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Polymer Enhanced Best Management Practice (PEBMP) Application Guide

University of Central Florida

Stormwater Management Academy
"Managed Stormwater is Good Water"

Senior Associate

June-13

Table of Contents:

Technical Guidance for using polyacrylamides …… 3

Soil Stabilization

Soft Armoring with Matting ……. 5
Hydroseeding & Grassing ……. 10
Dry Spread with Mulch or Straw ……. 14
Dust Control ……. 16

Stormwater Treatment

Storm-drain Applications ……. 18
Down Drains …… 20
Closed Pipe Systems ……... 24

Water Clarification

Dewatering Bag…… 26
Dewatering / Treatment Ditches ……. 30
Dewatering / Treatment Split-pipes ……..…… 34
In-stream Baskets ……..…… 37
Tank Systems…… 39

Particle Collection

Dispersion Field …….. 42
Particle Curtains ……..…….. 45
Wattle / Check System …… 48
Baffle Grid ……..……..... 50

Sediment Control

Inlet Protection …… 52
Sediment Retention Barriers ……..……..... 55
Rock Checks ……..……..…… 58
Outlet Protection...…… 61
Large Scale Dredging…… 63
Mud/Sediment Removal …….. 71

Pond & Lake Clarification

Aerator or Bubbler Mixing System…… 74
Floating Fountain Mixing System ……..... 77
Waterfall Mixing System…… 80

Submitting Samples for Analysis …..…….. 82

Each PEBMP application in this guide has been tested or is currently being tested by various universities, State or Federal agencies, or Departments of Transportation across the United States and Canada.

Technical Guidance for the Use of Polyacrylamides (PAM) and PAM-blends for Erosion Control and Storm Water Clarification

Practice Description

PAM used for erosion control is a water-soluble anionic polyacrylamide product used to minimize soil erosion caused by water and wind by binding soil particles, especially clays, to hold them on site. In addition, these types of materials may also be used as a water treatment additive to remove suspended particles from runoff. When PAM is used on construction sites it is typically applied with temporary seeding and or mulching on areas where the timely establishment of temporary erosion control is so critical that seeding and mulching need additional reinforcement. It may be used alone on sites where no disturbances will occur until site work is continued and channel erosion is not a significant potential problem. Permanent grassing applications can be better established using PAM as a tackifier and soil conditioner.

PAMs are manufactured in various forms to be used on specific soil types, and are generally applied at a rate of up to 50 pounds/acre for dry products or 2 ½ gallons/acre for emulsion-liquid products. Using the wrong form of a PAM on a soil will result in some degree of performance failure, and increase the potential for this material to enter surface waters. PAM used alone may not reduce NTU values enough resulting in noncompliance water quality discharges or poor soil binding conditions. Site specific soil-PAM testing must be performed. Exceeding the maximum application rates for this product does not increase the effectiveness of the product.

Block or Log forms of PAM and PAM blends are manufactured for specific use in drainage ditches to remove suspended particulates from runoff.

General Components of the Practice

Prior to the start of construction, a qualified professional should design the application of PAM and plans and specifications should be available to field personnel.

The application should conform to the design and specifications provided in the plans. Typical applications include the following components.

- Site Preparation
- Equipment Preparation
- PAM Application

Site Preparation

Prepare site following design and specifications.

Equipment Preparation

If using a liquid application system, pump a surfactant through the injection system before and after injecting concentrated liquid PAM into sprinkler irrigation systems to help prevent valves and tubing from clogging.

PAM used in hydroseeding applications should be added as the last additive to the mix.

After their use, rinse all PAM mixing and application equipment thoroughly with water to avoid formation of PAM residues. Rinse residue should be applied to soil areas to create binding to the soil structure and increase erosion reduction.

PAM Application- Criteria for Land-applied PAM Specifications

PAM shall be mixed and/or applied in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet (MSDS) requirements and the manufacturer's recommendations for the specified use conforming to all federal, state and local laws, rules and regulations.

1.) Toxicity

All vendors and suppliers of PAM, PAM mixes or blends shall present or supply a written toxicity report which verifies that the PAM, PAM mix or blend exhibits acceptable toxicity parameters which meet or exceed the requirements for the state and federal water quality standards.

Cationic forms of PAM are not allowed for use under this guideline due to their high levels of toxicity to aquatic organisms. Emulsions shall never be applied directly to stormwater runoff or riparian waters due to surfactant toxicity.

2.) Performance

All vendors and suppliers of PAM, PAM mixes or blends shall supply written "site specific" testing results demonstrating a performance of 95% or greater reduction of NTU or TSS from stormwater discharges.

PAM Application

Emulsion batches shall be mixed following recommendations of a testing laboratory that determines the proper product and rate to meet site requirements. Application method shall insure uniform coverage to the target area. (**Emulsions shall never be applied directly to stormwater runoff or riparian waters**)

Dry form (powder) may be applied by hand spreader or a mechanical spreader. Mixing with dry sand or lime will aid in spreading. Pre-mixing of dry form PAM into fertilizer, seed or other soil amendments is allowed when specified in the design plan. Application method shall insure uniform coverage to the target area.

Block or Log forms shall be applied following site testing results to assure proper placement and performance and shall meet or exceed state and federal water quality requirements.

Common Problems

Consult with a registered design professional for assistance if any of the following occur:

- Problems with application equipment clogging.

- PAM alone may not meet testing requirements for NTU reduction and soil stabilization. Site specific "blends" may be needed to meet these requirements.

- Application specifications for PAM cannot be met; alternatives may be required. Unapproved application techniques could lead to failure.

- Visible erosion occurs after application.

Maintenance

An operation and maintenance plan must be prepared for use by the operator responsible for PAM application. Plan items should include the following items.

- Reapply PAM to disturbed or tilled areas that require continued erosion control.
- Maintain equipment to provide uniform application rates.
- Rinse all PAM mixing and application equipment thoroughly with water to avoid formation of PAM residues and discharge rinse water to soil areas where PAM stabilization may be helpful.
- Downstream sediment deposition from the use of PAM may require periodic sediment removal to maintain normal functions.

Soil Stabilization

Soft Armoring with Matting

Soft Armoring is the process by which soft pliable matting such as jute, coir, coconut, hemp or burlap is placed onto the soil surface. The soil-specific Silt Stop is then applied on top of the matting; the Silt Stop powder reacts with the metals and clays within the soil to bind it together. This complex attaches to the matting creating a highly erosion-resistant surface that will support vegetation along with aiding in the attachment of fine particulate to the matting surface.

Applications are for soil stabilization and can be used in any area where water velocity may be high. Soft Armoring can be applied in conjunction with Channel Stabilization, Stream Crossings, Turf Reinforcing Matting, or Earth Berms.

i. Application rate (per acre coverage): varies by soil content and grade of slope.
   - Gentle to Moderate slopes (0 to 4H:1V)
     - High Clay Content: 10-20 # powder
     - High Sand Content: 25-50 # powder
   - Steep slopes (3H:1V to 1H:1V)
     - High Clay Content: 20-35 # powder
     - High Sand Content: 45-50 # powder

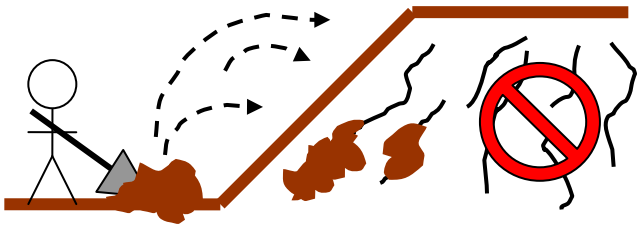
ii. One or more layers of jute or other woven geotextile matting shall be applied to the surface of all exposed soil on 2:1 slopes or greater.

iii. Open weave matting (having ½" – 1" open areas) should be applied first allowing for polymer, seed, and fertilizer to fall through the matting. If tighter weaved matting is used, apply the soil specific Silt Stop powder to the ground first.

iv. Silt Stop powder can be applied dry using a seed or fertilizer spreader and may be mixed with other dry spread additives.

Step-by-step Soft Armoring with Matting

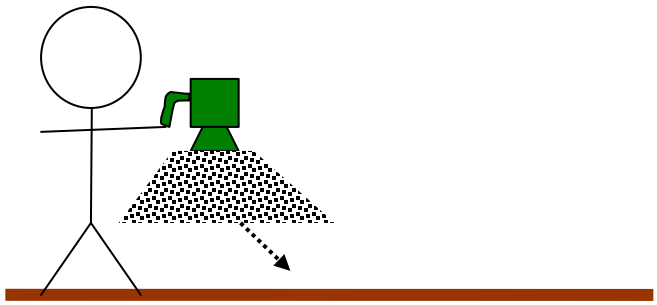
For Tight-weave geotextile matting and NAG products



Step 1: Prepare site.

Fill any rills or gullies caused by previous erosion.

Ensure the matting can be applied flush to the soil surface to prevent tenting.

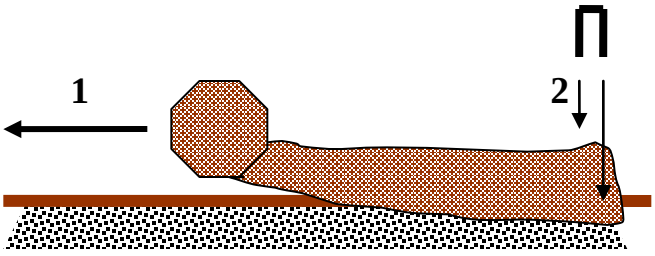


Step 2: Apply Silt Stop powder

The Silt Stop powder should be spread dry over the ground. Preferably the ground should also be dry.

The Silt Stop powder can be applied by hand or with a seed/ fertilizer spreader.

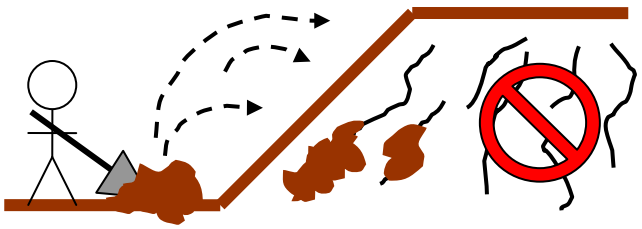
Grass seed and fertilizer may be spread at the same time.



Step 3: Apply Matting.

Secure the matting to the soil surface with stakes or soil staples, taking care to ensure the matting is flush to the ground.

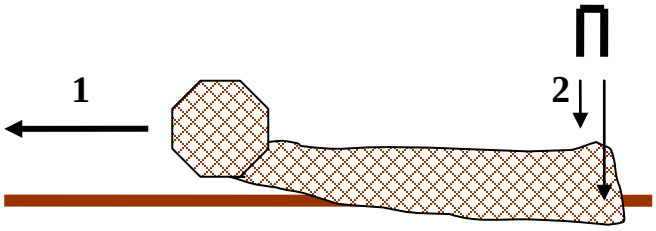
For Open-weave geotextile matting (i.e. jute, coir, etc.)



Step 1: Prepare site.

Fill any rills or gullies caused by previous erosion.

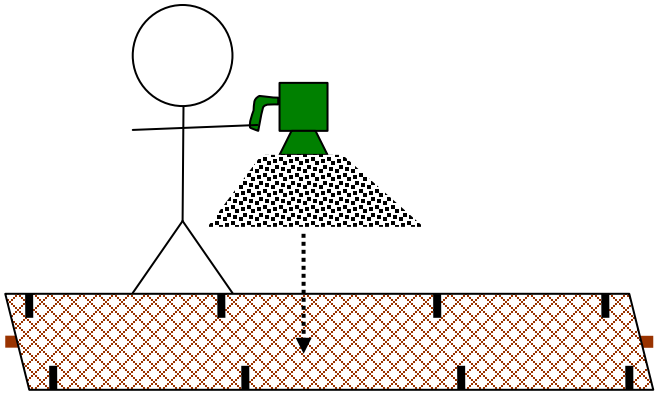
Ensure the matting can be applied flush to the soil surface to prevent tenting.



Step 2: Apply Matting.

We suggest using an open-weave jute or coir matting, preferably with ½ - 1 inch open spaces.

Secure the matting to the soil surface with stakes or soil staples, taking care to ensure the matting is flush to the ground.



Step 3: Apply Silt Stop powder

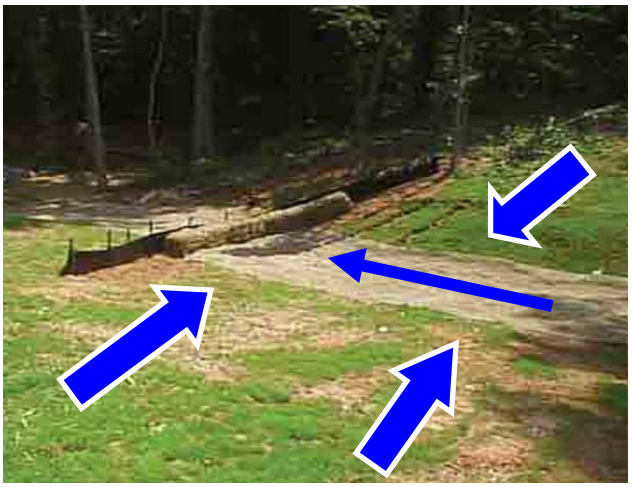
The Silt Stop powder should be spread dry over the matting. Preferably the ground and matting should also be dry.

The Silt Stop powder can be applied by hand or with a seed/ fertilizer spreader.

Grass seed and fertilizer may be spread at the same time.

Apply Matting flush to soil surface:

Application in areas of concentrated flow:



Grassing Application with Hydroseeder over Soft Armoring:

Application Example: Soft Armoring Culvert Stabilization
Shoulder Stabilization of a Logging Road

1) Fill rills and gullies

2) Lay matting

3) Secure matting

4) Apply Silt Stop powder

5) Apply seed & fertilizer

6) Stabilized 1 year later

Soil Stabilization

Hydroseeding and Temporary or Permanent Grassing

A soil-specific polymer can be added into the hydroseeding mix and applied over exposed soil and slopes. The polymer reacts with the soil, binding the mulch, seed, fertilizer, and other additives to the soil, holding it together until vegetation is established. Open weave matting can be applied before hydroseeding areas, especially in areas with steep slopes or sandy conditions, to provide additional structural support, creating a highly erosion-resistant surface to support vegetation establishment.

i. Application rate (per acre coverage): varies by soil content and grade of slope.
   - Gentle to Moderate slopes (0 to 4H:1V)
     - High Clay Content:
       10-20 # powder or 1.0-2.0 gallons emulsion
     - High Sand Content:
       25-50 # powder or 2.0-3.0 gallons emulsion
   - Steep slopes (3H:1V to 1H:1V)
     - High Clay Content:
       20-35 # powder or 1.0-2.5 gallons emulsion
     - High Sand Content:
       40-50 # powder or 2.5-3.0 gallons emulsion

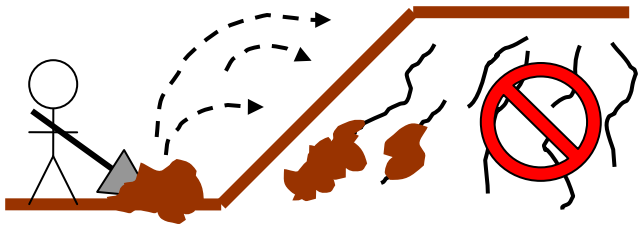
ii. Silt Stop emulsion or powder shall be added to all hydroseeding mixes at the above application rates per 3000 gallons of water, and then applied at the rate of 3000 gallons of hydroseed mix/ acre (**NOTE: Polymer additions are limited by extremely high viscosity, do not exceed the recommended dosage rates.)** Site testing will determine the correct polymer type.

iii. Silt Stop shall be added **slowly** as the final additive to the hydroseeding mix. **Addition of the polymer all at once will cause clumping of the polymer and may cause clogging of the spraying equipment.**

iv. Due to the viscous nature of the polymers, the hydroseed mix should be applied to the soil as soon as possible after Silt Stop has been added and thoroughly mixed.

v. Straw, mulch, or tight-weave matting may be applied over the hydroseeded application. Open-weave matting such as jute may be applied before the hydroseed application.

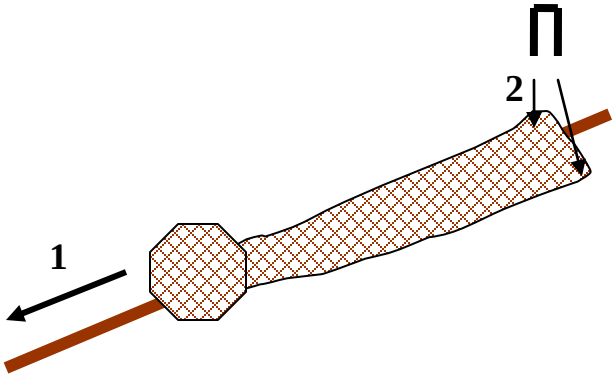
Step-by-step Hydroseeding and Grassing



Step 1: Prepare site.

Fill any rills or gullies caused by previous erosion.

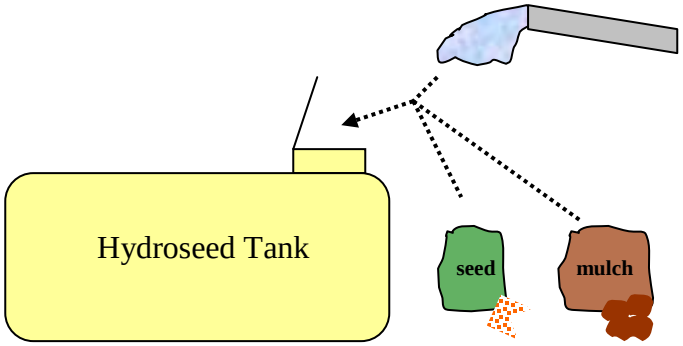
Ensure the matting can be applied flush to the soil surface to prevent tenting.



Step 2: Apply Matting.

We suggest using an open-weave jute or coir matting, preferably with ½ - 1 inch open spaces.

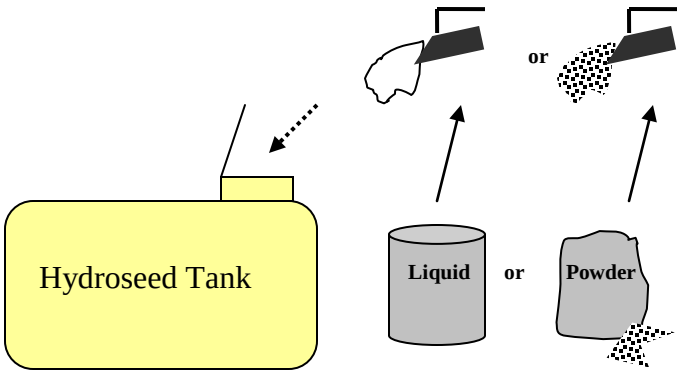
Secure the matting to the soil surface with stakes or soil staples, taking care to ensure the matting is flush to the ground.



Step 3: Hydroseed Mix

Fill the hydro-seeder tank with water, and add the normal mix of seed, fertilizer, fiber mulch, etc.

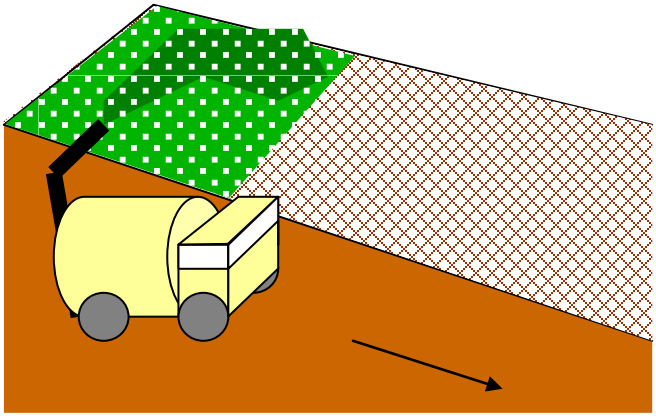
Be sure the machine has an agitator or mechanical mixing device.



Step 4: Add Silt Stop

Slowly add the Silt Stop polymer as the final additive to the hydroseed mix while the agitator is running to ensure mixing.

Allow 5 minutes of mixing before beginning to apply.



Step 5: Apply Hydroseed

Spray the hydroseed mixture over the top of the open-weave matting.

Proper application should result in complete coverage with no bare soil visible.

The matting and polymer will help hold the seed and fertilizer in place and prevent the soil from eroding until the vegetation can germinate and establish root structure.

Application Example: Hydroseeding over Matting

1) Clear site

2) Fill rills and gullies

3) Apply matting

4) Add Silt Stop as final additive to mix

5) Spray onto slope

6) Stabilization 4 weeks later

Soil Stabilization

Dry Spread with Mulch or Straw

A soil-specific polymer can be applied directly to the soil surface, using a seed/fertilizer spreader, either alone or as part of a mix. The polymer reacts with the soil, binding the mulch, seed, fertilizer, and other additives to the soil, holding it together until vegetation is established. Mulch, straw, or matting can be applied over the top of these areas to provide additional structural support, creating a highly erosion-resistant surface.

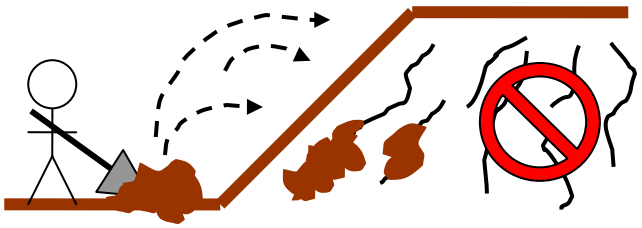
i. Application rate (per acre coverage): varies by soil content and grade of slope.

- Gentle to Moderate slopes (0 to 4H:1V)
  - High Clay Content: 10-20 # powder
  - High Sand Content: 25-50 # powder
- Steep slopes (3H:1V to 1H:1V)
  - High Clay Content: 20-35 # powder
  - High Sand Content: 45-50 # powder

ii.Dry soil-specific Silt Stop powder shall be applied using a seed or fertilizer spreader or may be mixed with other dry spread additives.

iii. Straw or mulch should be applied over the Soil-specific Silt Stop application. Applications using matting are outlined in the Soft Armoring with Matting section of this guide.

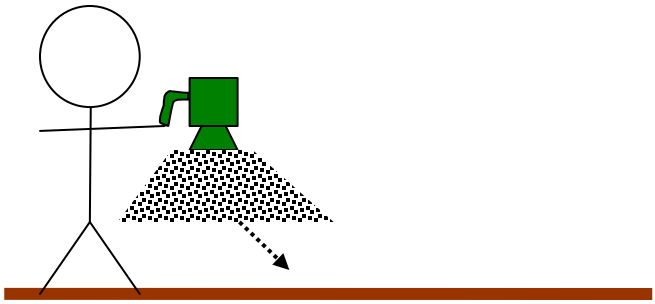
Step-by-step Dry Spread with Mulch or Straw



Step 1: Prepare site.

Fill any rills or gullies caused by previous erosion.

Ensure the cover material can be applied flush to the soil surface.

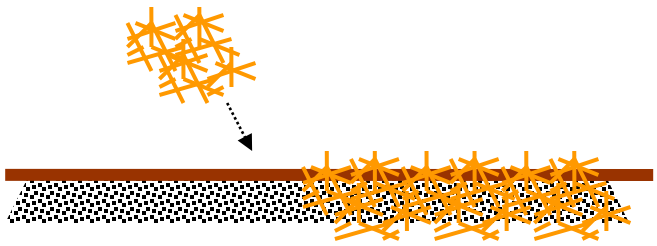


Step 2: Apply Silt Stop powder

The Silt Stop powder should be spread dry over the ground. Preferably the ground should also be dry.

The Silt Stop powder can be applied by hand or with a seed/ fertilizer spreader.

