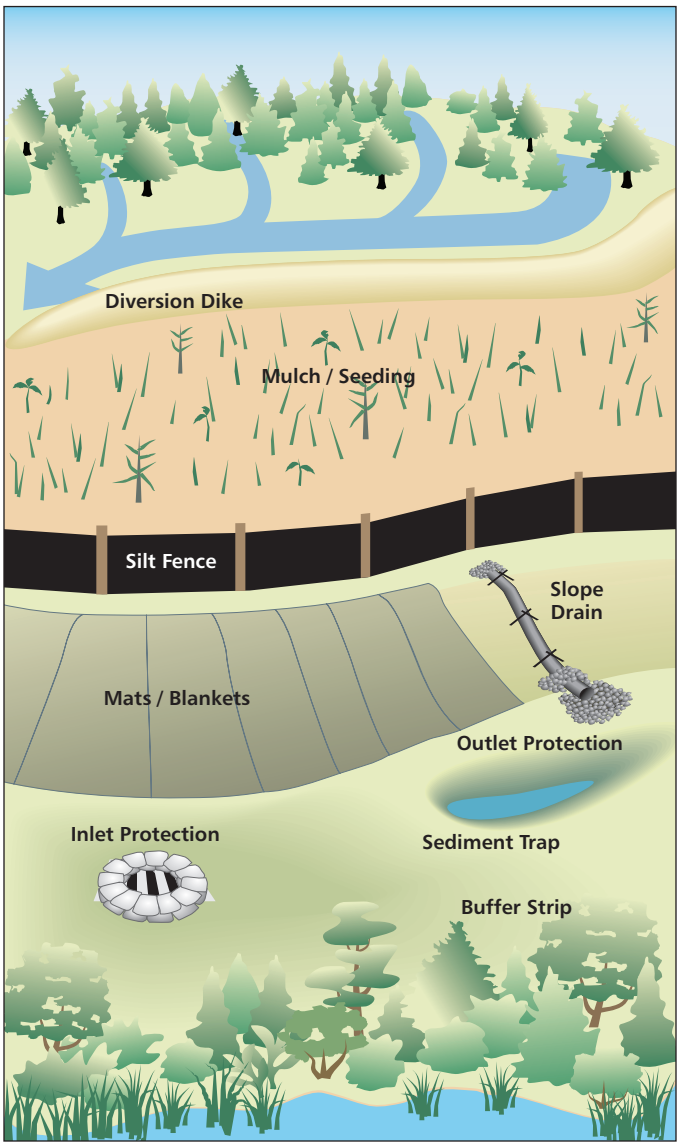
Idaho Construction Site EROSION *and* SEDIMENT CONTROL

FIELD GUIDE



Preface

This Field Guide was prepared to provide a quick handy guide for persons involved in land disturbing activities. This includes homebuilders, general contractors, road builders, installers of best management practices, erosion and sediment control planners and designers, plan reviewers and inspectors.

The Field Guide covers the most commonly used erosion and sediment control practices. The controls in this Guide should be installed in accordance with industry standards and good engineering practices, and where available, manufacturer's specifications.

Please notify Shannon Campbell, Environmental Assistance Coordinator, at the Idaho Small Business Development Center of any corrections or changes that should be made in future editions. Email shannoncampbell@boisestate.edu or phone 208-426-1839.

Acknowledgements

This Field Guide is a product of a partnership coordinated by the Idaho Small Business Development Center. The partnering organizations are listed below.

- Associated General Contractors
- U.S. Environmental Protection Agency
- Idaho Association of Highway Districts
- Idaho Transportation Department
- Multiple Idaho cities and highway districts
- Local Highway Technical Assistance Council

Graphics in this document were produced by Emily Faalasli for a similar manual developed by Tetra Tech for the Kentucky Division of Water and Division of Conservation. For more information, email Barry Tonning of Tetra Tech at barry.tonning@tetratech.com.

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Table of Contents

Introduction

This Field Guide provides general guidance (descriptions and illustrations) for installing and maintaining many of the erosion and sediment control practices, referred to as Best Management Practices (BMPs). Detailed design plans/drawings are the basis for meeting requirements on most sites and the plan design requirements take precedence over details in the Field Guide. Also, the Field Guide is not intended to be used for specifications in instances where a design is not available. A professional should always be consulted.

Compliance Considerations

Construction activities (including other land-disturbing activities) that disturb 1 acre or more or smaller sites that are part of a larger common plan for development or sale are required to obtain coverage under the federal storm water permit. Local regulations may also apply.

Before Construction

Operators of regulated construction sites are required to develop and implement a Storm Water Pollution Prevention Plan (SWPPP) and to obtain permit coverage from the Environmental Protection Agency (EPA) under the Construction General Permit (CGP). The CGP outlines applicable requirements for all owners of land where applicable construction activity occurs, including:

- Develop, implement, and update a SWPPP for the site.
- Schedule installation of Best Management Practices (BMPs).
- Submit a Notice of Intent (NOI) 30 days prior to construction if this is a new project. Secondary operators on a project that already has coverage should submit a NOI seven days prior to construction.
- Install clean water diversions, sediment traps/basins and stabilize drainage channels with grass, liners, and silt check dams *before* excavation, fill, or grading work begins.
- Install silt fences and other sediment barriers downhill from bare soil areas before clearing or excavation work begins.
- Implement housekeeping BMPs (e.g., covering stockpiles) as soon as possible after the project breaks ground.
- Post sign near the main entrance of the site with a copy of the NOI, the location of the SWPPP and a contact person listed.

During Construction - Inspections

- Inspect all areas of the site disturbed by construction activity, all erosion and sediment controls and all stormwater discharge points.
- Inspect erosion and sediment controls at least once every two weeks (once a month in areas with <20 inches ppt), within 24 hours of the end of a storm event of 0.25 inches or greater, and within 24 hours of a discharge generated by snowmelt.
- Visually examine stormwater discharges for the presence of suspended sediment, turbidity, discoloration and oil sheen.

During Construction - Maintenance

- Maintain all temporary and permanent erosion control BMPs as needed to assure continued performance.
- Remove brush and other debris from culvert and channel inlets.
- Remove rock or sediment accumulating behind silt fences or other sediment filters regularly.
- Repair all structures that have become dislodged or damaged (such as silt fences, check dams, etc.) as soon as possible and prior to next storm event.
- Take corrective action by close of next full working day if a control is not functioning properly or immediately if there is a muddy or prohibited discharge from the construction site.
- Eliminate non-stormwater discharges from the construction site to storm drains and other water bodies. Non-stormwater discharges may result from a variety of sources, including dumping, leaking storage and maintenance areas, and spillage of chemicals and waste materials.

During Construction - Records

- Keep stormwater permit documentation on-site or within reasonable access to the site (i.e., General Permit, NOI, SWPPP and Site Log Book).
- Keep records of inspection observations, maintenance activities and corrective actions taken, and file with other paperwork.
- Amend the SWPPP whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the potential for discharge of pollutants.
- Amend the SWPPP if it is ineffective in significantly reducing pollutants.

- Amend the SWPPP if a new contractor and/or subcontractor will implement any measure of the SWPPP.
- Sign, date and keep all amendments as attachments to the original SWPPP.
- Stabilize all portions of the site.

After Construction

- Remove temporary controls such as silt fence and permanently stabilize site when the project is completed.
- Fill, grade, and seed temporary sediment traps or basins and remove silt fences, check dams, and other controls prior to filing a NOT.
- See details of the federal CGP for more information on post-construction closeout requirements.
- File Notice of Termination (NOT) when final stabilization has been achieved.

Best Management Practices

The section provides information about the most common BMPs. These practices are organized by where they are found on a construction site as follows.

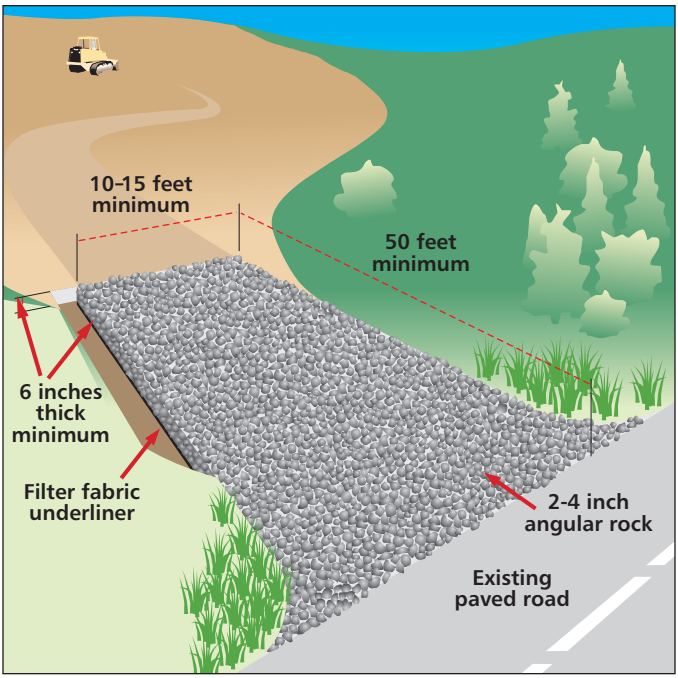
- Construction Entrance/Exit
- Staging Areas
- Slopes
- Channels
- Bare Ground
- Inlets and Outlets
- Water Collection and Discharge Areas

Construction Entrance/Exit

Stabilized Construction Entrance/Exit

Minimize vehicle tracking of dirt or mud from the construction site. A rock construction exit can reduce the amount of dirt transported onto paved roads by vehicles by knocking mud off the vehicle tires. Use street sweeping or install a wheel wash if the stabilized entrance is not effective in preventing track-out. No visible signs of tracking from vehicles should be present on public or private roadways exiting the site.

Inspect construction exits daily and after storm events for evidence of off-site tracking onto paved surfaces. Remove tracked dirt from all off-site paved surfaces within 24 hours of discovery, or if applicable, within a shorter time.



