Summit County
Sediment and
Erosion Control
BMP Manual
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Appendix C2: Typical Residential Stormwater Pollution Prevention Plan ............................................. C2-1
List of Temporary and Permanent Erosion/Sediment Controls contained in Appendix B.

1. Revegetation
2. Mulching
3. Geotextiles
4. Surface Roughening
5. Silt Fence
6. Straw Bale Barrier
7. Stabilized Construction Entrance
8. Division Ditch/Dike
9. Water Bar
10. Storm Drain Inlet Protection
11. Brush Barrier
12. Gravel Check Dams
13. Straw Bale Check Dams
14. Slope Drains
15. Open Chute Drains
16. Rock Lined Ditches
17. Grassed/Matted Swales
18. Temporary Excavated Sediment Traps
19. Equipment and Vehicle Wash Down Area
20. Material Storage
21. Waste Disposal

UDOT Standard Drawings Temporary Erosion Control Drawings Number 1010-1014
This list is not to be construed to be the limit of available BMPs, only as a partial list, and as examples which may be employed.

**REVEGETATION**

**DEFINITION:** Placement of seed material or sod over open area for temporary or permanent erosion control.

**PURPOSE:**
- Reduce velocity of storm water runoff.
- Reduce erosion by preventing rainfall directly hitting soil.

**APPLICATION:**
- All areas disturbed by construction activity, including cut and fill slopes.

**LIMITATIONS:**
- Revegetation on slopes steeper than 3:1 must utilize geotextiles to promote establishment of vegetative cover.

**INSTALLATION:**

**Temporary Seeding**
- Grade and shape the area to be seeded so that it will drain properly and accommodate seeding equipment.
- Loosen compacted soil by racking, or discing where hydraulic seeding will not be used, to provide for seed retention and germination.
- Apply seed and fertilization suitable for the area and season. The seed species and fertilization requirements must be developed by a professional or the local Soil Conservation Service Office.

**Permanent Seeding**
- Grade and shape the area to be seeded so that it will drain properly and accommodate seeding equipment. If slopes are steeper than 3:1, the use of hydraulic seeding equipment is encouraged.
- Loosen compacted soil by racking, or discing where hydraulic seeding will not be used, to provide for seed retention and germination.
- Spread at least 3 inches of topsoil, if required, before seeding. If topsoil is required, the subsoil should be serrated or disced to provide an interface.
Apply seed and fertilization suitable for the area and season. The seed species and fertilization requirements must be developed by a professional or the local Soil Conservation Service Office.

MAINTENANCE:
- Inspect seeded areas after every rainfall event and at a minimum of monthly.
- Replace seed on any bare areas, or area showing signs of erosion as necessary.

MULCHING

DEFINITION: Placement of material such as straw, grass, wood-chips, wood-fibers or fabricated matting over open area.

PURPOSE:
- Reduce velocity of storm water runoff.
- Reduce erosion by preventing rainfall directly hitting soil.
- Facilitate plant growth by holding seeds and fertilizer in place, retaining moisture and providing insulation against extreme temperature.

APPLICATION:
- Any exposed area to remain untouched longer than 14 days and that will be exposed less than 60 days (seed areas to be exposed in excess of 60 days).
- Areas that have been seeded.
- Stockpiled soil material.

LIMITATIONS:
- Anchoring may be required to prevent migration of mulch material.
- Down-gradient control may be required to prevent mulch material being transported to storm water system.

INSTALLATION:
- Rough area to revive mulch to create depressions that mulch material can settle into.
- Apply mulch to required thickness and anchor as necessary.
- **Recommended Application Rates:**
  - Straw: 2-3 bales/1000 square feet (90-120 bales/acre)
  - Wood Fiber: 25-30 pounds/1000 square feet (1000-1500 pounds/acre)

- Ensure material used is weed free and does not contain any constituent that will inhibit plant growth.

**MAINTENANCE:**
- Inspect mulched areas after every rainfall event and at a minimum of monthly.
- Replace mulch and any bare areas and re-anchor as necessary.
- Clean and replace down-gradient controls as necessary.

### Recommended Application Rates for Mulching

<table>
<thead>
<tr>
<th>Material</th>
<th>Application</th>
<th>Depth</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel: Washed 3/4&quot; to 1 1/2&quot;</td>
<td>9 cu yd/1000 sq ft</td>
<td>3 inches</td>
<td>Good for traffic areas. Good for short slopes.</td>
</tr>
<tr>
<td>Straw: Air-Dried, free of seeds and coarse material.</td>
<td>2-3 bales/1000 sq ft</td>
<td>2 inches (Min.)</td>
<td>Subject to wind blowing. Tack down or keep moist.</td>
</tr>
<tr>
<td>Wood Fiber Cellulose: Free from growth inhibitors; dyed green</td>
<td>35 lb/1000 sq ft</td>
<td>1 inch (Min.)</td>
<td>For critical areas, double application rate; Limit to slopes &lt;3% and &lt; 150 feet</td>
</tr>
</tbody>
</table>
GEOTEXTILES

DEFINITION: Matting or netting made biodegradable materials (such as Excelsior blanket, jute, wood fiber, straw, coconut, paper, or cotton) to reduce rainfall impact and surface erosion on disturbed soils.