Grass seed and fertilizer may be mixed dry with the polymer and spread at the same time.



Step 3: Apply Straw or Mulch

Straw or mulch application should completely cover the ground, leaving no areas of exposed soil.

Soil Stabilization

Dust Control

The APS Silt Stop emulsion material is designed to agglomerate and bind very fine particulate. This mechanism has been shown to reduce airborne dust from haul roads, waste dumps, tailings piles, and open areas on construction sites. Duration between watering will vary with weather and road conditions.

The use of APS Silt Stop material is intended to reduce the amount of airborne dust by increasing the soil particle size, and decrease the amount of water applications required to control fugitive dust.

i. This application is not intended to completely replace a dust control watering regime.

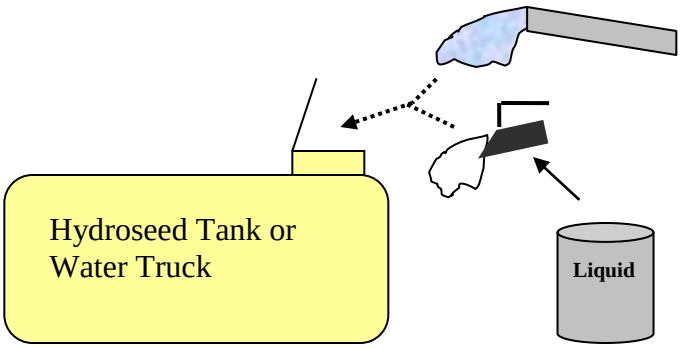
ii. The application rate should be ¼ - ½ gallons of emulsion or 7-10 pounds of powder / 1000 gallons water per 1/3 acre coverage. Polymeric additions to water are limited by high viscosity; do not exceed 1 gallon emulsion / 1000 gallons water.

iii. Spraying device with a mechanical agitator, mixing apparatus or hydraulic recirculation is best. However, the Silt Stop emulsion can be added in any water truck but care should be taken to assure mixing of the emulsion into the water.

iv. Application will need to contact 85% or greater of the target material within the spray area for the Silt Stop to be effective.

v. The Silt Stop material is designed for temporary stabilization only. Reapply the Silt Stop emulsion as needed. Heavy traffic areas may require more frequent applications.

Step-by-step Dust Control Application

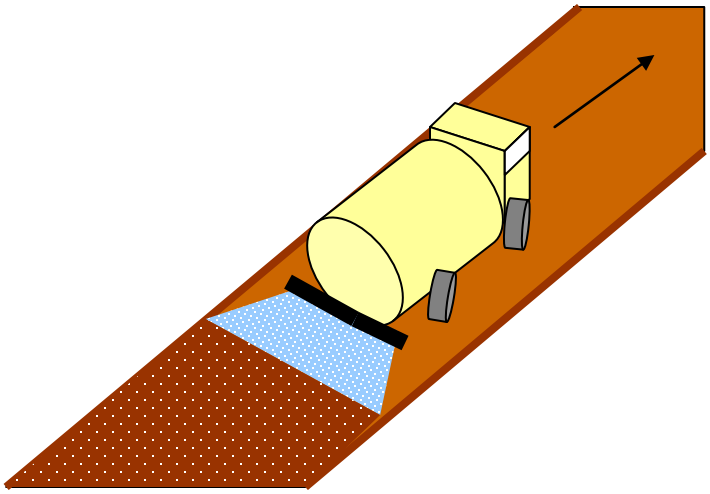


Step 1: Add Emulsion/Powder to Water

Add the Silt Stop slowly to the water to prevent clumping and poor performance.

It is suggested that the polymer material be added while the tank is filling and/or the agitator is running.

Allow 2-3 minutes of mixing time before application.



Step 2: Spray Target Area

Spray the target area just like a normal water application.

Spray needs to contact at least 85% of the target surface area to be effective.

Before Application **After Application**

Stormwater Treatment

Storm-drain Applications

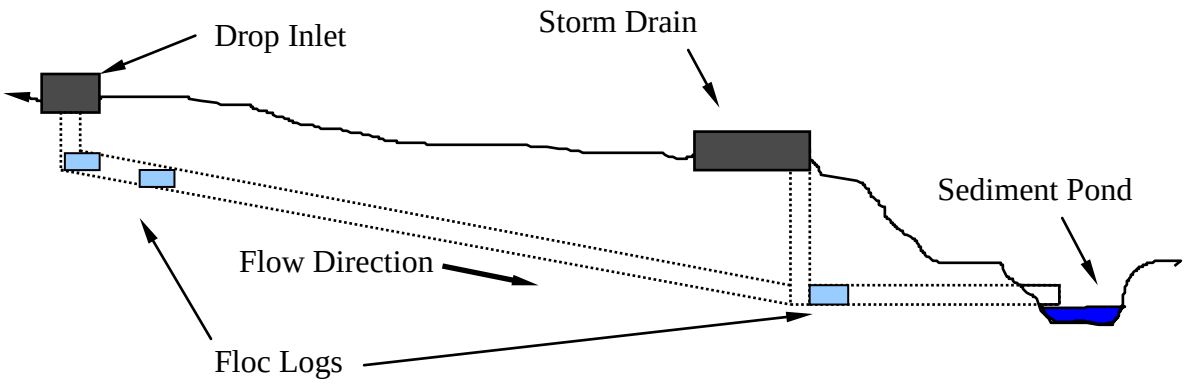
Polymer Enhanced Stormwater Treatment Storm-drain Applications are used to introduce site-specific polymers to turbid waters in such a manner to facilitate mixing and reaction between the polymer and the suspended particles. Collection of the flocculated particulate will greatly reduce turbidity in stormwater.

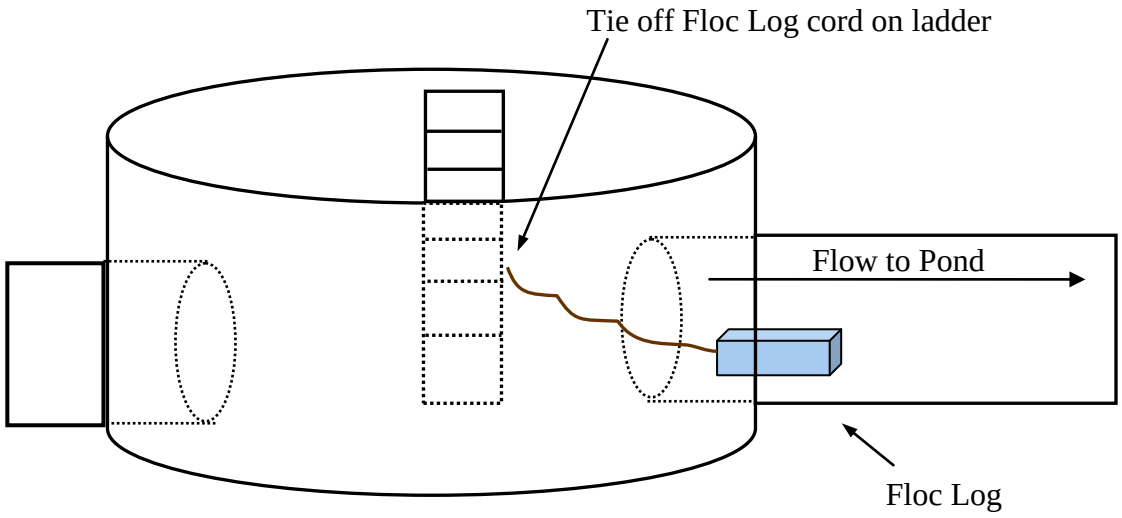
Inserting the site-specific Floc Log at drop inlets within the storm-drain system will create a passive treatment system. The Floc Logs are secured within the pipe, allowing the water to mix with the site-specific polymer blend and begin reacting with the suspended sediment. Placement of the Floc Logs should be as close to the source of the particle suspension as possible, to allow adequate mixing and reaction with the polymers.

i. Ensure only turbid water is entering the storm drain system. The turbidity of the water flowing through the system should not exceed 4% solids. Adequate protection of the inlets should ensure that the sediment load of stormwater is not over this limit.

ii. Logs should be placed in a series, one after another. The number of logs is determined by the flow rate of the water and the reaction time required.

iii. Particle collection can be accomplished using the methods of particle collection as outlined in the next section.


Drop Inlet
Storm Drain
Sediment Pond
Flow Direction
Floc Logs


Tie off Floc Log cord on ladder
Flow to Pond
Floc Log

Stormwater Treatment

Down Drains

A down drain is a temporary or permanent pipe used to convey stormwater safely down a slope. By introducing Floc Logs to the turbid water within the permanent storm water structure, the polymer reacts with the metals and clays within the soil to bind it into particulate. A layer of jute matting is laid around the outlet at the bottom of the slope and applied with a soil-specific polymer powder. The reacted sediment attaches to the matting creating a highly erosion-resistant surface and clarifying the runoff water.

i. Soft Armor the soil around the top of the down drain to prevent erosion and undercutting. Soft Armor application is outlined in the Soil Stabilization section of this guide.

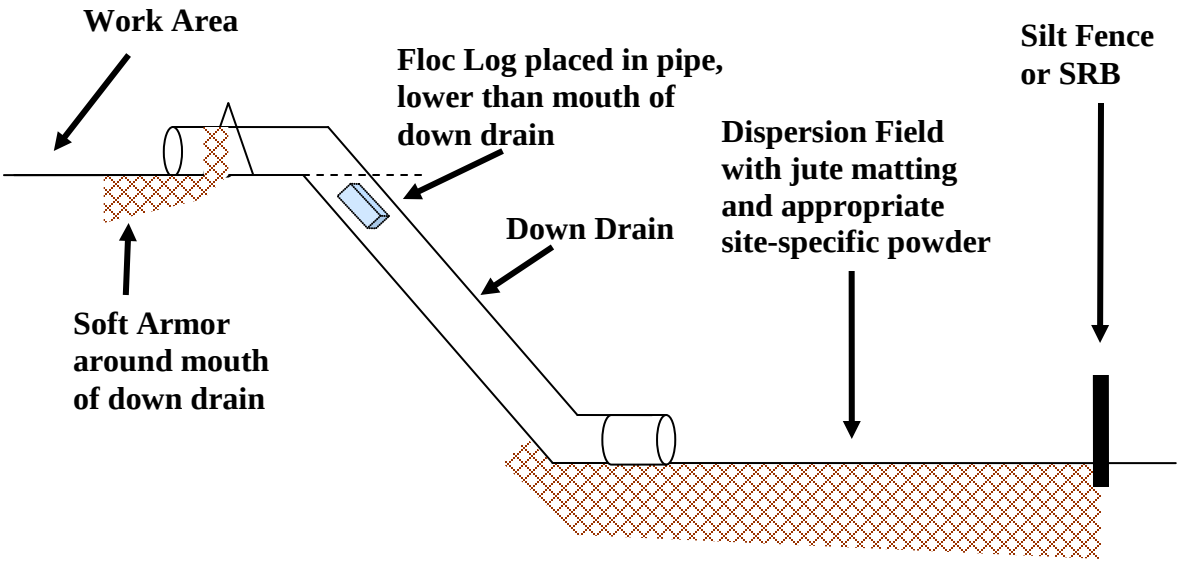
ii. The appropriate site-specific Floc Log should be placed in the down drain at the top of the slope to treat turbid runoff water.

iii. At the bottom of the down drain, create a dispersion field by laying jute matting applied with the appropriate site-specific polymer powder, allowing the water to spread out and slow its velocity to 0.5 ft/sec before hitting the silt fence or Sediment Retention Barrier (SRB). **More information on dispersion fields can be found on page 35.**

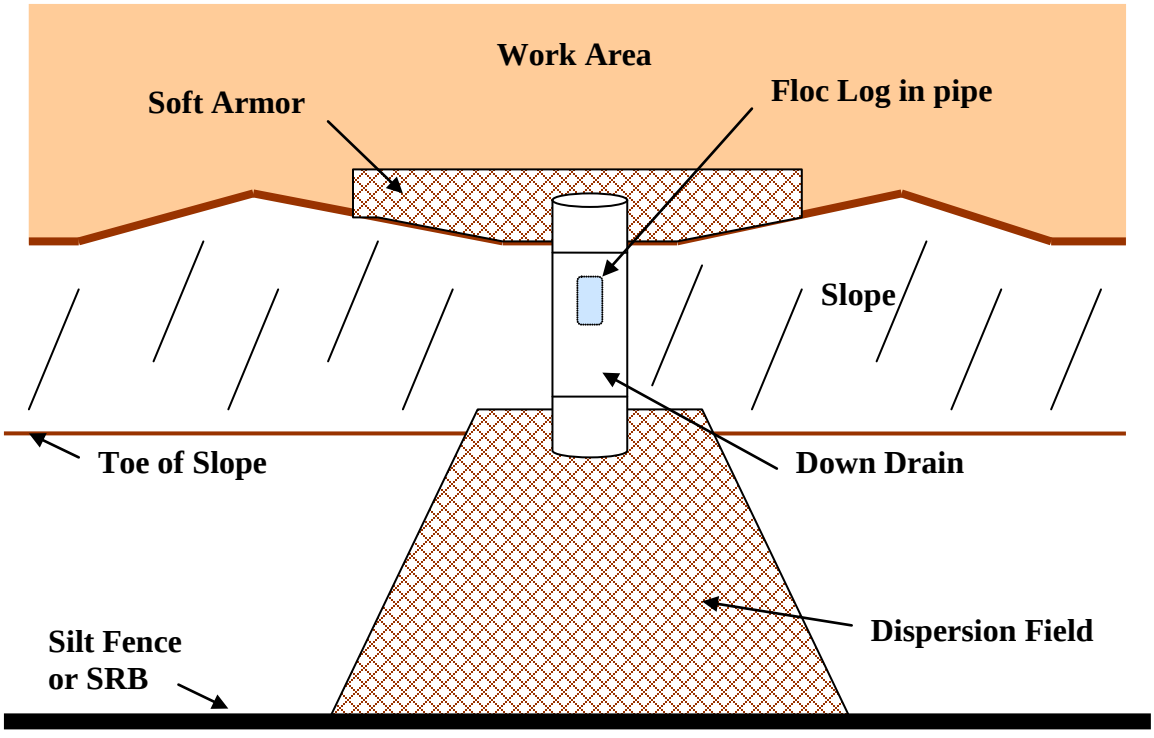
iv. The silt fence should be designed to allow water to pass through it. The silt fence shall allow water to pass at a rate of 70 GPM/ft^2 or greater.

Example Diagrams DISTANCES NOT TO SCALE

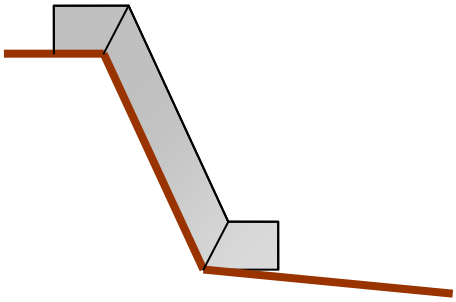
Side View



Top View

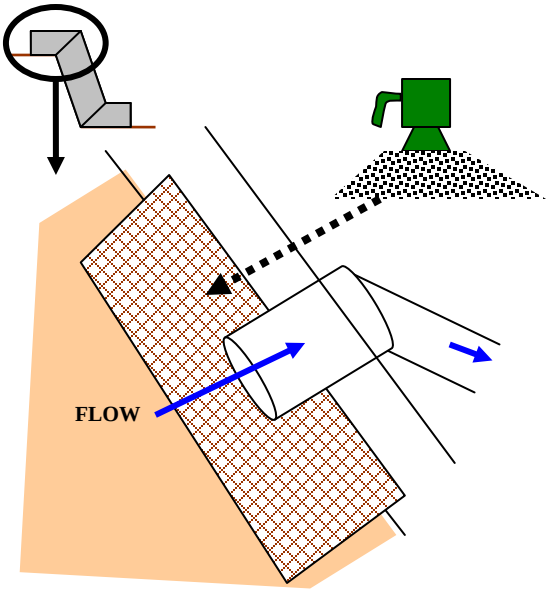


Step-by-step Down Drains



Step 1: Install Down Drain.

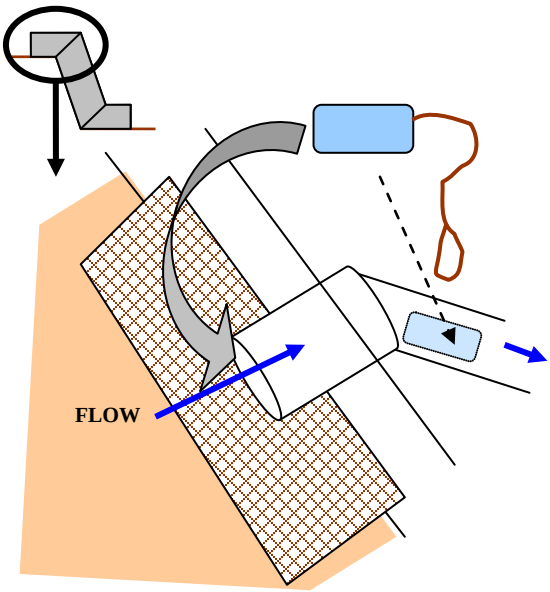
Install the stormwater conveyance down the slope.



Step 2: Stabilize Top Slope.

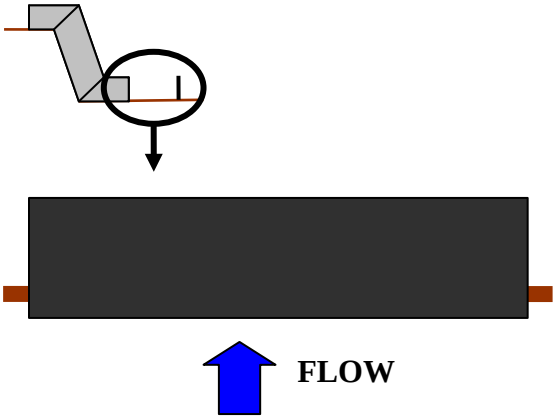
Soft Armor the soil around the mouth of the down drain.

Apply jute matting and Silt Stop powder to the area around the inlet to prevent erosion.



Step 3: Install Floc Log.

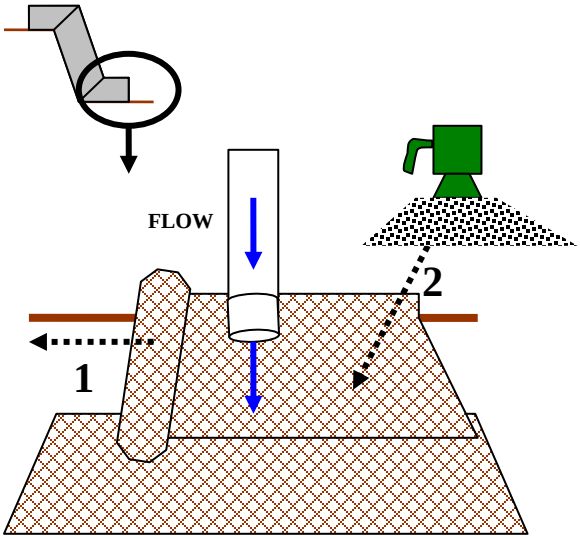
Secure the Floc Log inside the down drain such that it rests lower than the mouth of the drain.



Step 4: Install Silt Fence or SRB.

Install silt fence or SRB as level as possible perpendicular to the flow of water as it exits the down drain.

More information on SRBs can be found in the Sediment Control section of this guide.



Step 5: Install Dispersion Field.

Install jute matting and apply with Silt Stop powder. Wattles or checks can be placed beneath the matting to help slow the velocity.

Additional information on dispersion fields is found in the Section on Particle Collection.

Stormwater Treatment

Closed Pipe Systems

The Floc Logs are designed for use in flowing conditions for treating turbid water to remove suspended sediment. Closed Pipe Systems are used to introduce site-specific polymers to turbid waters in such a manner to facilitate mixing and reaction between the polymer and the suspended particles. Collection of the flocculated particulate that exits the pipe will greatly improve final clarity of the discharge water.

The site-specific Floc Logs are secured inside a closed pipe where the turbid water mixes over and around them. Fins, checks, or other partial obstructions inside the pipe can be used as needed to increase mixing potential.

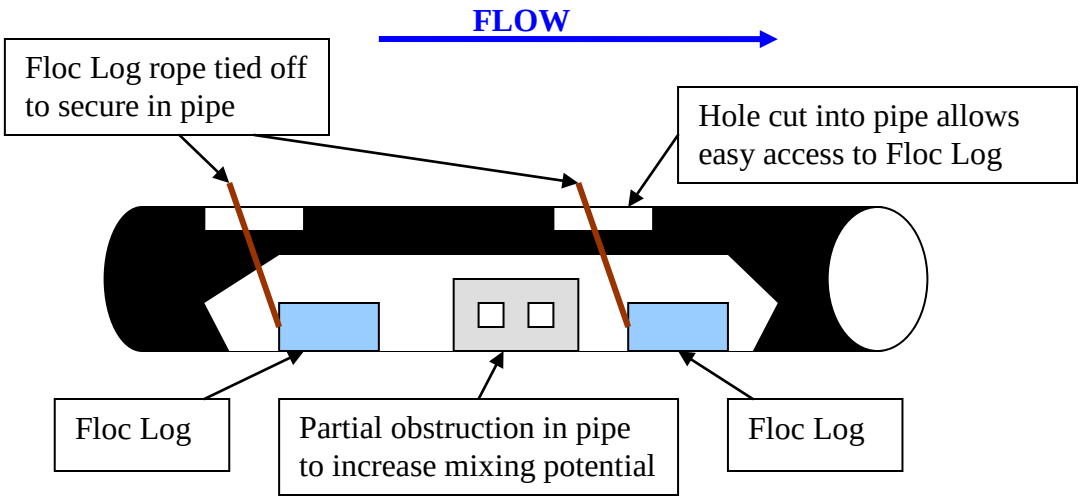
If the pipe system will not be under pressure, holes or access points can be cut into the pipe to facilitate easy loading, monitoring, and replacement of the Floc Logs.

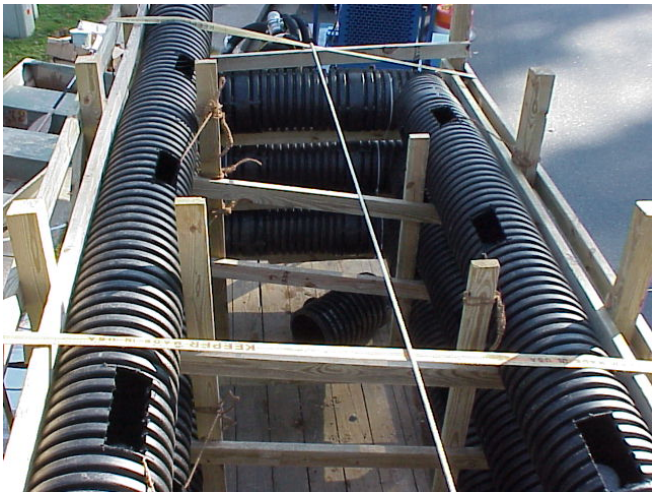
i. Ensure only turbid water is entering the closed pipe system. The turbidity of the water flowing through the system should not exceed 4% solids. Primary settling ponds or grit pits can be used to ensure that the sediment load of stormwater is not over this limit.

ii. High pressure flow and coarse suspended particles will wear down the Floc Logs at an accelerated rate. Inspection of the Floc Logs should be done intermittently during operations, and replacement of the Floc Logs should occur when decreased performance is evident.

iii. Logs should be placed in a series, one after another. The number of logs is determined by the flow rate of the water and the reaction time required.

iv. Particle collection can be accomplished using the methods of particle collection as outlined in the next section.