The stabilized area may be larger or smaller, depending on the size of the construction site and equipment. On a single lot, the stabilized are should be a minimum of 12 feet wide and the length of the lot driveway or the maximum length that can be achieved.

Stabilized Construction Entrance/Exit Troubleshooting tips

Condition	Common Solution
Dirt tracking from the site.	Reschedule project activities for dry periods, prevent vehicles from accessing bare soils or provide wheel wash or equivalent control. Sweep, shovel, or vacuum these surfaces to remove track-out material by the end of the same work day.
Vehicles are leaving the site from other locations and not using the designated construction exit.	Designate access points and require all employees, subcontractors, and others to use them. Fence or barricade other access points.
Aggregate needs to be replaced or replenished.	Remove accumulated sediment and/or replace material as needed.
Aggregate material is being incorporated into soil.	Use filter fabric under base material.
Construction exit not long enough to remove mud from the tires.	The access point should be at least 50 feet in length or four times the circumference of the largest construction vehicle tire, whichever is greater.
Runoff leaving the site.	Grade construction entrance/exit points to prevent runoff from leaving the construction site.

Staging Areas

Material Storage and Waste Management

CONSTRUCTION MATERIALS

Store materials delivered in bags and boxes on pallets. Cover bagged/boxed materials on non-working days and prior to rain events to protect materials from wind and precipitation.

HAZARDOUS MATERIALS/WASTE

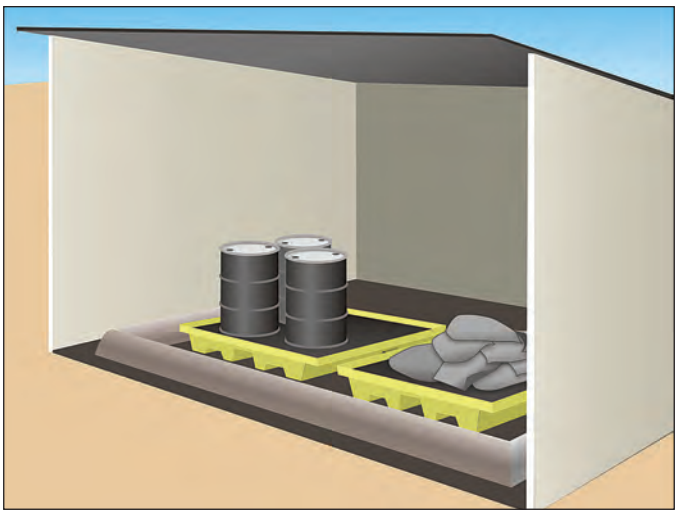
Store oil, gasoline, paint and any hazardous substances in drums and bags on pallets under cover and in secondary containment. Storage of larger fuel containers requires secondary containment and spill control requirements may apply. Store hazardous materials in the original containers with their original product labels. Restrict access to storage areas to prevent vandalism.

SOLID WASTE

Properly dispose of solid waste (collected sediment, paper, plastic, construction and demolition debris, and other wastes).

PORTABLE TOILETS

Do not locate portable toilets near drainage facilities, water bodies, or in areas that will collect water. Check toilet waste storage and disposal procedures weekly. Ensure that the toilets are maintained in good working order and wastes are transported offsite by a licensed service. Stake toilets or otherwise secure to ground.



Material Storage and Waste Management Troubleshooting tips

Condition	Common Solution
Materials located throughout construction site.	Designate storage area away from water bodies and storm drains. When practical do not stockpile materials on site. Bring to the site only what will be used within a reasonable timeframe.
Litter and trash found on construction site or in the storm drain system.	Provide dumpsters or other containers. Collect trash and dispose of properly.
Overflowing dumpsters.	Arrange for waste collection before containers overflow.
Leaking dumpsters.	Contact dumpster provider and request new dumpster. Close lid or provide covering.
Hazardous chemicals, drums, or bagged materials are stored directly on the ground.	Place material on a pallet and when possible, under cover and in temporary containment.
Hazardous waste containers are not labeled.	Re-label items with an original label or remove substances from the site.
Leaking hazardous materials containers.	Contain immediately. Overpack leaking container. Properly dispose of waste and any contaminated soil as a hazardous waste. Provide secondary containment for hazardous materials.
Portable toilet tipped over.	Place toilet on level surface and out of drainage paths or traffic areas. Stake down.
Portable toilet leaks.	Repair or replace.

Staging Areas

Stockpile Management

Stockpile protection is a year-round concern. Install temporary barriers around stockpile perimeters to prevent contact with storm water runoff when necessary. Temporary barriers can be berms, dikes, silt fences, or sandbag barriers. Protect all active stockpiles with sediment barriers prior to rain events.

SOIL STOCKPILES

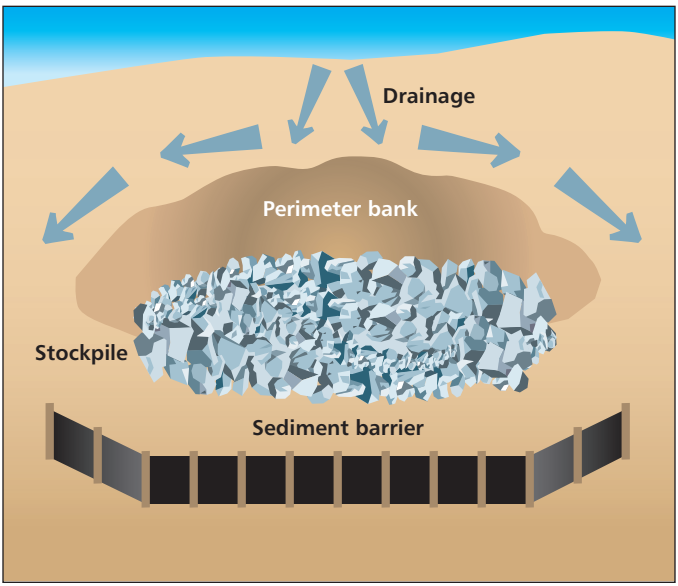
Cover inactive soil stockpiles or protect them with soil stabilization: tackifier, sandbag-weighted plastic, or seed and mulch.

PAVING MATERIAL STOCKPILES

During the rainy season, cover inactive stockpiles of Portland Cement concrete aggregate, asphalt concrete, rubble, and aggregate base and sub-base, and protect with a temporary perimeter barrier at all times. During the non- rainy season, cover inactive stockpiles or protect with a sediment barrier.

ASPHALT BASED COLD-MIX STOCKPILES

Place active and inactive cold-mix stockpiles on plastic and cover with plastic prior to rain events.



Stockpile Management
Troubleshooting tips

Condition	Common Solution
Stockpile eroded.	Cover stockpile with plastic sheeting or spray with a soil stabilizer. Protect with a temporary perimeter sediment barrier around the stockpile.
Stockpile in water flow path.	Remove stockpile from the drainage path or protect with a berm, dike, or temporary diversion device.
Storm water run-on affects stockpile.	Protect the stockpile by using temporary perimeter sediment barriers such as berms, dikes, silt fencing, or sandbags.
Wind causes erosion and/or blowing dust.	Cover stockpile or spray with a soil stabilizer. Use a water application to suppress dust. Install wind barrier.
Cold-mix stockpile is on the bare ground.	Remove stockpile and place on plastic or similar material.
Cold-mix is stored in curb drainage way.	Remove stockpile from flow line.

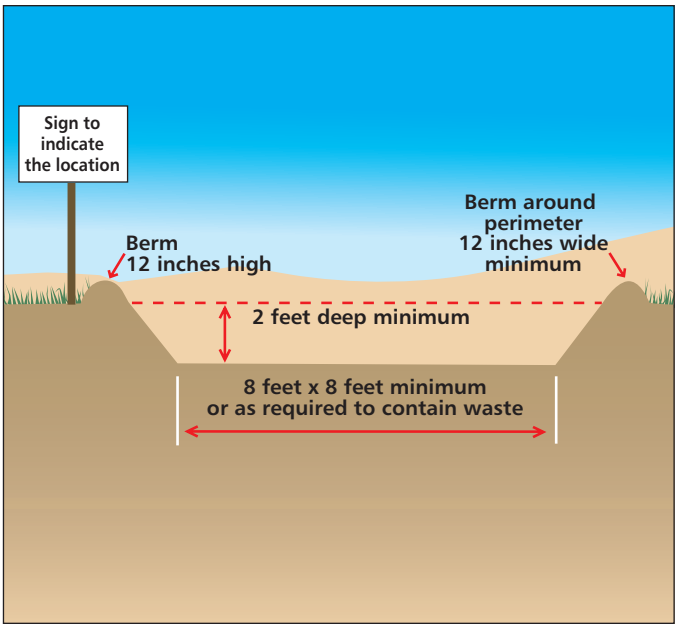
Condition (Plastics)	Common Solution
Plastic sheeting separates along the seams.	Overlap edges of plastic sheeting by 12-24 inches, tape the entire length or anchor with sandbags along seam.
Plastic sheeting tears and separates.	Overlap plastic sheets by 12-24 inches, tape edges together or weight down. Maintain installation by replacing torn areas.
Plastic sheet is blown or displaced by winds.	Maintain installation by replacing sheets in position. Anchor with sandbags or other suitable tethered anchoring system, space on 10 foot grids.

Staging Areas

Washout Area

Concrete washout structures are used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery.

- Washout area can also be used for concrete, sheet rock mud, stucco, and masonry.
- The pit (or ready-made structure) should be large enough to contain the anticipated waste from operations.
- Washout pits should be lined with a minimum of 10-ml polyethylene sheeting, free of holes or other defects when located in sandy soils, environmentally sensitive areas, in areas where there is high ground-water or when used for disposal of wastes other than those listed above.
- Washout areas should be located a minimum of 50 feet from storm drains or receiving waters.
- Inspect daily when in use.
- Maintain washouts to provide a minimum of one foot freeboard. Clean existing facilities or construct additional facilities when the washout is 50% full.
- Allow waste to dry and then dispose of as solid waste.