PURPOSE:
• Reduce velocity of storm water runoff.
• Reduce erosion by preventing rainfall directly hitting soil.
• Facilitate plant growth by holding seeds, fertilizer, and mulch in place, retaining moisture and providing insulation against extreme temperature.
• Provide flexible roadway ditch lining to promote establishment of vegetative cover.

APPLICATION:
• Areas that have been seeded, fertilized and mulched with slopes that are steeper than 3:1.
• Stabilize vegetated roadway ditches while permanent vegetative cover becomes established.

LIMITATIONS:
• Effectiveness may be reduced drastically if the fabric is not properly selected, designed, or installed.
• Should not be placed on 1:1 slopes if they are to be covered with overlying material.
• Many synthetic geotextiles are sensitive to light and must be protected prior to installation.

INSTALLATION:
• Allow for an overlap of 4 inches on both sides of each roll and 36 inches at the ends of the roll.
• The fabric must extend beyond the edge of the exposed area at least 12 inches at the sides and 36 inches at the top and bottom.
• At the top of the area, bury the end of each roll in a trench at least 8 inches deep. The trench should then be backfilled and tamped.
• Staples should be driven perpendicularly into the slope face. Staples must be of 3/16" diameter (or heavier) steel wire. Allow for spacing of approximately 5 feet apart along the sides and center of each roll and not more than 12 inches apart along upper end of a roll or at the overlap of two rolls.
• The soil must be reasonably smooth. Fill and compact any rills and gullies. Remove any protruding rocks and other obstructions.
• Apply the individual rolls up and down the slope, from top to bottom--never along the contour.
• Make sure that the fabric makes uniform contact with the slope face underneath. No bridging of rills or gullies should be allowed.

MAINTENANCE:
• At a minimum, inspect geotextiles on a monthly basis, and after rain events greater than 0.5 inch of precipitation.
• Clean and replace down gradient controls as necessary.
SURFACE ROUGHENING

DEFINITION: Rough preparation of working areas leaving depressions and uneven surface.

PURPOSE: Depressions trap water and sediment reducing erosion and facilitating establishment of vegetative cover.

APPLICATION:
• Surface roughening is appropriate for all construction that will not be receiving impervious cover within 14 days and that will be exposed less than 60 days (seed areas to be open in excess of 60 days).

LIMITATIONS:
• Will not withstand heavy rainfall.
• Slopes steeper than 2:1 (50% ) should be benched.

CONSTRUCTION:
• Surface should be left in rough condition during initial earthwork activity.
• Surfaces that have become smoothed or compacted due to equipment traffic should be roughened by use of disks, spring harrows, teeth on front end loader, or similar, operating along the contour of the slope. Tracking (by crawler tractor driving up and down slope ) may also be used to provide depressions parallel to contours.
• Avoid compaction of soils during roughening as this inhibits plant growth and promotes storm water runoff. Limit tracked machinery to sandy soil.
• Seed or mulch areas to be exposed in excess of 60 days.
• Employ dust controls.

MAINTENANCE:
• Inspect following any storm event and at a minimum of weekly.
• If erosion in the form of rills (small waterways formed by runoff) is evident, perform machine roughening of area.
• For vegetated slopes reseed areas that are bare or have been reworked.
SILT FENCE

DEFINITION: A temporary sediment barrier consisting of filter fabric stretched across and secured to supporting posts and entrenched.

PURPOSE: To filter storm water runoff from up-gradient disturbed area and trap sediment on site.

APPLICATION:
- Perimeter Control: Place fence at down-gradient limits of disturbance.
- Sediment Barrier: Place fence at an offset distance from the toe of slope or soil stockpile required to contain anticipated sediment and storm water.
- Protection of Existing Waterways: Place fence at top of stream bank.
- Inlet Protection: Place fence surrounding catch basins.
- Sediment Removal: Place fence to capture sediment moving through roadway ditches.

LIMITATIONS:
- Recommended maximum drainage area of 0.5 acre per 100 feet of fence.
- Recommended maximum up-gradient slope length of 150 feet.
- Recommended maximum uphill grade of 2:1 (50%).
- Long-term ponding should not be allowed behind fence.

INSTALLATION:
- Place posts 6 foot on center along contour (or use preassembled unit) and drive 2 feet (min.) into ground. Excavate an anchor trench (8 inches wide and 8 inches deep) immediately up-gradient of posts.
- Secure wire mesh (14 gage min. with 6 inch openings) to up slope side of posts. Attach with heavy duty wire staples 1 inch long, tie wires or hog rings.
- Cut fabric to required width, unroll along length of barrier and drape over barrier. Secure fabric to, mesh with twine, staples, or similar, with trailing edge extending into anchor trench.
- Backfill trench over filter fabric to anchor.

MAINTENANCE:
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff bypassing ends of barriers or undercutting fence (repair immediately).
- Repair or replace damaged areas of the fence and remove accumulated sediment.
- Re-anchor fence as necessary to prevent shortcutting.
- Remove accumulated sediment when it reaches \( \frac{1}{2} \) the height of the fence.
ATTACHING TWO SILT FENCES

PLACE THE END POST OF THE SECOND FENCE INSIDE THE END POST OF THE FIRST FENCE

ROTATE BOTH POSTS AT LEAST 180 DEGREES IN A CLOCKWISE DIRECTION TO CREATE A TIGHT SEAL WITH THE FABRIC MATERIAL

DIRECTION OF RUNOFF WATERS

DRIVE BOTH POSTS ABOUT 24 INCHES INTO THE GROUND AND BURY FLAP
STRAW BALE BARRIER

DEFINITION: Temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

PURPOSE: To filter storm water runoff from up gradient disturbed area and trap sediment on site.