FLOW
Floc Log rope tied off to secure in pipe
Hole cut into pipe allows easy access to Floc Log
Floc Log
Partial obstruction in pipe to increase mixing potential
Floc Log



Water Clarification

Dewatering/Sediment Bag

Dewatering bags are used to capture sediment that is in water being pumped from a sediment basin. The bag is excellent at controlling sediment being discharged during dewatering. However, fine particulate is allowed to leave the dewatering bag. By using a polymer enhanced dispersion field and Floc Logs **AFTER** the sediment bag the fine particulate can be flocculated out and captured allowing only clean water to leave the site.

i. Using wattles construct a perimeter where the dewatering bag is going to be placed to create a containment area. This waddle and contained area needs to be covered with a geotextile.

ii. On top of the containment area a layer of jute matting needs to be staked/stapled in place. Continue the layer of jute matting a distance from the containment zone where the dewatering to allow for a mixing ditch area and dispersion zone.

iii. Apply the site-specific Silt Stop powder **evenly** to the surface of the jute matting. **DO NOT** dump the Silt Stop into a pile!

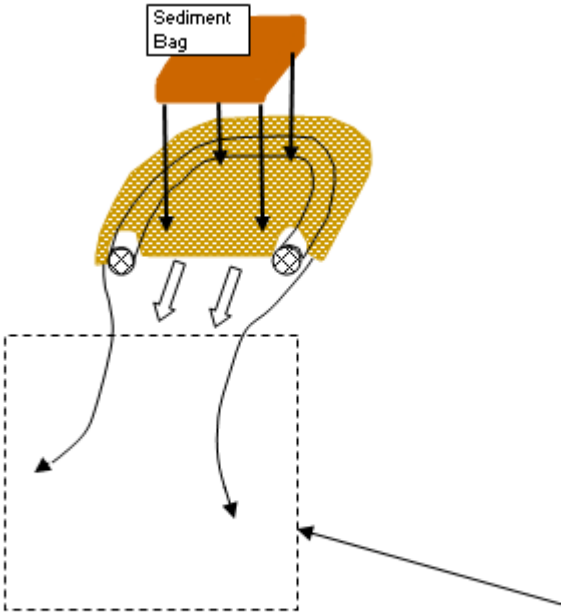
iv. Place waddles in the ditch section of the treatment structure to create a mixing zone.

v. Install site specific Floc Logs before and after each waddle in the flow of the mixing ditch.

vi. Place the sediment bag into the containment area and follow manufacturer's instructions for assembly and pumping requirements.

vii. In the dispersion zone place waddles under the geotextile or jute matting to add additional area for particle collection.

Step-by-Step Dewatering/Sediment Bag



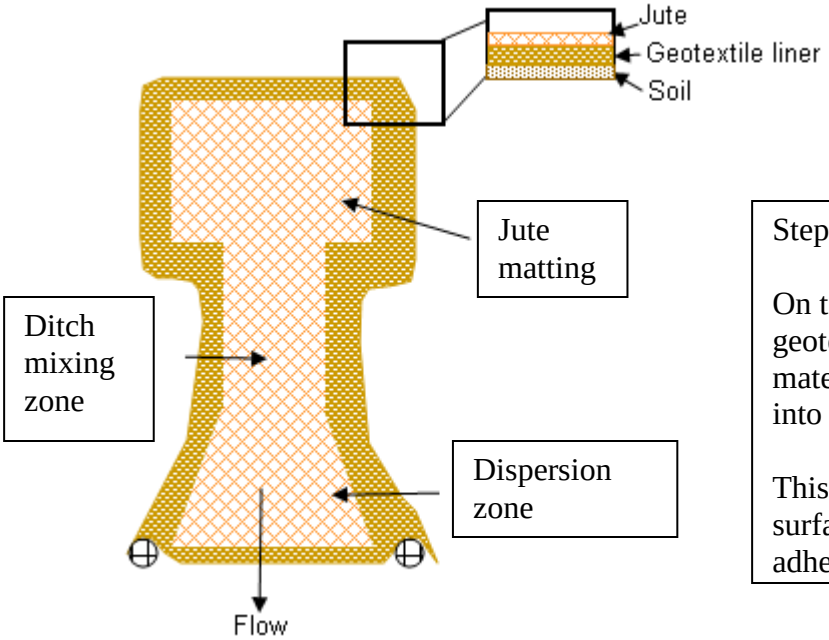
Step 1:

Put waddle containment system in place and cover with geotextile fabric.

This is to direct the flow of the source water through the treatment system and to prevent further erosion of the underlying soils.

* Note: Do not yet place sediment bag, used in the diagram as point of reference for containment structure placement.

Continue geotextile fabric and containment area for length of system. At end of system, widen the area to create a dispersion zone for particle catchment.

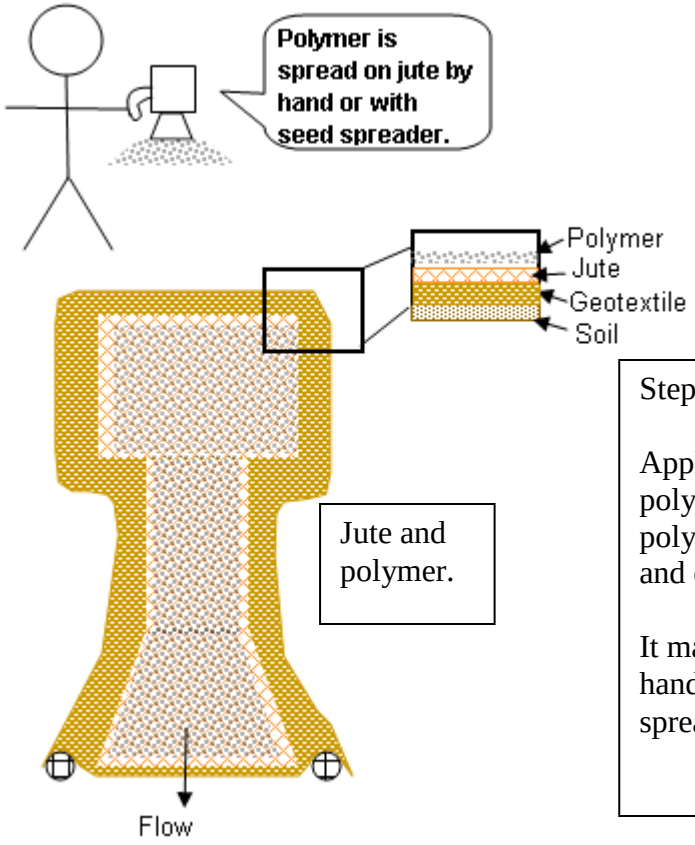


Step 2:

On top of containment geotextile layer, lay out jute material and stake or staple into place.

This layer will provide a surface area for particles to adhere to.

Step-by-Step Dewatering/Sediment Bag

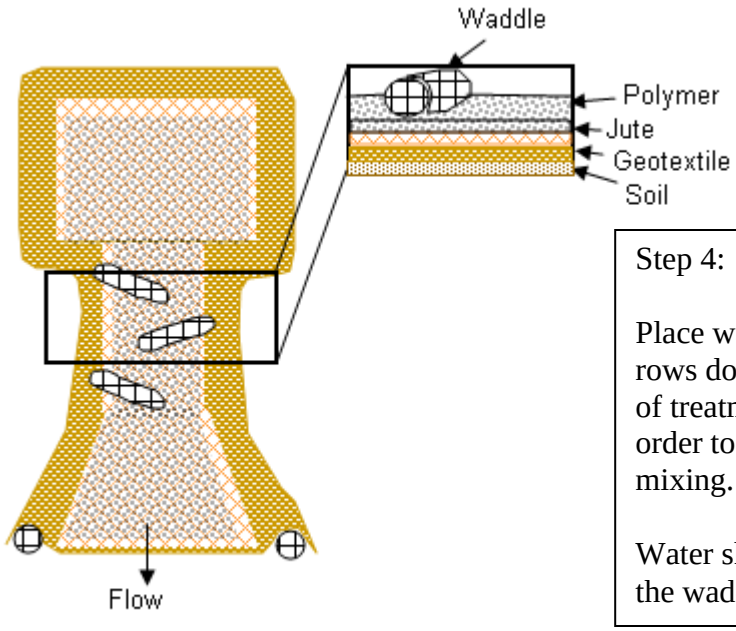


Jute and polymer.

Step 3:

Apply site specific powder polymer form. The silt stop polymer should be put on dry, and on preferably dry ground.

It may be applied by either hand, or with a seed/ fertilizer spreader.

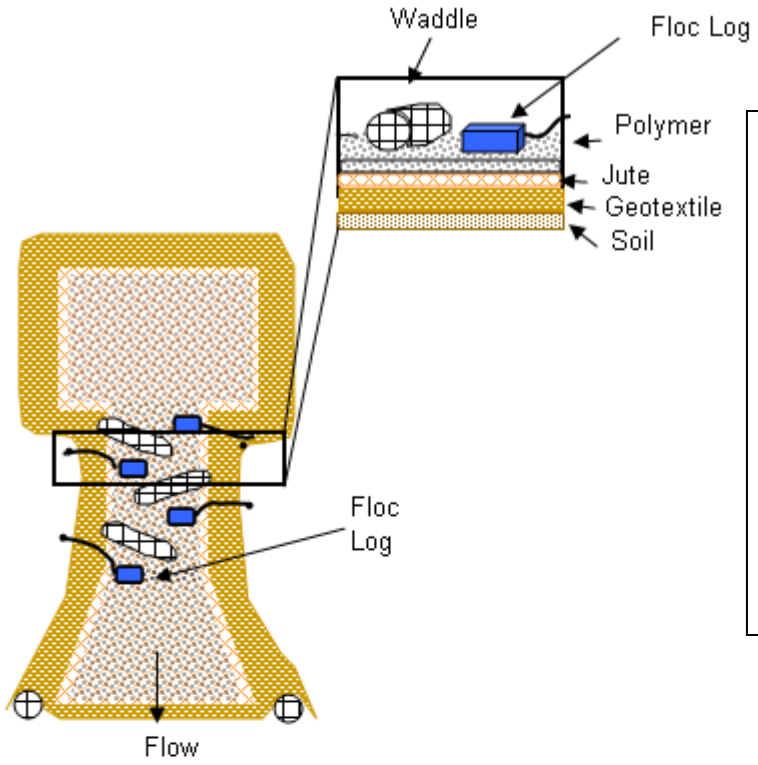


Step 4:

Place waddles in staggering rows down the ditch section of treatment structure in order to create a zone of mixing.

Water should flow around the waddles.

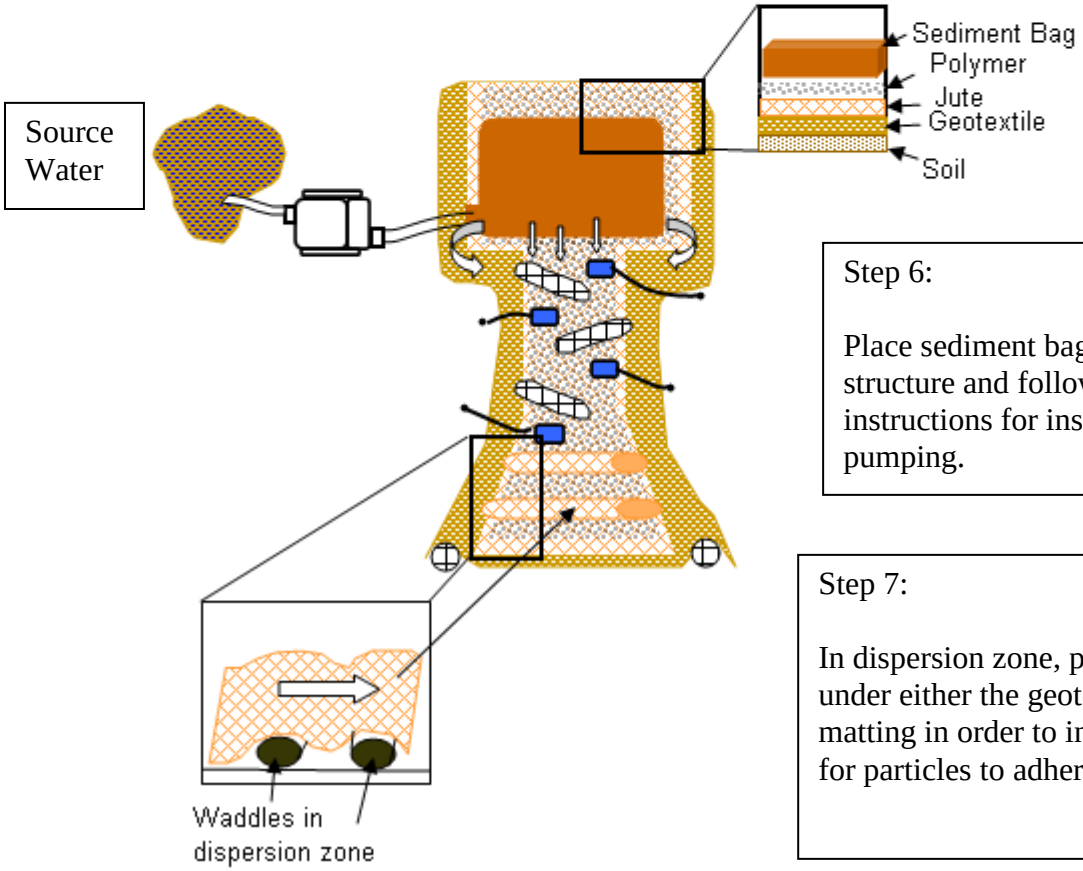
Step-by-Step Dewatering/Sediment Bag



Step 5:

Place Floc Logs before and after each waddle in the flow channel. Floc Log type should be determined by site specific soil and water tests.

They should be staked off and water should flow over and around the log to ensure maximum mixing and polymer dispersion.



Step 6:

Place sediment bag into treatment structure and follow sediment bag instructions for installation and pumping.

Step 7:

In dispersion zone, place waddles under either the geotextile or the jute matting in order to increase the area for particles to adhere.

Water Clarification

Dewatering / Treatment Ditches

The Floc Logs are designed for use in flowing conditions for treating turbid water to remove suspended sediment. Treatment Ditches are used to introduce site-specific polymers to turbid waters in such a manner to facilitate mixing and reaction between the polymer and the suspended particles. Collection of the flocculated particulate that forms will greatly reduce turbidity in stormwater.

A temporary ditch is created, either by digging out the bed or building up the walls, and lined with plastic or geosynthetic fabric to prevent erosion. Floc Logs are secured along the ditch, allowing the water to mix with the site-specific polymer blend and begin reacting with the suspended sediment. Checks can be placed along the ditch, forcing the water to flow over and around them, to increase turbulence and mixing with the Floc Logs. The ditch is lined with jute or similar matting to provide surface area for the flocculated sediment to adhere to and help remove fine particulate from the water.

i. This application can be used for temporary dewatering applications, recirculation treatment, or continuous flow treatment systems.

ii. Cover the exposed soil with jute matting and apply Silt Stop powder to prevent erosion. With highly erosive soils protection with geotextile or plastic sheeting may be necessary.

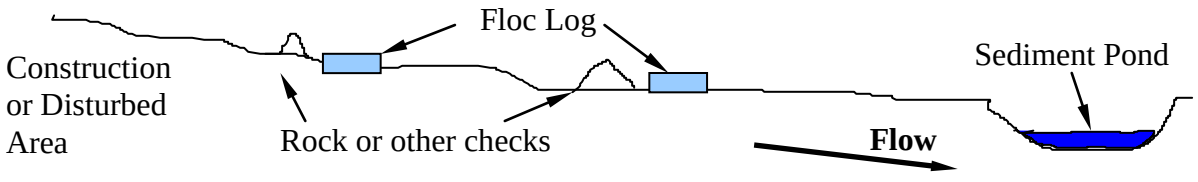
iii. Ensure only turbid water is entering the ditch. The turbidity of the water flowing through the system should not exceed 4% solids. If the sediment load of the water is above this limit, a grit pit or settling tank may need to be installed to encourage primary settling before treatment.

iv. Make sure that the logs are not resting in mud or buried by sediment; drive rebar or wooden “feet” into the logs to raise them slightly if needed.

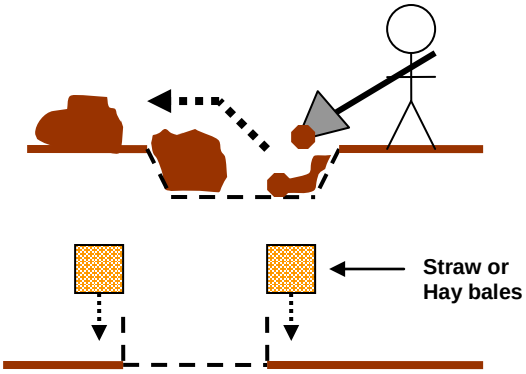
v. Logs should be placed in a series, one after another. The number of logs is determined by the flow rate of the water and the length of the mixing ditch is determined by the reaction time required for the polymer.

vi. Particle collection can be accomplished using jute matting in the ditch, as outlined here, or by using another method of particle collection as outlined in the next section.

Open Ditch Placement

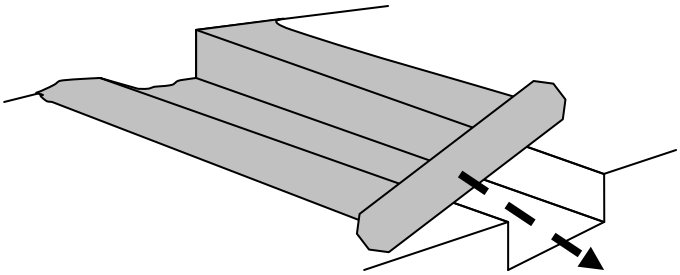


Step-by-Step Dewatering / Treatment Ditch



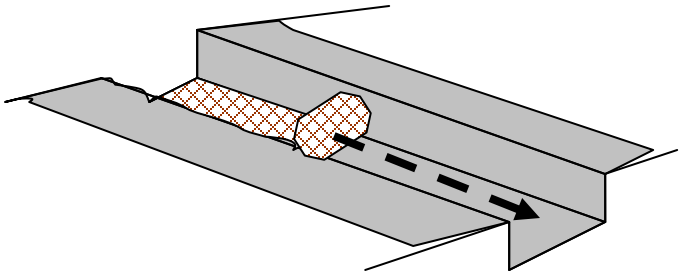
Step 1: Create temporary ditch.

The ditch can be dug into the ground, or created by building up the walls



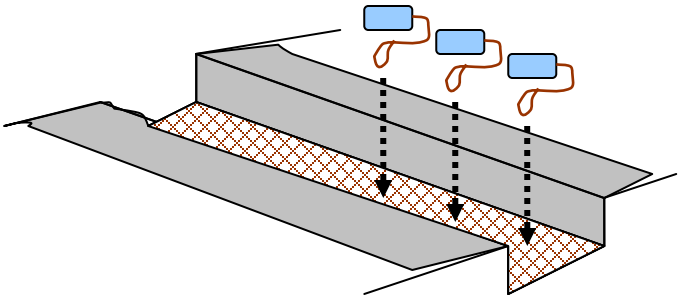
Step 2: Line with Plastic.

The plastic sheeting is used to prevent the water being treated from picking up sediment and causing erosion.



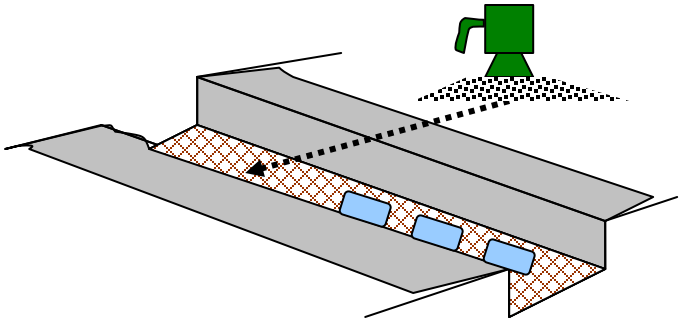
Step 3: Lay Jute Matting.

The jute matting provides a surface for the particulate formed during treatment to adhere onto.



Step 4: Place Floc Logs.

The Floc Logs are positioned in a line at the top of the ditch, allowing the water to flow over and around them.



Step 5: Apply Silt Stop powder.

Sprinkling the correct site-specific Silt Stop powder over the jute matting in the bottom portion of the ditch will assist in final water clarification.

Here is the water being pumped into the treatment ditch. Note the light brown color and turbidity.

The clarified water as it is leaving the site can be discharged directly to riparian waters.

Application Example: Treatment Ditch Dewatering Operation

1) Dig ditch

2) Line with plastic

3) Lay jute matting

4) Place Floc Logs (upstream end)

5) Apply Silt Stop (downstream end)

6) Ready for pumping

Water Clarification

Dewatering / Treatment Split-pipes

The Floc Logs are designed for use in flowing conditions for treating turbid water to remove suspended sediment. Polymer Enhanced Stormwater Treatment Split Pipes are used to introduce site-specific polymers to turbid waters in such a manner to facilitate mixing and reaction between the polymer and the suspended particles. Collection of the flocculated particulate will greatly reduce turbidity in stormwater.

Floc Logs are secured along the split pipe, allowing the water to mix with the site-specific polymer blend and begin reacting with the suspended sediment. Checks can be placed along the split pipe, forcing the water to flow over and around them, to increase turbulence and mixing with the Floc Logs. The split pipe is lined with jute or similar matting to provide surface area for the flocculated sediment to adhere to and help remove fine particulate from the water.

i. This application can be used for dewatering applications or recirculation treatment systems.

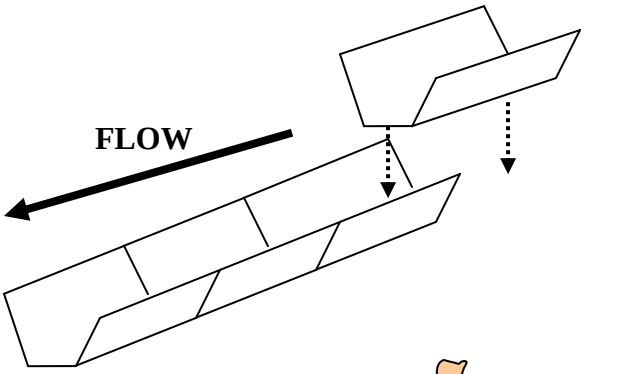
ii. Pitch or caulk may be used to seal the joints, but is not always necessary. It is suggested to seal the joints when the split pipe is placed on highly erosive soils.

iii. Ensure only turbid water is entering the treatment ditch. The turbidity of the water flowing through the system should not exceed 4% solids. If the sediment load of the water is larger than this limit, a grit pit or settling tank may need to be installed to encourage primary settling before treatment.

iv. Logs should be placed in a series, one after another. The number of logs is determined by the flow rate of the water, and the length of the split pipe trough is determined by the reaction time required for the polymer.

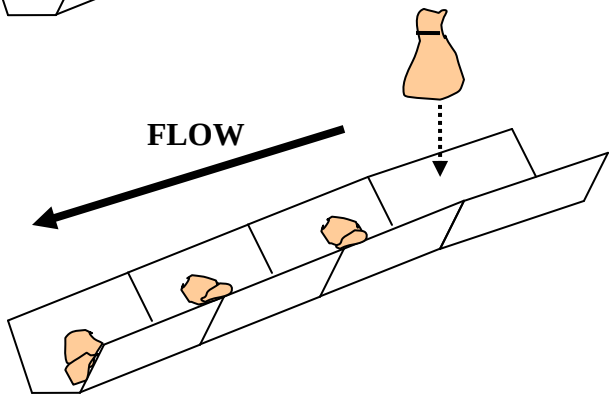
v. Particle collection can be accomplished using jute matting in the split-pipe, as outlined here or by using another method of particle collection as outlined in the next section.