Concrete Washout
Troubleshooting tips

Condition	Common Solution
Washout overflows.	Pump or siphon off excess liquids and properly dispose. If necessary, discontinue using washout and construct new facility to contain anticipated washout operations.
Drivers not using washout area.	Place sign at washouts and instruct drivers of the washout locations. Educate drivers and other concrete company personnel.

Slopes

Stabilize slopes immediately after grading work is completed or within 14 days of construction either temporarily or permanently ending on that area of the site. Tracking is often the first practice used to stabilize bare slopes. Seeding and mulching provide the best and cheapest protection. Use one or more of the following actions to reduce erosion on slopes.

Mats and Blankets

Mats and blankets are used for temporary stabilization of disturbed soils and establishing vegetation. Erosion control blankets are used to protect steep slopes, drainage ditches, and other areas where erosion potential is high. Mats are similar to erosion control blankets, but are thicker and sturdier because they have more layers and sturdier fill material.

Installation

- Install blankets and mats up and down long slopes.
- For channels, install parallel to flow of the channel, as per manufacturer's directions.
- For short slopes (less than roll width) above channels, install blankets across the slope (horizontal).
- Grade, disk, and prepare seedbed. Seed the area before mat installation.
- Install the product starting from the top of the slope, anchored in a 6 inch by 6 inch trench that is backfilled and tamped firmly.

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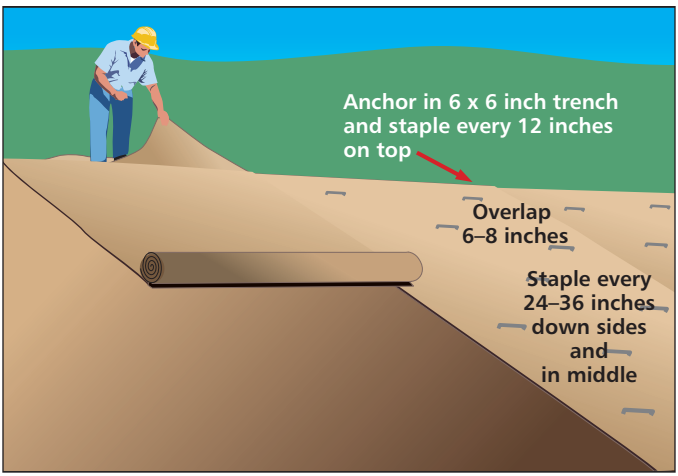
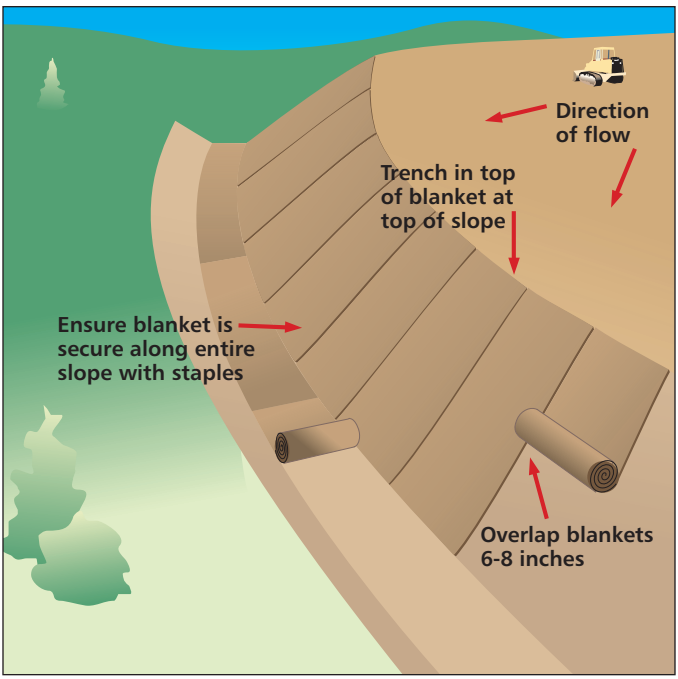


- Walk blankets and mats down to ensure good contact with the soil. Staple blankets/mats every 12 inches on tops and 24–36 inches down the sides and in the middle, according to manufacturer's directions.
- Do not stretch blankets, and do not exceed manufacturer's directions on maximum slope angle for the product.
- Additional staking or stapling is needed for applications in channels that carry flowing water, and on steep slopes. Inspect before and after each rain event and twice monthly until the tributary drainage area has been stabilized.



Mats and Blankets
Troubleshooting tips

Condition	Common Solution
Anchoring is failing. Undercutting occurring.	Dig trench along the top and bury the blankets. Use staples to anchor according to manufacturer's recommendations.
Undercutting due to inadequate preparation.	Repair the soil surface. Remove rocks, clods and other obstructions. Fill in rills in uneven areas to promote good contact between mat and soil.
Excessive water flow across stabilized surface.	Use other BMPs to limit flow onto stabilized area or reduce slope length. See Berms, Ditches and Swales, Slope Tracking.

Condition (Geotextiles)	Common Solution
Undercutting occurs along the top of the slope.	Dig a trench along the top of the slope (6 in by 6 in) and anchor blanket into trench by back filling and tamping the soil.
Blankets separate along the seams.	Overlap edges of blanket by 6 inches and staple every 3 feet, or according to manufacturer's directions.
Blankets separate where the rolls are attached end to end.	Shingle the blanket so that the top blanket overlaps the bottom blanket by 6 inches and staple through the overlapped areas every 12 inches.
Blanket does not make complete contact with the soil surface.	Prepare the soil surface by removing rocks, clods, sticks and vegetation; fill in uneven areas.

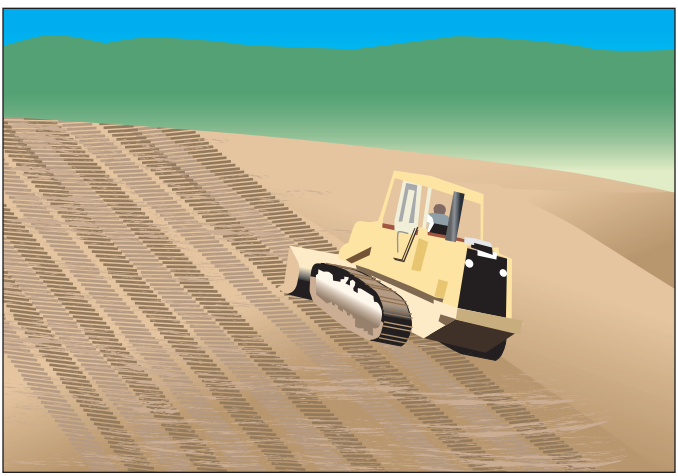
Slopes

Slope Tracking

Slope tracking will help hold soil in place, trap seed and reduce runoff velocity. This can be done using tracked equipment, by using a serrated wing blade attached to the side of a bulldozer, or by other agricultural equipment such as spike-toothed harrows.

SLOPE TRACKING CAN BE USED ON:

- all slopes to be seeded,
- all slopes steeper than 1:3 having a vertical rise of 5 feet or greater,
- on areas that would otherwise be unfavorable for plant establishment,
- or as a temporary stabilization on bare soils exposed by construction activities.



Tread-track slopes up and down hill to reduce erosion.

Slope Tracking
Troubleshooting tips

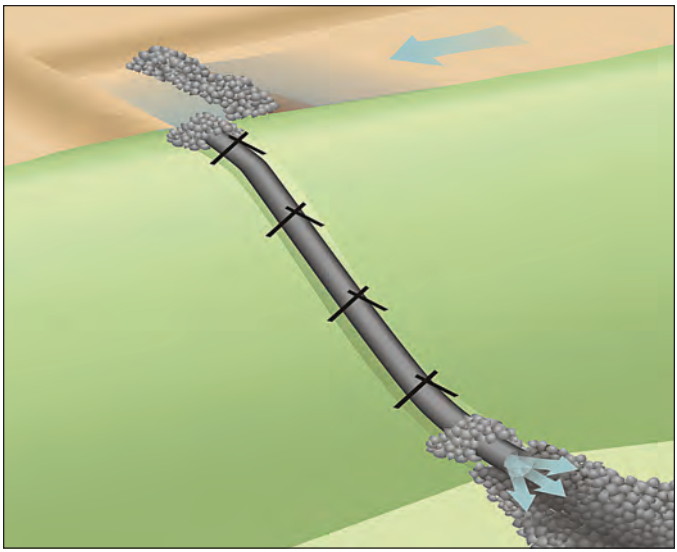
Condition	Common Solution
Evidence of rills or washes.	Verify that indentations are perpendicular to the slop of the hill. Re-track, if necessary. Evaluate upslope controls and install additional BMPs.

Slope Drain

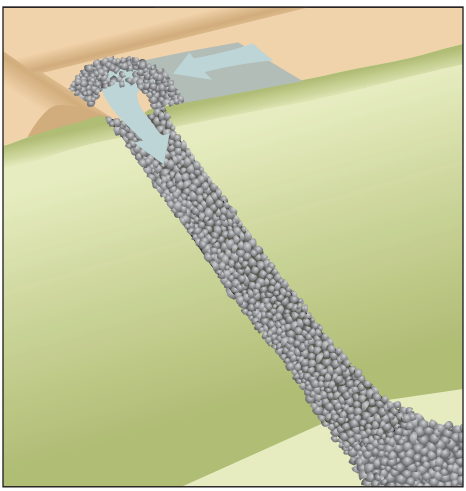
If slopes are broken up into benches or steps, runoff can be collected and diverted along berms or in channels to pipe or open channel slope drains with stable outlets. A slope drain conveys water down a slope into a trapping device or stabilized area to prevent contact between clean run-on water and soil.

Installation

- Install slope drains perpendicular to the slope contour. Compact the soil around and under the slope drain inlet, outlet, and along the length of the pipe.
- Protect the pipe inlet with filter fabric or flared end sections.
- Ensure that pipe connections are watertight. Stake down securely.
- Protect outlet with riprap. For high-velocity discharges, reinforce riprap with concrete or reinforced concrete devices.
- It may be necessary to capture discharge and allow sediment to settle out.