APPLICATION:
- Perimeter Control: Place barrier at down gradient limits of disturbance.
- Sediment Barrier: Place barrier at an offset distance from the toe of slope or soil stockpile required to contain anticipated sediment and storm water.
- Protection of Existing waterways: Place barrier at top of stream bank.
- Velocity Dissipation: Reduce velocities in roadway ditches.

LIMITATIONS:
- Recommended maximum drainage area of 0.5 acre per 100 foot barrier.
- Recommended maximum up gradient slope length of 150 feet.
- Recommended maximum uphill grade of 2:1 (50% ).

INSTALLATION:
- Excavate a 4-inch minimum deep trench along contour line, i.e. parallel to slope, removing all grass and other material that may allow underflow.
- Place bales in trench with ends tightly abutting, fill any gaps by wedging loose straw into openings.
- Anchor each bale with 2 stakes driven flush with the top of the bale. Extend Stakes 18 inches (min.) into the ground.
- Backfill around bale and compact to prevent piping, backfill on uphill side to be built up 4-inches above original ground at the barrier.
- In roadway ditches, straw bales should not be placed in such a way as to direct water around sides. Riprap should be placed around straw bale edges.

MAINTENANCE:
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff bypassing ends of barriers or undercutting barriers.
- Repair or replace damaged areas of the barrier and remove accumulated sediment.
- Realign bales as necessary to provide continuous barrier and fill gaps.
- Re-compact soil around barrier as necessary to prevent piping.
STABILIZED CONSTRUCTION ENTRANCE

DEFINITION: A stabilized pad of crushed stone located where construction traffic enters or leaves the site from or to a paved surface.

PURPOSE: To reduce potential for vehicle tracking of sediment or flow of sediment onto a paved surface where it may runoff to a storm water collection system, waterway, or lake.

APPLICATION:
• At any point of ingress or egress at a construction site where adjacent traveled way is paved. Applies to all sites which require a Storm Water Pollution Prevention Permit and Erosion Control Permit.
• Any project having a duration of 3 months or more must instal filter fabric beneath the crushed stone to minimize sediment pumping into the crushed stone.

LIMITATIONS: Not listed.

INSTALLATION:
• Clear and grub area and grade to provide slope shown for driveway, or access/intersection. If adjacent to waterway, use a maximum slope of 2%.
• Compact subgrade and place filter fabric if required.
• Place coarse aggregate, 1 to 2 ½ inches size, to a minimum depth of 6 inches for commercial projects, and 4 inches for residential projects.

MAINTENANCE:
• Inspect daily for loss of gravel or sediment buildup.
• Inspect adjacent roadway for sediment deposit and clean by sweeping or shoveling.
• Repair entrance and replace gravel as required to maintain control in good working condition.
• Expand stabilized area as required to accommodate traffic, and off site street parking and prevent erosion at driveway.
STABILIZED CONSTRUCTION ENTRANCE

TYPICAL DESIGN LAYOUT

SUMMIT COUNTY APPENDIX C1
December 2004 Erosion and Sediment Controls
DIVERSION DITCH/DIKE

DEFINITION: A temporary sediment barrier and storm water conveyance consisting of an excavated channel and compacted earth ridge.

PURPOSE: To protect down-gradient areas from sedimentation and erosion by diverting runoff to a controlled discharge point.

APPLICATION:
- Construct along the top of construction slope to intercept up-gradient runoff.
- Construct along the toe of construction slope to divert sediment laden runoff.
- Construct along midpoint of construction slope to intercept runoff and channel to a controlled discharge point.
- Construct around base of soil stockpiles to capture sediment.
- Construct around perimeter of disturbed areas to capture sediment.

LIMITATIONS:
- Recommended maximum drainage of 5 acres.
- Recommended maximum side slopes of 2:1 (50%).
- Recommended maximum slope on channel of 1%.

INSTALLATION:
- Clear and grub area for ditch/dike construction.
- Excavate channel and place soil on down gradient side.
- Shape and machine compact excavated soil to form ditch/ridge.
- Place erosion protection (Riprap, mulch, appropriate geotextiles) at outlet.
- Stabilize channel and ridge as required with mulch, gravel or vegetative cover.

MAINTENANCE:
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff breaching dike or eroding channel or side slopes.
- Check discharge point for erosion or bypassing of flows.
- Repair and stabilize as necessary.
- Inspect daily during vehicular or construction equipment activity on slope, check for and repair any traffic damage.
DIVERSION DIKE

TYPICAL DESIGN LAYOUT

DIVERSION DIKE AT TOP OF SLOPE

DIVERSION DIKE AT TOE OF SLOPE
DIVERSION DIKE

TYPICAL DESIGN LAYOUT

DIVERSION DIKE AT TOP OF SLOPE

DIVERSION DIKE AT TOE OF SLOPE
WATER BAR

DEFINITION: A constructed drainage feature that diverts water off unpaved roads or trails to a controlled discharge point.

PURPOSE: To prevent water from ponding and/or flowing on/or along an unpaved road or trail by diverting runoff to a controlled discharge point.

APPLICATION:
• Construct along roads/trails to intercept up-gradient runoff and prevent rills from forming on fill slopes.
• Construct in low areas where water ponding is likely to occur to divert water off of the road/trail surface.
• Construct where erosion problems are occurring due to uncontrolled runoff.

LIMITATIONS:
• Discharge point should be stable and not sensitive to increases in runoff.
• Unfiltered discharges should not be directed directly into natural waterways.
• Waterbars must be appropriately sized for specific traffic types and levels of use.

INSTALLATION:
• Location and frequency should be based on road slopes, runoff patterns, and topography.
• Determine discharge point and appropriate discharge method (slope drain, vegetated swale, rip rapped chute, or storm drain).
• Excavate trough and/or construct berm with fill.
• Compact the fill material.
• Construct discharge point.
• Use straw bales, silt fencing, gravel check dams, excavated sediment traps, or existing vegetation to filter the discharge as necessary.

MAINTENANCE:
• Inspect immediately after any rainfall and at least daily during prolonged rainfall.
• Remove sediment as necessary.
• Inspect for runoff breaching water bar or eroding at/or below the discharge point.
• Repair vehicle ruts on the top of the berm and stabilize as necessary.
STORM DRAIN INLET PROTECTION

DEFINITION: Concrete block, filter cloth, and gravel filter placed over inlet to storm drain system.

PURPOSE: Reduce sediment discharge to storm drain system by filtering storm water flows and reducing flow velocities allowing deposition of sediment.

APPLICATION:
• Construct at storm drain inlets in paved or unpaved areas where up-gradient area is to be disturbed by construction activities.

LIMITATIONS:
• Recommended for maximum drainage of one acre.
• Excess flows may bypass the inlet requiring down gradient controls.
• Ponding will occur at inlet.

INSTALLATION:
• Place wire (with ½ inch openings) over the inlet extending 12-inches past inlet opening. Place filter fabric over mesh.
• Place concrete blocks around the inlet with openings facing outward. Stack blocks to minimum height of 12-inches and a maximum height of 24-inches.
• Place wire mesh around outside of blocks.
• Place gravel (3/4 inch to 3 inches) around blocks.

MAINTENANCE:
• Inspect inlet protection after every large storm event and at a minimum of once monthly.
• Remove sediment accumulated when it reaches 4-inches in depth.
• Replace filter fabric and clean or replace gravel if clogging is apparent.
STRAW BALE DROP-INLET BARRIER

DEFINITION:  Straw Bale placed around inlet to storm drain system. Bale drop-inlets operate by intercepting and ponding sediment-laden runoff. Ponding the water reduces the velocity of the incoming flow and allows most of the suspended sediment to settle out. When the pond height reaches the top of the barrier, water flows over the bales and into the drop inlet.

PURPOSE:  Reduce sediment discharge to storm drain system by some filtering of storm water flows and reducing flow velocities allowing deposition of sediment.

APPLICATION:
• Construct at storm drain inlets in unpaved areas where up-gradient area is to be disturbed by construction activities.
• Use at median drop-inlet boxes.

LIMITATIONS:
• Recommended for maximum drainage of one acre.
• Excess flows may bypass the inlet requiring down gradient controls.
• Ponding will occur at inlet.
• Do not use where ponding may stretch out onto adjacent roadway.

INSTALLATION:
• Excavate a trench around the perimeter of the drop inlet that is at least 6 inches deep by 1.5 times the width of the bale wide
• Place bales in the trench, making sure that they are butted tightly. Some bales mat need to be shortened to fit the trench around the drop inlet. Two stakes must be driven though each bale approximately 8 inches from each end. The stakes must be driven a minimum of 18 inches into the ground.
• The bales must also be placed directly against the outside of the drop-inlet. This allows overtopping water to flow directly into the inlet instead of onto nearby soil causing scour.
• Place the excavated against the outside of the bales and compacted. The compacted soil should be no deeper than 4 inches against the bale.
• This method may be enhanced with the use of a silt catching/filtering sack placed inside the drop-inlet.

MAINTENANCE:
• Inspect inlet protection after every large storm event and at a minimum of once weekly.
• Remove sediment accumulated when it reaches half the height of the bale.
• Replace bales which become damaged.
• Replace filter sack (if used) if clogging is apparent.
REMOVE DRAIN GATE
INSERT SILTSACK™
REPLACE GRACE TO HOLD
SILTSACK IN POSITION
SILTSACK TRAPS SILT
REMOVE FILLED SILTSACK
(WITH FRONT-LOADER OR OTHER EQUIPMENT)
LIFT DUMP STRAPS
CLEAN AND REUSE OR
REPLACE AND DISCARD
SIZED TO FIT ANY SIZE OR SHAPE CATCH BASIN
ALL SEAMS DOUBLE STITCHED
PERMEABILITY—REGULAR FLOW SILTSACK = 40 GALLON/MIN/FT²
HIGH FLOW SILTSACK = 200 GALLON/MIN/FT²
UPS SHIFTABLE
BRUSH BARRIER

DEFINITION: A vertical barrier constructed of tree trimmings, limbs, and brush obtained from the clearing operation. A filter cloth should be used over the brush barrier to maximize effectiveness.

PURPOSE: To trap sediment and filter construction runoff.

APPLICATION:
- Sediment Barrier: Place barrier at toe of slope or soil stockpile.
- Velocity Dissipation: Reduce velocities and trap sediment at culvert outlets and in roadway ditches.

LIMITATIONS:
- Adequate material for the barrier is available from the clearing operation.

INSTALLATION:
- Construct barrier with trimmings, limbs, and brush and perform necessary trimming.
- Construct small trench (8 inches wide and 8 inches deep) on front side of barrier.
- Cut filter cloth to proper size and place over brush.
- Bury the filter cloth to prevent undermining.
- Attach filter cloth to brush by stapling or other means.
- Brush barriers located below pipe culverts should be constructed prior to culvert installation.

MAINTENANCE:
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff bypassing ends of barriers or undercutting barriers.
- Repair or replace damaged areas of the barrier and remove accumulated sediment.
- Re-compact soil around barrier as necessary to prevent piping.
GENERAL NOTES:

1. SHRUBS AND CUT TREES ARE TO BE PLACED APPROXIMATELY 2 FEET BELOW TOE OF FILL SLOPE.

2. BRUSH BARRIER NOT TO BE COVERED BY FILL MATERIAL.

3. BRUSH BARRIER NOT INTENDED FOR SLOPE STABILITY OF FILL MATERIAL.

4. WHERE FILL IS NOT USED ALONG ROAD, BRUSH BARRIER SHALL BE PLACED DOWN GRADIENT AS RECOMMENDED BY ENGINEERING REPRESENTATIVE.
GRAVEL CHECK DAMS

DEFINITION: Small temporary dam constructed across dry drainage path (i.e. not in live streams).

PURPOSE: To reduce erosion of drainage path by reducing velocity of flow and by trapping sediment and debris.

APPLICATION:
- Temporary drainage paths.
- Permanent drainage ways not yet stabilized.
- Existing drainage paths receiving increased flows due to construction.

LIMITATIONS:
- Maximum recommended drainage area is 10 acres.
- Maximum recommended height is 24".
- Do not use in running stream.

INSTALLATION:
- Prepare location of dam by removing any debris and rough grading any irregularities in channel bottom.
- Place rocks by hand or with appropriate machinery, do not dump.
- Construct dam with center lower to pass design flow.
- Construct 50% side slopes on dam.

MAINTENANCE:
- Inspect dams daily during prolonged rainfall, after each major rain event and at a minimum of once monthly.
- Remove any large debris and repair any damage to dam, channel, or side slopes.
- Remove accumulated sediment when it reaches one half the height of the dam.
GRAVEL CHECK DAMS

TYPICAL DESIGN LAYOUT

<table>
<thead>
<tr>
<th>DITCH GRADE (%)</th>
<th>CHECK DAM SPACING (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>60</td>
</tr>
<tr>
<td>6.0</td>
<td>50</td>
</tr>
<tr>
<td>7.0</td>
<td>43</td>
</tr>
<tr>
<td>8.0</td>
<td>38</td>
</tr>
<tr>
<td>9.0</td>
<td>33</td>
</tr>
<tr>
<td>10.0</td>
<td>30</td>
</tr>
</tbody>
</table>
STRAW BALE CHECK DAMS

DEFINITION: Small temporary dam constructed across dry drainage path (i.e. not in live streams).

PURPOSE: To reduce erosion of drainage path by reducing velocity of flow and by trapping sediment and debris.

APPLICATION:
- Temporary drainage paths.
- Permanent drainage ways not yet stabilized.
- Existing drainage paths receiving increased flows due to construction.

LIMITATIONS:
- Maximum recommended drainage area is 10 acres.
- Sufficient number of bales are required to force runoff over the flow line.
- Do not use in ditches with slopes of 6% or more. For ditches with slopes over 6%, use rock check dams.
- Do not use where high flows are expected.
- Do not use directly in front of a culvert outlet.
- Do not use in running stream.

INSTALLATION:
- Prepare location of dam by removing any debris and rough grading any irregularities in channel bottom.
- Bales must be free of weeds declared noxious by the State of Utah, Department of Agriculture.
- Excavate a vertical trench perpendicular to the ditch flow line the length of the straw bale dam that is 6 inches deep, and 1.5 time the width of the bale.
- Place bales in the trench, making sure that they are tightly butted against each other, and the excavated trench on the downstream side.
- Place two stakes through each bale, approximately 8 inches from each end and drive at least 18 inches into the ground.
- Construct dam with center lower to pass design flow.
- Place and compact the excavated material in the remaining trench area on the upstream side. The compacted soil should be no more than 4 inches deep and extend upstream no more than 24 inches.
- Use downstream scour apron where required.

MAINTENANCE:
- Inspect dams daily during prolonged rainfall, after each major rain event and at a minimum of once monthly.
- Remove any large debris and repair any damage to dam, channel, or side slopes.
• Remove accumulated sediment when it reaches one half the height of the dam.
STRAW BALE CHECK DAM
TYPICAL DESIGN LAYOUT

CHECK DAM SPACING

THE FOLLOWING TABLE PROVIDES CHECK DAM SPACING FOR A GIVEN DITCH GRADE:

<table>
<thead>
<tr>
<th>PITCH (%)</th>
<th>CHECK DAM SPACING (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>200</td>
</tr>
<tr>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>3.0</td>
<td>66</td>
</tr>
<tr>
<td>4.0</td>
<td>50</td>
</tr>
<tr>
<td>5.0</td>
<td>40</td>
</tr>
<tr>
<td>6.0</td>
<td>33</td>
</tr>
</tbody>
</table>
SLOPE DRAIN

DEFINITION: A devise used to carry concentrated runoff from the top to the bottom of a slope.

PURPOSE:
• Convey runoff from offsite around a disturbed portion of the site.
• Drain saturated slopes that have the potential for soil slides.

APPLICATION:
• Use on cut or fill slopes before permanent storm water drainage structures have been installed.
• Use where diversion ditches or other diversion measures have been used to concentrate flows.
• Use on any slopes where concentrated runoff crossing the face of the slope may cause gullies, channel erosion, or saturation of slide-prone soils.
• Use as an outlet for a natural drainage way.

LIMITATIONS: Not suitable for drainage areas greater than 10 acres.

INSTALLATION:
• The slope drain design should handle the peak runoff for the 10-year 24-hour storm. Typical relationships between area and pipe diameter are shown below:

<table>
<thead>
<tr>
<th>Maximum Drainage Area (Acres)</th>
<th>Pipe Diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>12</td>
</tr>
<tr>
<td>0.75</td>
<td>15</td>
</tr>
<tr>
<td>1.00</td>
<td>18</td>
</tr>
</tbody>
</table>

• Place slope drain on undisturbed or well-compacted soils.
• Place filter cloth under the inlet, extend it to 3 to 6 feet in front of the inlet, and key it in 6 to 8 inches on all sides to prevent erosion. A 6 to 8 inches metal toe plate may also be used for this purpose.
• Securely stake the drain pipe to the slope at intervals of 10 feet or less, using grommets.
• Make sure that all slope drain sections are securely fastened together and have watertight fittings.
• Extend the pipe beyond the toe of the slope and discharge at a non-erosive velocity into a stabilized area or to a sediment trap. Use riprap outlet protection if necessary.

MAINTENANCE:
• Inspect the slope drain regularly and after every storm. Check to see if water is bypassing the inlet or undercutting the inlet or pipe. If necessary, install head walls or sandbags to prevent bypass flow.
• Check for erosion at the outlet point and check the pipe for breaks or clogs.
SLOPE DRAIN
TYPICAL DESIGN
LAYOUT

NOTE: WHERE RIBBON IS NOT USED, USE SILT FENCE PLUS STAKED STRAW FANCE TO CARRY AWAY OF THE WATER AND FILTER THE RUNOFF.

PLAN VIEW
SLOPE DRAIN

TYPICAL DESIGN LAYOUT
OPEN CHUTE DRAIN

DEFINITION: An excavated channel placed across disturbed slopes used to protect exposed slopes by intercepting runoff and directing it to a stabilized outlet or sediment-trapping devise.

PURPOSE: Convey runoff over disturbed soil without causing further erosion of the slope.

APPLICATION:
- Used on cut and fill slopes as a permanent or temporary storm water drainage structure.
- Used where diversion ditches or other diversion measures have been used to concentrate flows.

LIMITATIONS:
- Should be sized based on anticipated runoff, sediment loading and drainage area size.
- May require temporary slope drain until final grade is established and open chute drain is constructed.
- Recommended maximum slope of 2:1 (50%).
- Recommended minimum slope of 20:1(5%).

INSTALLATION:
- Detail design is required.
- Implementation of energy dissipaters at the outlet end to protect against scour.
- The elevation of the top of the lining of the inlet structure must not be higher than the lowest diversion dike(s) or other devices that direct flow to the chute.
- Design with adequate capacity to convey the 50-year, 6-hour storm.
- Compact some soil around the inlet to ensure that a good bond is attained at the interface of the structure and diversion dikes and to prevent piping failure. Place Rip Rap if required.

MAINTENANCE:
- Inspect after major storms. Look for piping failure at the interface of the inlet and adjoining diversion dike(s) or berm(s).
- Repair any damage promptly.
ROCK-LINED (RIP RAP) DITCHES

DEFINITION: A channel or ditch lined with rocks to prevent erosion. May be used as a temporary or permanent control.

PURPOSE: Convey runoff without causing erosion of the ditch or channel.

APPLICATION:
- Used in ditches or channels which may or may not have continuous flow.
- Used along roadways where the ditch or channel does not jeopardize the Clear Zone.

LIMITATIONS:
- Should be sized based on anticipated runoff, sediment loading and drainage area size.
- Recommended maximum slope of 2:1 (50%).
- Ditches or Channels having slopes greater than 8% must utilize geotextiles beneath the rock.
- Minimum Rock size shall be 6". The gradation shall be determined by the detailed design.

INSTALLATION:
- Detail design is required.
- Implementation of energy dissipaters at the outlet end to protect against scour.
- Design temporary ditches with adequate capacity to convey the 50-year, 6-hour storm. Design permanent ditches per Summit County Standards.
- Excavate ditch or channel to the designed cross section and grade. The ditch or channel side slope may be no steeper than 2:1.
- Place geotextiles (if required) along the full width of the excavated ditch or channel. Be sure to overlap the material as required in the manufacturers guidelines.
- Place the rock by machine, or by hand as required.

MAINTENANCE:
- Inspect after major storms. Look for undermining failures.
- Repair any damage promptly.
GRASSED/MATTED SWALES

DEFINITION: A channel or ditch lined with vegetated matts to prevent erosion. May be used as a temporary or permanent control.

PURPOSE: Convey runoff without causing erosion of the ditch or channel.

APPLICATION:
• Used in ditches or channels which do not have continuous flow.
• Used along roadways where the ditch or channel is used to convey storm water.

LIMITATIONS:
• Should be sized based on anticipated runoff, sediment loading and drainage area size.
• Recommended maximum slope of 20:1 (5%).

INSTALLATION:
• Detail design is required.
• Implementation of energy dissipaters at the outlet end to protect against scour.
• Design temporary ditches with adequate capacity to convey the 50-year, 6-hour storm. Design permanent ditches per Summit County Standards.
• Excavate ditch or channel to the designed cross section and grade. The ditch or channel side slope may be no steeper than 3:1.
• Place matt along the full width of the excavated ditch or channel. Be sure to overlap the material if required in the manufacturers guidelines.

MAINTENANCE:
• Inspect after major storms. Look for undermining failures.
• Repair any damage promptly.
TEMPORARY EXCAVATED SEDIMENT TRAP

DEFINITION: A small temporary containment area with gravel (Rip Rap) outlet.

PURPOSE:
- Reduce velocities and peak discharge of storm water runoff.
- Create temporary ponding to allow settlement and deposition of suspended solids.
- Protect down-gradient discharge point from sediment laden runoff and eroding velocities.

APPLICATION:
- Temporary control for runoff from disturbed areas of less than 3 acres.
- Temporary control for discharge from diversion dike, surface benching, or other temporary drainage measures.

LIMITATIONS:
- Should be sized based on anticipated runoff, sediment loading and drainage area size.
- May require silt fence at outlet for entrapment of very fine silts and clays.

INSTALLATION:
- Design basin for site specific location.
- Excavate basin or construct compacted berm containment.
- Construct outfall spillway with gravel (Rip Rap) apron.
- Provide downstream silt fence if necessary.
- Use straw bales in trap to reduce gullying.

MAINTENANCE:
- Inspect after each rainfall event and at a minimum of monthly.
- Repair any damage to berm, spillway or sidewalls.
- Remove accumulated sediment as it reaches 50% height of available storage.
- Check outlet for sediment/erosion of down-gradient area and remediate as necessary. Install silt fence if sedimentation down stream is apparent.
EQUIPMENT AND VEHICLE WASH DOWN AREA

DEFINITION: A stabilized pad of crushed stone for general washing of equipment and construction vehicles.

PURPOSE: To reduce potential of sediment being tracked onto roads and streets by vehicles leaving a construction site and entering a storm water collection systems, or waterways.

APPLICATION:
- At any site where regular washing of vehicles and equipment must occur to reduce the potential of sediment being tracked onto roads and streets by vehicles leaving a construction site.
- May also be used as a filling point for water trucks limiting erosion caused by overflow or spillage of water.

LIMITATIONS:
- Cannot be utilize for washing equipment or vehicles that may cause contamination of runoff such as fertilizer equipment or concrete equipment. Solely used to remove mud from vehicles leaving construction sites.
- A Sediment trap must be used in conjunction to control sediment runoff with wash water.

INSTALLATION:
- Clear and grub area and grade to provide maximum slope of 1%.
- Compact subgrade and place filter fabric if desired (required for wash areas which will remain in use for 3 months or more).
- Place coarse aggregate, 1 to 2 ½ inches in size, to a minimum depth of 8 inches.
- For small projects, instal silt fence down gradient (see silt fence BMP information sheet).
- For large projects, instal sediment basin down gradient (see excavated sediment trap BMP information sheet).

MAINTENANCE:
- Inspect daily for loss of gravel or sediment buildup.
- Inspect adjacent area for sediment deposit and install additional controls if necessary.
- Repair area and replace gravel as required to maintain control in good working condition.
- Expand stabilized area as required to accommodate activities.
- Maintain silt fence as outline in specific silt fence BMP information sheet.
- Maintain sediment trap as outline in specific sediment trap BMP information sheet.
EQUIPMENT AND VEHICLE
WASH DOWN AREA
TYPICAL DESIGN LAYOUT

NOTE: SEE IMP INFORMATION SHEET FOR SILT FENCE ERECTION TIPS.
MATERIAL STORAGE

DEFINITION: Controlled storage of on-site materials.

PURPOSE: To limit potential for materials contaminating storm water runoff.

APPLICATION:
- Storage of hazardous, toxic, and all chemical substances.
- Any construction site with outside storage of materials.

LIMITATIONS:
- Does not prevent contamination due to mishandling of products.
- Spill Prevention and Response Plan still required.
- Only effective if materials are actively stored in a controlled location.