Step-by-Step Dewatering Treatment Split Pipe



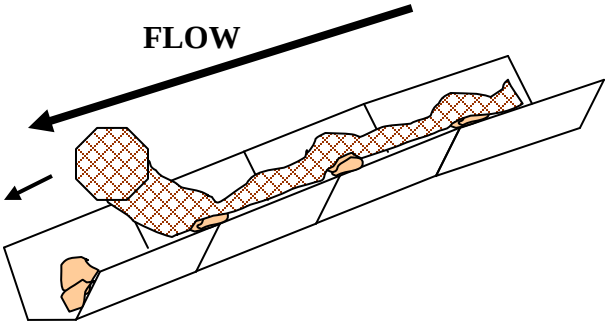
Step 1: Install Split Pipe Trough.

Overlap the split pipe segments so that the up-stream piece overlaps the down-stream piece. Seal the joints if needed.



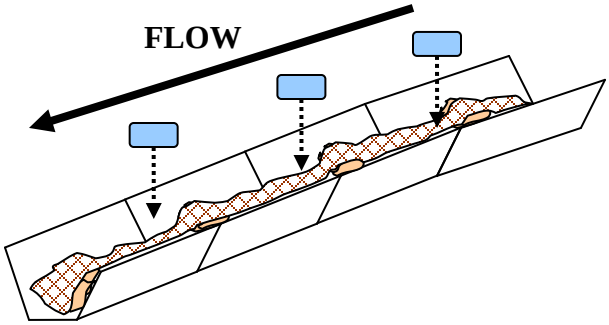
Step 2: Install Checks.

These can be made from sandbags, plywood, or other materials. Their purpose is to cause turbulence and facilitate mixing.



Step 3: Line with Jute Matting.

The jute matting provides a surface for the particulate formed during treatment to adhere onto. Place the matting to ensure it will be within the flow of water.



Step 4: Place Floc Logs.

The Floc Logs are positioned in a line at the top of the trough, allowing the water to flow over and around them.

Water Clarification

In-stream Baskets

The Floc Logs are designed for use in flowing conditions for treating turbid water to remove suspended sediment. In-stream Baskets are used to introduce site-specific polymers to turbid waters in such a manner to facilitate mixing and reaction between the polymer and the suspended particles. Collection of the flocculated particulate that forms will greatly reduce turbidity created by in-stream work.

A large wire basket is constructed to hold site-specific Floc Log polymers, allowing water to pass over and around them. The basket with the polymer logs is placed just downstream of the work site, to allow the turbid water to mix with the polymer and react. Particle Curtains can be placed in a series downstream to collect the flocculated sediment and remove fine particulate from the water.

Direct in-stream applications of polymer materials are not allowed everywhere, check state and local regulations before beginning project.

i. A wire basket system is used to introduce Floc Log polymer into an aquatic site, when diversion of the water is not feasible, such as storm water ditch and drain cleanout projects.

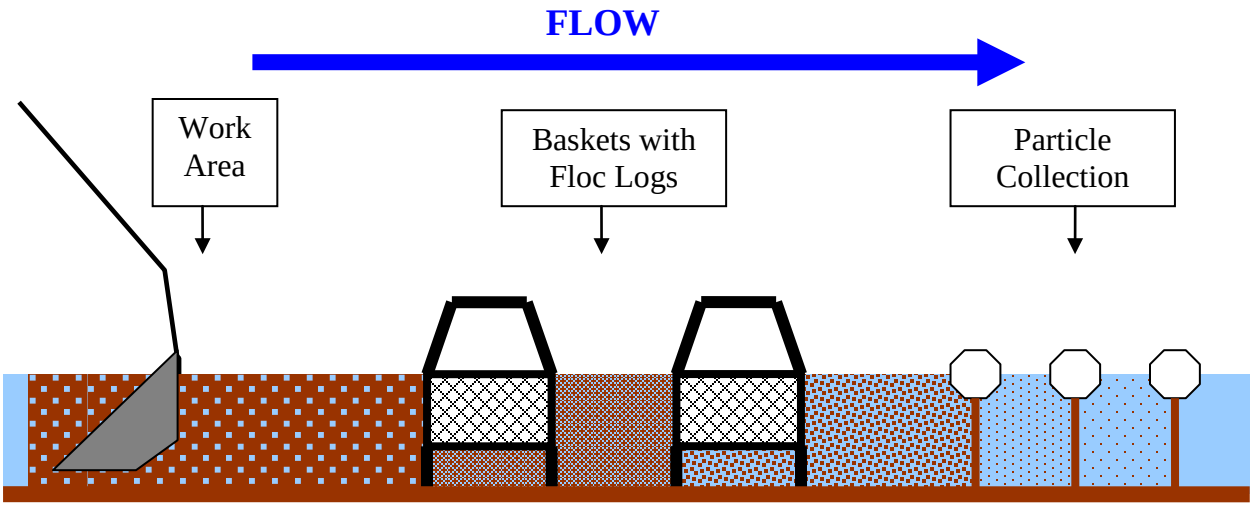
ii. The wire basket is designed to hold a number of Floc Logs and allow water to flow over and around them. Multiple baskets may be needed to provide the correct dosage rate and allow for adequate mixing.

iii. The basket(s) should be placed in a series, closest to the point of turbidity without interfering with the work site; to allow adequate mixing with the polymer as the sediment is introduced into the water column. Additional Floc Logs can be attached to the working equipment to provide additional dosing directly at the point of turbidity.

iv. Additional mixing structures may need to be placed in the stream around the wire basket(s) to create turbulence to facilitate appropriate mixing.

v. The number of Floc Logs needed is determined by the flow rate of the water and the soil characteristics of the suspended sediment.

vi. Sediment collection system should be constructed or installed downstream of the work site and the basket(s), to collect the sediment that is flocculated.



Handles allow for easy placement of basket with excavating equipment.

Wire mesh basket, open on the top.

Feet on bottom, to raise basket 4-6” out of sediment and allow water flow underneath.

Water Clarification

Tank Systems

The Water Clarification Treatment Split Pipe Launder System is designed to perform in a variety of flow conditions. The launder needs to be long enough to meet the required reaction time as seen on the site-specific lab report. Increasing the length of the launder will result in better mixing and reaction forming more flocculated particulate.

Filling the launder with sediment will reduce/ impair the reaction. The launder needs to be installed with a gradient drop that allows the turbid water to flow through it; higher sediment load will require a greater angle to allow the Floc Logs to mix effectively.

Use of the Floc Logs may require more frequent sediment removal from the tank as the Floc Logs will increase the efficiency of the tank. Installation of rows of particle curtains inside the baker tank will increase the particle collection capability of the settling tank.

i. Using any type of tank affix half of a 16” to 20” pipe on top to three of the four sides.

ii. Place site specific Floc Logs and checks for mixing inside the half pipe, ensuring that there is adequate mixing based on the sample analysis.

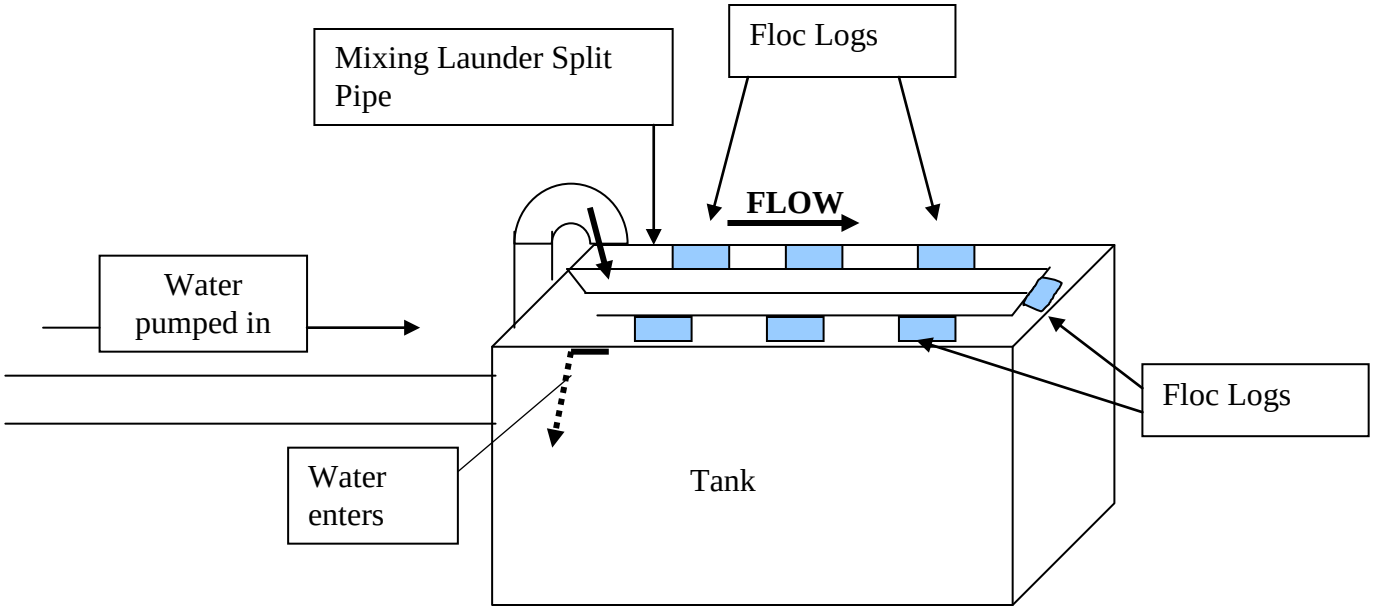
iii. Secure a hose to the beginning of the half pipe and pump turbid water into the half pipe.

iv. The treated water will enter the tank at the opposite end of the split pipe.

v. Inside the tank, place particle curtains one after another so that the treated water will flow through them.

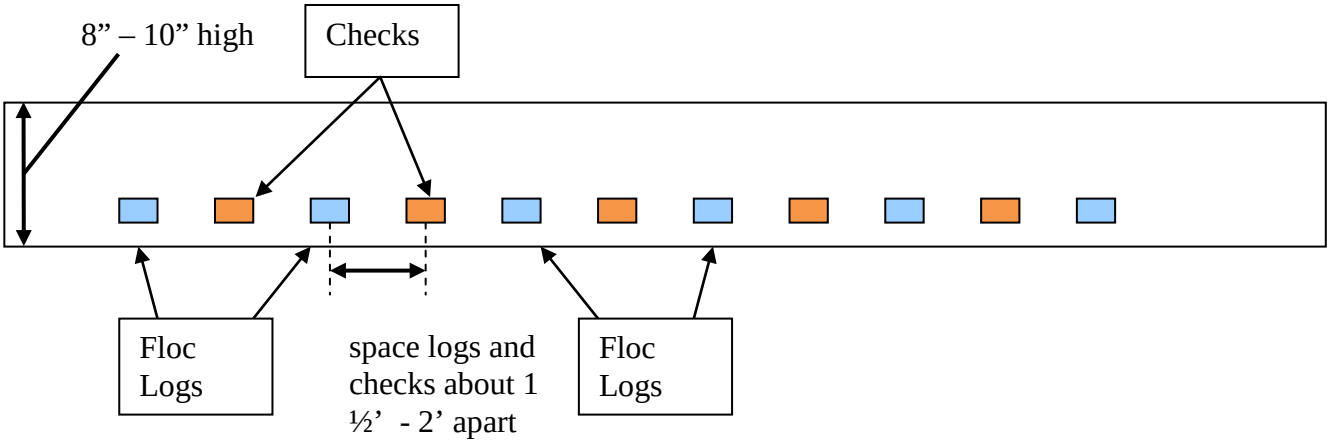
vi. Create a discharge point in the tank at the opposite end of where the treated water enters the tank.

Example Only –
Modify design to fit site conditions



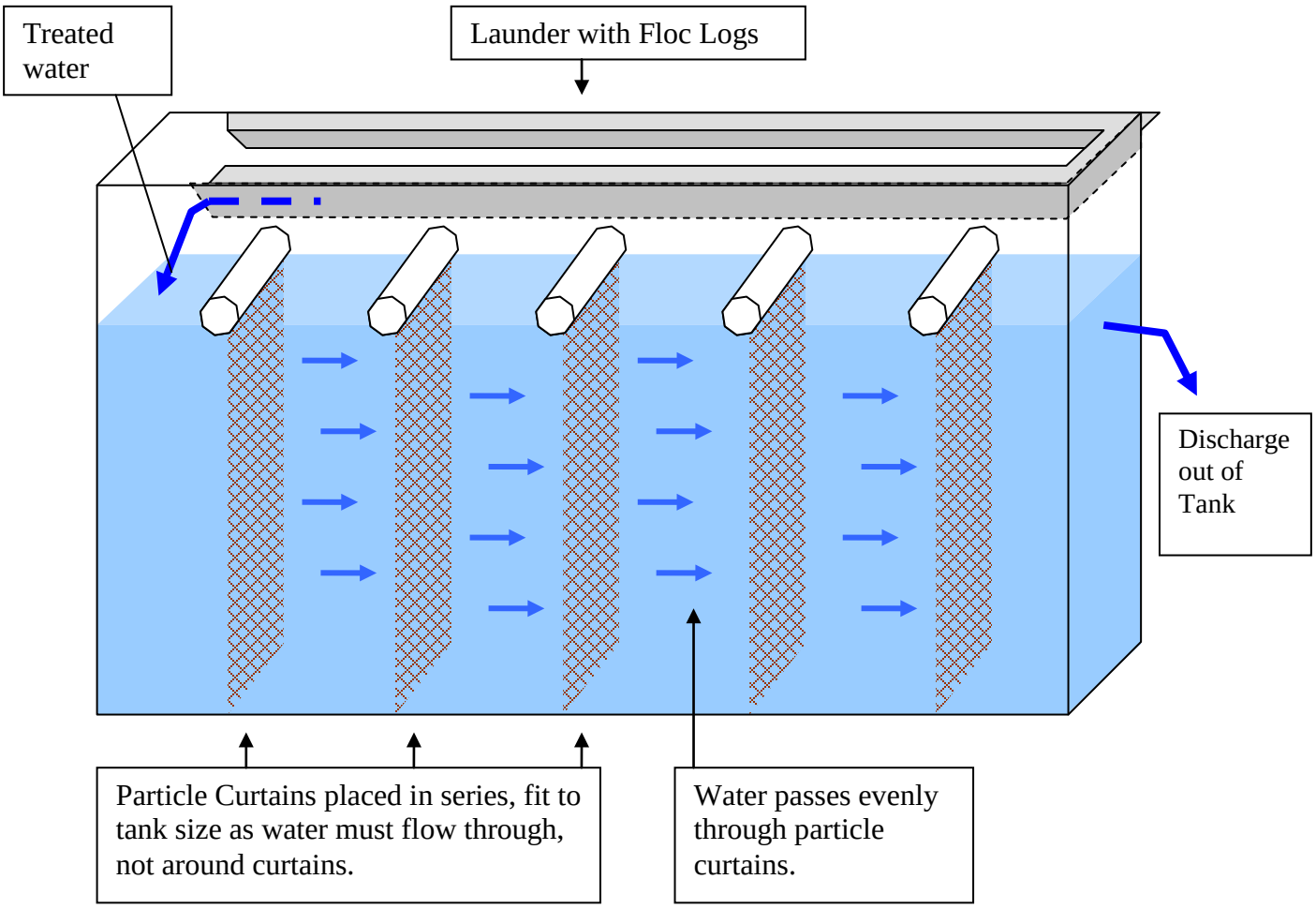
Ensure a gradient drop along length of the launder:

0.5% if treating only turbid water or 4% or greater if treating high sediment load



Mixing Launder Split Pipe length fit required reaction time

Particle Curtain inside tank:



Particle Collection

Dispersion Field

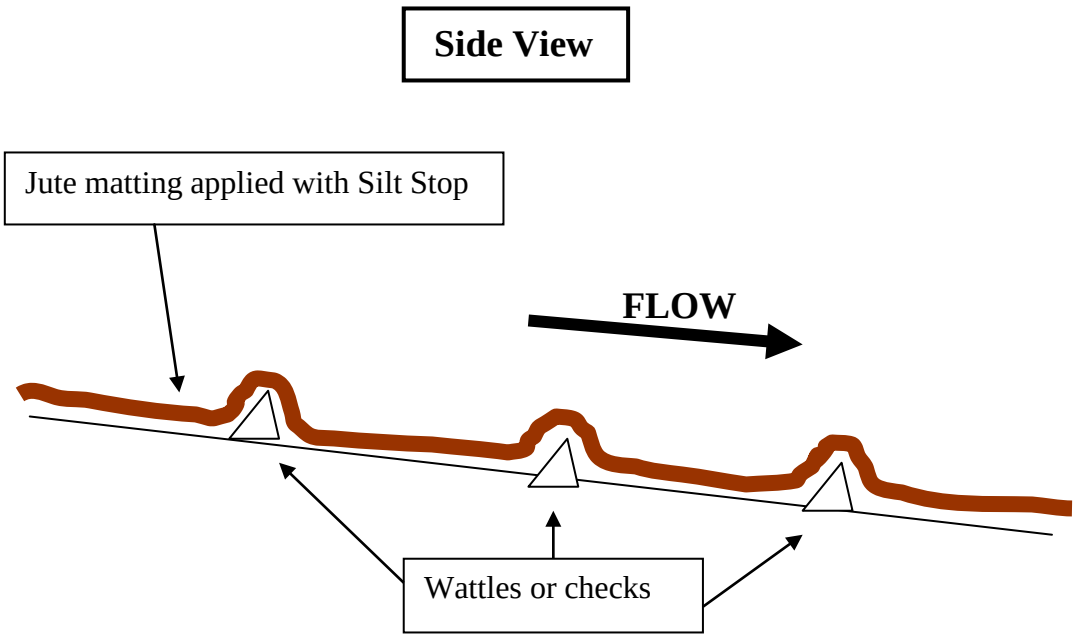
A polymer enhanced dispersion field is a delta laid with jute or similar matting treated with site-specific polymer to allow for collection of fine sediment particles from high velocity flow conditions. The dispersion field is for use in conjunction with a stormwater treatment system and possibly a primary sediment collection device.

i. This BMP is intended for particle collection only. It is not intended to be a stand-alone BMP, as it is not adequate sediment control by itself. This BMP should be used with one of the stormwater treatment systems as outlined in the previous section.

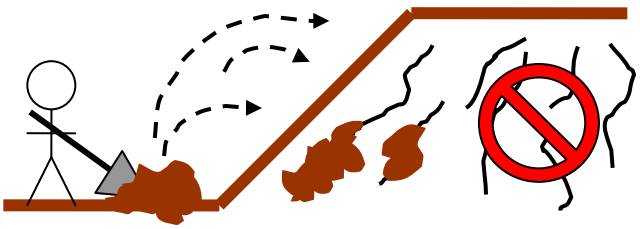
ii. A dispersion delta is created to allow the treated stormwater to spread out and slow its velocity. Rip-rap, wattles, or checks can be placed to help reduce the velocity.

iii. The dispersion field should be covered in jute matting and applied with the site-specific Silt Stop powder, to provide a surface for the particles to adhere to and help in final clarification of the stormwater. With highly erosive soils protection with geotextile or plastic sheeting may be necessary.

iv. The velocity of the treated stormwater entering the dispersion field determines the size of the delta; it needs to be large enough that the velocity is reduced to 0.5 ft/sec.



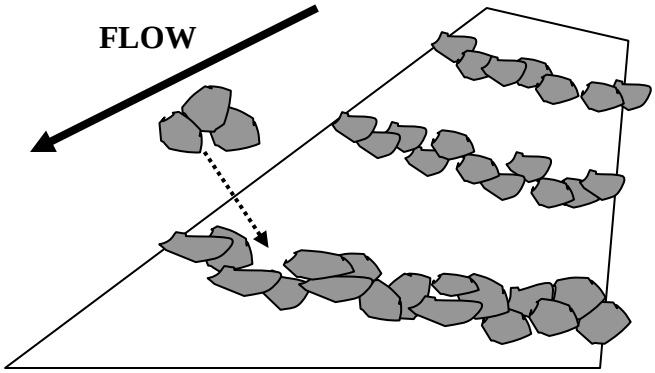
Step-by-step Dispersion Field



Step 1: Prepare site.

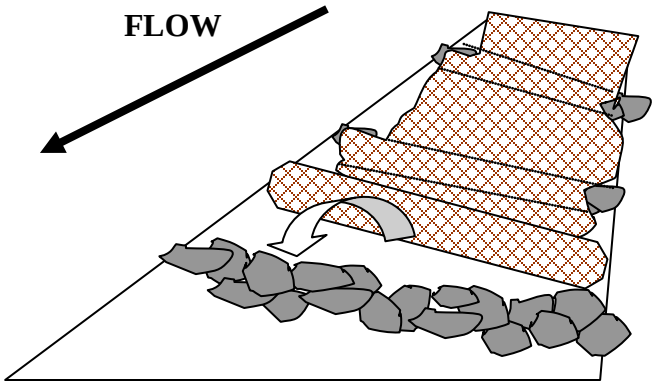
Fill any rills or gullies caused by previous erosion.

Ensure the stormwater will sheet flow over the dispersion field.



Step 2: Install Checks or Wattles.

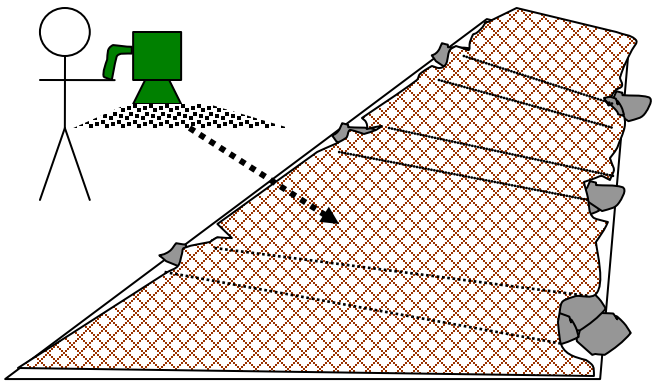
These can be made from sandbags, rock, wood, rip-rap, or other materials. Their purpose is to slow the velocity of the stormwater and encourage ponding.



Step 3: Line with Jute Matting.

The jute matting provides a surface for the particulate formed during treatment to adhere onto.

A layer of plastic beneath the jute matting may be necessary, especially in highly erosive soils.



Step 3: Apply Silt Stop powder.

Apply the site-specific Silt Stop powder evenly over the jute covering the dispersion field.

The Silt Stop powder reacts with the sediment, binding it together and adhering it to the jute matting.