Temporary downdrain using plastic pipe. Stake down securely, and install where heavy flows need to be transported down highly erodible slopes. Note gravel check dam in front of inlet.



Temporary or permanent downdrain using geotextile underliner and riprap. Provide flow dissipaters at the outlet to absorb high energy discharges, and inlet protection until vegetation is established.

Slope Drain Troubleshooting tips

Condition	Common Solution
Pipe separates.	Reconnect pipe sections. Stake down securely. Ensure that pipe connections are watertight.
Pipe outlet erodes.	Repair damage and stabilize outlet with a flared end section, riprap, or velocity dissipation device. If necessary, reduce flows being discharged.
Pipe becomes clogged.	Flush out pipe. Place a screen or grate at inlet to capture large particles. Identify source of material and consider additional BMPs.
Erosion occurs around inlet.	Stabilize area around inlet with filter fabric or flared end section. Re-grade around inlet.
Excessive sediment accumulates around inlet/outlet.	Remove accumulated sediment and stabilize upstream area.
Slope drain overtops.	Limit drainage area and flow velocity. Check pipe diameter to ensure that it is sized properly to accept flow. Add additional pipes to carry flows as necessary.

Slopes

Sediment Barriers – Fiber Roll, Silt Fence, and Buffer Strip

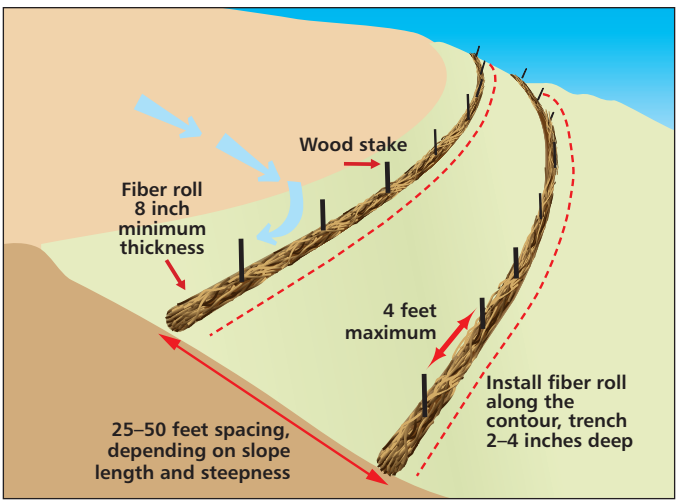
Use sediment barriers along the face, and at grade breaks of exposed and erodible slopes. They can also be used as controls along the property boundary and to protect storm drains, dry wells and water bodies.

FIBER ROLL

A fiber roll consists of straw, flax, compost or similar material that is rolled and bound into a tight tubular cylinder and placed at regular intervals on a slope face. Fiber rolls intercept runoff, reduce runoff flow velocity, release the runoff as sheet flow and remove sediment from runoff.

INSTALLATION

- Install at the toe of the slope or slightly away from the toe, and every 10 to 20 feet apart on long slopes depending on the slope steepness and soil type.
- If more than one fiber roll is placed in a row, the ends of the adjoining rolls should be tightly overlapped 12 to 18 inches.
- Fiber rolls are typically left in place. If they are removed, dispose of the accumulated sediment and fill in trenches, holes, or depressions to blend in with adjacent ground contours.
- Inspect prior to and after rain events, and at least daily during prolonged rainfall.



Fiber Roll Troubleshooting tips

Condition	Common Solution
Excessive sediment accumulation.	Remove accumulated sediment before it reaches halfway up the roll. Apply erosion controls upstream to reduce sediment in runoff.
Fiber rolls split, tear, unravel, or become ineffective.	Replace them immediately.
Runoff flows along fiber roll and discharges around ends.	Make sure rolls are placed on a level contour and turn ends of fiber rolls up-slope.
Runoff flows between fiber rolls.	Fiber rolls should be butted tightly together or overlapped and staked.

SILT FENCE

A silt fence is a temporary linear barrier that captures sediment by ponding and filtering storm water runoff to allow sediment to settle out. Silt fence can be used along slopes, below exposed soil areas, and around temporary stockpiles.

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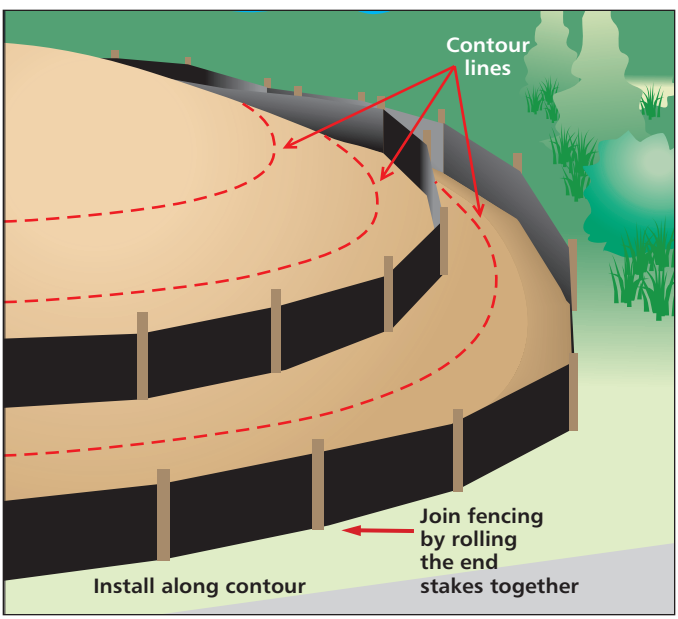
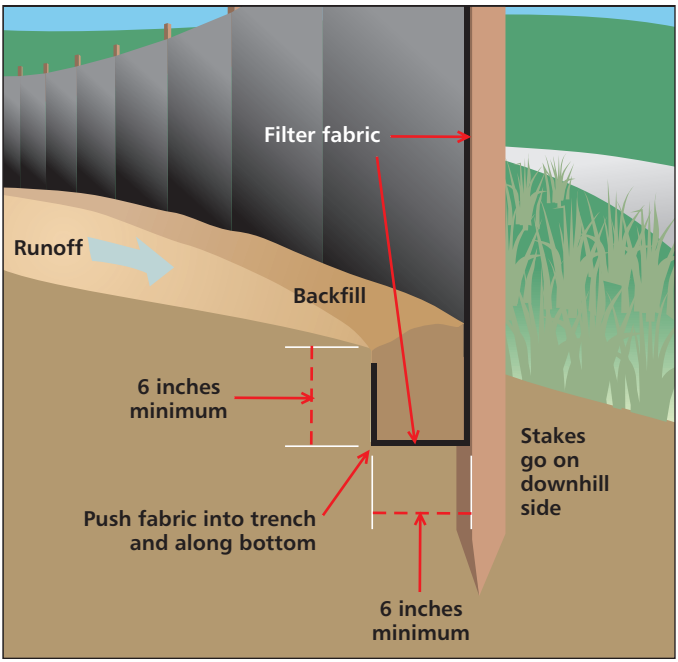
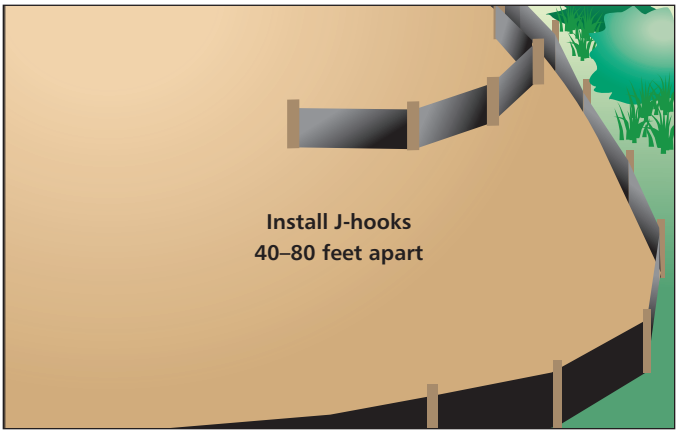


- Silt fences should be installed on the contour below bare soil area. Use multiple fences on long slopes. See spacing table below.
- Silt fencing **should not** be installed up and down hills, above (uphill from) areas of bare soil, or in ditches, channels, or streams.
- For silt fences treating high flows from steep slopes, reinforce the silt fence with woven wire and metal fence posts.
- Install wire fencing between the posts and the silt fence filter fabric, so pressure on the fabric from uphill flows is distributed across the wire fencing, then to the posts. Turn ends of fence uphill one full panel (or 6 feet).
- Inspect prior to and after rain events, and at least daily during prolonged rainfall.

Maximum Allowable Silt Fence Spacing

Slope Steepness	Maximum Slope Length (feet)
2:1	50
3:1	75
4:1	125
5:1	175
Flatter than 5:1	200





If muddy runoff flows along the uphill side of a silt fence, install "J-hooks", curved sections of silt fence that act as small dams to stop, pond up, and filter or settle out flows.

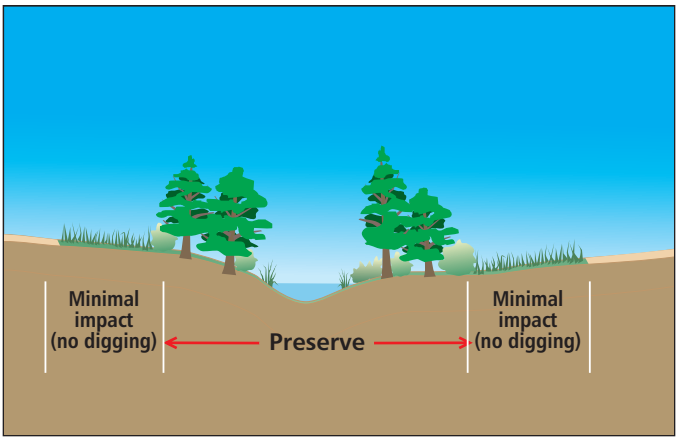
Silt Fence
Troubleshooting tips

Condition	Common Solution
Excessive sediment accumulation.	Remove accumulated sediment before it reaches halfway up the fence. Apply erosion controls upstream to reduce sediment in runoff.
Flow undermining fence. Bottom of fence is not properly keyed in.	Trench, place fabric, and backfill.
Lack of sufficient ponding area.	Fence should be installed with at least a 3 foot setback from the toe of slope where possible. Divert flow at top of slope.
Erosion occurs around barrier ends or runoff escaping around end.	Extend fence and turn ends up-slope.
Slope draining to fence is too steep.	Shorten slope length using fiber rolls or equivalent. Increase setback of silt fence from the toe of slope.
Fence is installed in concentrated flow area.	Replace fence with check dams.
Stakes are too far apart.	Add stakes a maximum of 10 feet apart.