INSTALLATION:
- Designate a secured area with limited access as the storage location. Ensure no waterways or drainage paths are nearby.
- Construct compacted earthen berm or similar perimeter containment around storage location for impoundment in the case of spills.
- Ensure all on-site personnel utilize designated storage area. Do not store excessive amounts of material that will not be utilize on-site.
- For active use of materials away from the storage area ensure materials are not set directly on the ground and are covered when not in use. Protect storm drainage during use.

MAINTENANCE:
- Inspect daily and repair any damage to perimeter impoundment or security fencing.
- Check that materials are being correctly stored (i.e. standing upright, in labeled containers, tightly capped) and that no materials are being stored away from the designated location.
MATERIAL STORAGE

TYPICAL DESIGN LAYOUT

CONTROLLED STORAGE LOCATION
BERMED PERIMETER IMPOUNDMENT
STORAGE OFF GROUND
COVER WHEN NOT IN USE
WASTE DISPOSAL

DEFINITION: Controlled storage and disposal of solid waste generated by construction activities.

PURPOSE: To prevent or reduce discharge of pollutants to storm water from improper disposal of solid waste.

APPLICATION: All construction sites.

LIMITATIONS: On-site personnel are responsible for correct disposal of waste.

INSTALLATION:
- Designate one or several waste collection areas with easy access for construction vehicles and personnel. Ensure no waterways or storm drainage inlets are located near the waste collection areas. Construct compacted earthen berm or similar perimeter containment around collection area for impoundment in the case of spills and to trap any windblown trash.
- Use water tight containers with covers which are to remain closed when not in use. Provide separate containers for different waste types where appropriate and label clearly.
- Ensure all on-site personnel are aware of and utilize designated waste collection area properly and for intended use only (e.g., all toxic, hazardous or recyclable materials shall be properly disposed of separately from general construction waste).
- Arrange for periodic pickup, transfer and disposal of collected waste at authorized disposal location. Include regular Porta-potty service in waste management activities.

MAINTENANCE:
- Discuss waste management procedures at progress meetings.
- Collect site trash daily and deposit in covered containers at designated collection area.
- Check containers for leakage or inadequate covers and replace as needed.
- Randomly check disposed materials for any unauthorized waste (e.g., toxic materials).
- During daily site inspections check that waste is not being incorrectly disposed of on-site (e.g., burial, burning, surface discharge, discharge to storm drain).
WASTE DISPOSAL

TYPICAL DESIGN LAYOUT

[Diagram of waste disposal area with 'NO TOXIC WASTE' and 'LANDFILL' labels]
GENERAL NOTES:
1. WHERE POSSIBLE INSTALL THE SILT FENCE 1.5 M TO 2.5 M
   BEYOND THE TOE OF SLOPE.
2. ALIGN THE FENCE ALONG THE CONTOUR AS CLOSE AS POSSIBLE.
3. WHEN INSTALLING THE FENCE USE MACHINERY THAT WILL
   PRODUCE NO MORE THAN THE DESIRED DIMENSIONS.
4. PULL THE BOTTOM 4.0 M OF FILTER FABRIC TO LINE ALL
   THREE SIDES OF THE TRENCH.
5. TO AVOID EXCESSIVE FLOWING OF WATER AT LOW POINTS ALONG
   THE FENCE PROVIDE AN OPENING IN THE SILT FENCE AND INSTALL
   A CHECK DRAIN.
6. AVOID USING JOINTS ALONG THE FENCE AS MUCH AS POSSIBLE.
   IF A JOINT IS NECESSARY SPlice THE FILTER FABRIC AT A POST
   WITH A 250 MM OVERLAP AND SECURELY TAPEN BOTH ENDS TO
   THE POST.
7. MAINTAIN A PROPERLY FUNCTIONING SILT FENCE THROUGHOUT
   THE DURATION OF THE PROJECT OR UNTIL DISTURBED AREAS HAVE
   BEEN REVEGETATED.
8. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE
   AREA APPROVED BY THE ENGINEER.
SLOPE DRAIN AND TEMPORARY BERM

SLOPE DRAIN SECTION

SLOPE DRAIN ISOMETRIC

TEMPORARY BERM

GENERAL NOTES FOR SLOPE DRAIN

1. Construct the slope drain a minimum of 4 ft above the elevation of the water table as shown on the project plans.
2. The slope drain should be constructed to extend below the elevation of the water table as shown on the project plans.
3. The slope drain should be designed to accommodate the maximum anticipated water flow.
4. The slope drain should be constructed with a minimum of 12 inches of compacted fill at the bottom.
5. The slope drain should be constructed with a minimum of 18 inches of compacted fill at the sides.

GENERAL NOTES FOR TEMPORARY BERM

1. Construct the temporary berm a minimum of 4 ft above the elevation of the water table as shown on the project plans.
2. The temporary berm should be designed to accommodate the maximum anticipated water flow.
3. The temporary berm should be constructed with a minimum of 12 inches of compacted fill at the bottom.
4. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
5. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
6. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
7. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
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12. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
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14. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
15. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
16. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
17. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
18. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
19. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
20. The temporary berm should be constructed with a minimum of 18 inches of compacted fill at the sides.
APPENDIX C2:  TYPICAL RESIDENTIAL STORM WATER POLLUTION PREVENTION PLAN