FLOW
Dispersion Field, covered in jute with checks built in
Plastic lining, due to highly erosive nature of soil

Particle Collection

Particle Curtains

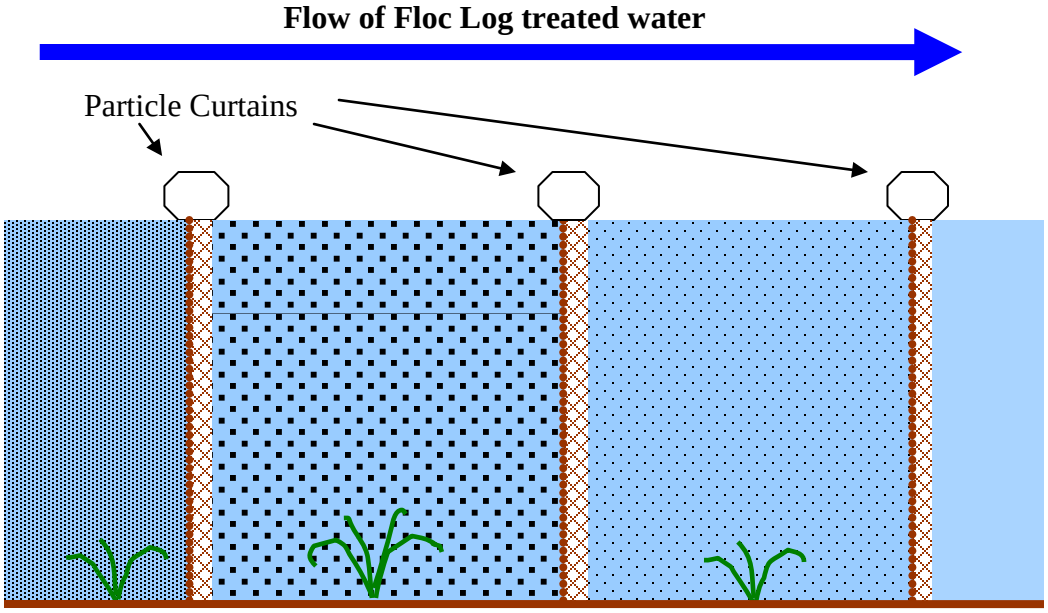
Polymer enhanced particle curtains are a series of curtains made of jute and coconut fabrics attached to floats to be used in wet ponds and flowing waterways to collect fine particles from turbid water after polymer reaction. Particle curtains are to be used in conjunction with site-specific Floc Log polymers upstream of the curtains.

i. This BMP is intended for particle collection only. It is not intended to be a stand-alone BMP, as it is not adequate sediment control by itself. This BMP should be used with one of the stormwater treatment systems as outlined in the previous section.

ii. Install the particle curtains in lines perpendicular to the flow across the sediment pond or waterway.

iii. The particle curtains will float.

iv. Inspect and repair or replace the particle curtains as required.

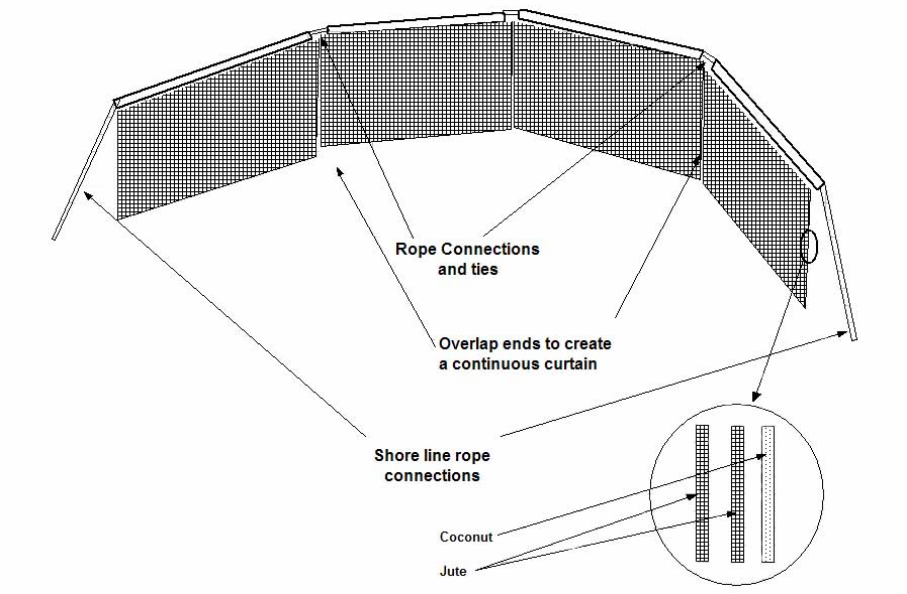


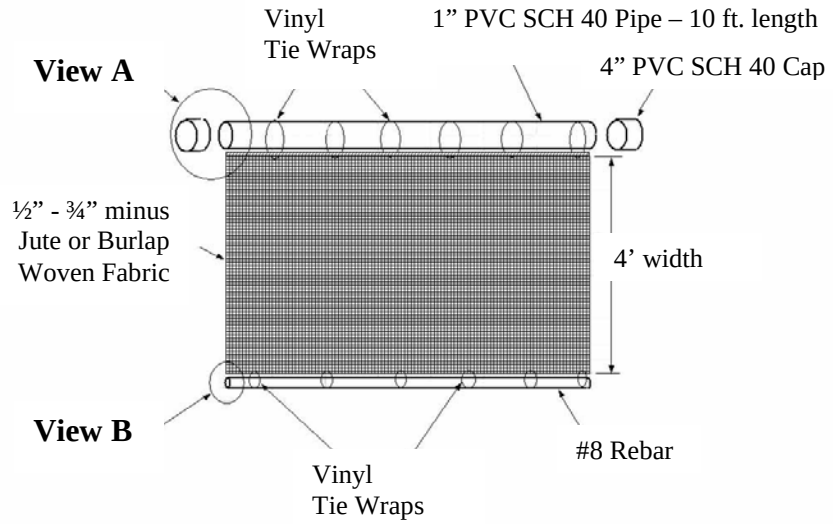
(Left) The particle curtain being lowered into the stream and secured along the banks.

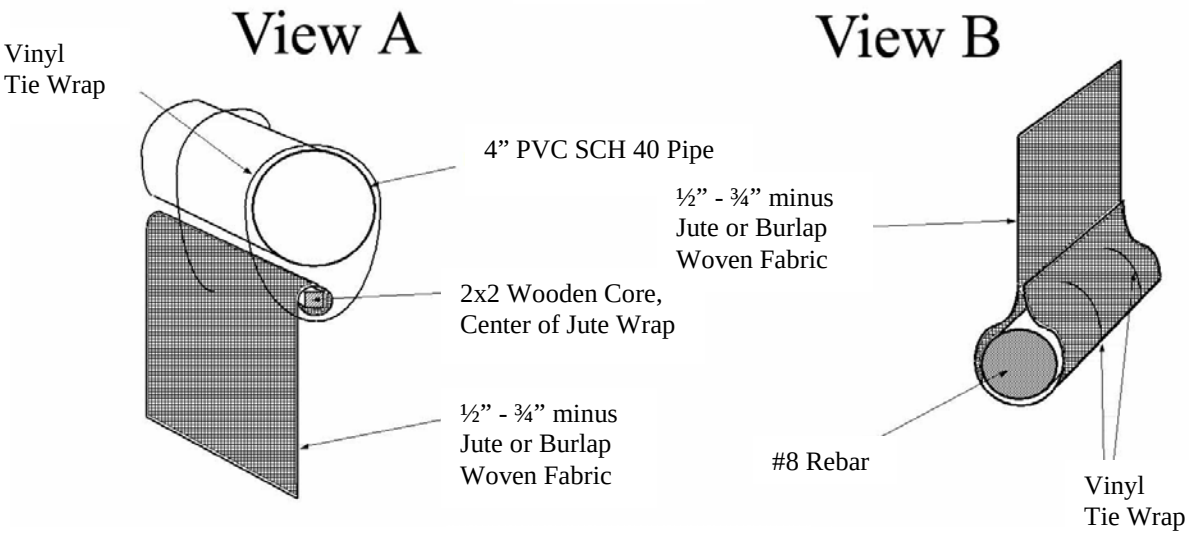
(Right) The particle curtain floating in the stream. Note the other particle curtains in place further down stream in the background.

(Left) A series of particle curtains collect suspended flocculated material resulting in progressively clearer water.

Example Construction of a Particle Curtain, Measurements must fit site conditions!







Particle Collection

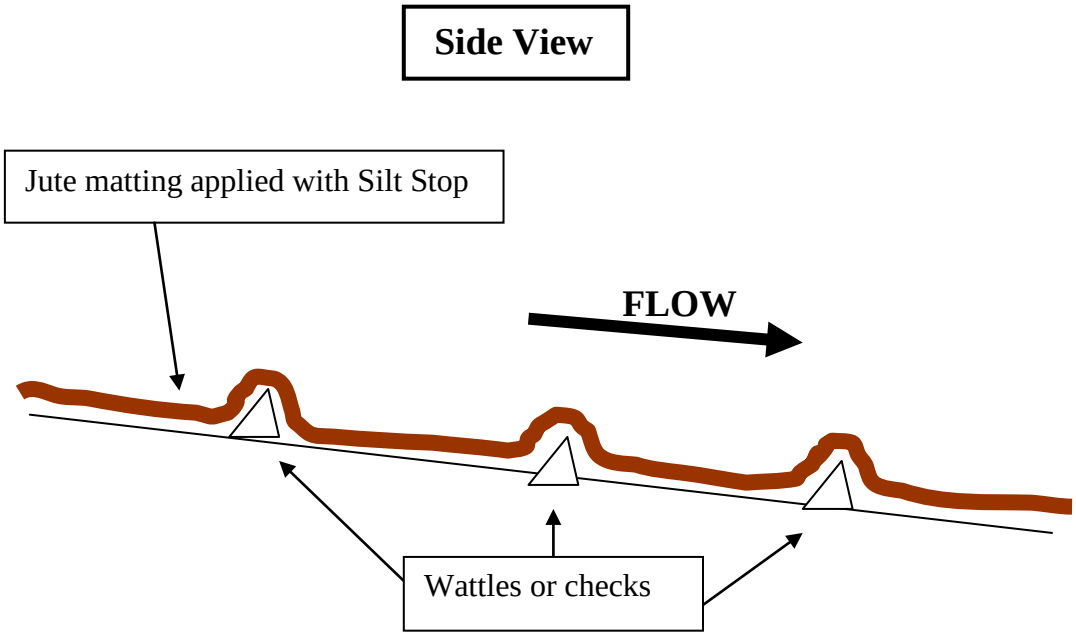
Wattle / Check System

A series of wattles are placed perpendicular to the flow to create a series of checks that will trap sediment and collect particulate created by a stormwater treatment system placed upstream. The polymer enhanced check system is improved by covering the wattles and the ditch line with jute fabric and applying the appropriate site-specific polymer powder.

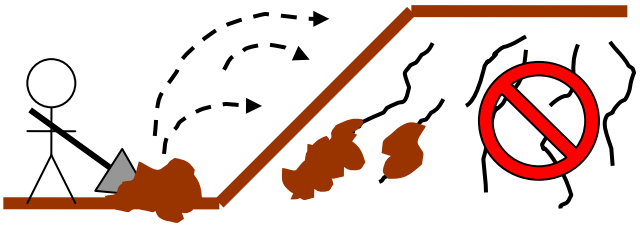
i. This BMP is intended for particle collection only. It is not intended to be a stand-alone BMP, as it is not adequate sediment control by itself. This BMP should be used with one of the stormwater treatment systems as outlined in the previous section.

ii. Place wattles perpendicular to the flow of water. Ensure there is sheet flow through the system, with the water flowing evenly over the checks.

iii. The wattles or checks should be covered in jute matting and applied with the site-specific Silt Stop powder, to provide a surface for the particles to adhere to and help in final clarification of the stormwater. With highly erosive soils protection with geotextile or plastic sheeting may be necessary.



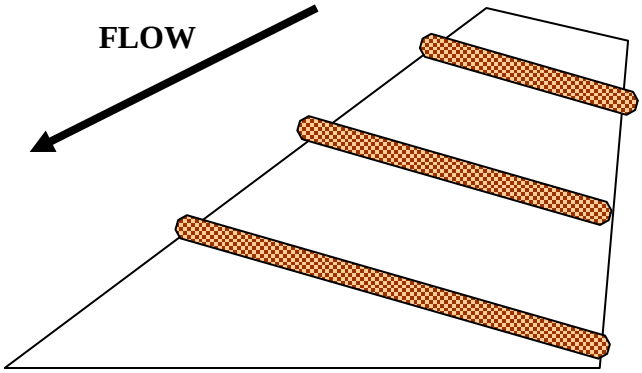
Step-by-step Wattle / Check System



Step 1: Prepare site.

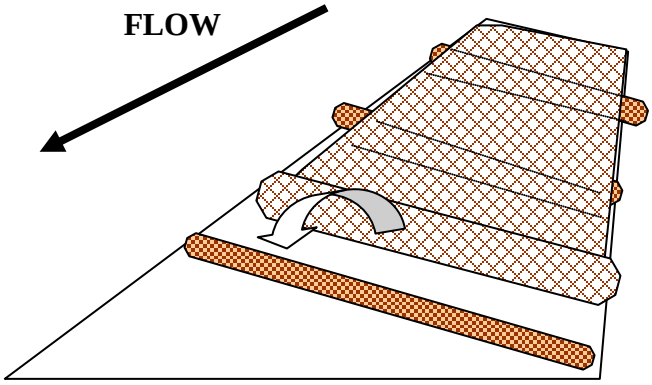
Fill any rills or gullies caused by previous erosion.

Ensure the stormwater will sheet flow over the wattles or checks.



Step 2: Install Checks or Wattles.

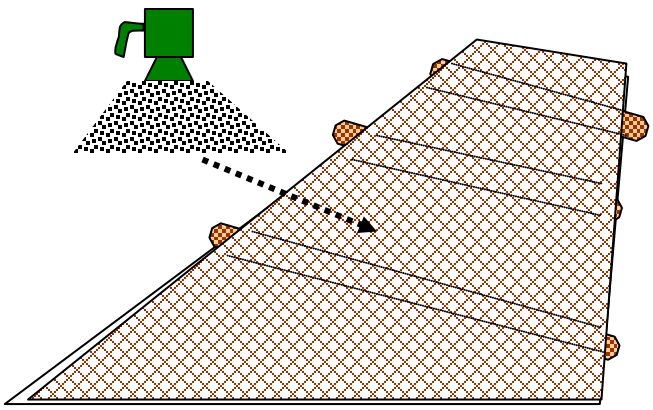
These can be made from sandbags, wood, rip-rap, or other materials. Their purpose is to slow the velocity of the stormwater and encourage ponding.



Step 3: Line with Jute Matting.

The jute matting provides a surface for the particulate formed during treatment to adhere onto.

A layer of plastic beneath the jute matting may be necessary, especially in highly erosive soils.



Step 3: Apply Silt Stop powder.

Apply the site-specific Silt Stop powder evenly over the jute covering the wattles / checks.

The Silt Stop powder reacts with the sediment, binding it together and adhering it to the jute matting.

Particle Collection

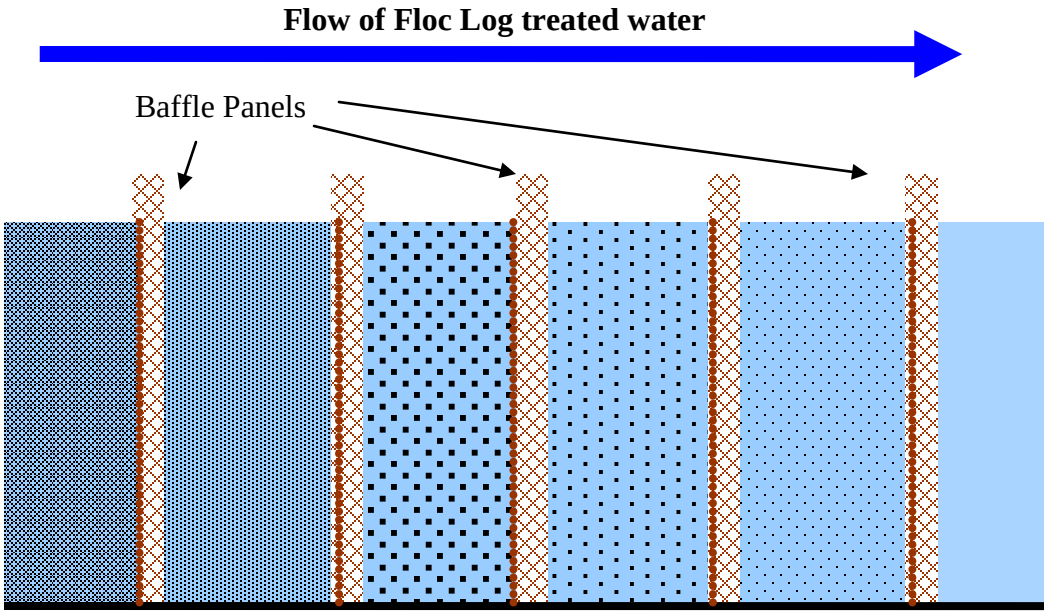
Baffle Grid

A polymer enhanced baffle grid system is a series of panels made of jute or similar fabric, used to collect fine particles from turbid water after polymer reaction. The panels can be treated with a site-specific polymer for short term increased performance and to aid in further water clarification. The baffle grid is for use in conjunction with a stormwater treatment system to flocculate the suspended particles, making larger particulate that can easily be removed from suspension using the baffle grid system.

i. This BMP is intended for particle collection only. It is not intended to be a stand-alone BMP, as it is not adequate sediment control by itself. The baffle grid system is intended for use as a final clarifier or polisher. This BMP should be used with one of the stormwater treatment systems as outlined in the previous section.

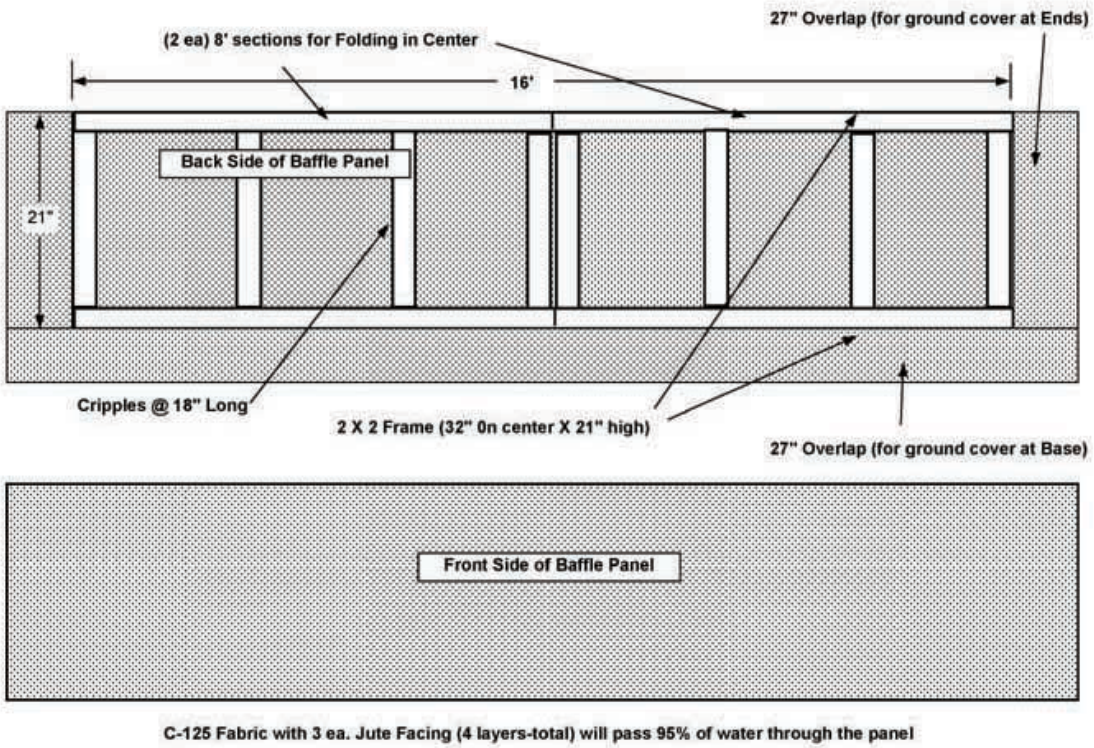
ii. Ensure only turbid water is entering the storm drain system. The turbidity of the water flowing through the system should not exceed 4% solids. Adequate protection of the inlets should ensure that the sediment load of stormwater is not over this limit.

iii. Baffle Grids are designed for the specific flow conditions of the site they are installed on. Alterations to the flow conditions of the site may result in compromised performance or failure. Discuss proposed changes to the flow conditions with a qualified professional before implementing them to ensure they will not detrimentally affect the baffle grid or stormwater quality.



Example Only, measurements need to fit site conditions!

Baffle Grid Panel Detail



C-125 Fabric with 3 ea. Jute Facing (4 layers-total) will pass 95% of water through the panel

Sediment Control

Inlet Protection

An inlet sediment trap is used to prevent silt from entering the pipe system at an inlet. Concentrated flow around and through these devices can cause undercutting that can compromise their performance. Polymer enhancement involves applying a layer of jute fabric to the soil surface surrounding the inlet protection device and applying a soil-specific polymer over the jute matting.

As with a Soft Armor application, the polymer powder binds the soil to the matting, preventing stormwater from undercutting the inlet protection device. Also as the turbid runoff water passes across the jute matting with site-specific polymer, it reacts with the polymer clarifying the water and dropping out the suspended particles before entering the storm drain system.

i. Install inlet sediment trap around the drop inlet. This can be a silt fence barrier, filter stone or gravel, straw bales (where allowed), Polymer Enhanced Sediment Retention Barrier (outlined later in this section), or a pre-fabricated cover.

ii. If silt fence is used, it should be designed to allow water to pass through it. The silt fence shall allow water to pass at a rate of 70 GPM/ft^2 or greater. Where used, silt fence should be installed as level as possible.

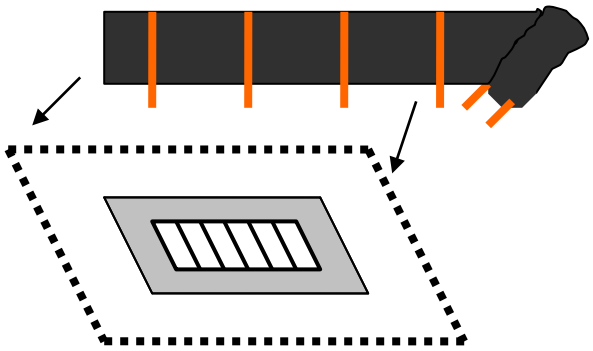
iii. Lay jute matting and apply with Silt Stop powder over the ground outside the barrier to reduce the erosion and prevent it from being undercut during heavy flow. Application rates for the polymer powder should follow the guidelines as detailed under Dry Spread applications under the Soil Stabilization section.

iv. Barriers made of straw bales (where allowed) or filter stone can have an added layer of jute matting laid over the top of the barrier as well and applied with the appropriate Silt Stop powder. This helps the barrier to filter the suspended sediment from the stormwater.

v. If the velocity of the runoff water is high when approaching the field of jute matting and polymer, an outer barrier (silt fence, wattles, straw bales, filter stone, rip-rap, etc.) can be installed to reduce the velocity of the water and prevent the jute field from being covered with sediment.

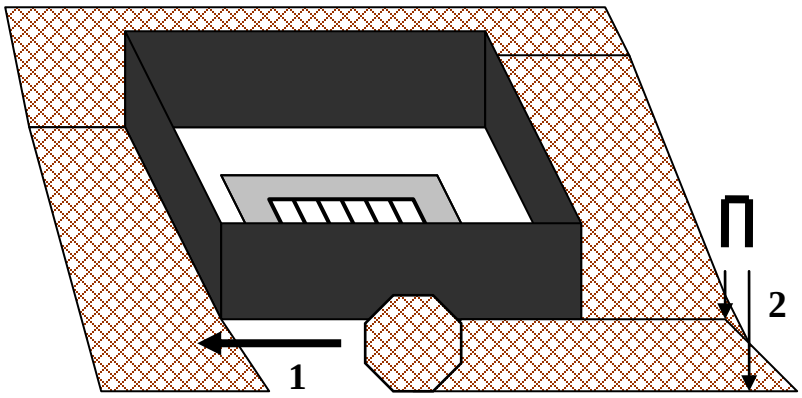
vi. Inspect and repair as needed, remove accumulated sediment after every storm.

Step-by-Step Inlet Protection



Step 1: Install Inlet Barrier.