BUFFER STRIP

A buffer strip is an undisturbed area or strip of natural vegetation or a newly established suitable planting adjacent to a disturbed area for the purpose of reducing erosion and runoff. It is used between disturbed areas and streams or other water bodies, along natural swales and wetlands, between a construction site and any impermeable surface, and any place an extra measure of erosion reduction and runoff control is desired.

Preserve grass, shrubs, trees, and other vegetation located above or below excavated areas, if possible. Vegetation above construction sites prevents high volume sheet runoff flows from moving across cut or fill areas. Vegetation below the construction site helps filter and trap sediment before it can move into ditches, channels, and streams.



Vegetated waterways help move upland water through or past your site while keeping it clear of mud. Do not disturb existing vegetation along banks, and leave a buffer of tall grass and shrubs between stream bank trees and disturbed areas.

Channels

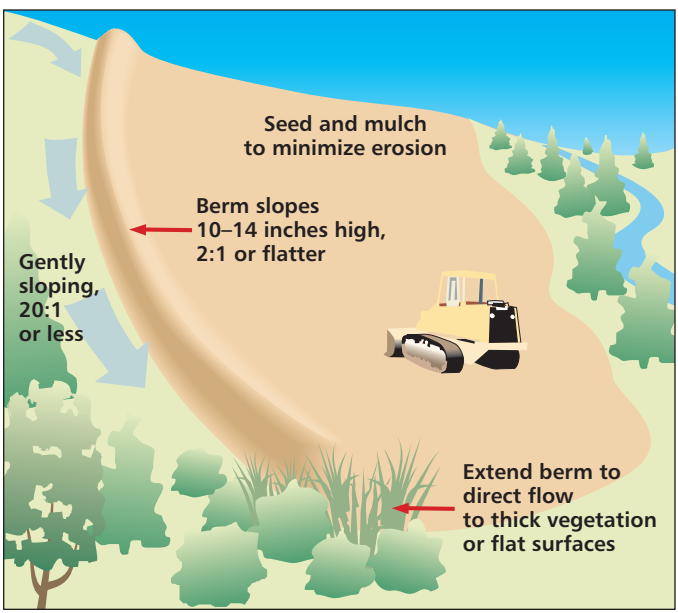
Berms, Ditches, and Vegetated Swales

Earth berms, ditches and vegetated swales are structures that intercept, divert, and convey water around or through the project site. They are used to convey water down sloping land, along paved surfaces to intercept runoff, along the top of slopes to divert surface flow from slopes, towards stabilized drainage systems and below steep grades where runoff begins to concentrate.

It may be necessary to use other practices such as check dams, plastic sheeting, or blankets to prevent scour and erosion in the swales and ditches.

BERMS

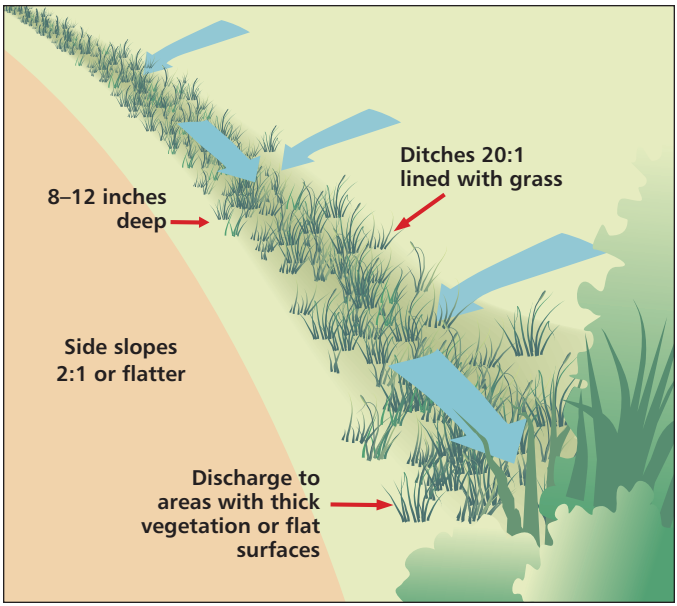
A berm is a long, mounded "collar" of compacted soil located uphill from the excavated area. The berm is created with soil excavated from an adjoining cut along the perimeter of the disturbed area. The berm is designed to intercept overland runoff and direct it around the construction site. Turf reinforcement mats, erosion control blankets, or rock protection might be needed for berms that channel water at a slope of 20:1 or greater.



DIVERSION DITCHES

Diversion ditches are similar to berms—they are designed to intercept and divert upland runoff around bare soil areas. Ditches are cut above cleared or fill areas and designed with a gentle slope to carry water away from work areas.

- Natural (i.e., not "man-made") drainage channels and creeks or streams cannot be cleared, re-routed, or otherwise altered without one or more permits from the U.S. Army Corps of Engineers and the Idaho Department of Water Resources.
- Construct and line "pass-through" ditches before general clearing or grading work begins.
- The outlet must be installed, seeded, stabilized, and protected before the ditch receives incoming flows.
- Ditches with slopes of 20:1 or more require erosion control blankets, mats, or rock liner protection.



VEGETATED SWALE

A swale is a vegetated channel that is used to convey and dispose of concentrated runoff without damage from erosion, deposition, or flooding.

- Ensure that the grass swale outlet is stable.
- Ensure that side drainage into the grass swale is not blocked.

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- Stabilize the grass swale with vegetation prior to large runoff events. Newly seeded areas need to be inspected frequently to ensure the grass is growing.
- Inspect every 7 days or every 14 days and within 24 hours of a storm event until the tributary drainage area has been stabilized.
- Repair or replace lost riprap, linings, or soil stabilization as needed.

Berms, Ditches, and Vegetative Swales Troubleshooting tips

Condition	Common Solution
Berms washed out.	Compact the soil used to build the berm.
Area behind berm eroded.	Stabilize the uphill side of the berm.
Outlet eroded.	Stabilize outlets; replace lost riprap.
Ditches or swales eroded due to high velocity flows.	Line channels with permanent stabilization. Place riprap or line channel with blankets or plastics. Add check dams upstream.
Ditches or swales filled up with sediment.	Remove sediment. Stabilize upstream contributing areas.
Ditches or swales are overtaken by flows.	Resize ditches to handle larger flows.
Ponding within ditch or swale. Poor vegetative cover.	Verify design slope and regrade. Re-establish grass. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly. If the seeded area is damaged due to runoff, additional storm water measures such as check dams or matting may be needed.
Accumulated debris. Scour and erosion occurring.	Remove and dispose of properly. Immediately make repairs and revegetate.

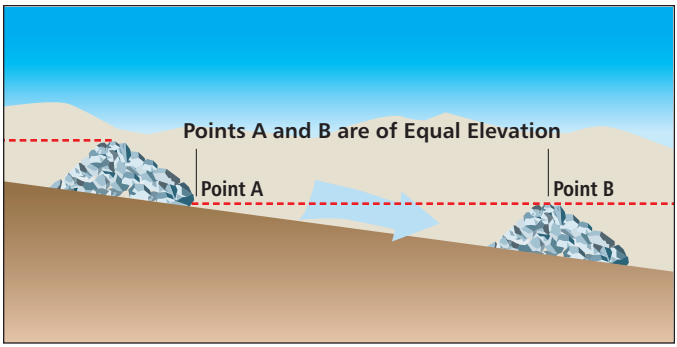
Check Dams

Drainage ditches may need temporary check dams to capture sediment and reduce ditch bottom downcutting.

- Dams can be made of rock, stone-filled bags, or brush and should be sized according to site-specific characteristics.
- Some types of fiber rolls may be used in situations with minimal slope and flow.
- Silt fencing and straw bales are not approved for use as silt check dams, and must not be used in drainage ditches that carry flowing water.

INSTALLATION

- Install check dams before uphill excavation or fill activities begin. Tied end of bag goes on downstream side.
- Space check dams according to the slope of the ditch bottom (see table).
- Extend the ends of the check dam to the top of the bank to prevent bypassing and sidecutting. Keep the middle part lower and relatively flat so overflows aren't too concentrated and bypasses are prevented.
- Placing filter fabric under the dam during installation will make removal much easier.
- Stone bag check dams are easiest to remove, and can be re-used.
- Intercept sediment before it reaches streams, lakes, rivers, or wetlands.
- Inspect every 7 days, or every 14 days and within 24 hours of a storm event.
- Check dams require extensive maintenance after storm events or high velocity flows to repair damage.
- Remove temporary dams after the site is stabilized and vegetation is established.



Check Dams
Troubleshooting tips

Condition	Common Solution
There is too much sediment.	Remove accumulated sediment to recover holding capacity. Remove sediment when it reaches 1/3 the check dam height.
There is insufficient ponding area.	Space check dams farther apart. Increase height of dam.
Flow travels around check dam.	Lower center of check dam so that it is 6 inches lower than the channel side.
Check dams wash away.	Replace check dams. Consider adding more dams upstream.
Wrong type of materials is used to construct barrier.	Use heavier materials such as larger rocks. Do not use straw bales or silt fence.
Check dams undercut.	Stabilize ditch with erosion control blanket, vegetation or other controls.
Rills and erosion channels between check dams.	Check dams are too far apart. Add more and stabilize bottom of ditch.

Channels

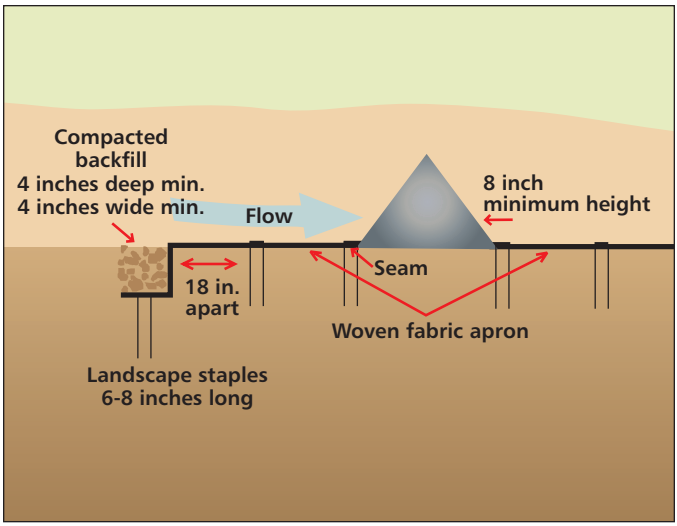
Triangular Dikes

Triangular dikes can be used as a continuous line barrier at the toe of slopes to contain sediment or as a ditch barrier placed perpendicular to the flow of water in a defined drainage ditch to minimize erosion and contain sediment.

- Do not place dikes in ditches where high flows are expected.
- Do not place dikes directly in front of a culvert outlet because they will not stand up to the concentrated flow.

INSTALLATION

- Extend the dike far enough so that the bottoms of the ends are higher than the top of the lowest center. This prevents water from flowing around the dike.
- Conform the dike to the geometry of the ditch so that no space exists between the dike and the ditch bottom.
- Place the first 6 inches of the upstream apron into the trench and anchor it with one row of 6 inch to 8-inch landscape staples at 18-inch centers.
- Place 6 inch to 8-inch landscape staples on 18-inch centers between the trench and seam, along the seam on the upstream side, where the downstream apron meets the dike, and on the edge of the downstream apron.
- Each dike has an open sleeve at either end. Connect adjoining dikes with these sleeves and then repeat the anchoring procedure.
- Once all the dikes have been joined and anchored, fill in the upstream trench with soil and compact it.
- Spacing of dikes is dependent on drainage area and grades.



Triangular Dikes
Troubleshooting tips

Condition	Common Solution
Runoff escaping around the dike.	Lengthen the dike.
Water flowing under the dike.	Re-anchor, add more as needed.
Sediment level at one half the dike height.	Clean out.

Bare Ground

Minimize the amount of bare ground exposed at one time and phase construction activity. The following practices can be used once ground has been disturbed.

Dust Control

Dust control consists of applying water or other dust-control substances. Care should be taken when applying water or liquid substances to prevent the washing of sediment offsite or into storm drains or water bodies.

- Provide stabilized roadway to minimize amount of dust generated by construction vehicles.
- Apply protective materials such as stone, mulch or binders to exposed areas.
- Install barriers to prevent dust from blowing off site. A board fence, wind fence, sediment fence, or similar barrier can control air currents and blowing soil.
- Establish vegetation at the earliest possible opportunity.
- Keep haul roads, detours, and other bare areas moist by sprinkling them with water or other dust control methods
- Perform street sweeping, as needed.
- Cover small stockpiles as an alternative to applying water or other substances.

Check site during windy conditions to monitor measure effectiveness. Reapply dust control measures as needed to maintain level of control required.

Dust Control
Troubleshooting tips

Condition	Common Solution
Excessive dust leaves the site.	Increase frequency of water application or other controls.
Vehicles kick up dust.	Water more frequently. Limit vehicle speeds. Stabilize the roadway.
Watering for dust control causes erosion.	Reduce water pressure on the water truck. Check watering equipment to ensure that it has a positive shutoff. Water less frequently.
Sprayed areas are ineffective at limiting dust.	Re-spray areas and ensure that the application rate is proper or stabilize site using other practices.

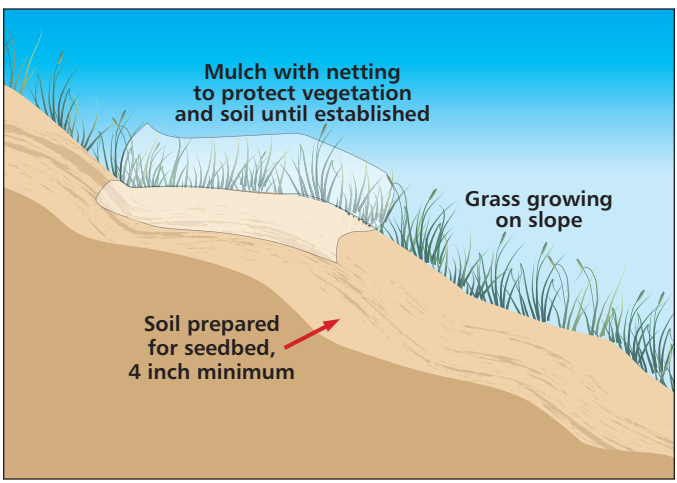
Bare Ground

Seeding, Mulches, and Binders

Bare soil in excavated or fill areas must be seeded, mulched, or covered immediately after final grading work is completed.

TEMPORARY SEEDING

- Stockpile topsoil and spread over site prior to seeding.
- Stabilize bare soil/disturbed areas with erosion controls within 14 days of these areas being inactive. These areas may be seeded, or other erosion controls may be used if they are more appropriate.
- Prepare bare soil for planting by disking across slopes, scarifying, or tilling if soil has been sealed or crusted over by rain. Seedbed should be dry with loose soil to a depth of 4 to 6 inches.
- For slopes steeper than 4:1, walk bulldozer or other tracked vehicle up and down slopes before seeding to create tread-track depressions for catching and holding seed. Mulch slopes after seeding if possible.
- Cover seed with erosion control blankets or turf mats if slopes are 2:1 or greater.
- Water seeded areas during dry conditions to ensure seed germination and early growth. Re-seed areas that do not show growth within 14 days after rain or watering.
- Protect bare areas during the cold season by sowing winter rye, winter wheat, and mulching. Sow permanent seed when weather permits.



MULCHES

Mulch by itself or applied over seed provides excellent erosion protection. Use binder on slopes greater than 3:1.

- In general, apply mulch so that at least 80 to 90 percent of the ground is covered.
- Straw mulch can be applied mechanically or by hand. Mechanical application involves a straw blower and may require an access road or driving surface capable of supporting the equipment. Manual application is time and labor intensive and should be used only on small areas or where equipment access is not feasible.
- Wood hydromulch or hydroseed will decrease sheet erosion.
- The preferred method for anchoring straw mulch in place is to use a binder. Other methods for anchoring the mulch include crimping, punching, or track walking. Track walking should be used only where crimping or punching is impractical.

Mulch Product	Typical Application Rate
Straw or hay	1½ to 2½ tons per acre
Wood chips, bark, sawdust	5 – 8 tons per acre
Rock	200 – 500 tons or more per acre
Hydraulic mulches and soil binders	1½ to 2 tons per acre
Compost	2 – 3 tons per acre

SOIL BINDERS

- Soil binders are materials applied to the soil surface to temporarily reduce erosion.
- Prepare soil before applying the binder so that the binder adheres to and penetrates the soil surface. The untreated surface must be roughened and must contain sufficient moisture for the binder to achieve uniform penetration.
- Binding agents can be sprayed over the slope with water or mixed with hydromulch or hydroseed.
- Soil binders require a minimum curing time before becoming fully effective, therefore binders should not be applied during or immediately before rainfall.

Seeding, Mulches, and Binders Troubleshooting tips

Condition	Common Solution
Slope was improperly dressed before application.	Roughen embankment and fill areas first by rolling with crimping or punching type roller or by track walking.
Coverage is inadequate.	Follow recommended application rates. Reapply where necessary.
Soil binder allowed inadequate drying time or washed off slope.	Allow at least 24 hours for the material to dry before a rain event. Reapply where necessary.
Portions of the mulch have been disturbed.	Keep workers and equipment off the mulched areas and repair damaged areas. Use fencing, if needed.
Slope was improperly dressed before application.	Roughen slopes. Furrow along the contour of areas to be seeded.
Seeds fail to germinate.	Apply straw mulch to keep seeds in place and to moderate soil moisture and temperature. Temporary irrigation may be necessary.
Seeded slope fails.	Fill in rills and re-seed. Combine with erosion control blankets or mats.
Seeding is washed off slope.	Reapply where necessary and mulch.
Excessive water flows across stabilized surface.	Use other BMPs to limit flow on stabilized area and to reduce slope lengths.
Sprayed areas degrade or become ineffective.	Consider other or additional BMPs. Reapply binder as necessary.
Sprayed slope has spot failures.	Repair slopes and re-spray damaged areas.
Binder fails to penetrate soil.	Roughen soil and pre-wet to manufacturer's recommendations. Reapply to areas where necessary.
Mulch blows away.	Anchor straw mulch in place by applying a tackifier, crimping, punching, or track walking. May need to use a different BMP.

Inlets and Outlets

Inlet Protection

Turbid (muddy) runoff that flows toward a culvert, ditch, dry well, or storm drain inlet must be slowed down and pooled to settle out and remove sediment. Inlets can be protected with compost socks, concrete blocks with a gravel filter, reinforced silt fences, manufactured catch basin insert products, or other sediment control devices. Straw bales should not be used for inlet protection. Other controls should also be used upstream to minimize erosion and sediment delivery.

- Place materials to form a small dam around the inlet.
- Build larger dams farther away from inlets with heavy incoming flows.
- When using rock, mix rock of various sizes so flows can seep through the dam slowly. If spaces between rocks are too large, runoff will move through the dam without adequate settling time.
- Ensure that inlet protection devices do not cause a safety hazard for pedestrians or vehicle traffic.

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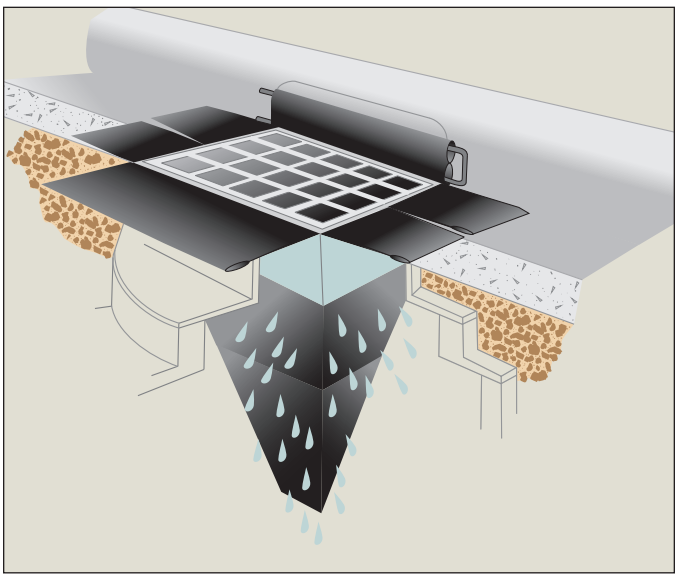
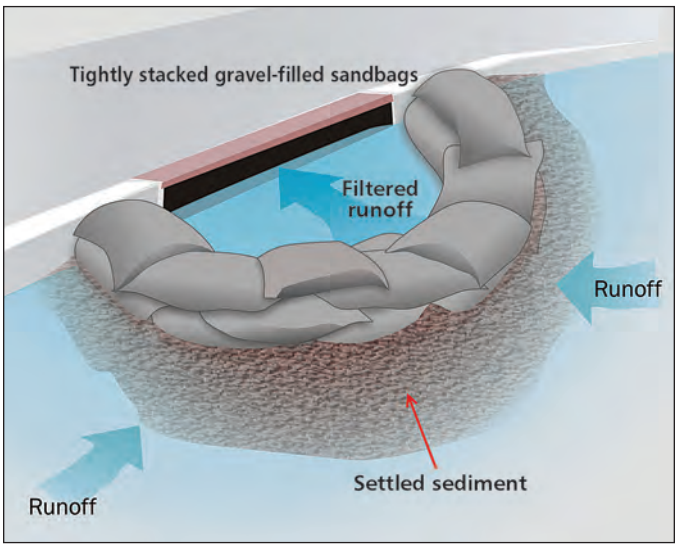
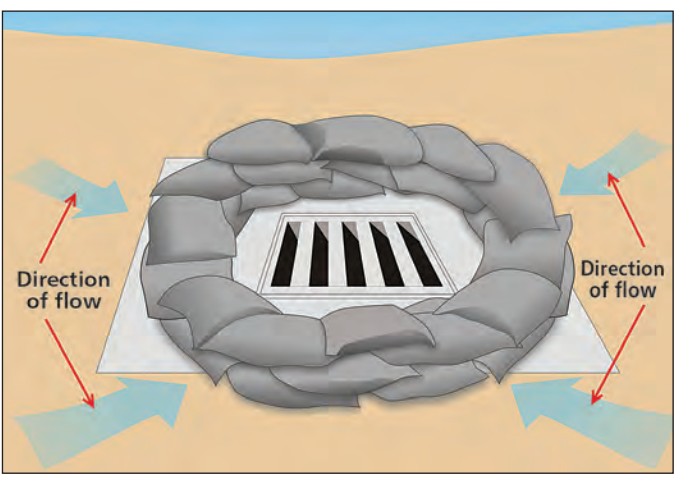


Catch basin inserts are commercially available products that remove one or more of the following contaminants: coarse sediment, oil and grease, and litter and debris. Units should be routinely maintained to achieve maximum removal efficiency.

- Accumulated sediment must be removed after each rain to ensure effectiveness.
- Place removed sediment in areas where it will not wash into inlets, ditches, channels, or streams. Do not wash sediment or any other material down curb, channel, or drain inlets.

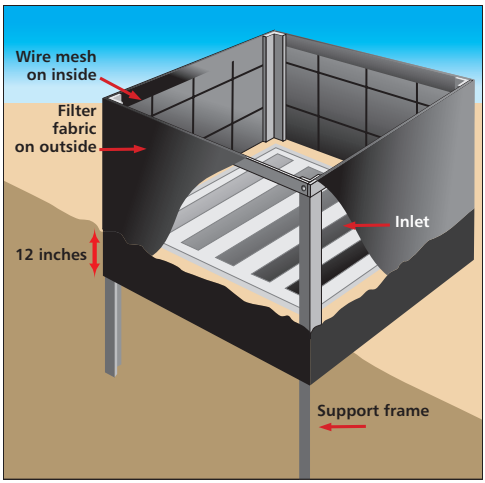


A stone-filled barrier is the most common type of protection due to the flexibility of its use. Bag barriers are constructed by placing the bags around the inlet to create a holding area that allows suspended sediment to settle. Bags need to be tightly abutted.



Gravel bags used to protect a drop inlet.

A filter fabric fence is effective in open areas where sheet flows are low and are not expected to exceed 1/2 cubic feet per second. Filter fabric fences are installed like silt fences but are constructed to surround the inlet to create an enclosure. Use diagonal bracing on sides and/or top to protect against incoming flow pressures. Trench in the fence and securely fasten to posts.



Inlet Protection
Troubleshooting tips

Condition	Common Solution
Excessive sediment accumulation behind protection device.	Remove accumulated sediment when it reaches 1/3 the barrier height or 1/3 the holding capacity. Repair bypasses and undercuts promptly.
Excessive sediment is entering the inlet.	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that the barriers around the inlet are installed correctly. Ensure that disturbed soil inside the protective device is prevented from entering drain by covering with plastic.
Sediment is bypassing silt fence.	Repair/replace fencing material and re-stake fences that are damaged. Filter fence needs to be keyed in so that water goes through filter fabric and not under it.
Material from broken bags is entering inlet.	Clean out inlet. Remove broken bags and replace as necessary.
Ponded water causes a traffic concern.	Use alternative BMPs upstream. Install below grade filter inlet.

Inlets and Outlets

Outlet Protection

Line outlets for storm drains, culverts, and paved channels that discharge into natural or constructed channels with rock or other armoring to prevent downstream bank and channel erosion when flow velocities are high. Dense angular rock works best.

Installation

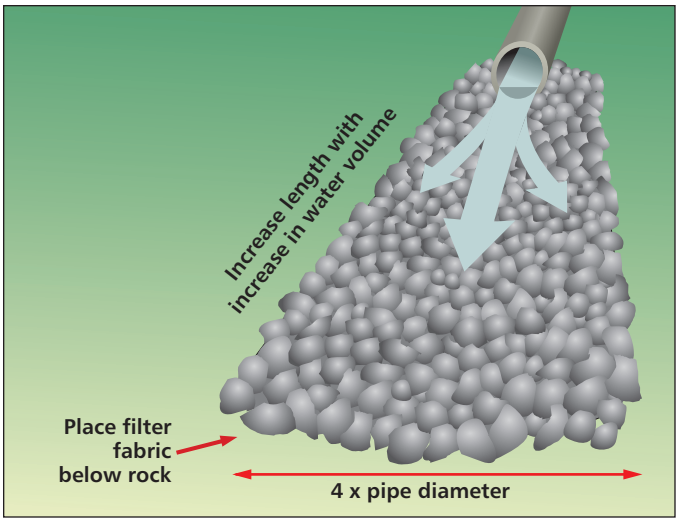
- The rock-lined "apron" at the outlet must be straight (lined up with the discharging pipe or channel) and laid in flat. Bring the sides up around outlet to prevent erosion and up the banks a little to prevent scouring.
- The apron is shaped like a long triangle, with the narrow end located at the outlet and sized about 4 times the diameter of the outlet pipe.
- The width of the downstream end of the apron will be wider, tied into the channel, and vary according to the shape of the channel it empties into.
- The table below provides general information for sizing rock and outlet aprons for various sized pipes. Follow the maximum suggested sizing criteria for outlets that discharge high flows.

Sizing for culvert outlet

Culvert size	Avg.rock diameter	Apron width*	Apron length (Slow flow culverts)	Apron Length (High flow culverts)
8 in	3 in	2-3 ft	3-5 ft	5-7 ft
12 in	5 in	3-4 ft	4-6 ft	8-12 ft
18 in	8 in	4-6 ft	6-8 ft	12-18 ft
24 in	10 in	6-8 ft	8-12 ft	18-22 ft
30 in	12 in	8-10 ft	12-14 ft	22-28 ft
36 in	14 in	10-12 ft	14-16 ft	28-32 ft
42 in	16 in	12-14 ft	16-18 ft	32-38 ft
48 in	20 in	14-16 ft	18-25 ft	38-44 ft

*Apron width at the narrow end (pipe or channel outlet)

If the culvert outlet and receiving channel do not line up straight, the channel bank receiving the brunt of the outlet flow must be lined or it will erode quickly. If rock will be used, double the average diameter when sizing the rock needed. Gabion baskets – galvanized wire mesh boxes filled with rock – are often used in this situation, and can be stacked to form a wall if necessary.



Outlet Protection
Troubleshooting tips

Condition	Common Solution
Riprap washes away.	Replace riprap with a larger diameter rock based on the pipe diameter and discharge velocity.
Apron is displaced.	Align apron with receiving water and keep it straight throughout its length. Repair fabric and replace riprap that has washed away.
Scour occurs around apron or riprap.	Repair damage to slopes or underlying filter fabric.
Outlet erodes.	Stabilize outlets; replace lost riprap; grout riprap.

Inlets and Outlets

Saw Cutting Operations

Prevent or reduce the discharge of pollutants from saw cutting operations using measures to prevent runon and runoff, and properly disposing of wastes.

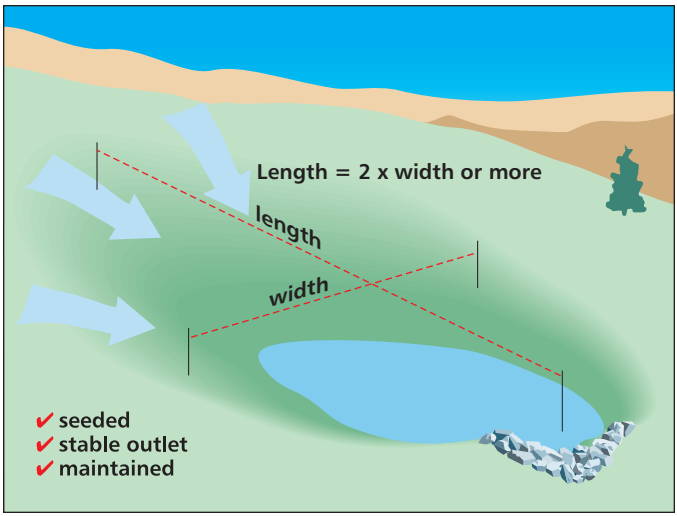
- Reschedule activities if rain is likely to occur.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Cover all storm drain inlets near the work with mats to prevent any slurry from entering the inlets.
- Use as little cooling water as possible and turn off water when not cutting.
- Gravel bags can be placed perpendicular to the curb to create an area to capture slurry.
- Residue from the operations should be vacuumed up in conjunction with the cutting and then properly disposed. There should not be any residue left on the site to become blowing dust after it has dried. Do not clean the cutting area by hosing it down.
- If saw cutting slurry enters a storm drain/natural outlet, clean it up immediately.
- Stockpile materials and wastes away from the drain inlets.

Water Collection and Discharge Areas

Temporary Sediment Trap

The purpose of a sediment trap is to provide an area where muddy runoff is allowed to pool, so heavier sediment will settle out.

- Any depression, swale, or low-lying place that receives muddy flows from exposed soil areas outside of a natural waterway can serve as a sediment trap.
- Sediment basins are somewhat larger than traps and are often designed to serve later as storm water treatment ponds. Sediment basins should be designed by a professional.
- Installing several small traps at strategic locations is often better than building one large basin.
- Sediment traps are installed before excavation or fill work begins.
- **Do not** depend on sediment traps alone to control sediment loss from your construction site. Use erosion controls as a first defense.
- Straw bales and silt fencing **should not** be used as containment structures for concentrated runoff flows.
- **Do not** put sediment traps in or next to flowing streams or other waterways.



Installation

- The simplest approach is to dig a hole or build a berm of earth or stone where concentrated flows are present. This will help to detain runoff so sediment can settle out.
- Side slopes for the excavation or earthen containment berms are 2:1 or flatter.
- Berms are made of well-compacted clayey soil, with a height of 5 feet or less.
- Place soil fill for the berm or dam in 6 inch layers and compact.
- Seed and mulch the entire trap including the ponding area, berms, outlet, and discharge area immediately after construction.
- An overflow outlet can be made by making a notch in the containment berm and lining it with rock. Rock in the notch must be large enough to handle overflows. Stabilize downhill outlet with rock or other flow dissipaters similar to a culvert outlet.
- The overflow outlet should be at an elevation so dam will not overtop. Allow at least one foot of freeboard. Outlets must be designed to promote sheet flow of discharges onto vegetated areas if possible. If the discharge will enter a ditch or channel stabilize it with vegetation or line it.
- Inspect inlets, berms, spillway, and outlet area for erosion after each rain exceeding 1/2 inch.

Temporary Sediment Trap Troubleshooting tips

Condition	Common Solution
Outlet pipe is clogged with debris.	Clean out pipe. Wrap outlet pipe with filter fabric or install fencing or trash rack around pipe to hold back larger debris particles.
Spillway erodes due to high velocity flows.	Stabilize outlet with riprap or line spillway with plastic sheeting or filter blankets.
Slope sides erode.	Stabilize slopes with rock, vegetation or equivalent method.
Accumulated sediment has built up.	Remove sediment before it fills half the trap or basin volume. Repair gullied areas and any upslope areas contributing large volumes of sediment.
Drainage area is too large.	Ensure that the trap is designed to accommodate the inflow for the designed storm. Limit drainage contributing area. Consider additional controls.

Dewatering

Muddy (turbid) water pumped from collection basins or other areas cannot be discharged into storm drains, bare ditches, streams, lakes, or wetlands unless sediment is removed prior to discharge. Options include:

- Retaining the water on site for construction use or allowing water to evaporate/infiltrate.
- Discharging to the sanitary sewer with permission from the local agency,
- Discharging to adjacent land or drainage facility with permission of the owner,
- Having the water transported and disposed of offsite.

Filter or settle water to remove sediment before discharge. Polluted water **should not** be discharged. Options include the following:

- Containment in a sediment basin or trap for a minimum of 4 hours or until water is clear.
- Pumping to a settling tank with sampling ports.
- Filtering through a sieve or other filter media (swimming pool filter). Simple on-site filter systems can be constructed by wrapping the ends of the suction and discharge pipes with filter fabric; discharging through a series of drums filled with successively finer gravel and sand; and other filtering techniques like those described in the inlet protection section.
- Manufactured bags. The sediment bags are placed on a stabilized area over dense vegetation, straw, or gravel and water is pumped into an opening in the bag using a low volume pump. The water flows from

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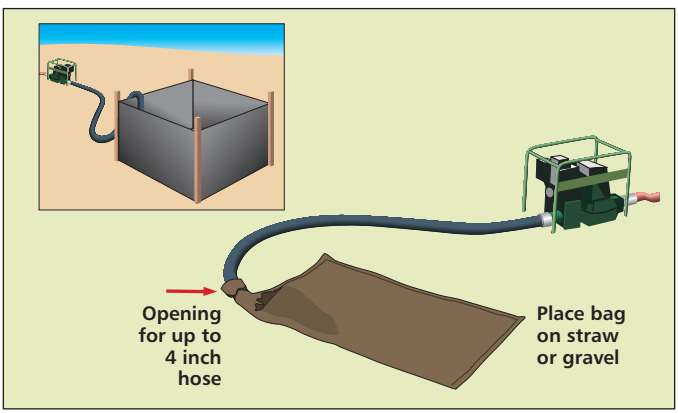

inside of the bag, through the filter cloth, and out onto the ground. These systems do not always work on fine clay soils.

Line or otherwise protect the flow path in some way to prevent mobilization of additional sediment. Dry and reuse filtered material on site in a mixture with other site soils or dispose of appropriately based on nature and levels of any contaminants present.

A permit or letter of authorization with discharge restrictions may be required for discharge to the storm drain system. Consider managing dewatering without discharge to a storm drain or receiving water.

Dewatering
Troubleshooting tips

Condition	Common Solution
Sediment laden discharge is escaping around the hose insert of sediment bag.	Cease pumping and insert discharge hose further into bag. Re-tie bag around the discharge hose to create a tight seal. Periodically check this connection.
Sediment bag is not dewatering efficiently.	Remove and replace bag and dispose of bag properly.
Discharge from outlet is becoming sediment laden once it discharges on the ground.	Relocate tank to a stabilized area or place on plastic sheeting to convey discharge to stabilized area.
Discharge of treated water causes erosion.	Install outlet protection.
Filter is clogged.	Check filtering devices frequently to make sure they are unclogged and operating correctly. Adjustments may be needed depending on the amount of sediment in the water being pumping.
Treatment unit fills with sediment.	Remove sediment when unit reaches 1/3 its capacity to preserve settling efficiency.
Dewatering discharge flow is higher than expected.	Alter the treatment unit to handle increased flow.
Water spread on the construction site is not infiltrating fast enough and is entering the storm drain system or receiving water.	Stop dewatering. Install a sediment treatment system and test discharge as necessary.

Top 10 Compliance Problems

Condition	Common Solution
Too much soil exposed at one time	• Limit the amount of disturbed area to what is absolutely necessary to meet schedule • Stabilize disturbed area or stockpiles not worked within 14 days
Missing or misunderstood sediment controls	• Use with erosion controls • Place properly
Poor management of temporary stockpiles	• Stabilize with seed or other cover when not worked within 14 days • Surround by sediment controls • Place stockpiles in appropriate areas
No inlet protection	• Install and maintain controls to protect catch basins and dry wells
Vehicle tracking onto roads	• Use gravel pads, wash racks, and wheel or truck washes
Improper solid or hazardous waste management	• Use good housekeeping practices • Provide containment for liquid/ hazardous materials and waste
Dewatering and other pollutant discharges	• Dirty water should be filtered or allowed to settle
Poorly managed washouts (concrete, paint, stucco)	• Highlight use of washouts during weekly construction meetings • Clearly mark and size washouts adequately • Be sure to clean out in a timely fashion • For large pours, supply multiple washouts
Inadequate BMP maintenance	• Inspect BMPs frequently • Maintain BMPs when not working or when damaged
Inadequate records or training	• Keep copies of NOI, SWPPP and SWPPP updates, and inspection records onsite • Provide BMP installation and maintenance training

Resources

EPA's Storm Water for Construction Sites Web Site
http://cfpub.epa.gov/npdes/stormwater/const.cfm

Storm Water Construction General Permit
http://www.epa.gov/npdes/pubs/cgp_proposed.pdf

Fact Sheet for the Construction General Permit
http://www.epa.gov/npdes/pubs/cgp_proposedfs.pdf

Notice of Intent – Electronic Filing
http://cfpub.epa.gov/npdes/stormwater/enoi.cfm

View NOIs
http://cfpub.epa.gov/npdes/stormwater/noi/noisearch.cfm

Developing Your Storm Water Pollution Prevention Plans: A Guide for Construction Sites
http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf

SWPPP Template
http://www.epa.gov/npdes/pubs/sw_swppp_template.doc

BMP Inspection Form
http://www.epa.gov/npdes/pubs/sw_swppp_inspection_form.doc

Construction Industry Compliance Assistance Center
http://www.cicacenter.org/

Idaho Department of Environmental Quality Stormwater Website
http://www.deq.idaho.gov/water-quality/wastewater/stormwater.aspx

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties
http://www.deq.idaho.gov/media/622263-Stormwater.pdf

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