Sediment Control Log

Figure 4 - Rock Check Dam

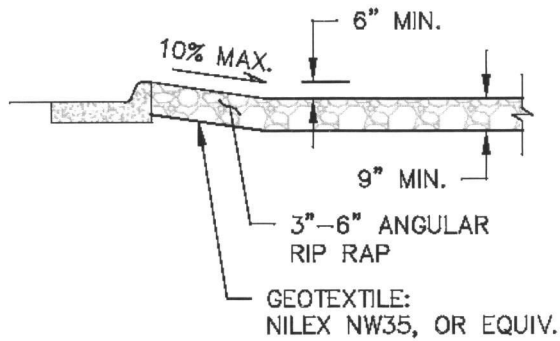
Figure 5 - Area Inlet Protection

Figure 6 - Reinforced Rock Berm

Figure 7 – Erosion Blanket

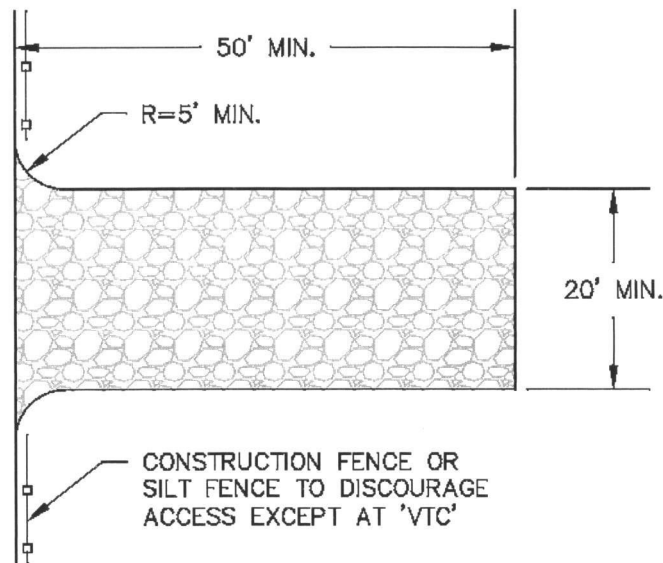
Figure 8 – Sediment Trap

# Figure 1 - Vehicle Tracking Control

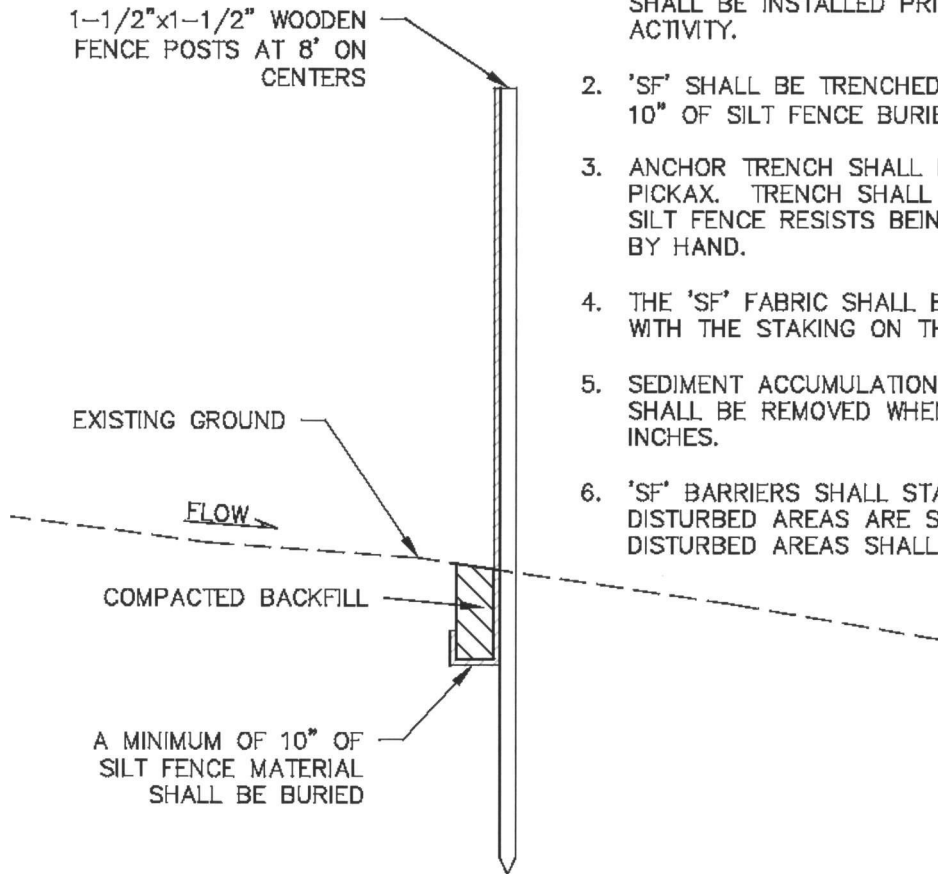


## VEHICLE TRACKING CONTROL (VTC) INSTALLATION NOTES

1. 'VTC' SHALL BE INSTALLED AT THE EXIT OF THE CONSTRUCTION ACCESS WHEN THERE IS A POTENTIAL FOR TRACKING MUD OFF OF THE PROPERTY.
2. AN ACCESS PERMIT IS REQUIRED IF ACCESSING COUNTY RIGHT OF WAY OR IF A NEW DRIVEWAY CUT IS REQUIRED.
3. RIP RAP USED FOR THE 'VTC' SHALL BE 3"-6" AND SHALL BE ANGULAR. A MINIMUM DEPTH OF 9" IS REQUIRED.
4. A GEOTEXTILE SEPARATOR IS REQUIRED UNDER THE RIP RAP PAD; USE NILEX NW35, OR EQUIVALENT.
5. CONSTRUCTION FENCE SHALL BE LOCATED ADJACENT TO BOTH SIDES OF THE 'VTC' TO AVOID SHORT CUTTING.
6. 'VTC' SHALL BE REMOVED AT THE END OF CONSTRUCTION. ONCE REMOVED, THE DISTURBED AREAS SHALL BE TOPSOILED, SEEDED AND MULCHED.

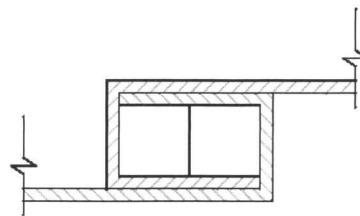
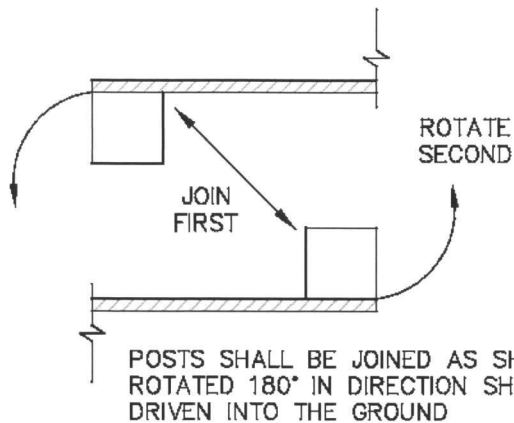


## Figure 2 - Silt Fence Barrier



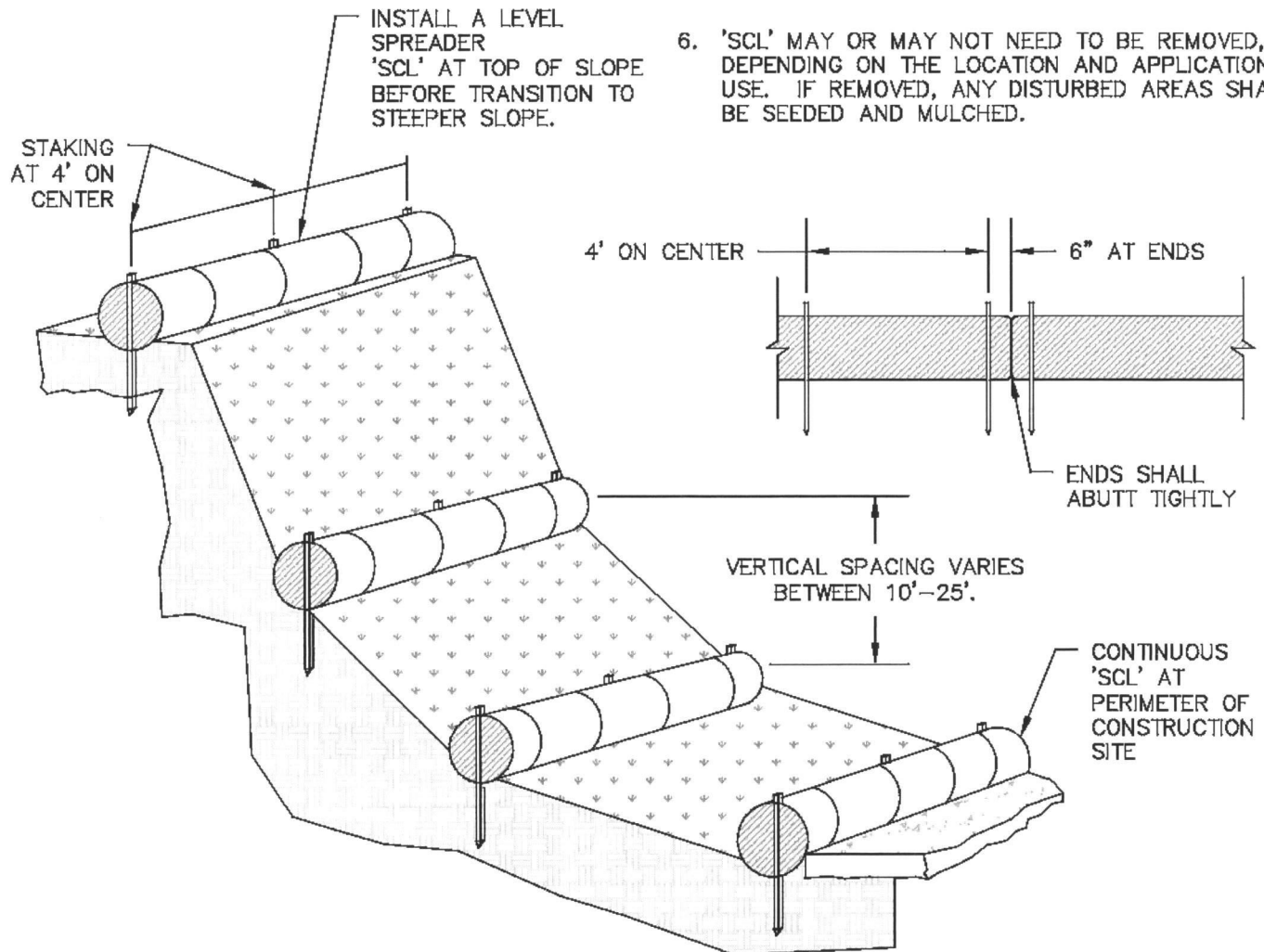
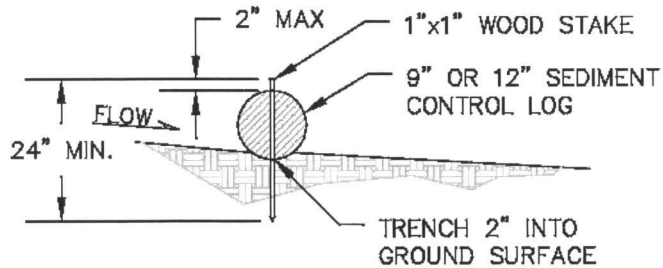
### SILT FENCE (SF) INSTALLATION NOTES

1. 'SF' BARRIERS INDICATED ON THE NOTICE OF INTENT PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITY.
2. 'SF' SHALL BE TRENCHED INTO THE GROUND WITH AT LEAST 10" OF SILT FENCE BURIED.
3. ANCHOR TRENCH SHALL BE EXCAVATED BY TRENCHER OR BY PICKAX. TRENCH SHALL BE COMPACTED SUCH THAT THE SILT FENCE RESISTS BEING PULLED OF THE ANCHOR TRENCH BY HAND.
4. THE 'SF' FABRIC SHALL BE LOCATED ON THE UPHILL SIDE, WITH THE STAKING ON THE DOWNHILL SIDE.
5. SEDIMENT ACCUMULATION UPSTREAM OF THE 'SF' BARRIER SHALL BE REMOVED WHEN THE SEDIMENT HEIGHT REACHES 6 INCHES.
6. 'SF' BARRIERS SHALL STAY IN PLACE UNTIL THE UPSTREAM DISTURBED AREAS ARE STABILIZED. ONCE REMOVED, ANY DISTURBED AREAS SHALL BE SEEDING AND MULCHED.



NOTE:  
THICKNESS OF MATERIAL  
HAS BEEN EXAGGERATED  
FOR CLARITY

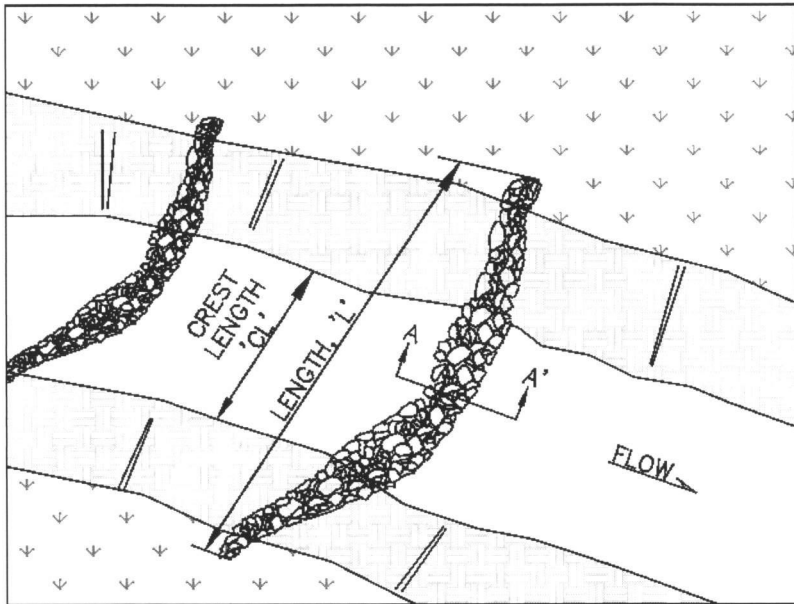
## Figure 3 - Sediment Control Log



### SEDIMENT CONTROL LOG (SCL) INSTALLATION NOTES

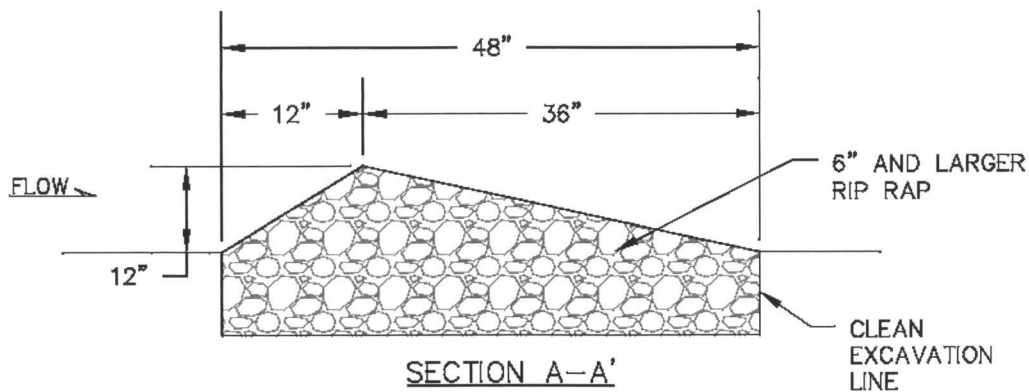
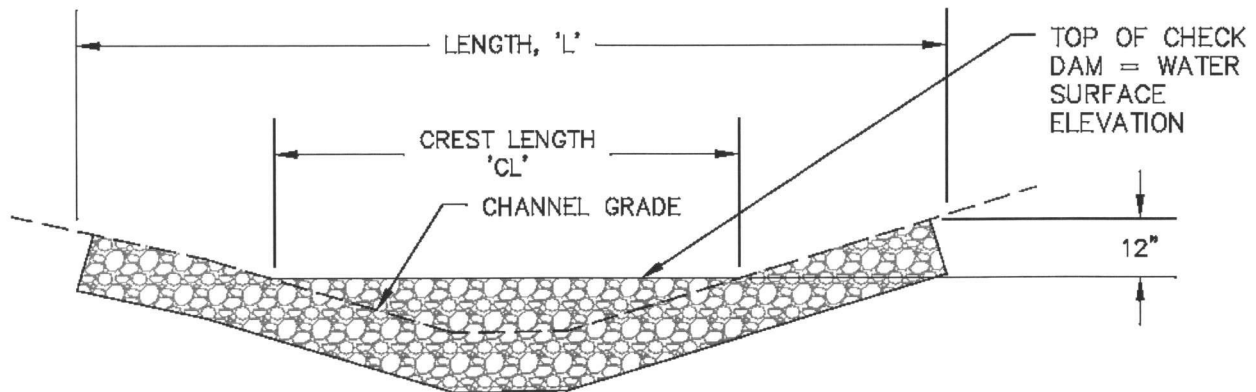
1. 'SCL' INDICATED ON THE NOTICE OF INTENT PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITY.
2. 'SCL' SHALL CONSIST OF STRAW, MULCH, OR COCONUT FIBER AND SHALL BE CONTAINED IN A PHOTO DEGRADABLE NETTING.
3. 'SCL' SHALL BE TRENCHED 2 INCHES INTO THE GROUND.
4. 'SCL' SHOULD NOT BE PLACED IN CONTINUOUS CONCENTRATED FLOW SWALES.
5. SEDIMENT ACCUMULATION UPSTREAM OF THE 'SCL' SHALL BE REMOVED WHEN THE SEDIMENT HEIGHT IS HALF OF THE HEIGHT OF THE 'SCL.'
6. 'SCL' MAY OR MAY NOT NEED TO BE REMOVED, DEPENDING ON THE LOCATION AND APPLICATION USE. IF REMOVED, ANY DISTURBED AREAS SHALL BE SEEDED AND MULCHED.

## Figure 4 - Rock Check Dam



### ROCK CHECK DAM (CD) INSTALLATION NOTES

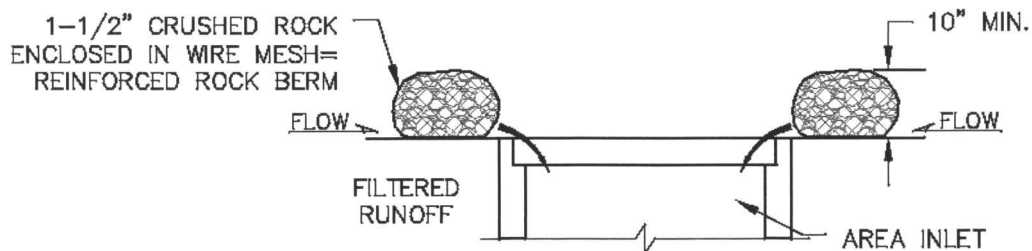
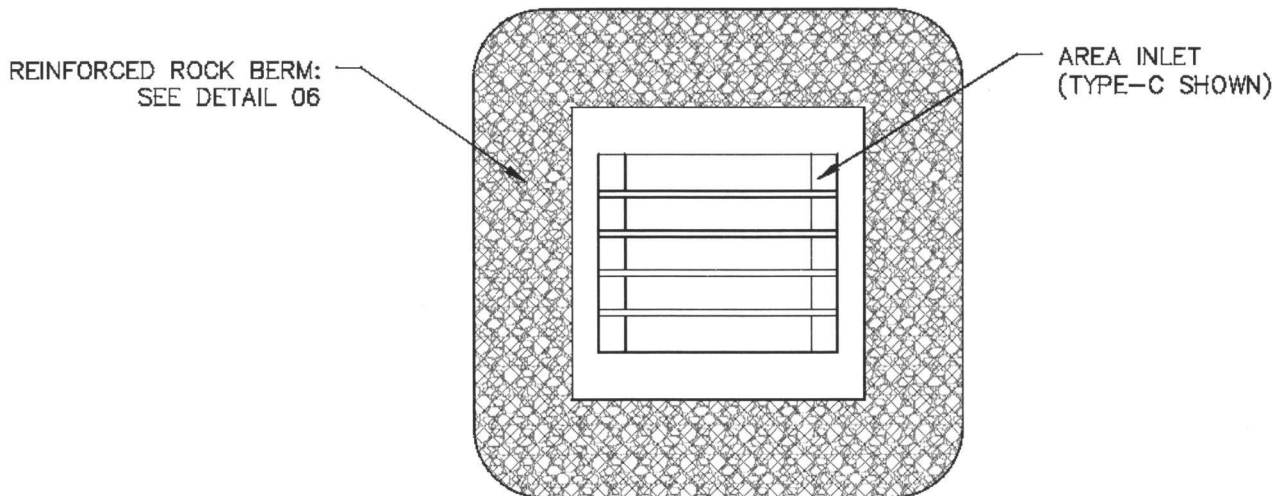
1. RIP RAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 12 INCHES.
2. THE ENDS OF THE 'CD' SHALL BE A MINIMUM OF 12 INCHES HIGHER THAN THE CENTER OF THE 'CD.'
3. SEDIMENT ACCUMULATION UPSTREAM OF THE 'CD' SHALL BE REMOVED WHEN THE SEDIMENT HEIGHT IS HALF THE HEIGHT OF THE 'CD'.
4. THE 'CD' SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED.
5. WHEN A 'CD' IS REMOVED, THE EXCAVATION SHALL BE FILLED WITH COMPACTED BACK FILL. ANY DISTURBED AREAS SHALL BE SEED AND MULCHED.



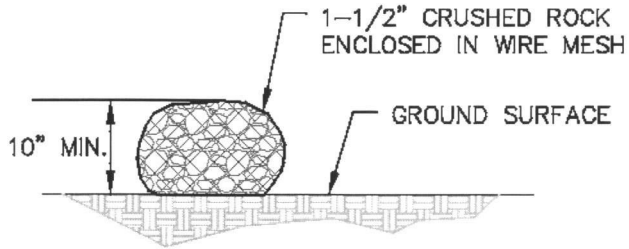
## Figure 5 - Area Inlet Protection

### AREA INLET PROTECTION (AIP) INSTALLATION NOTES

1. A REINFORCED ROCK BERM (RRB) SHALL BE PLACED AROUND THE OPENING OF THE AREA INLET, WITH NO GAPS.
2. 1-1/2" CRUSHED ROCK OR RECYCLED CONCRETE MAY BE USED IN THE 'RRB'.
3. WIRE MESH SHALL BE MADE OF 10 GAUGE WIRE CHICKEN WIRE AND SHALL COME IN 48" WIDTHS WITH A MAXIMUM OPENING OF 1 INCH.
4. WIRE MESH SHALL BE SECURED WITH WIRE TIES EVERY 6 INCHES ALONG THE LENGTH.
5. SEDIMENT ACCUMULATION UPSTREAM OF THE 'AIP' SHALL BE REMOVED WHEN THE SEDIMENT HEIGHT IS HALF OF THE HEIGHT OF THE ROCK 'RRB.'
6. THE 'AIP' SHALL STAY IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED.

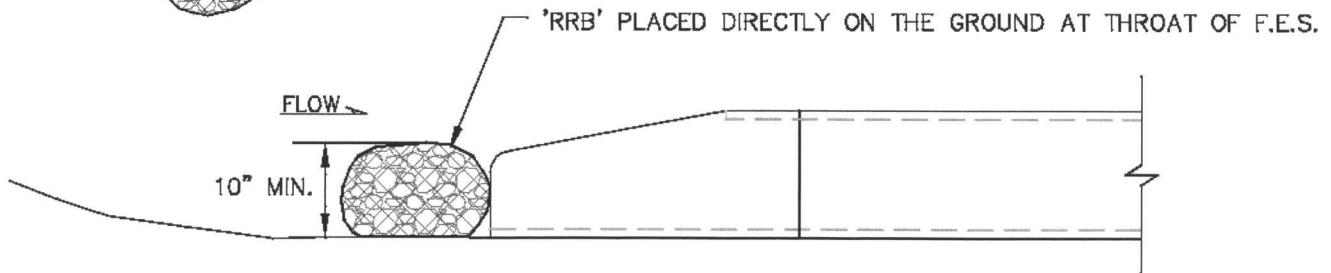
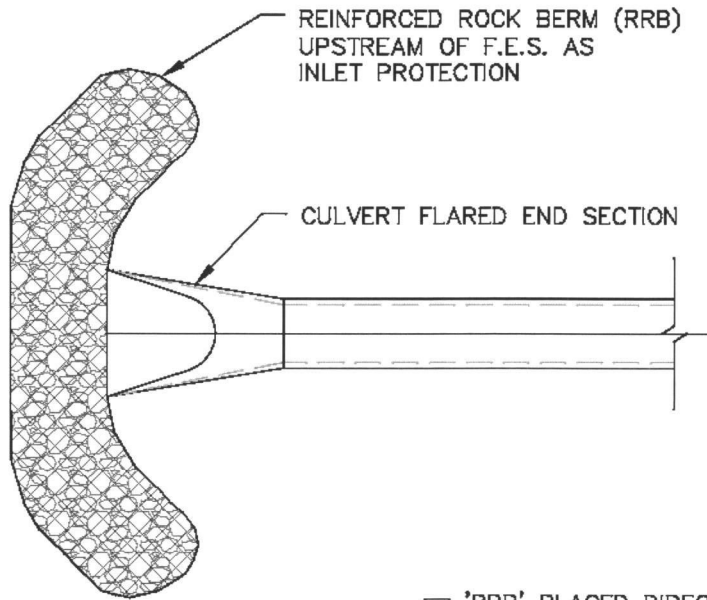


## Figure 6 - Reinforced Rock Berm



### REINFORCED ROCK BERM (RRB) INSTALLATION NOTES

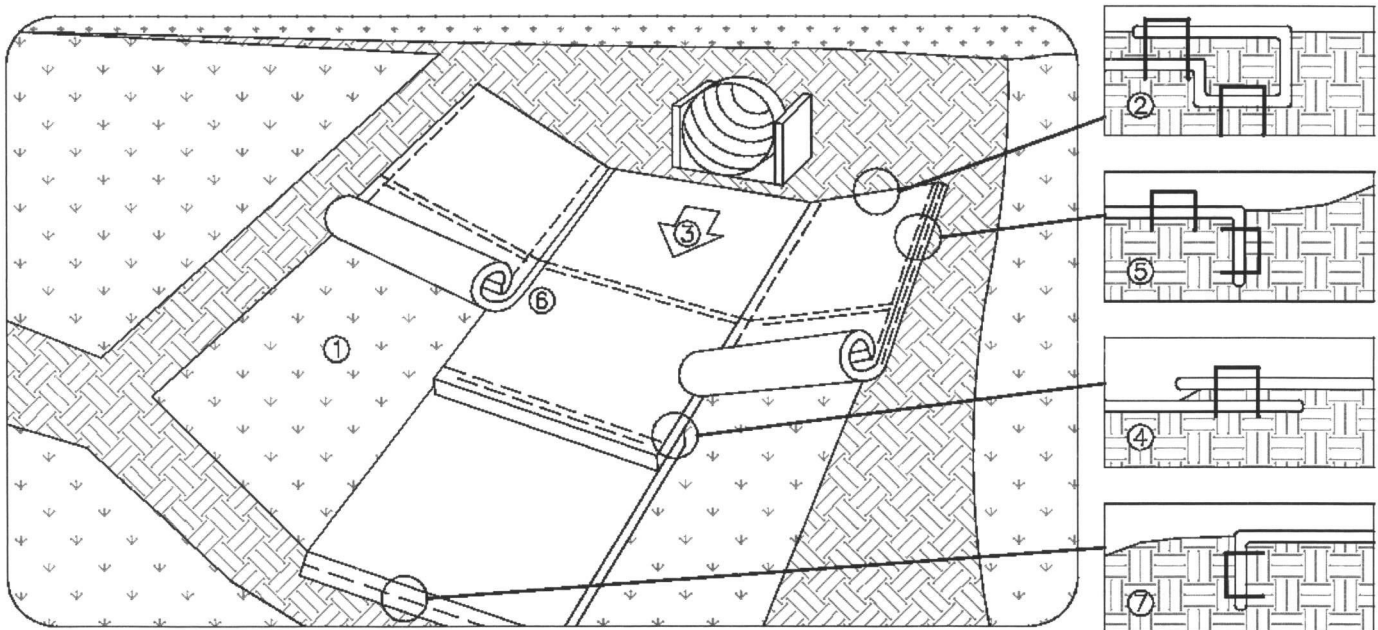
1. A 'RRB' SHALL BE PLACED AT THE THROAT OF ALL CULVERT FLARED END SECTIONS ON THE UPSTREAM END.
2. 1-1/2" CRUSHED ROCK OR RECYCLED CONCRETE MAY BE USED.
3. WIRE MESH SHALL BE MADE OF 10 GAUGE WIRE CHICKEN WIRE AND SHALL COME IN 48" WIDTHS WITH A MAXIMUM OPENING OF 1 INCH.
4. WIRE MESH SHALL BE SECURED WITH WIRE TIES EVERY 6 INCHES ALONG THE LENGTH.
5. SEDIMENT ACCUMULATION UPSTREAM OF THE 'RRB' SHALL BE REMOVED WHEN THE SEDIMENT HEIGHT IS HALF OF THE HEIGHT OF THE 'RRB'.
6. THE 'RRB' SHALL STAY IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED.



## Figure 7 - Erosion Control Blanket

### EROSION BLANKET (EB) INSTALLATION NOTES

1. PREPARE SOIL BY SMOOTHING AND REMOVING ANY CLUMPS OF VEGETATION, AS WELL AS PLACING SEED OR FERTILIZER.
2. ANCHOR THE 'EB' AT THE TOP OF THE SLOPE IN A 6-INCH DEEP x 6-INCH WIDE TRENCH WITH A ROW OF STAPLES APPROXIMATELY 12 INCHES APART IN THE BOTTOM OF THE TRENCH. LEAVE APPROXIMATELY 12 INCHES OF 'EB' EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING, AND APPLY SEED TO THE COMPACTED SOIL. FOLD THE REMAINING 12 INCHES OF THE 'EB' BACK OVER, AND SECURE WITH A ROW OF STAPLES (OR STAKES) APPROXIMATELY 12 INCHES APART ACROSS THE WIDTH OF THE BLANKET.
3. UNROLL THE CENTER BLANKET IN THE DIRECTION OF WATER FLOW ON THE BOTTOM OF THE CHANNEL. SECURELY FASTEN 'EB' TO SOIL SURFACE WITH STAPLES (OR STAKES) AS SHOWN IN THE PATTERN GUIDE ACCOMPANYING THE PARTICULAR 'EB.'
4. PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4-6 INCH OVERLAP. SECURE 'EB' WITH A DOUBLE ROW OF STAPLES, STAGGERED 4 INCHES APART AND 4 INCHES ON CENTER.
5. ANCHOR FULL-LENGTH EDGE OF 'EB' AT TOP OF SIDE SLOPES WITH A ROW OF STAPLES APPROXIMATELY 12 INCHES APART IN A 6-INCH DEEP x 6-INCH WIDE TRENCH. BACKFILL, AND COMPACT THE TRENCH AFTER STAPLING.
6. OVERLAP ADJACENT BLANKETS 2-5 INCHES, AND STAPLE.
7. ANCHOR THE END OF THE BLANKET WITH A ROW OF STAPLES APPROXIMATELY 12 INCHES APART IN A 6-INCH DEEP x 6-INCH WIDE TRENCH. BACKFILL, AND COMPACT THE TRENCH AFTER STAPLING.



## Figure 8 - Sediment Trap

### SEDIMENT TRAP (ST) INSTALLATION NOTES

1. 'ST's INDICATED ON THE NOTICE OF INTENT PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITY.
2. 'ST's SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED.
3. THE TOP OF THE EARTHEN BERM SHALL BE A MINIMUM OF 6 INCHES HIGHER THAN THE TOP OF THE OVERFLOW STRUCTURE.
4. THE CENTER OF THE OVERFLOW STRUCTURE SHALL BE A MINIMUM OF 6 INCHES BELOW THE SIDES OF THE STRUCTURE.
5. SEDIMENT ACCUMULATED UPSTREAM OF THE RIP RAP SHALL BE REMOVED WHEN THE THE SEDIMENT HEIGHT IS HALF THE HEIGHT OF THE OVERFLOW STRUCTURE.
6. WHEN A 'ST' IS REMOVED, THE EXCAVATION SHALL BE FILLED WITH COMPACTED BACK FILL. ANY DISTURBED AREAS SHALL BE SEEDED AND MULCHED.