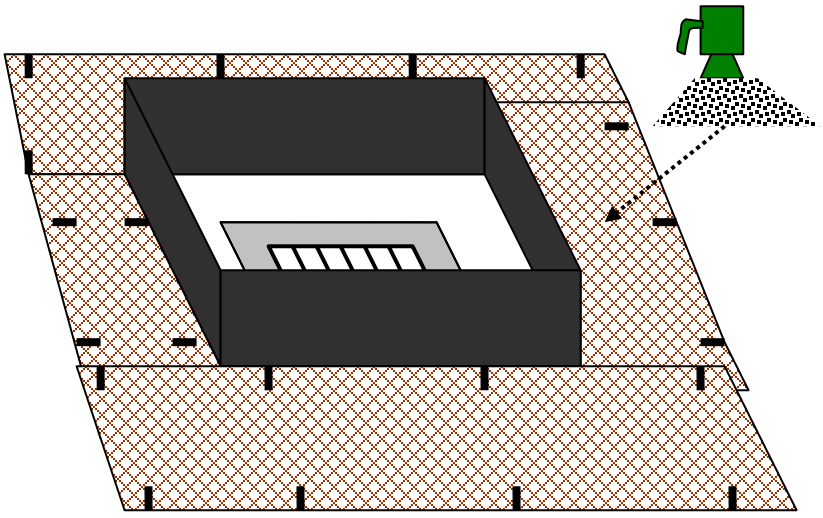
This is the primary barrier to prevent sediment depositing within the inlet structure.



Step 2: Lay Jute Matting.

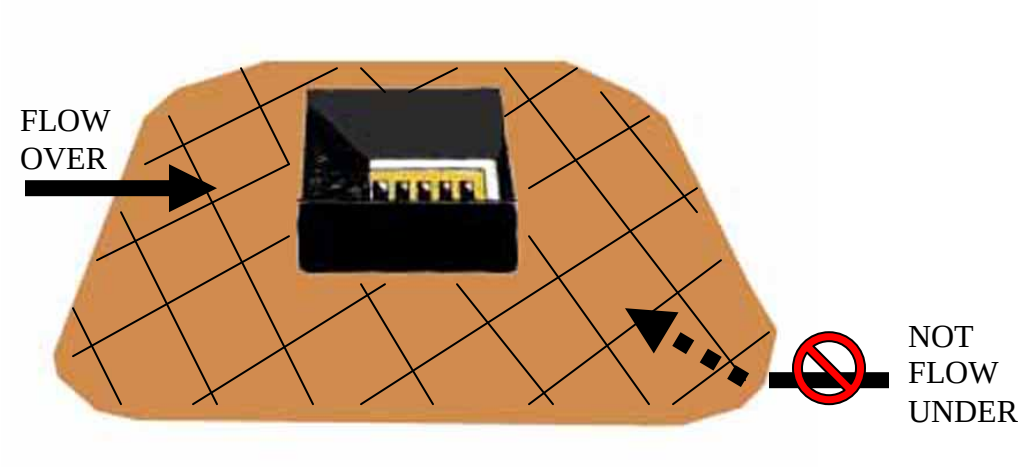
The jute matting should extend 6 – 8 feet from the drop inlet.

Secure the matting to the soil surface with stakes or soil staples, taking care to ensure the matting is flush to the ground.



Step 3: Apply Silt Stop.

The correct site-specific Silt Stop powder can be applied by itself or added to dry sand to aid in spreading.


FLOW
OVER
NOT
FLOW
UNDER

Sediment Control

Sediment Retention Barriers (SRB)

The Sediment Retention Barrier (SRB) is a double row of silt fence, standing about 4-6 feet apart, filled with loose mulch, straw, woodchips, or other organic matter mixed or blended with the site-specific Silt Stop polymer. It is used on graded sites to trap the fine sediment and clays that flow through the silt fence barrier. With the use of the site-specific Silt Stop polymer, stormwater clarity can be greatly improved while utilizing the function of the silt fence.

i. Install in areas where stormwater will exit a site, keeping the installation as level as possible; fill low spots as necessary.

ii. Place the barrier perpendicular to flow.

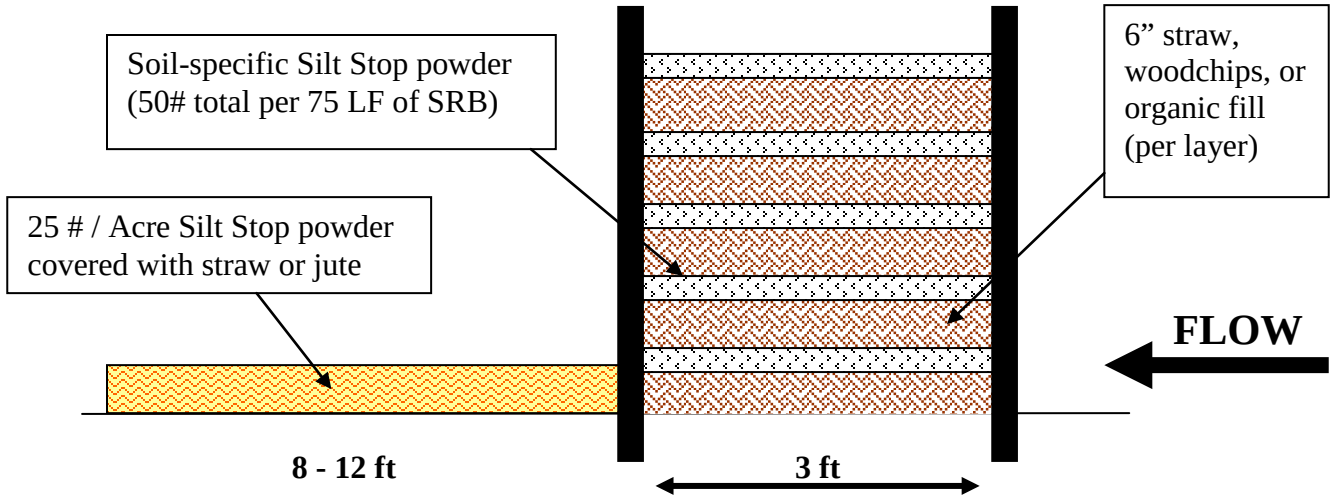
iii. The silt fence should be designed to allow water to pass through it. The silt fence shall allow water to pass at a rate of 70 GPM/ft^2 or greater.

iv. Place 2 parallel rows silt fence 4-6 feet apart. Place loose straw or mulch 3 feet deep between the silt fences (do not compact).

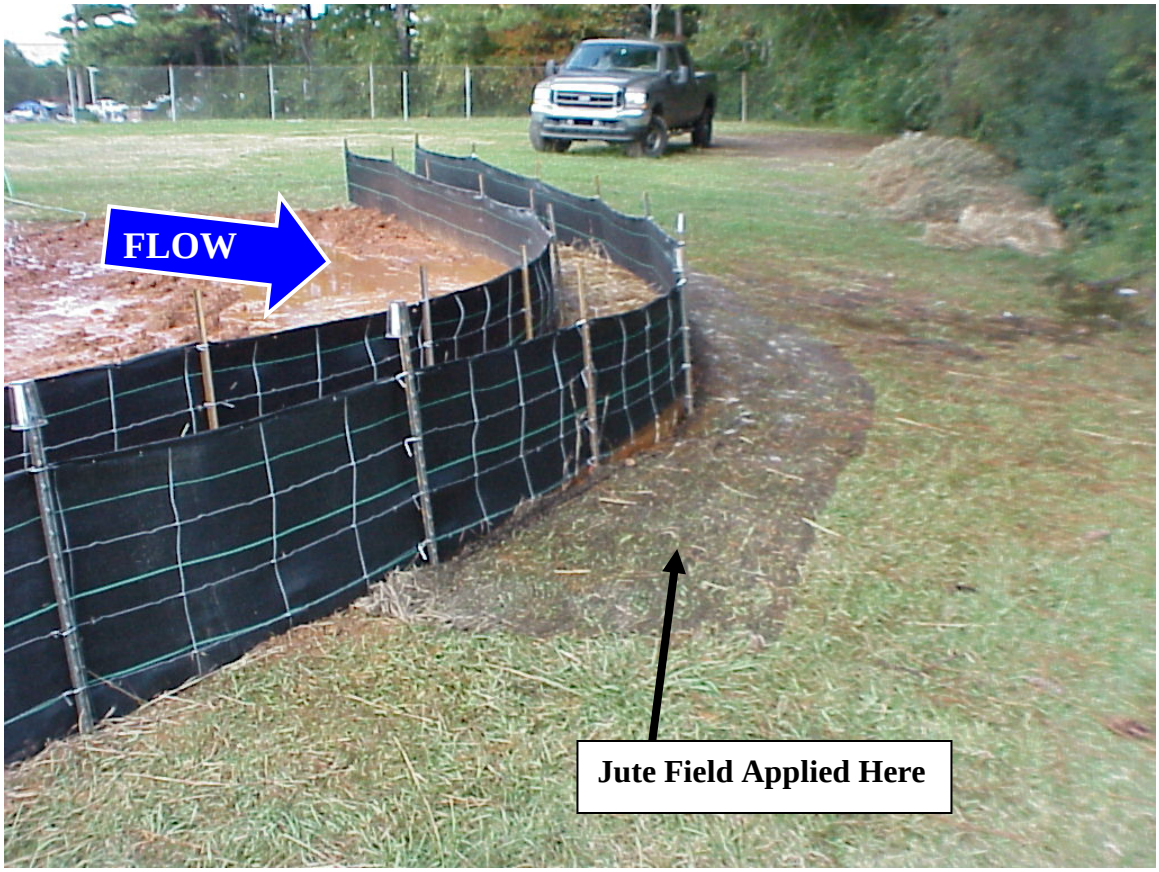
v. Dry site-specific Silt Stop powder should be spread throughout the organic fill material, mixed evenly or spread in small layers. **Application rates should be around 50# powder / 75 linear feet of SRB.**

vi. Stabilizing the soil behind the SRB with Silt Stop powder and straw or jute matting provides final clarification of the stormwater. It should be used where water clarity is extremely important.

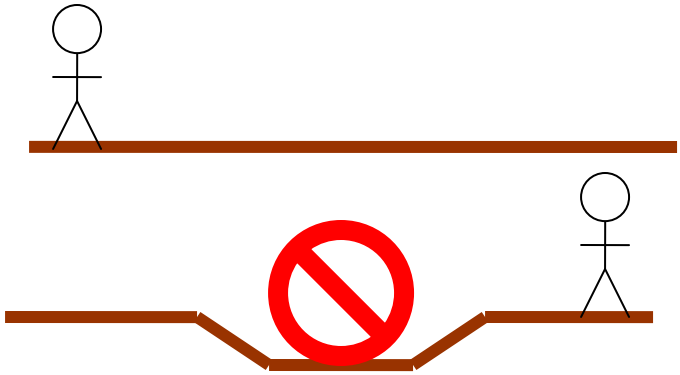
Cross section of a Sediment Retention Barrier:




FLOW

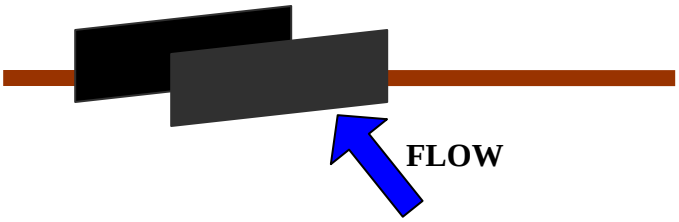

FLOW
Jute Field Applied Here

Step-by-Step Sediment Retention Barriers



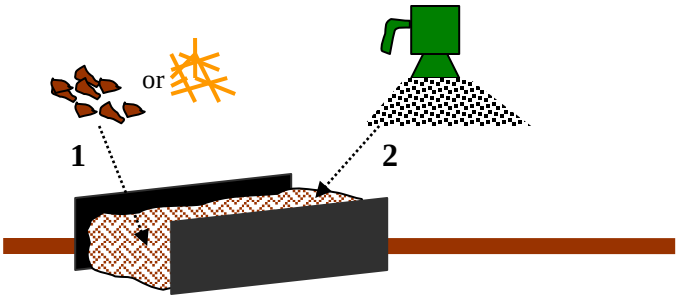
Step 1: Grade Site.

Fill low spots to ensure the installation of the silt fence is as level as possible perpendicular to the flow.



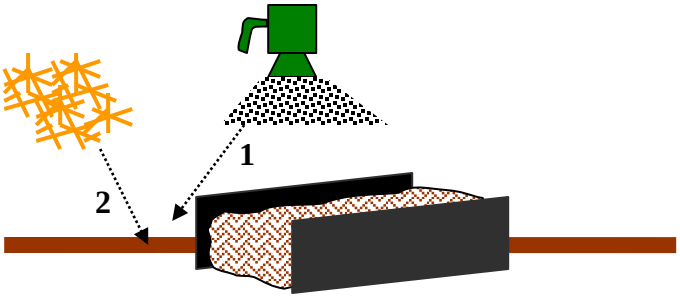
Step 2: Install Silt Fence.

Place a double row of silt fence perpendicular to the direction of flow. The two lines of silt fence should be 3 to 4 feet apart.



Step 3: Fill with layers of woodchips/ straw and Silt Stop powder.

Loosely fill the area between the silt fences with woodchips or straw and the site-specific Silt Stop powder in **layers**.



Step 4: Apply Silt Stop behind SRB and cover with straw or matting.

Apply the appropriate Silt Stop powder at the rate of 25 #/acre to a distance of 8-12 feet, and cover with straw or jute matting.

Sediment Control

Rock Checks

Standard rock check systems cannot address water quality standards and usually only address the capture of heavier sediments. The use of polymer enhancement technology will allow the rock check system to become effective as a water clarifying system while retaining the ability to be an effective sediment control device.

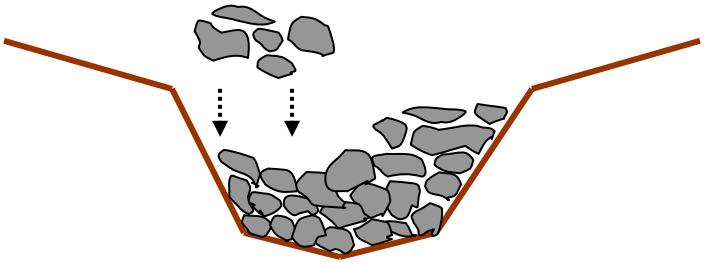
i. Apply one or two layers of jute open weave matting to the entire surface of each rock check. Large rocks, stakes, or soil staples may be used to secure the jute to the stone surface. Jute matting and Silt Stop application can be used to stabilize the areas between the rock checks as well.

ii. Apply the site-specific Silt Stop powder **evenly** to the surface of the jute covering. Care should be taken to apply the Silt Stop powder evenly over the surface of the cover. **Spillage of the powder can create very slippery conditions.**

iii. Application rates for the polymer powder should follow the guidelines as detailed under Dry Spread applications under the Soil Stabilization section.

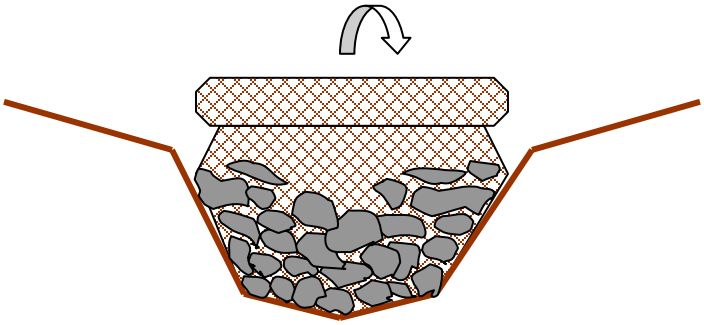
iv. Install a series of Polymer Enhanced Rock Check Systems at each conveyance or discharge area. A sequential treatment is much more effective for both sediment retention and water quality enhancement.

Step-by-Step Rock Check Systems



Step 1: Install Rock Checks.

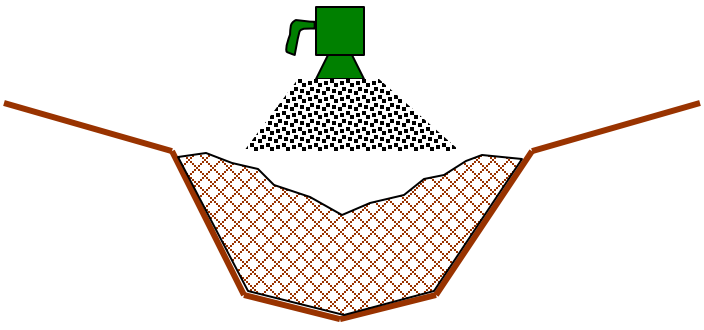
Install in a series in ditchlines and areas of concentrated flow to help reduce the velocity of the stormwater to allow some of the sediment to settle out.



Step 2: Cover with jute matting.

Completely cover the rock check with one to two layers of open-weave jute matting.

The matting provides surface area for the treated sediment to adhere to.



Step 3: Apply Silt Stop powder.

Apply the site-specific Silt Stop powder evenly over the jute covering the rock check.

The Silt Stop powder reacts with the sediment, binds it together, and adheres it to the jute matting.

Cover rock check with jute matting

Apply Silt Stop powder over rock check

Particle attachment to jute matting with polymer after rain event

By installing a series of polymer enhanced rock checks down the ditch line, they become much more effective at controlling stormwater, both for water clarity and sediment load.

Lining the entire ditch, including the sides, with jute matting and applying the correct site specific Silt Stop powder will ensure erosion or cutting does not occur during rain events, even with sandy soils.

Sediment Control

Outlet Protection

An outlet is any pipe or box culvert outlet headwall with an apron and dissipater blocks used to prevent erosion and slow water. This BMP is to be used in conjunction with site-specific Floc Logs secured upstream of the outlet within the storm water system, as outlined in Storm-drain Applications.

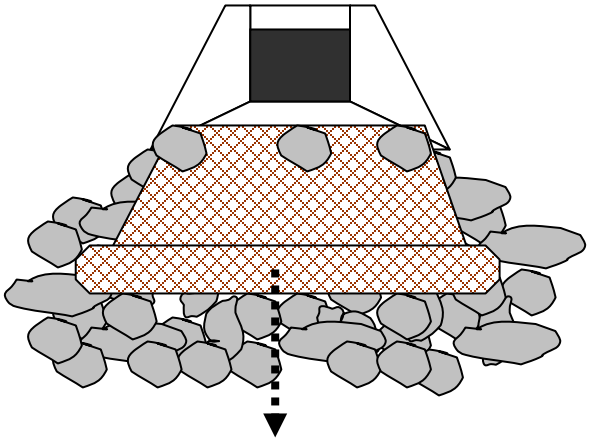
The outlet is enhanced through the use of polymers by laying down jute matting over the dissipater rocks and applying with a soil-specific Silt Stop powder. The particulate formed during reaction with the Floc Log in the storm-drain system exits the outlet structure. The jute matting applied around the structure provides surface area for the particulate to adhere to, resulting in increased water clarity. The jute matting around the outlet also creates a highly erosion-resistant surface which protects the surrounding soil structure from high velocities.

i. Secure the appropriate site-specific Floc Logs in the storm water system far enough above the outlet to allow for adequate mixing to occur. For more information on this, see Storm-drain Applications under the Stormwater Treatment section.

ii. Cover exposed soil and rip rap around the outlet with a layer of jute matting to allow particle adhesion of flocculated material and prevent erosion of exposed soil below rip-rap if heavy flow occurs.

iii. Apply Silt Stop powder on top of matting using a seed or fertilizer spreader alone or mixed with other dry spread additives. Application rates for the polymer powder should follow the guidelines as detailed under Dry Spread applications under the Soil Stabilization section.

Step-by-step Outlet Protection

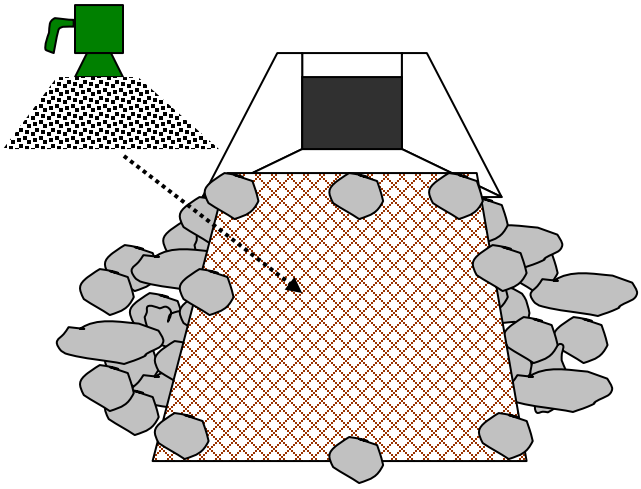


Step 1: Apply Matting.

Secure the jute matting over top of the rip-rap and any areas of bare soil.

Secure the matting with stakes, soil staples, or rocks as appropriate to expected outflow.

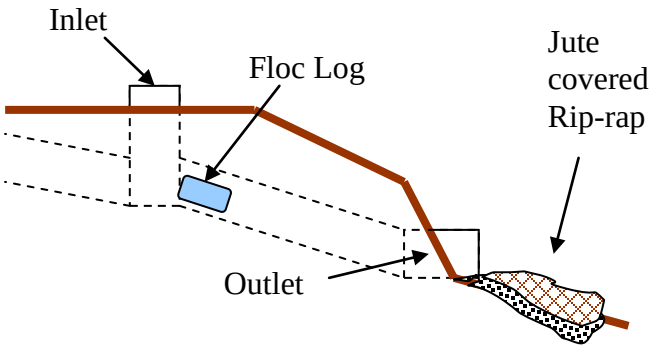
Ensure the matting is flush to the ground over any areas of bare soil.



Step 2: Apply Silt Stop powder.

The Silt Stop powder should be spread dry over the matting. Preferably the ground and matting should also be dry.

The Silt Stop powder can be applied by hand or with a seed/ fertilizer spreader.



Step 3: Install Floc Logs.

The Floc Logs shall be placed far enough above the outlet to meet the required mixing time with the stormwater before flowing through the outlet.

See Storm-drain Applications in the Stormwater Treatment section for more information.

Sediment Control

Large Scale Dredging System

Large scale dredging operations, where flow rates can exceed 20,000 GPM, require specific treatment systems. Here is a list of important things to remember when handling these situations:

- It is crucial that the bulk sediment is settled out before treatment; leaving only turbid water, not mud.
- Adequate mixing is imperative. Flocculation begins when water moves over and around the Floc Logs.
- Provide a settling pond collects the flocculated particulate that settles out of the water leaving clean water for discharge.
- A particle collection system is very useful for catching the fine floating particulate that might not have settled in the settling pond.

Large scale dredging systems need to be constructed using the following methodology:

i. Pump the material that has been dredged into a deposition pit to settle out bulk sediment.

ii. Turbid water leaving the deposition pit is pumped through a mixing system that contains site specific Floc Logs; this is where the flocculation process begins. **The specific dimensions of this mixing system are specific to the site.**

iii. The treated water is captured in a settling pond where the flocculated particulate can settle, so clean water can then be discharged. Particle curtains capture flocculated particulate as water flows through the settling pond.

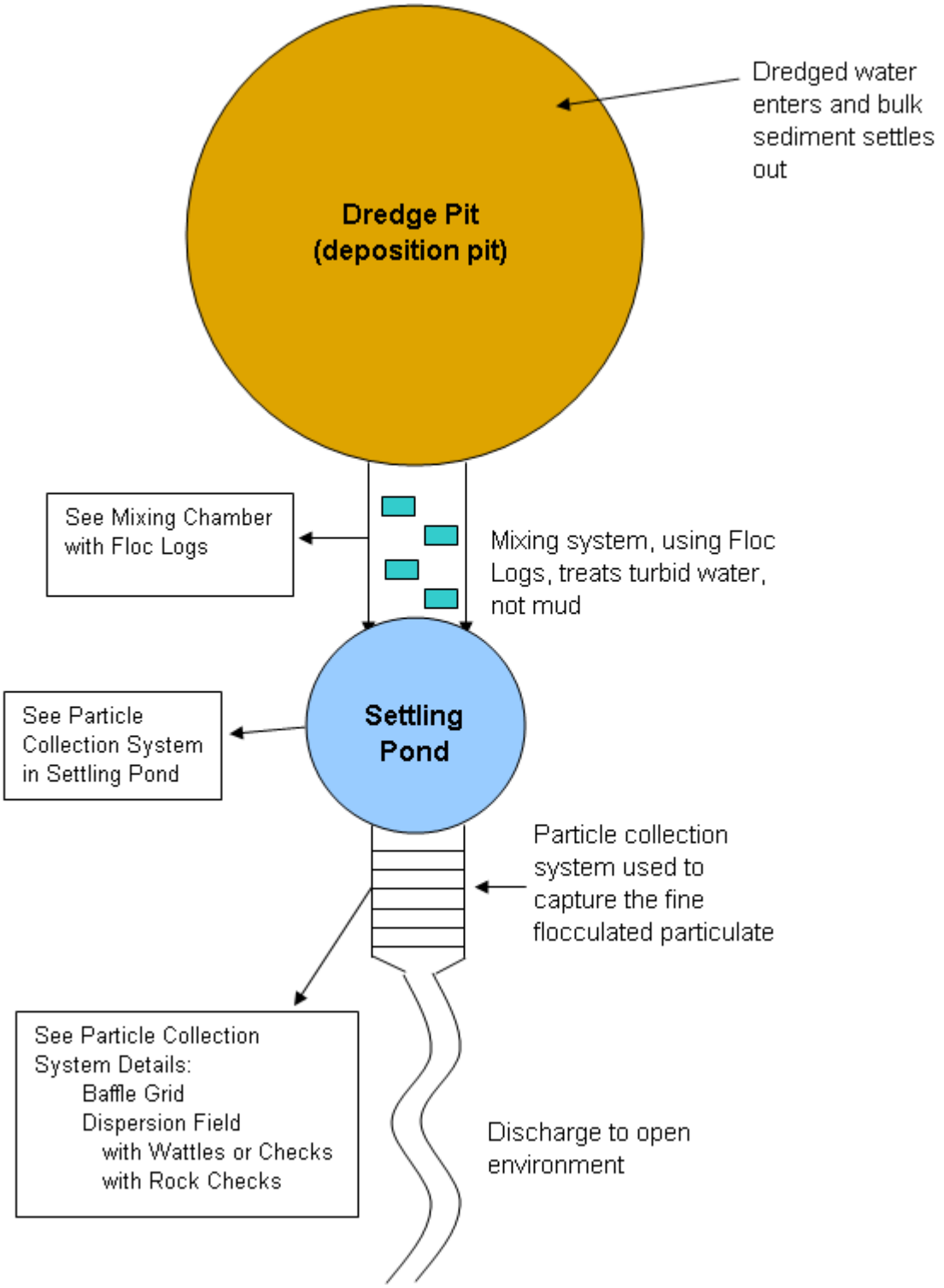
iv. A particle collection system (baffle grid or dispersion field) is used after the settling pond for final polishing of the water to capture any remaining fine particulate. **The dimensions of this particle collection system are specific to the site.**

v. Once the treated water has passed through the particle collection system it can then be discharged into the open environment.

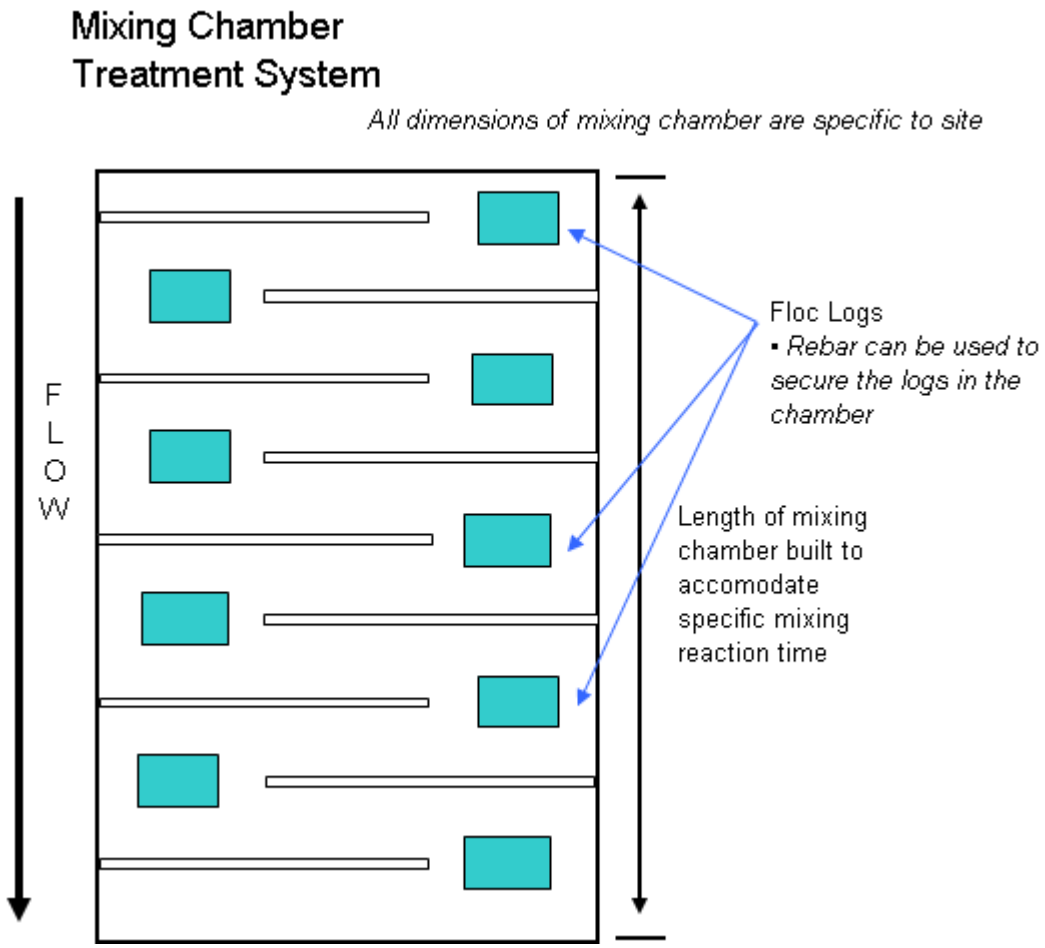
*For smaller scale or temporary dredging systems the dredge pit can be demucked following the procedures outlined in the Demucking Section page 71.

Step-by-Step Large Scale Dredging System

Dredging System Overview



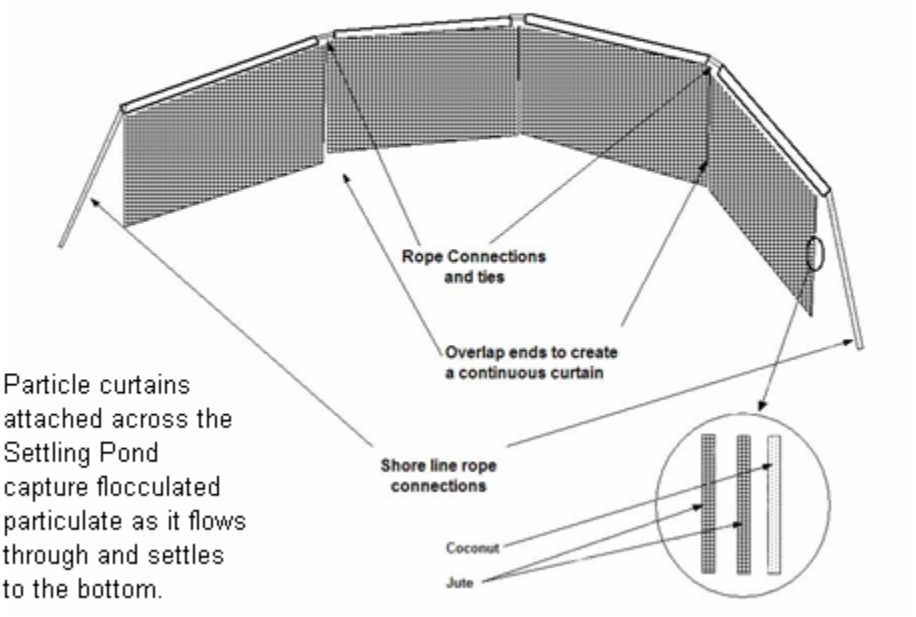
Mixing Chamber with Floc Logs in Detail



Particle Collection System in Settling Pond

Particle Curtains in Settling Pond

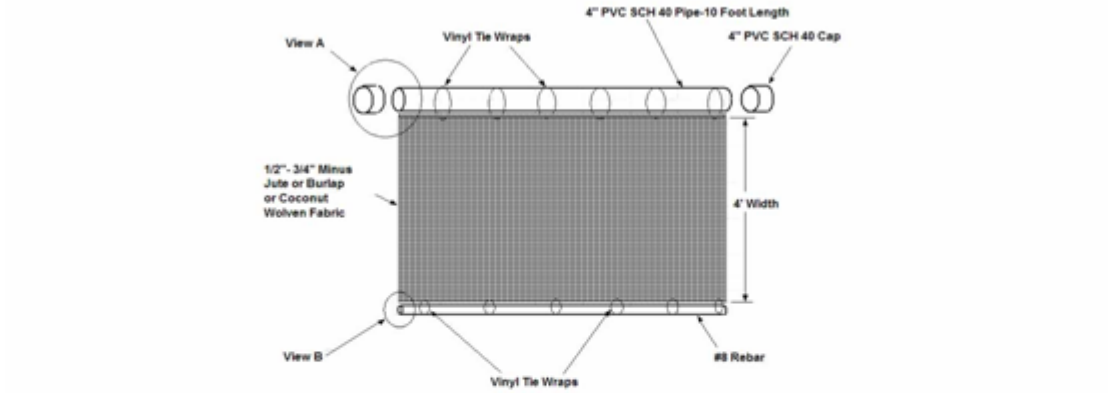
All dimensions of particle curtains are specific to site.

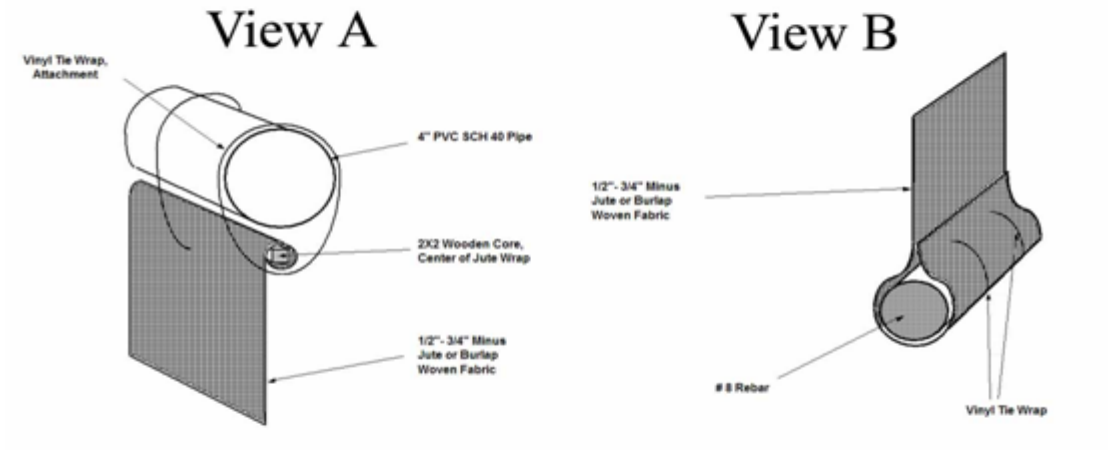


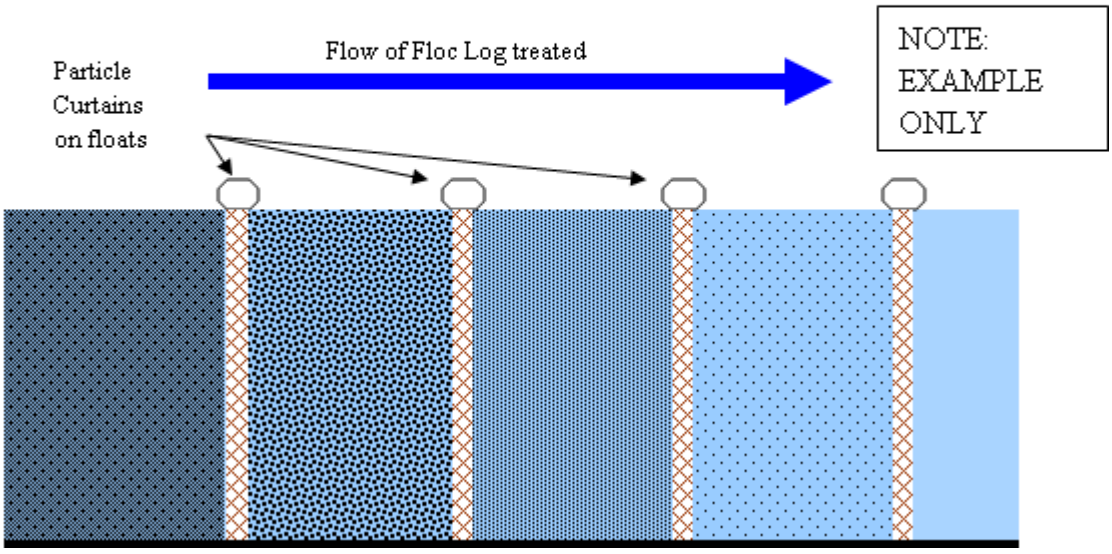
Particle curtains attached across the Settling Pond capture flocculated particulate as it flows through and settles to the bottom.

Particle Curtains Details

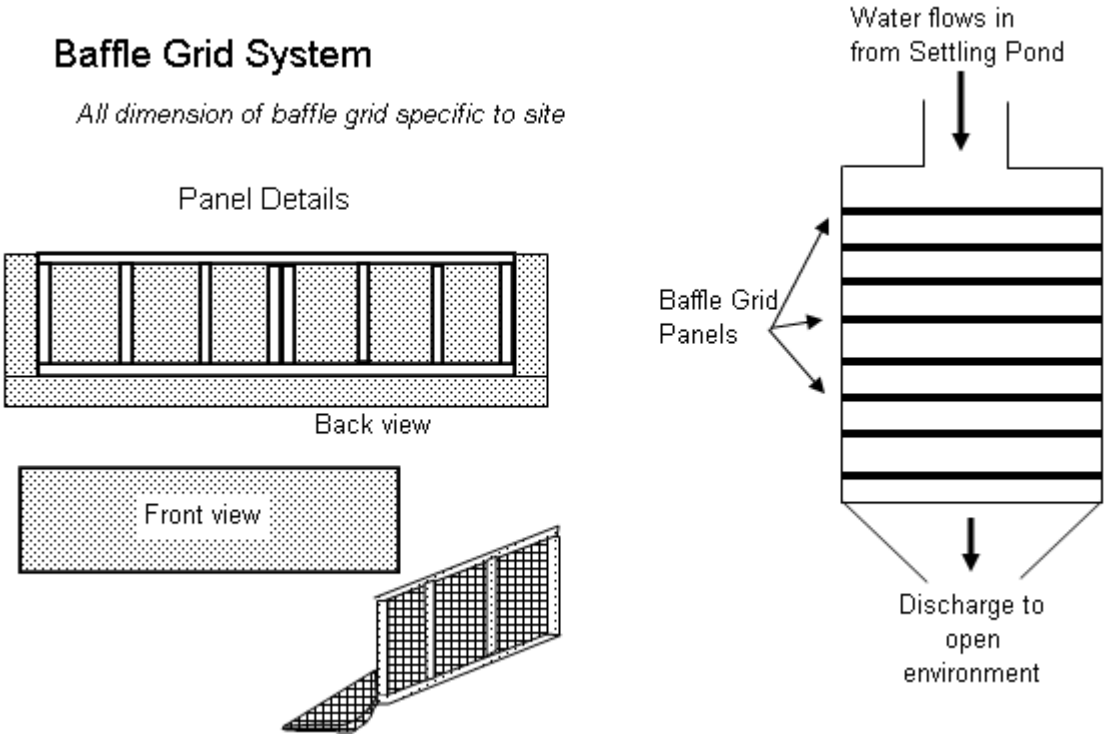
All dimensions of particle curtains are specific to site.



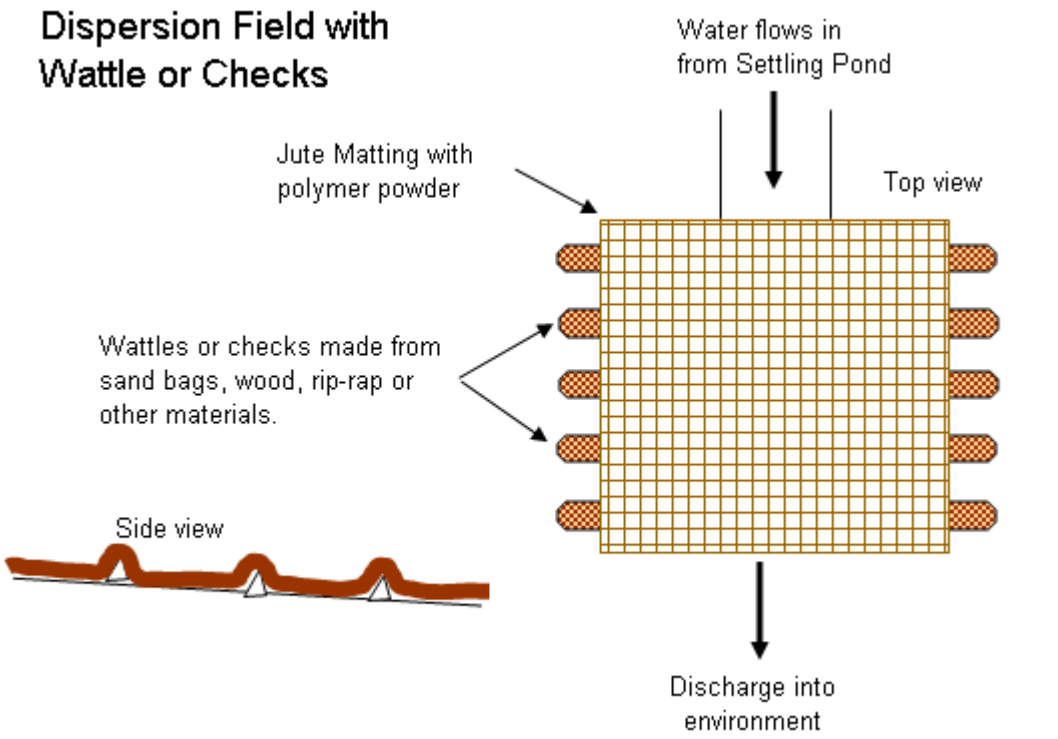




Particle Collection Systems Details



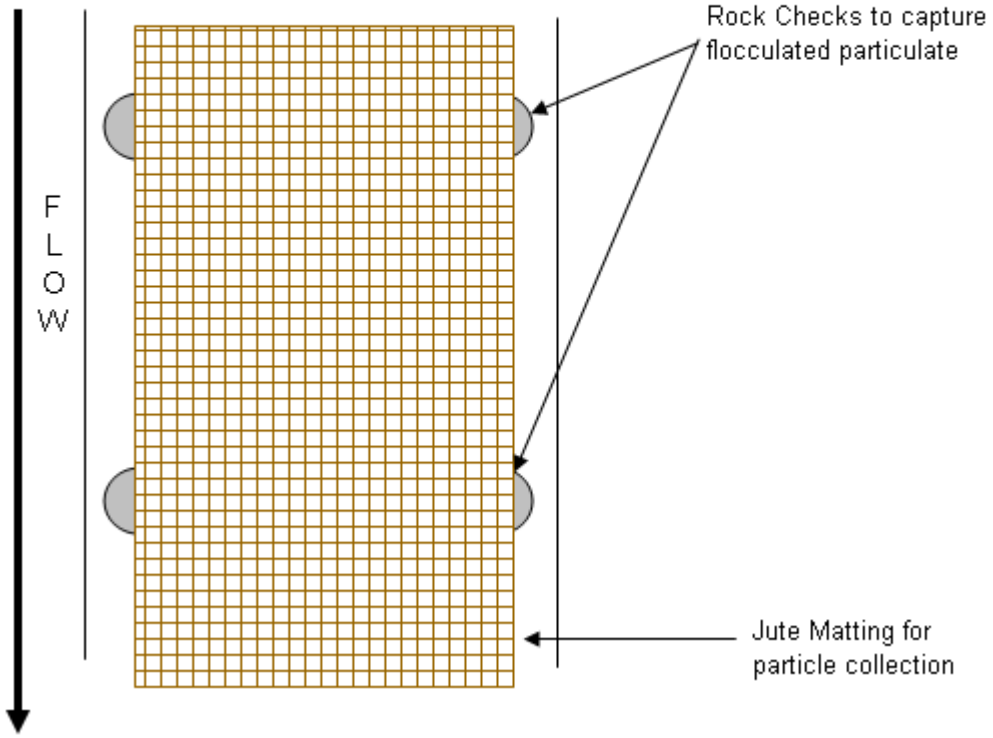
Particle Collection Systems Details



Particle Collection Systems Details

Dispersion Field
with Rock Checks

All dimensions of treatment ditch are specific to site



Sediment Control

Mud/Sediment Removal

Highly saturated soils can be messy and difficult to remove without spills or dripping. Adding a soil-specific polymer to the soil and mixing it in will bind the soil together, thickening the soil and making it easier to remove.

vi. Application rate: 50 pounds of Silt Stop powder/ 100-200 cubic yards. This application rate will vary with soil type and content.

vii. Pump or drain off the water from the pond, leaving the wet sediment behind. Note that there can be **no standing water**.

viii. Apply the site-specific Silt Stop powder **evenly** to the surface of the sediment, and use the bucket of the removal equipment to **stir it into the soil** to a maximum of 3 feet deep/ application. **DO NOT** dump the Silt Stop into a pile!

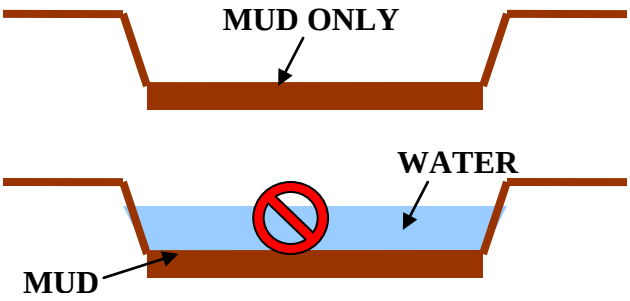
ix. Removal of sediment more than 3 feet deep shall be accomplished in layers.

x. Allow 10-20 minutes while mixing for the polymer to react with the soil, the more mixing you do, the less time this will take. There should be a visible texture change to the sediment to denote a completed reaction.

xi. The polymer will cause the sediment to thicken, making it easier to remove without liquid spills or dripping.

xii. The thickened sediment can then be used as a topsoil amendment to improve vegetation establishment, especially in areas prone to erosion. **This material is not suitable for use as structural fill.**

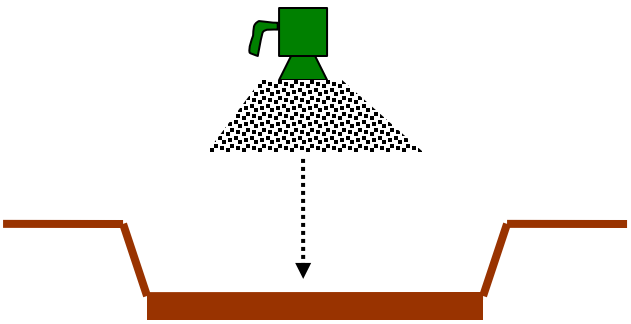
Step-by-Step Mud / Sediment Removal



Step 1: Remove Standing Water.

Pump the standing water off or dig a sump and allow the water to drain off of the working area.

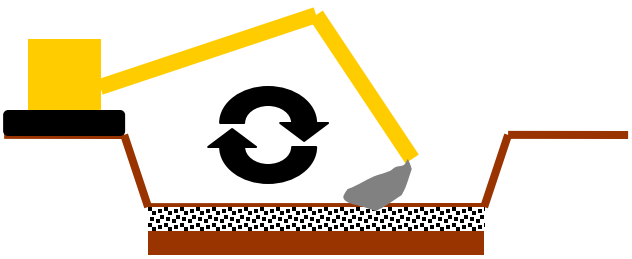
The polymer will not react properly if there is standing water covering the sediment.



Step 2: Apply Silt Stop powder.

Apply the site-specific Silt Stop powder evenly to the surface of the wet sediment.

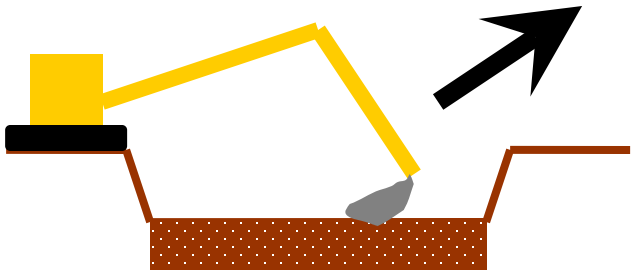
The powder can be applied using a hand-, mechanical-, or pneumatic-spreader.



Step 3: Mix the Silt Stop powder into the soil.

Using the excavation equipment, stir the powder into the mud to a depth of three feet. While mixing, the sediment should bind together and thicken.

If the sediment is deeper than three feet, the mixing and removal will have to be done in layers.



Step 4: Removal

Allow 15-20 minutes of mixing for the Silt Stop powder to react with the sediment, thickening it up. There should be a noticeable change in the texture of the sediment. Once the reaction is complete, the sediment can be removed in full bucket-loads just like normal dirt.

Thickened sediment can be used as a topsoil amendment, especially in areas prone to erosion, to improve vegetation establishment though it is not suitable for use as a structural fill material.

Pond & Lake Clarification

Aerator or Bubbler Mixing System

Pond Logs are designed for use in flowing conditions that will generate adequate mixing and reacting to allow the polymer blend to dissolve and disperse. Pond Logs are used to treat turbid water or nutrient laden water reducing TSS values, NTU values, nutrients and metals. An aerator or bubbler mixing system is used to introduce site-specific polymers to turbid waters in such a manner as to facilitate mixing and reaction between the polymer, and suspended particles. This type of system is most useful where there is a pond that does not have a natural source of agitation to stimulate a reaction for the Pond Logs.

An aerator is placed on the bottom of the pond where site specific Pond Logs are tethered allowing the bubbles to flow over and around them creating the agitation needed for the reaction that will allow the polymer blend to dissolve and be dispersed throughout the water. The aerator should be placed in the center of the pond so that the Pond Log concentration is not only in one area; this will promote even distribution and better performance.

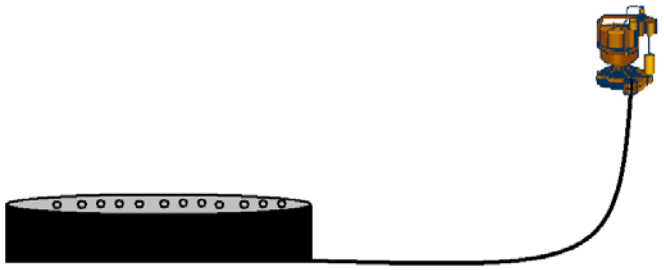
i. An aerator or bubbler mixing system is used to introduce the Pond Logs polymer blend into an aquatic site whenever a natural agitator (i.e. flowing water) is not available.

ii. The aerator system can be designed to hold multiple Pond Logs in a series for deep ponds or to hold many logs at a certain depth to combat turbidity.

iii. Floats are vitally important to this system for two reasons: to mark the place of the system in the pond and to hold up of the Pond Logs over the aerator. By securing the Pond Logs to the float line the Pond Logs will remain in the pathway of the bubbles produced by the bubbler or aerator.

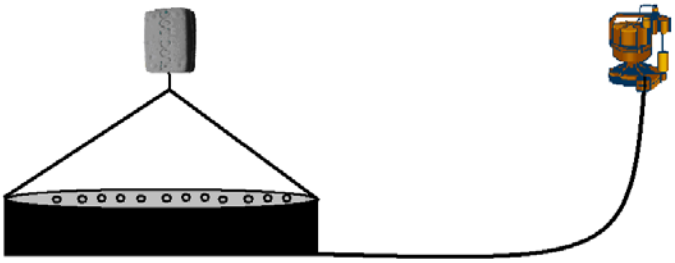
iv. Allowing the continual operation of the aerator, the Pond Logs will dissolve over time and therefore periodic observation and replacement is necessary

Step-by-Step Aerator or Bubbler Mixing System



Step 1: Pump Preparation

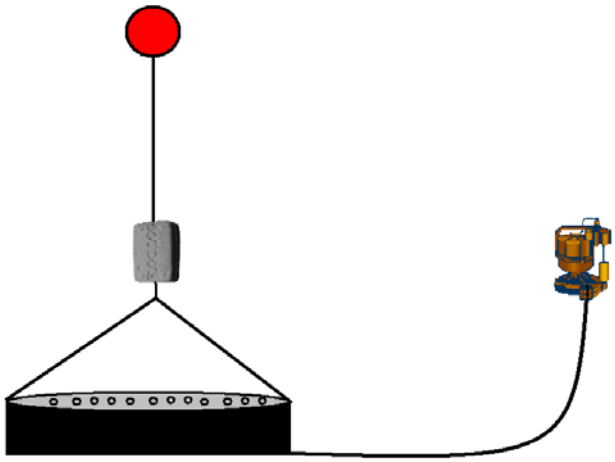
Prepare an aerator and pump system with air lines sufficient to place the aerator on the bottom of the pond. This system should be placed in a central location underwater in the pond.



Step 2: Pond Log Attachment

Tie a rope from the edge of the aerator in two or more positions to secure the Pond Logs.

When attaching the Pond Logs be sure that an inverted "V" shape is made by the rope, logs and aerator.

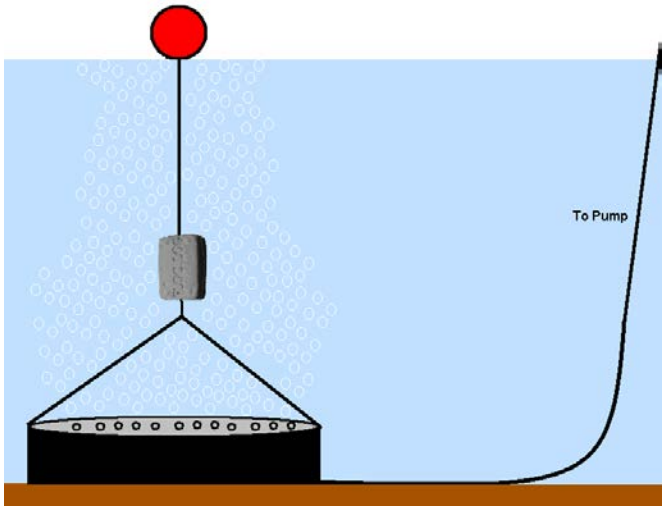


Step 3: Float Attachment

Secure the float to the system at the same point that the Pond Logs are attached.

This is recommended to ensure that the float does not get unattached from the system as the Pond Logs dissolve.

Step-by-Step Aerator or Bubbler Mixing System

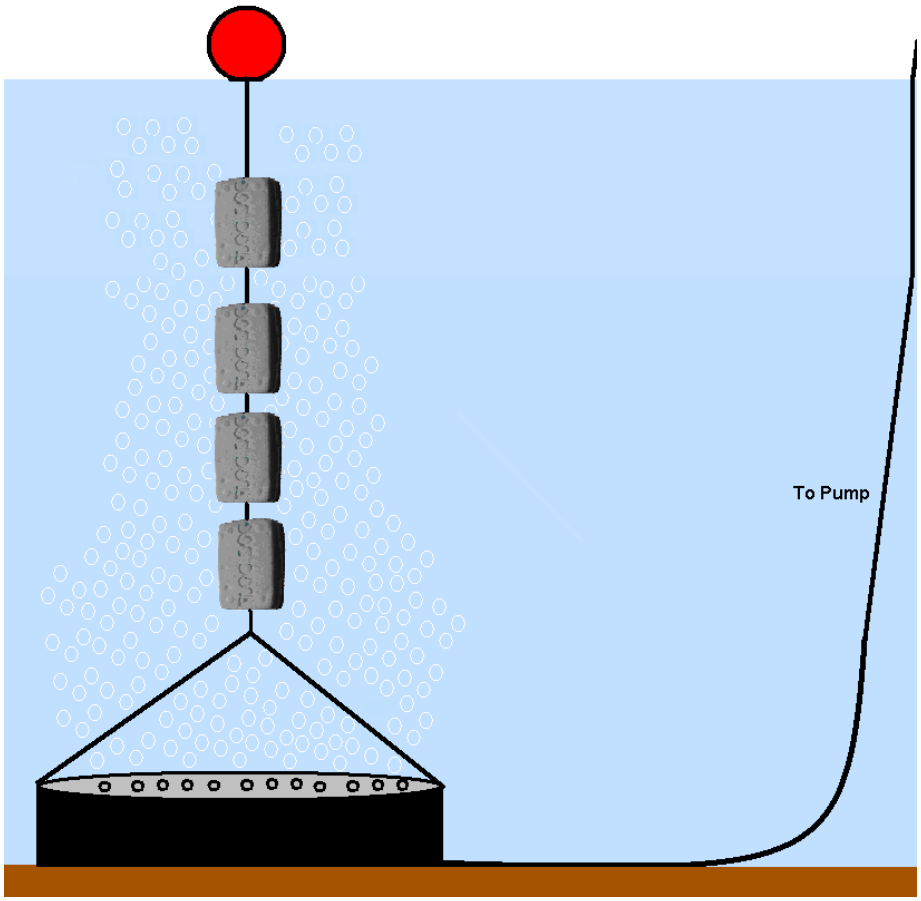


Step 4: Positioning of System

Using a boat slowly guide the system to the desired location (as close to the center of the pond as possible).

Be aware of the air line between the pump and aerator to prevent kinking and possible cutting from boat motor.

Aerator or Bubbler Mixing System with Multiple Pond Logs in Series



Pond & Lake Clarification

Floating Fountain Mixing System

The Pond Logs are designed for use in flowing conditions that will generate adequate mixing and reaction to allow the polymer blend to dissolve and disperse. Pond Logs are used to treat turbid water or nutrient laden water reducing TSS values, NTU values, nutrients and metals. A floating fountain mixing system is used to introduce site-specific polymers to turbid waters in such a manner as to facilitate mixing and reaction to dissolve the polymer block/logs and disperse the polymer throughout the body of water. This type of system is most useful where there is not a natural source of agitation to stimulate a reaction for the Floc Logs.

A basket is hung on the bottom of the fountain where site specific Pond Logs are tethered allowing the water flowing up to the fountain to create the reaction necessary to distribute the site specific Pond Log polymer blend by flowing over and around the Pond Logs. The fountain should be placed in the center of the pond so that the Pond Log concentration is not only dispersed in one area; this will promote even distribution and better performance.

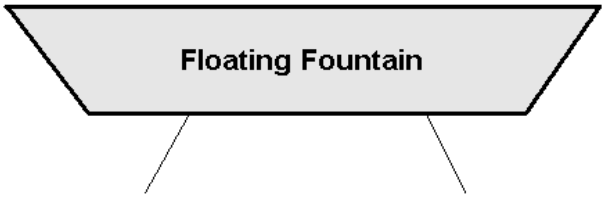
v. A floating fountain mixing system is used to introduce site specific polymer into an aquatic site whenever a natural agitator (i.e. flowing water) is not available.

vi. The floating fountain mixing system is designed to hold Pond Logs suspended in a basket under the fountain. It is important that the Pond Logs are in the flow of the water being pulled up by the fountain or this system will not perform at the maximum efficiency.

vii. The size of the basket used in this system depends on the number of Pond Logs that are needed in the system. Keep in mind; however, if the water source that is being treated is large it might be best to use multiple floating fountains instead of a larger basket on one fountain. Also, the logs need to stay in the flow of the water to work properly.

viii. Allowing the continual operation of the floating fountain, the Pond Logs will dissolve over time and therefore periodic observation and replacement is necessary.

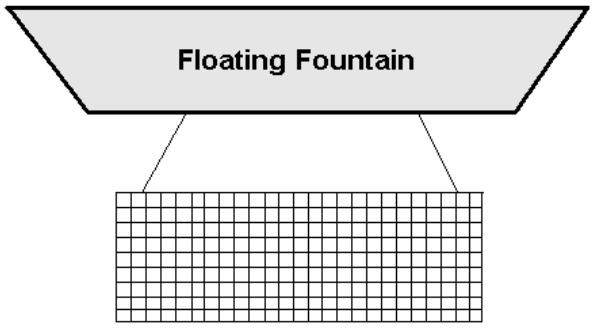
Step-by-Step Floating Fountain Mixing System



Step 1: Fountain Preparation

Assemble the floating fountain in accordance with the manufacturers' instructions.

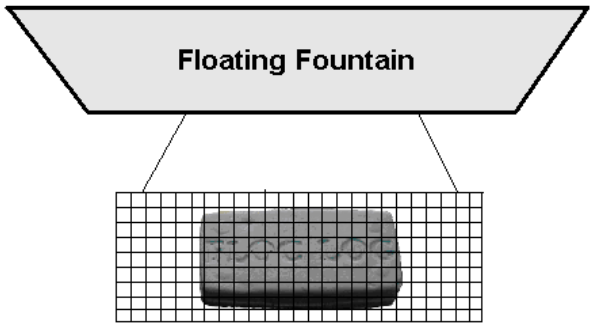
Next attach two lines to the bottom of the fountain approximately 6" long.



Step 2: Attaching the Basket

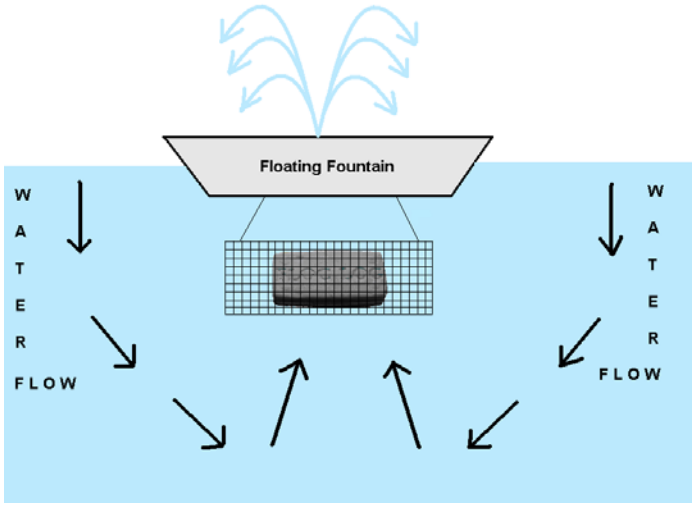
Secure these lines to the top of the Pond Log basket; making sure that the door to the basket is still accessible.

Be sure that there are no obstructions that would prevent water to flow past the logs.



Step 3: Pond Logs in Basket

Simply place the Pond Logs inside the basket and securely close it.



Step 4: Submerge the Fountain

Using a boat, take the entire system to the desired position and slowly release it.

It is important to remember that the continual operation of the fountain will shorten the life span of the Pond Logs so frequent observation is necessary.

Pond & Lake Clarification

Waterfall Mixing System

The Pond Logs are designed for the use in flowing conditions that will generate adequate mixing and reaction to allow the polymer blend to dissolve. Pond Logs are used to treat turbid water or nutrient laden water reducing TSS values, NTU values, nutrients and metals. A waterfall mixing system is used to introduce site-specific polymers to turbid waters in such a manner as to facilitate mixing and reaction to allow the polymer block/log to dissolve and be dispersed throughout the pond or lake. This type of system is most useful where there is a man made waterfall.

The Pond Logs are simply placed on each "step" to facilitate adequate mixing and reacting. This would be similar to a towel in a washer machine. It is important that the Pond Logs are in the flow of the water from the water fall or this system will not perform at maximum efficiency. The Pond Logs will need to be secured to prevent them from falling down the steps of the waterfall as a result of high rate water flow.

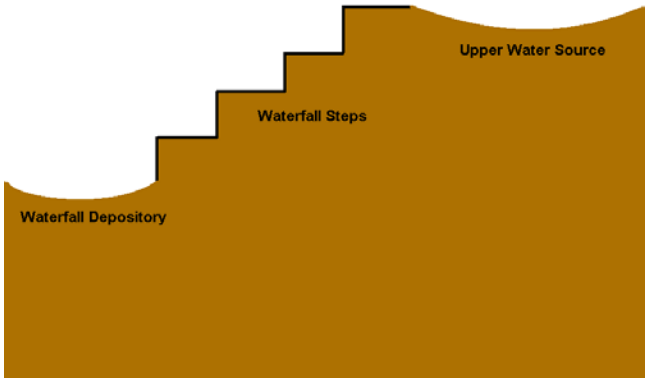
ix. A waterfall mixing system is used to introduce the Pond Logs polymer blend into an aquatic system.

x. The waterfall mixing system is designed to insert Pond Logs into the flow of water created by the waterfall. It is important that the Pond Logs are in the flow of water to facilitate mixing and reacting or this system will not perform at the maximum efficiency.

xi. The number of Pond Logs used in this system will vary on the dosage rate needed for the system and the number of steps available in the system. If there is a need for a high concentration but there are only a few steps it could be possible to put more than one Pond Log on each step.

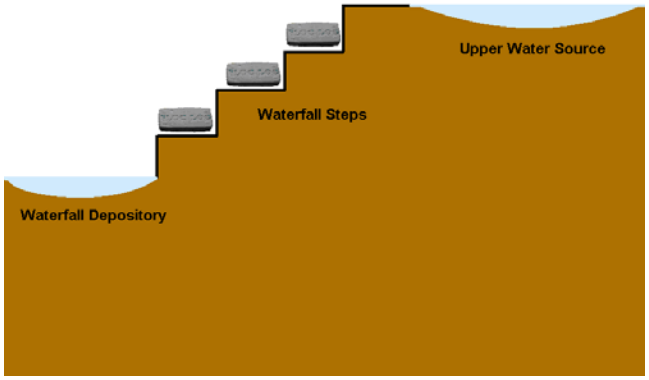
xii. Allowing the continual operation of the waterfall, the Pond Logs will dissolve over time and therefore frequent observation and replacement will be necessary.

Step-by-Step Waterfall Mixing System



Step 1: Waterfall Preparation

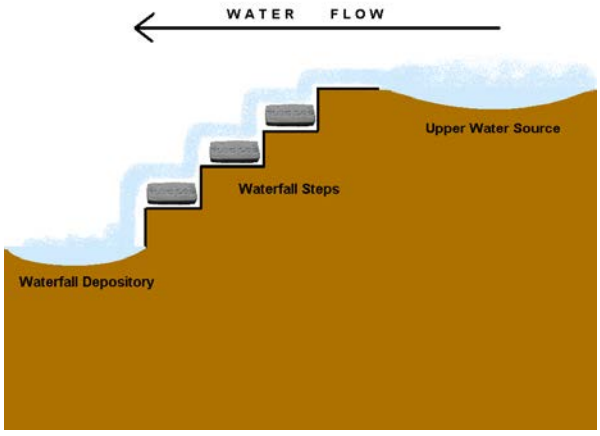
In man made waterfalls "steps" must be created for the Pond Logs to sit on.



Step 2: Pond Log Placement

Secure the Pond Logs to the appropriate steps of the waterfall depending on the needed dosage rate for the system.

In areas where the water flow is faster it may be necessary to secure the Pond Logs at both ends to the ground outside the waterfall.



Step 3: Start the System

Turn on the water ensuring that the Pond Logs are being completely covered with water as it flows downward.

Sampling Submission Procedure

The important thing to remember about these polymers and their application is that they are **site-specific**; we match the blend of material to the specific soil type at your site to ensure the best performance possible. However this means that we need to test the soil from **each site** to be able to choose the appropriate polymer blend.

We are happy to offer this analysis of samples from your job site, **completely free of charge**, to determine exactly which blend of polymer will be most effective with your specific soil lithology. We usually have **one day turn-around** on sample analysis, to help you get results fast.

For free sample analysis at our lab, please include:

♦ **Sample from site**

200g of soil (about a coffee cup sized sample) in a plastic bag or container and/or
500 mL of turbid water (about a pop-bottle sized sample) in a plastic container.

If there are different types of soil on the site (fill material being brought in, etc.) please provide samples of each. If runoff from each of these soil types flows into the same ditch or storm water pond, they may be mixed together as a single composite soil for analysis.

♦ **Contact Information**

Your name, company name, and contact information (phone number, fax number and email) so that we can get back to you with the results. A business card or letter head is fine.

♦ **Information about the site/ project**

What are you doing on the site, and what types of applications are you are looking at using the polymer for? Are you looking for a tackifier/binder, water clarifier, thickener for mud removal, etc?

A rough sketch, design, or photos of the site can help us to fit the appropriate polymer application to your site. If you are interested in storm water clarification, please provide the distances or lengths of water flow conveyances (pipes, ditches, etc.) as well as the volume of flow expected through these conveyances.

Please send the samples to:

Applied Polymer Systems, Inc.
ATTN: Lab 519 Industrial Drive
Woodstock, GA 30189

Submitting Samples for Analysis

Send Samples to:

Applied Polymer Systems, Inc.
Attn: Lab
519 Industrial Dr.
Woodstock, GA 30189

678-494-5998 phone
678-494-5298 fax
info@siltstop.com

Client Information:

Name: _____
Company: _____
Address: _____
_____
_____
_____
_____
Phone: _____
Fax: _____
Email: _____

Project Name: _____
Site Location: _____

Send Report to: (normally sent via fax or email)
_____
_____
_____
_____
_____

Turn Around Time:
- □ Normal (usually 1 day)
- □ Rush (must be pre-approved by APS)
  Approved by _____

Sample Type:
(send in leak-proof container)
- □ 200g of soil
- □ 500mL of water (turbid)
- □ Both

Job Specifications:
Please include a rough sketch, diagram, or photographs as needed

□ **Soil Stabilization** – soil specific polymer additions for grassing/ hydroseeding/ mulching

□ **Water Treatment** – site specific polymers used to clarify turbid stormwater, remove sediment and reduce TSS. *Placed in areas of flow.*
Distance/ length of water conveyance: _____
Volume of flow expected: _____
Flow rate expected: _____

□ **Demucking** – soil specific polymer for highly saturated soils (thicken for easier removal)

□ **Soft Armoring** – soil specific polymer to bind matting (jute, coir, coconut, hemp, etc.) to create a highly erosive resistant surface.

□ **Check Dams** – soil specific polymer enhancement to allow for collection of fine particles

□ **Other –** Please specify: