

# **APPENDIX A**

## **STORM WATER TECHNICAL MANUAL & BEST MANAGEMENT PRACTICES**

(Updated November 2020)

# PART 1

## STORM WATER TECHNICAL MANUAL

### A. INTRODUCTION

The Storm Water Technical Manual contains requirements for land development and construction activities as well as design criteria and guidelines for those performing such activities. It includes best management practices applicable to development and construction activities. It also includes the plan submittal requirements. The City Engineer has authority to modify the requirements of the Storm Water Technical Manual as needed to accomplish reasonable and effective storm water pollution prevention objectives.

### B. REQUIREMENTS FOR PROPOSED DEVELOPMENTS

#### 1. Incorporate best management practices (BMPs) into development design to limit quantity of runoff and preserve quality of runoff

Storm water BMPs must be considered throughout the development process. PART 2, CONSTRUCTION AND LONG-TERM BEST MANAGEMENT PRACTICES (formerly Post Construction) of the Pleasant Grove Storm Water Management Program contains fact sheets for BMPs whose use Pleasant Grove City encourages. Section F.2, Storm Water Quality Criteria of this Storm Water Technical Manual identifies BMPs that are required on all Construction Site Storm Water Management Plans.

#### 2. Prepare Construction Site Storm Water Management Plan

A Construction Site Storm Water Management Plan must be prepared and submitted with the development plans for approval. This requirement applies to all developments (other than construction of a single-family home, with associated on-site improvements). See section G of this chapter, CONSTRUCTION SITE STORM WATER MANAGEMENT PLAN CONTENTS for the required contents of the plan.

#### 3. Provide financial guarantee that improvements contained in the Construction Site Storm Water Management Plan will be installed and maintained

Financial guarantee must be posted with Pleasant Grove City prior to beginning construction. In the case of a subdivision of land, this will be included in the bond that is required for the cost of the subdivision improvements. In the case of site improvements, rather than a financial guarantee, non-monetary methods of enforcement already in place in Pleasant Grove City (business licenses, utility services, building and occupancy permits) are available to encourage compliance with the improvements contained in the approved Construction Site Storm Water Management Plan.

At the time of development, the developer shall provide an estimate of the cost of the required improvements. The City will review the estimate and establish the dollar amount of the financial guarantee.

**4. Prepare a Long-Term Storm Water Management Plan for new development and re-development**

A Long-Term Storm Water Management Plan must be prepared and submitted with the development plans for approval. This requirement applies to all developments and re-developments in which private improvements are constructed (except construction of single-family homes, with associated on-site improvements). See section H of this chapter, LONG-TERM STORM WATER MANAGEMENT PLAN CONTENTS for the required contents of the plan.

**5. Obtain UPDES Permit (all sites having land disturbance area equal to or greater than 1 acre)**

Developments having a disturbed area of 1 acre or more require a UPDES Storm Water General Permit for Construction activities from the Division of Water Quality of the Department of Environmental Quality of the State of Utah.

Obtaining the permit requires preparation of a Storm Water Pollution Prevention Plan (we would expect that the Construction Site Storm Water Management Plan previously described would suffice) and a Notice of Intent. Information regarding this process is available at: <https://deg.utah.gov/water-quality/general-construction-storm-water-updes-permits>. The developer must submit a copy of the Notice of Intent to the City before the site plan or improvement plans will be considered finalized.

Note that when a development of over 1 acre in size is phased, the permit is required for each phase, even if each phase is less than 1 acre in size.

## **C. REQUIREMENTS FOR CONSTRUCTION ACTIVITIES (OTHER THAN THOSE ASSOCIATED WITH INDIVIDUAL RESIDENTIAL STRUCTURES)**

### **1. Provide instruction to construction site operators regarding the Construction Site Storm Water Management Plan**

Prior to beginning work, developers and contractors must provide appropriate instruction to on-site construction supervisors and operators, regarding the requirements of the Construction Site Storm Water Management Plan. A copy of the approved plan must be present at the construction site.

### **2. Following Construction Site Storm Water Management Plan**

The improvements shown in the approved Construction Site Storm Water Management Plan must be constructed as indicated in the plan. The appropriate activities outlined in the Construction Site Storm Water Management Plan must be performed prior to any other construction activities on the site. Pleasant Grove City encourages modifications to the plan, when needed, to improve storm water management in light of site conditions. However, variations from the plan that reduce or eliminate elements of the plan must only be done with the approval of the Pleasant Grove City Public Works Representative or City Engineer.

### **3. Monitor effectiveness of the elements included in the Construction Site Storm Water Management Plan and make improvements as necessary to achieve the plan objectives.**

After initial implementation of the improvements outlined in the approved Construction Site Storm Water Management Plan, rainfall activity will provide opportunity to observe the effectiveness of the storm water management improvements. Those responsible for construction activities must monitor the in-place storm water management improvements to assess their effectiveness; they must then make adjustments to the improvements as needed to accomplish effective storm water management.

### **4. Provide verification that improvements were constructed as approved**

Following implementation of the improvements contained in the Construction Site Storm Water Management Plan, the preparer of the plan shall provide Pleasant Grove City with a statement as to the condition of the improvements contained in the plan. The statement shall be made on a copy of the Construction Site Storm Water Management Plan document and shall be signed.

If the improvements were constructed as approved, it shall include language verifying such. If the improvements were not constructed as approved, it shall state the differences, the reason for the differences, and provide an opinion as to the adequacy of the constructed improvements. This statement must be provided to

Pleasant Grove City at the time record drawings are submitted (in the case of public improvements) or prior to issuance of an occupancy permit (in the case of private site improvements)

## **D. REQUIREMENTS FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH INDIVIDUAL RESIDENTIAL STRUCTURES**

### **1. Construction Site Storm Water Management Plan**

While the Public Works Representative or City Engineer may require that a Construction Site Storm Water Management Plan be created on individual residential lots in special circumstances, generally no lot-specific plan is required.

### **2. Sediment Control on Small Construction Sites**

The BMP fact sheet for Sediment Control on Small Construction Sites (SCSCS) is to be included as a part of the building permit. This BMP applies to construction and landscaping activities associated with individual residential structures and shall be followed.

### **3. Owner or operator shall make adjustments to practices as needed to prevent storm water pollution**

Sediment that is left in the street or on adjacent lots is evidence of inadequate sediment control. Where storm water pollution prevention measures are inadequate, or are not being properly followed, the Public Works Representative, Community Development Representative or City Engineer may refuse to perform inspections or shut down work on the project.

## **E. REQUIREMENTS FOR EXISTING DEVELOPMENTS**

### **1. Following approved Long-Term Storm Water Management Plan**

The owners of existing developments are responsible to maintain improvements and observe practices that were part of an approved Long-Term Storm Water Management Plan. Failure to adhere to the plan may result in failure of the City to renew business licenses, fines, or other action as prescribed by Pleasant Grove City Code.

### **2. Operator or owner makes adjustments to practices or improvements when necessary to achieve Long-Term Storm Water Management Plan objectives**

Pleasant Grove City encourages adjustments to the plan that enhance effective storm water management. However, significant reduction of practices contained in the plan is to be accomplished through formal modification of the plan and resubmission to the Development Review Committee (or designee) for approval.

## **F. STORM WATER PERFORMANCE CRITERIA AND DESIGN GUIDELINES**

The following storm drainage criteria and design guidelines apply to all storm drainage plans in Pleasant Grove and shall be used in storm drainage calculations. The City Engineer has authority to modify the criteria and guidelines as needed to meet changing or unusual needs or conditions, or updates in federal or state requirements. Two principle categories of design criteria must be met:

- Low Impact Development meeting all local, state and federal requirements
- Design storm detention and conveyance

The design criteria for each of these is outlined in further detail below.

### **1. Low Impact Development Design Guidelines (LID)**

- A. 80<sup>th</sup> Percentile Storm Management: Infiltrate, evapotranspire and/or harvest and use rainwater on site for the first 0.5 inches of water per storm (daily rainfall) to the maximum extent practicable. The city's analysis has determined that 0.5 inches is the appropriate depth within its boundaries for the 80<sup>th</sup> percentile storm.
- B. Specific LID Design methodology and BMPs acceptable to Pleasant Grove City are included in the most recent version of "A Guide to Low Impact Development within Utah" prepared for the Utah Department of Environmental Quality, Division of Water Quality ("Guide").
  - i. Variances from the Guide specific to Pleasant Grove City:
    - a. Typical Single-Family Residential Developments must purchase credits towards the City's LID bank in lieu of implementing infiltration or water quality measures onsite, unless subject to the following exclusions:
      - i. Purchases of credit towards the LID bank are subject to availability of existing or planned banking facilities, as determined by the City Engineer.
      - ii. Available or planned banks must be effective in offsetting the LID design volume ( $V_{goal}$ ) for the proposed development, as determined by the City Engineer.
    - b. Non-Single-Family Residential Developments are required to fully implement LID standards onsite and ensure operation and maintenance through long term storm water management plan development and implementation.
    - c. Include Drinking Water Source Protection areas (DWSP) in Flow Chart 1 consideration. Typically, surface infiltration in vegetative areas is acceptable in these areas. Direct underground infiltration is not acceptable unless water is first cleaned through pretreatment, such as a hydrodynamic separator. No direct underground injection of storm water is permitted within Zone 1

of any Drinking Water Source Protection Zone for wells and springs.

- i. The city may supply a “Stormwater LID Information” map which may be used as a reference in determining DWSP zones but is not considered final or all-inclusive.
- d. The necessity of sprinklers, fertilization, and operation and maintenance issues must also be considered in selecting BMP and vegetation types.
- e. Permeable pavements in areas regularly trafficked by vehicles are generally not permitted but may be considered on a case-by-case basis by the City Engineer.
- f. The developer may propose additional LID BMP’s if they are similar in analysis, form, and function as the BMP’s in the Guide. Calculations and/or documentation must be provided demonstrating the effectiveness. The City Engineer reserves the right to accept or reject the BMPs based on its opinion of effectiveness for the given situation, or the adequacy of the documentation.
- g. The City Engineer may reject or require adjustments to BMPs that may be ineffective, unproven, or create excessive or unaddressed maintenance concerns, or may create a public nuisance.

### C. LID Design Process

All developments that disturb an area greater than one acre or re-development projects that increase the amount of impervious area by 10 percent are required to manage rainfall from the 80<sup>th</sup> percentile storm through infiltration, evapotranspiration and/or harvesting or reusing. The State of Utah has developed “A Guide to Low Impact Development within Utah” (Guide) to help meet this requirement. Pleasant Grove City has differentiated between typical single-family residential developments and non-single-family developments and created separate design processes for each to meet the requirements. These processes are described below.

- i. Non-Single-Family Residential, Mixed-Use, and similar Developments, as determined by City Engineer:
  - a. Fill out Storm Water Quality Report Template located in Appendix A of the Guide.
  - b. Follow Flow Charts 1-3 from the “LID BMP Selection” section of the Guide to determine if retention or treatment BMP is appropriate for the proposed development.
  - c. Select BMP’s appropriate for proposed development and follow provided checklists in design.
  - d. Design site storm water system including LID requirements and submit all checklists, flow charts, and calculations to the City for review.
- ii. Single-Family Residential:
  - a. Follow design process for Non-Single-Family Residential or purchase credits towards the LID bank.

- b. A combination of implementing some LID measures and purchasing credits in a bank may be considered by the City Engineer on a case-by-case basis.
- c. The City Engineer may require specific minimum water quality measures be put in place even if LID bank credits are approved to offset infiltration or more rigorous water quality measures.
- iii. The City retains the right to accept or reject ownership of LID measures implemented onsite for any reason. For any LID measure, whether located in city right-of-way or not, the city may require that specific measures be maintained by the property owners under an acceptable long-term maintenance agreement with the owner or a property owners' association. This includes, but is not limited to, measures requiring continual maintenance of vegetation or otherwise high levels of maintenance.

## **2. Storm Water Detention and Conveyance Quantity Criteria & Design Guidelines**

### **A. Detention and Conveyance Design Storm**

- i. Frequency
  - a. Design piping system for a 25-year storm and detention for a 10-year storm
  - b. Control the point of discharge and the flooding hazard of a 100-year storm
  - c. Design piping and detention systems for a 100-year storm in those areas identified in the City's most recent Storm Water Master Plan as requiring the higher standard.
- ii. Depth and Intensity— site specific per the following Website:  
[http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html?bkmrk=ut](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ut)
- iii. Hydrograph method
  - a. A 6-hour SCS type II rainfall distribution is considered acceptable for hydrograph method analysis.
  - b. Other methods will be considered on a case-by-case basis.

### **B. Runoff Coefficients**

The design engineer is to calculate a composite runoff coefficient based on surface type and associated runoff coefficient, weighted by the area of each surface type.

### **C. Inlet Spacing**

Two criteria must be met:

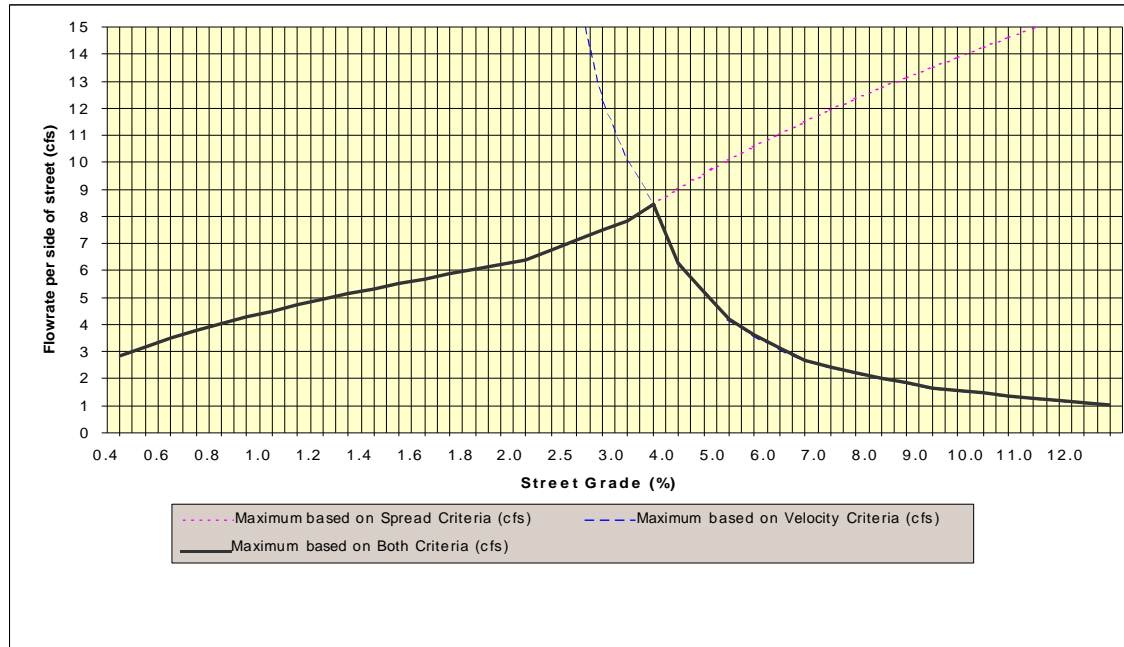
- i. Spread of water in the street—storm water must be delivered from the street into an underground piped system when the spread of water in the street covers the outside 10 feet of asphalt. This will leave two 7-foot traffic lanes in local streets and three 10-foot traffic lanes in collector streets that are not submerged.



- ii. Gutter velocity—water must be delivered from the street into an underground piped system when the velocity of water in the deepest part of the gutter reaches 10 feet per second (as a safety consideration).

Each of these requirements is a function of street slope and storm water flow rate. Storm water must be delivered from the street to storm drains when flows reach amounts shown in the following graph, Figure 2:

**Figure 2. Maximum Flow Rates Allowed in Streets (25-year storm)**



Note: The spread of water in the street is calculated using the Manning Equation in the form developed by Izzard, with a roughness coefficient of 0.013 and the standard street cross section. The velocity criteria calculates the velocity at the deepest part of the gutter with the Manning's Equation, with a roughness coefficient of 0.013, and using a depth at a point six inches from the face of the curb as the hydraulic radius.

#### D. Inlet Capacity

The designer is to assume 50% blockage of inlets when considering storm drain inlet capacity.

#### E. Detention

Storm water must be detained such that the peak flow rate released from the site does not exceed 0.15 cubic feet per second per acre (cfs/acre) (0.05 cfs/acre in areas identified in the City's most recent Storm Water Master Plan as requiring the higher standard). The following limitations apply to detention basins:

- i. No part of the bottom of a landscaped detention area may be flatter than 1%.
- ii. Within 10 feet of the outlet, the slope of a landscaped basin bottom must not be flatter than 3% unless a concrete apron is constructed around the outlet.
- iii. Excluding areas within 10 feet of the outlet, the maximum allowable depth of the basin is 3 feet. Basins proposed with greater depths may be allowed

with conditions including but not limited to security fencing, escape facilities etc.

- iv. Storm drain pipes are to continue through detention areas to allow low flows to proceed through the storm drainage system without having to come to the surface. These low flows must still pass through the outlet restriction that limits runoff rates.
- v. Basins are to be designed such that water does not run into them after they reach a maximum depth (unless a free flowing overflow is provided)—this can often be controlled by the elevation of an inlet box in the street adjacent to the basin.
- vi. The design drawings for the basin shall include the total basin area, side slopes and width of the berm or height of retaining walls if used, basin depth, storage capacity curve, and design details of the outlet control structure including orifice plate installation.
- vii. Side slopes shall not be steeper than 3-feet horizontal to 1-foot vertical (3:1).
- viii. A minimum freeboard of 1' shall be provided except when designing for the 100-year storm event freeboard shall be a minimum of 3 inches in order to direct flows from the detention basin to a public right of way at the location of a provided spillway.
- ix. The minimum top-width of any berm shall be 3 feet unless approved otherwise by the City Engineer.
- x. Control structures must be in locations accessible to cleaning equipment.
- xi. Where accessibility is required through a landscaped area, provide a design for the access way that will accommodate the weight of the cleaning equipment/vehicles.
- xii. The volume of pipe, manholes, boxes (and similar structures), and ponding in parking lots may be used as part of the detention volume, but the ponding water cannot interfere with the ability of the conveyance, treatment, and LID facilities to function.
- xiii. Detention in parking lots cannot exceed 6" in depth before the water overflows the detention system for up to the 100-year event. All other typical parking design criteria must be met

F. Deviations from this standard may be approved on a case by case basis by the City Engineer given unusual site conditions and/or storm water management objectives.

### **3. Storm water quality criteria**

#### **A. Storm Water Treatment**

Pretreatment must be utilized prior to discharging storm water into city systems, bodies of water, drainages, or into the soil. It must be treated to reduce illicit discharges of sediment, oils, floatables and other pollutants. The treatment method must be approved by the City Engineer.

Pretreatment Design Criteria:

- Treat all flow up to the 2-year storm peak flow and volume.
- Must retain the majority of trapped sediment and pollutants during bypass events.
- In a system that injects water directly into the soil, the City Engineer may specify a larger design event for pretreatment or require that other protective measures be installed.

B. Use of Best Management Practices

Pleasant Grove City encourages the use of the BMP fact sheets included in PART 2, CONSTRUCTION AND LONG-TERM BEST MANAGEMENT PRACTICES. **The following BMPs are required to be a part of all Construction Site Storm Water Management Plans:**

* BMP Inspection & Maintenance	BMPIM
* Concrete Waste Management	CWM
* Dust Controls	DC
* Hazardous Waste Management	HWM
* Material Storage	MS
* Portable Toilets	PT
* Spill Clean-Up	SCU
* Vehicle and Equipment Cleaning	VEC
* Vehicle and Equipment Fueling	VEF

There is no list of BMPs that are required on all Long-Term Storm Water Management Plans.

In addition to the required BMPs listed above, other BMPs from PART 2, CONSTRUCTION AND LONG-TERM BEST MANAGEMENT PRACTICES that apply to a given development should be used. Pleasant Grove City also encourages the use of practices in addition to those contained in the Pleasant Grove Storm Water Management Program that may be suitable for a given development. Engineering judgment must be used in selecting BMPs for a given development.

C. Prohibited Practices

The following practices are specifically prohibited:

- i. Soil or construction materials may not be piled in streets.
- ii. Soil bridges over curb and gutter may not be constructed.

## **G. CONSTRUCTION SITE STORM WATER MANAGEMENT PLAN CONTENTS**

### **1. Purpose of the Construction Site Storm Water Management Plan**

The purpose of the Construction Storm Water Management Plan is to control storm water runoff and reduce pollutants in storm water runoff during construction by accomplishing the following:

- A. Controlling soil erosion
- B. Controlling discharge of sediment into storm drainage facilities or onto adjacent properties
- C. Preventing illicit discharges into on-site soils, into storm drainage facilities, or onto adjacent properties
- D. Preventing uncontrolled discharge of storm water to adjacent property
- E. Controlling construction waste
- F. Controlling dust

### **2. Contents of the Construction Site Storm Water Management Plan**

The Construction Storm Water Management Plan is to be submitted with the site plans or improvement plans, and is to contain at least the following elements:

- A. Utilize the standard SWPPP template and instruction provided at the following website: <https://deq.utah.gov/water-quality/general-construction-storm-water-updes-permits>
- B. Plan views shall be provided on 11” x 17” paper
- C. Existing and proposed contours as shown on the grading plan
- D. Existing and proposed storm drainage improvements
- E. Best management practices to accomplish the purpose of the plan – show the following for each BMP specified, as applicable:
  - i. Location and extent of specified BMP
  - ii. Timing of implementation, possibly in terms of planting season or number of days following commencement of grading
  - iii. Duration of implementation
  - iv. Any information in addition to or different from that shown on the BMP fact sheet as necessary to employ the BMP on the site

- F. BMP Fact sheets or other descriptive material for all specified BMPs
- G. Proposed re-vegetation—show the following:
  - i. Location and type of re-vegetation proposed
  - ii. Timing of re-vegetation, possibly in terms of planting season or number of days following commencement of grading
- H. Sequencing of construction activities and BMPs
- I. Name, address & telephone number of individual who has responsibility for implementation and maintenance of the plan.
- J. Final SWPPP plan to be submitted in an 8.5” x 11.0” binder

## **H. LONG-TERM STORM WATER MANAGEMENT PLAN CONTENTS**

### **1. Purpose of the Long-Term Storm Water Management Plan**

The purpose of the Long-Term Storm Water Management Plan is to control storm water runoff and reduce pollutants in storm water runoff after construction is complete and the developed site is in operation. This is achieved by accomplishing the following:

- A. Controlling soil erosion
- B. Controlling discharge of sediment into storm drainage facilities or onto adjacent properties
- C. Preventing illicit discharges into on-site soils, into storm drainage facilities, or onto adjacent properties
- D. Mirror the predevelopment hydrology as much as practicable for new development and improve the hydrology of redeveloped sites

### **2. Contents of the Long-Term Storm Water Management Plan**

The Long-Term Storm Water Management Plan is to be submitted separate from the site plan or improvement plans. It shall be contained in a manila folder and is to contain at least the following:

- A. Name and contact information of the person responsible for long-term maintenance of the storm water system.
- B. A Storm Water Maintenance Agreement. This should be filled out completely and ready for review and signature by a City Official.
- C. An 11" x 17" copy of the site plan, including vicinity map, proposed contours, permanent storm drainage improvements, landscaping, and best management practices to accomplish the purpose of the plan. Examples of appropriate BMPs may include those addressing operation and maintenance of storm drainage quality control facilities, operation and maintenance of storm water discharge control facilities, maintenance of landscaping, good housekeeping practices, etc. Show the following for each BMP specified:
  - i. Location and extent of specified BMPs, as appropriate
  - ii. Detailed schedule of execution for each specified BMP, in terms of starting time, duration, frequency, etc., as appropriate
  - iii. Any information in addition to or different from that shown on the BMP fact sheets as necessary to employ the BMPs on the site

- D. BMP fact sheets or other descriptive material for all specified BMPs. BMP fact sheets that are part of the Long-Term Storm Water Management Plan are to be on a separate sheet from those BMP fact sheets associated with the Construction Site Storm Water Management Plan. Each BMP fact sheet should be printed on a separate 8.5" x 11" paper.
- E. Final storm drainage calculations. These should be a finalized set of calculations defined in Section F of this document.
- F. The following statement shall prominently appear on the site plan submitted with all Long-Term Storm Water Management Plans:

The owner(s) of the property are responsible to perpetually follow this Long-Term Storm Water Management Plan. Failure to follow the plan may result in the City refusing to renew business licenses or taking other action against the property owner.

The objectives of the Plan are to:

1. Control soil erosion
2. Control discharge of sediment into storm drainage facilities or onto adjacent properties
3. Prevent illicit discharges into on-site soils, into storm drainage facilities, or onto adjacent properties
4. Mirror the predevelopment hydrology as much as practicable for new development and improve the hydrology of redeveloped sites

If the objectives of the Plan are not being met, the site operator or owner shall make adjustments to the Plan as needed to accomplish its purposes.

Pleasant Grove City encourages adjustments to the plan that enhance effective storm water management. However, significant reduction of practices contained in the plan is to be accomplished through formal modification of the plan and resubmission to the City Engineer for approval.

## **I. PROPOSED CONSTRUCTION AND LONG-TERM STORM WATER MANAGEMENT PLAN REVIEW PROCEDURES**

The Construction Storm Water Management Plan and Long-Term Storm Water Management Plan will be submitted to Pleasant Grove City with the development plans. They will be reviewed along with the development plans, with storm water quantity and quality benefits in mind. The review procedure will be the same as for subdivision improvement plans and site plans.

## **J. CONCLUSION**

Inasmuch as the construction and post construction related best management practices will generally be carried out by those in the private construction industry, they will be implemented as specified in specific construction site and long-term storm water management plans as development occurs. The BMPs found in PART 2, BMPs PERFORMED BY PLEASANT GROVE CITY, cover Pleasant Grove City's efforts to assure that the plans are followed.

Pleasant Grove City's Storm Water Technical Manual satisfies, in part, two of the six minimum control measures established by the Storm Water Phase II Rule: #4: Construction site storm water runoff control, and #5: Post-construction storm water management in new development and redevelopment.



# PART 2

## CONSTRUCTION AND LONG-TERM BEST MANAGEMENT PRACTICES

### A. BMP Index

Pleasant Grove City encourages the use of the following best management practices on Construction Site and Long-Term Storm Water Management Plans. As established in Section F.3.A of PART 1, STORM WATER TECHNICAL MANUAL, **BMPs with an asterisk are required to be a part of all Construction Site Storm Water Management Plans.** Additional LID BMPs are available in the State’s LID Guide and should be considered for each site.

Benching	BE
Biofilters	BF
* BMP Inspection & Maintenance	BMPIM
Brush or Rock Filter	BRF
Building Repair, Remodeling & Construction	BRRC
Catch Basin Cleaning	CBC
Contaminated or Erodible Surface Areas	CESA
Compaction	CP
Construction Road Stabilization	CR
Construction Sequencing	CS
Constructed Wetlands	CW
* Concrete Waste Management	CWM
* Dust Controls	DC
Diversion Dike	DD
Detention/Infiltration Device Maintenance	DIDM
Earth Berm Barrier	EB
Erosion Control Blankets	ECB
Extended Detention Basins	EDB
Filter Strips	FS
Geotextiles and Mats	GM
Grading Practices	GP
Grassed Swales	GS
Hydromulching	HM
* Hazardous Waste Management	HWM
In-Line Storage	ILS
Infiltration	IN
Inlet Protection – Concrete Block	IPC
Inlet Protection – Excavated	IPE
Inlet Protection – Gravel	IPG
Inlet Protection – Silt Fence or Straw Bale	IPS
Level Spreaders	LS

* Material Storage	MS
Mulching	MU
Outlet Protection	OP
Parking Lot Sweeping/Vacuuming	PLSV
* Portable Toilets	PT
Rock Check Dams	RCD
Riprap	RR
Sediment Basin	SB
Sand Bag Barrier	SBB
Street Cleaning	SC
Stabilized Construction Entrance and Wash Area	SCEWA
Sediment Control on Small Construction Sites	SCSCS
* Spill Clean-Up	SCU
Slope Drain	SD
Storm Drain Flushing	SDF
Silt Fence	SF
Seeding and Planting	SP
Surface Roughening	SR
Sediment Trap	ST
Straw Bale Barrier	STB
Temporary Drains and Swales	TDS
Temporary and Permanent Seeding	TPS
Temporary Stream Crossing	TSC
* Vehicle and Equipment Cleaning	VEC
* Vehicle and Equipment Fueling	VEF
Waste Disposal	WD
Wet Ponds	WP

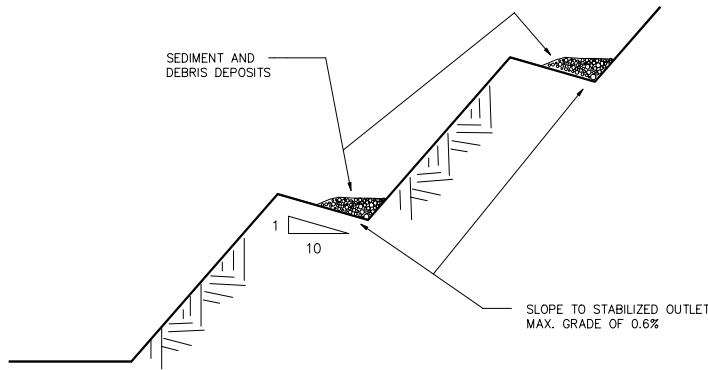
## **B. LID LONG-TERM MANAGEMENT BMPs**

No specific list of Long-Term Low Impact Development (LID) BMP fact sheets is provided. Reference is made to the manual distributed by the Utah Division of Water Quality titled “A Guide to Low Impact Development within Utah” (Guide), particularly the maintenance portion of the BMP Fact Sheets found in Appendix C of the Guide. For BMPs which may not be in the manual, BMP Maintenance Fact Sheets equivalent in scope and detail must be provided, in accordance with industry standards and published data.

LID BMP information and Fact Sheets should be included in the Long-Term Management Plan in the same fashion as traditional BMP measures, with any necessary additional data as may be required to provide a complete maintenance guide and plan.

## **C. BMP FACT SHEETS**

The following sheets contain BMP Fact Sheets for use in Pleasant Grove.



**DESCRIPTION:**

Slope construction with benches spaced at regular intervals perpendicular to the slope which intercept and collect sheet flow and direct it to a stable outfall point.

**APPLICATION:**

- ▶ Unstabilized cut and fill slopes
- ▶ Large stockpiles
- ▶ Existing unstable slopes

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Benches should be formed as slope is constructed and graded to the outlet point.
- ▶ Stabilized outlet with sediment controls should be in place prior to slope construction.

**LIMITATIONS:**

- ▶ Construction slope design must accommodate benching
- ▶ Not appropriate for sandy or rocky soil
- ▶ Only effective if suitable outlet provided

**MAINTENANCE:**

- ▶ Inspect after major storm events and at least biannually, repair any damaged areas
- ▶ Remove debris blocking water flow
- ▶ Inspect outlet, repair/replace sediment controls and remove sediment build up.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

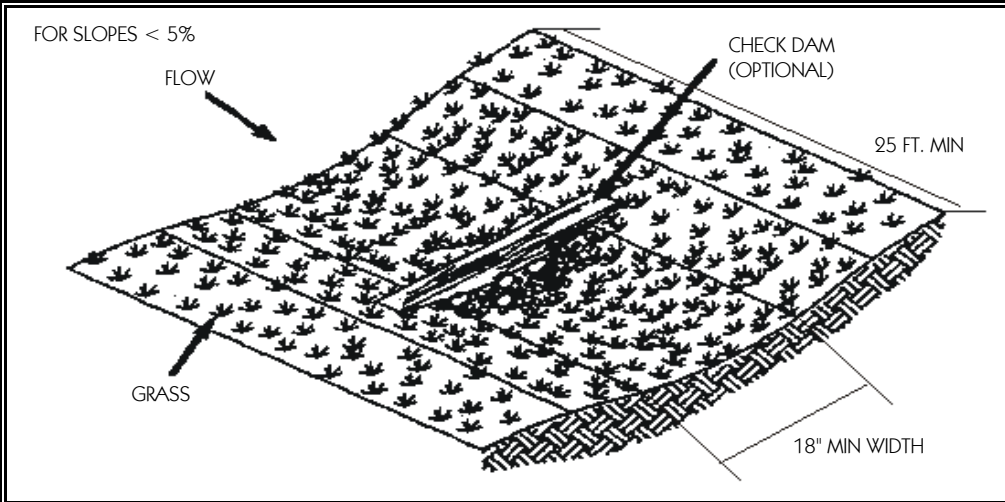
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Biofilters are of two general types: vegetated channel and vegetated filter strip. The vegetated channel is sloped like a standard storm drain channel; the storm water is treated as it passes through the channel. With filter strips the flow is distributed broadly along the width of the vegetated area.

**APPLICATION:**

- ▶ Comparable performance to wet ponds and constructed wetlands.
- ▶ Limited to treating a few acres.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ The surface area must be defined.
- ▶ The minimum width for a swale is determined by Mannings Equation.
- ▶ Minimum length of a strip is 10 feet.
- ▶ The longitudinal slope must not exceed 5%.
- ▶ Use a flow spreader and energy dissipater at the entrance of a swale.
- ▶ Good soils are important to achieve good vegetation cover.

**LIMITATIONS:**

- ▶ Good performance depends upon good design
- ▶ May be limited to areas where summer irrigation is feasible.
- ▶ Can be difficult to maintain sheet flow in strips.
- ▶ Can be difficult to avoid channelization in swales.
- ▶ Cannot be placed on steep slope.
- ▶ Area required may make infeasible on industrial sites.
- ▶ Proper maintenance required to maintain health and density of vegetation.
- ▶ Limited to treating a few acres and availability of water during dry season.

**MAINTENANCE:**

- ▶ Make sure soils are suitable for healthy vegetation.
- ▶ Level cross-section and even longitudinal slope for swales.
- ▶ Any damage to the channel such as rutting must be repaired with suitable soil, properly tamped and seeded.

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

Inspect and maintain all structural BMP's (both existing and new) on a routine basis to remove pollutants from entering storm drain inlets. This includes the establishment of a schedule for inspections and maintenance.

**APPROACH:**

Regular maintenance of all structural BMP's is necessary to ensure their proper functionality.

- Annual inspections.
- Prioritize maintenance to clean, maintain, and repair or replace structures in areas beginning with the highest pollutant loading.
- Clean structural BMP's in high pollutant areas just before the wet season to remove sediments and debris accumulated during the summer and fall.
- Keep accurate logs of what structures were maintained and when they were maintained.
- Record the amount of waste collected.

**LIMITATIONS:**

- Availability of trained staff



**TARGETED POLLUTANTS**

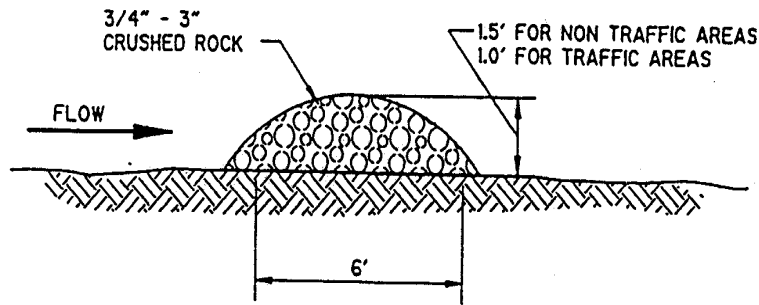
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Staffing
- Training
- Administrative

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

A rock filter is made of rock 3/4 - 3" in diameter and placed along a level contour. A brush filter is composed of brush (usually obtained during the site clearing) wrapped in filter cloth and anchored to the toe of the slope. If properly anchored brush or rock filters may be used for sediment trapping and velocity reduction.

**APPLICATION:**

- ▶ As check dams across mildly sloped construction roads.
- ▶ Below the toe of slopes.
- ▶ Along the site perimeter.
- ▶ In areas where sheet or rill flow occurs.
- ▶ Around temporary spoil areas.
- ▶ At sediment traps or culvert/pipe outlets.

**INSTALLATION/APPLICATION CRITERIA:**

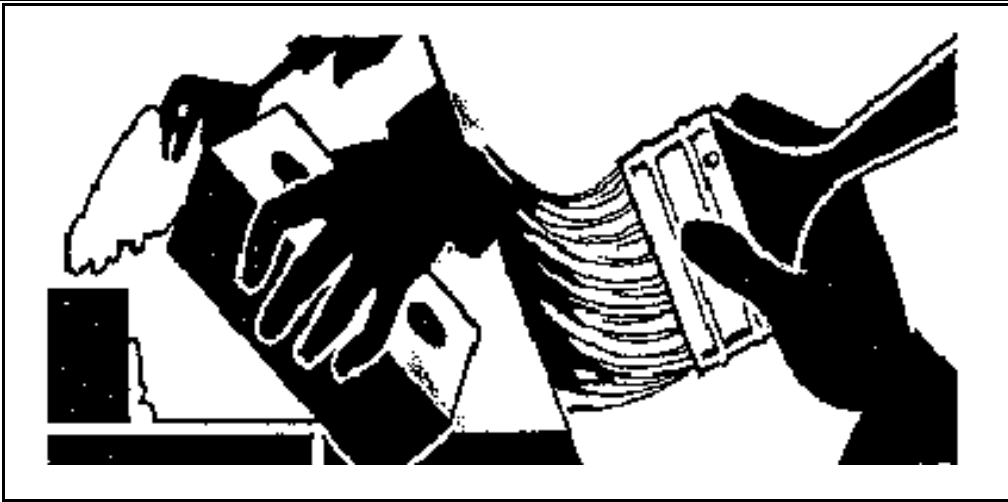
- ▶ For rock filter, use larger rock and place in a staked, woven wire sheathing if placed where concentrated flows occur.
- ▶ Install along a level contour.
- ▶ Leave area behind berm where runoff can pond and sediment can settle.
- ▶ Drainage areas should not exceed 5 acres.

**LIMITATIONS:**

- ▶ Rock berms may be difficult to remove.
- ▶ Removal problems limit their usefulness in landscaped areas.
- ▶ Runoff will pond upstream of the filter, possibly causing flooding if sufficient space does not exist.

**MAINTENANCE:**

- ▶ Inspect monthly after each rainfall.
- ▶ If berm is damaged, reshape and replace lost/dislodged rock.
- ▶ Remove sediment when depth reaches 1/3 of berm height, or 1 ft.



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Prevent or reduce the discharge of pollutants to storm water from building repair, remodeling and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

**APPLICATION:**

- ▶ Use soil erosion control techniques if bare ground is temporarily exposed.
- ▶ Use permanent soil erosion control techniques if the remodeling clears buildings from an area that is not to be replaced.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Enclose painting operations consistent with local air quality regulations and OSHA.
- ▶ Properly store materials that are normally used in repair and remodeling such as paints and solvents.
- ▶ Properly store and dispose of waste materials generated from the activity.
- ▶ Maintain good housekeeping practices while work is underway.

**LIMITATIONS:**

- ▶ This BMP is for minor construction only.
- ▶ Hazardous waste that cannot be re-used or recycled must be disposed of by a licensed hazardous waste hauler.
- ▶ Safer alternative products may not be available, suitable, or effective in every case.
- ▶ Be certain that actions to help storm water quality are consistent with OSHA and air quality regulations.

**MAINTENANCE:**

None.

**TARGETED POLLUTANTS**

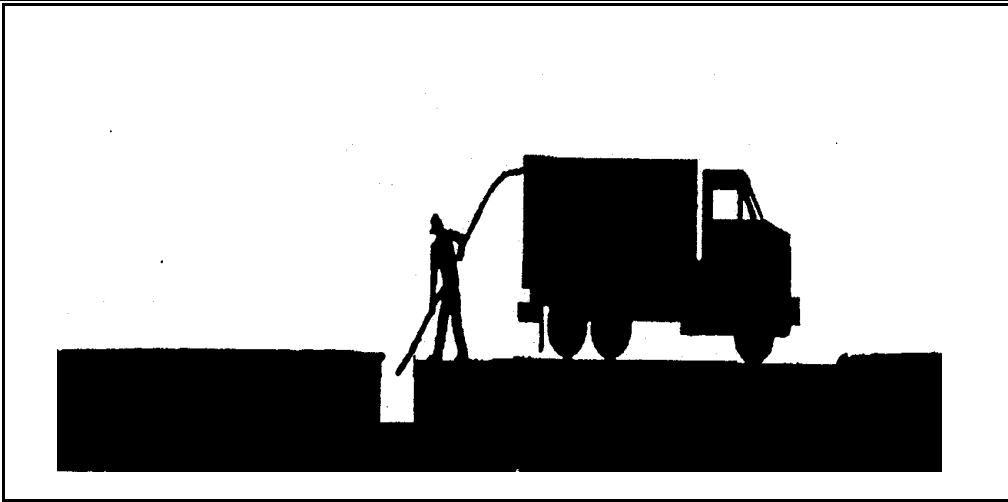
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

Maintain catch basin and stormwater inlets on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, and restore the catch basins' sediment trapping capacity. A catch basin is distinguished from a stormwater inlet by having at its base a sediment sump designed to catch and retain sediments below the overflow point. This information sheet focuses on the cleaning of accumulated sediments from catch basins.

**APPROACH:**

Regular maintenance of catch basins and inlets is necessary to ensure their proper functioning. Clogged catch basins are not only useless but may act as a source of sediments and pollutants. In general, the key to effective catch basins are:

- ▶ At least annual inspections.
- ▶ Prioritize maintenance to clean catch basins and inlets in areas with the highest pollutant loading.
- ▶ Clean catch basins in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.
- ▶ Keep accurate logs of the number of catch basins cleaned.
- ▶ Record the amount of waste collected.

**LIMITATIONS:**

There are no major limitations to this best management practice.

**MAINTENANCE:**

Regular maintenance of public and private catch basins and inlets is necessary to ensure their proper functioning. Clogged catch basins are not only useless but may act as a source of sediments and pollutants. In general, the keys to effective catch basins are:

- ▶ Annual/monthly inspection of public and private facilities to ensure structural integrity, a clean sump, and a stenciling of catch basins and inlets.
- ▶ Keep logs of the number of catch basins cleaned.
- ▶ Record the amount of waste collected.

**PROGRAM ELEMENTS**

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High
- Medium
- Low





**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Prevent or reduce the discharge of pollutants to storm water from contaminated or erodible surface areas by leaving as much vegetation on-site as possible, minimizing soil exposure time, stabilizing exposed soils, and preventing storm water runoff and runoff.

**APPLICATION:**

This BMP addresses soils which are not so contaminated as to exceed criteria but the soil is eroding and carrying pollutants off in the storm water.

**INSTALLATION/APPLICATION CRITERIA:**

Contaminated or erodible surface areas can be controlled by:

- ▶ Preservation of natural vegetation
- ▶ Re-vegetation
- ▶ Removal of contaminated soils
- ▶ Geosynthetics.

**LIMITATIONS:**

Disadvantages of preserving natural vegetation or re-vegetating include:

- ▶ Requires substantial planning to preserve and maintain the existing vegetation.
- ▶ May not be cost-effective with high land costs.
- ▶ Lack of rainfall and/or poor soils may limit the success of re-vegetated areas.

**MAINTENANCE:**

Maintenance should be minimal, except possibly if irrigation of vegetation is necessary.

**TARGETED POLLUTANTS**

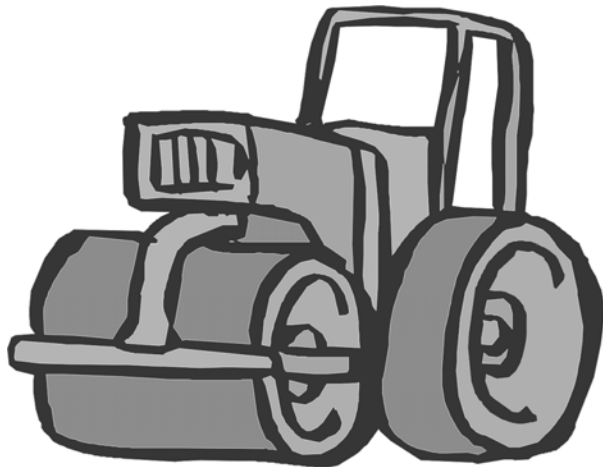
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

Use of rolling, tamping, or vibration to stabilize fill materials and control erosion by increasing the soil density. Increasing the density of soil improves soil strength, reduces long-term soil settlement, and provides resistance to erosion.

**APPLICATIONS:**

- ▶ Stabilize fill material placed around various structures.
- ▶ Improve soil in place as foundation support for roads, parking lots, and buildings.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Make sure soil moisture content is at optimum levels.
- ▶ Use proper compaction equipment.
- ▶ Install sediment control and storm water management devices below compacted areas and runoff interceptor devices above these areas. Drainage from compacted areas must be carefully planned to protect adjacent uncompacted soils.
- ▶ The surface of compacted areas should be scarified and seeded or mulched and seeded to increase the effectiveness of compaction.

**LIMITATIONS:**

- ▶ Compaction tends to increase runoff.
- ▶ Over-compaction will hamper revegetation efforts.

**MAINTENANCE:**

No maintenance required.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

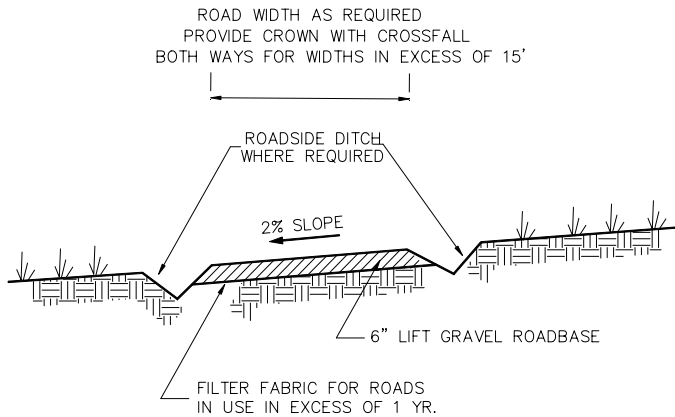
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

Temporary stabilization of on-site roadway by placement of gravel roadbase.

**APPLICATION:**

- ▶ On-site roadways used daily by construction traffic (may not apply to gravelly type soils)
- ▶ Parking or staging areas susceptible to erosion due to traffic use

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Grade temporary access road with 2% cross fall, for two-way width provide crown.
- ▶ Provide roadside ditch and outlet controls where required.
- ▶ Place 6 inches of 2-inch to 4-inch crushed rock on driving area

**LIMITATIONS:**

- ▶ May require removal of gravel roadbase at completion of activities if final cover is not impervious
- ▶ May require controls for surface storm water runoff

**MAINTENANCE:**

- ▶ Inspect after major rainfall events and at least monthly.
- ▶ Place additional gravel as needed and repair any damaged areas.
- ▶ Maintain any roadside drainage controls.



**In sequenced construction, sites are completed in stages and completed portions are permanently stabilized before other areas are disturbed**

**DESCRIPTION:**

Construction sequencing requires creating and following a work schedule that balances the timing of land disturbance activities and the installation of measures to control erosion and sedimentation, in order to reduce on-site erosion and off-site sedimentation. Staging areas can be used to limit contamination and erosion.

**APPROACH:**

Construction sequencing can be used to plan earthwork and erosion and sediment control (ESC) activities at sites where land disturbances might affect water quality in a receiving water body.

Construction sequencing schedules should, at a minimum, include the following:

- The ESC practices that are to be installed
- Principal development activities
- Which measures should be installed before other activities are started
- Compatibility with the general contract construction schedule

The following activities and features should be included (as they apply):

- Construction access—entrance to site, construction routes, areas designated for equipment parking
- Sediment traps and barriers—basin traps, sediment fences, outlet protection
- Runoff conveyance system—stabilize stream banks, storm drains, channels, inlet and outlet protection, slope drains
- Land clearing and grading—site preparation (cutting, filling, and grading, sediment traps, barriers, diversions, drains, surface roughening)
- Landscaping and final stabilization—top-soiling, trees and shrubs, permanent seeding, mulching, sodding, riprap

**LIMITATIONS:**

- Weather and other unpredictable variables may affect construction sequence schedules.

**MAINTENANCE:**

- The construction sequence should be followed throughout the project and the written plan should be modified before any changes in construction activities are executed.

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices



**TARGETED POLLUTANTS**

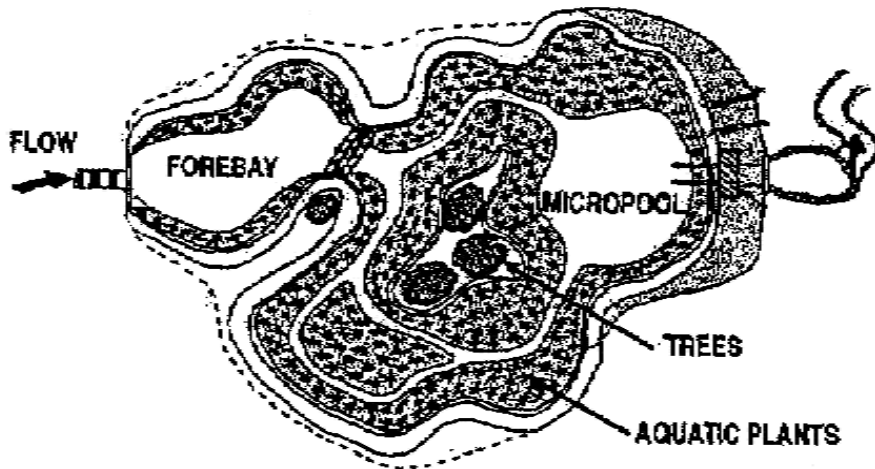
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Constructed wetlands have a significant percentage of the facility covered by wetland vegetation.

**APPLICATION:**

- ▶ Need to achieve high level of particulate and some dissolved contaminant removal.
- ▶ Ideal for large, regional tributary areas.
- ▶ Multiple benefits of passive recreation and wildlife.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Suitable soils for wetland vegetation are required.
- ▶ Surface area equal to at least 1% and preferably 2% of the tributary watershed.
- ▶ Include a forebay for extra storage and to trap incoming sediment.
- ▶ Involve qualified wetland ecologist to design and install wetland vegetation.
- ▶ Establishing wetland vegetation may be difficult.

**LIMITATIONS:**

- ▶ Concern for mosquitoes.
- ▶ Cannot be placed on steep unstable slopes.
- ▶ Need base flow to maintain water level.
- ▶ Not feasible in densely developed areas.
- ▶ Nutrient release may occur during winter.
- ▶ Overgrowth can lead to reduced hydraulic capacity.
- ▶ Regulatory agencies may limit water quality to constructed wetlands.

**MAINTENANCE:**

- ▶ Remove foreign debris and sediment build-up.
- ▶ Areas of bank erosion should be repaired.
- ▶ Remove nuisance species.
- ▶ Control mosquitoes.

**TARGETED POLLUTANTS**

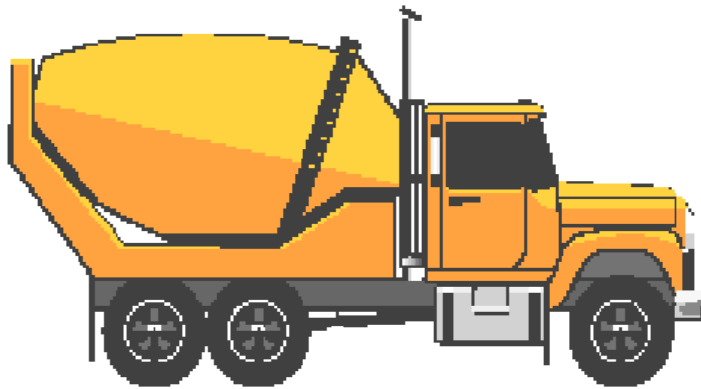
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout off-site, performing on-site washout in a designated area, and training employees and subcontractors.

**APPLICATIONS:**

This technique is applicable to all types of sites.

**INSTALLATION/APPLICATION CRITERIA:**

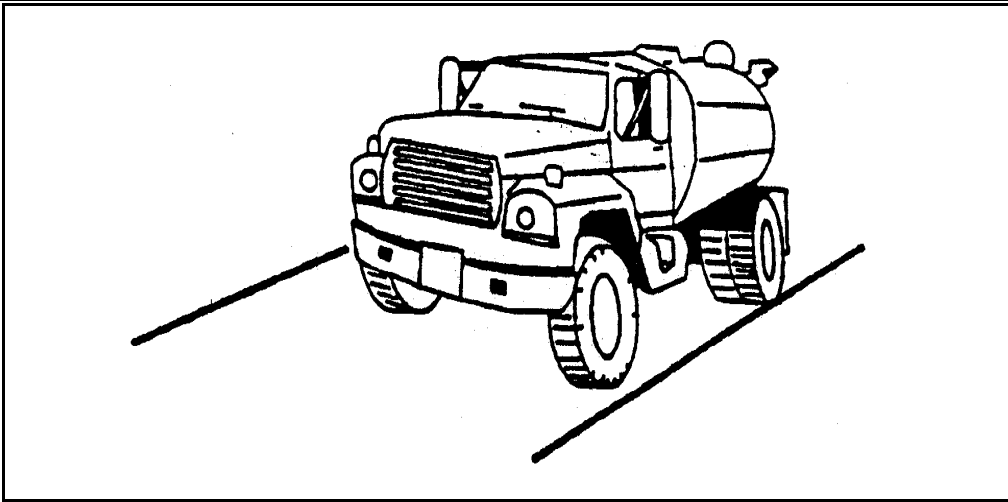
- ▶ Store dry and wet materials under cover, away from drainage areas.
- ▶ Avoid mixing excess amounts of fresh concrete or cement on-site.
- ▶ Perform washout of concrete trucks off-site or in designated areas only.
- ▶ Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- ▶ Do not allow excess concrete to be dumped on-site, except in designated areas.
- ▶ When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by draining the water within a bermed or level area. (See Earth Berm Barrier information sheet.)
- ▶ Train employees and subcontractors in proper concrete waste management.

**LIMITATIONS:**

- ▶ Off-site washout of concrete wastes may not always be possible.

**MAINTENANCE:**

- ▶ Inspect subcontractors to ensure that concrete wastes are being properly managed.
- ▶ If using a temporary pit, dispose hardened concrete on a regular basis.



**DESCRIPTION:**

Dust control measures are used to stabilize soil from wind erosion, and reduce dust by construction activities.

**APPLICATION:**

Dust control is useful in any process area, loading and unloading area, material handling areas, and transfer areas where dust is generated. Street sweeping is limited to areas that are paved.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Two kinds of street sweepers are common: brush and vacuum. Vacuum sweepers are more efficient and work best when the area is dry.
- ▶ Mechanical equipment should be operated according to the manufacturers' recommendations and should be inspected regularly.
- ▶ Water may be sprayed on the ground surface to moisten dry soils, making it less susceptible to wind erosion.

**LIMITATIONS:**

- ▶ Street sweeping is labor and equipment intensive and may not be effective for all pollutants.
- ▶ Water sprayed from water trucks must be done at a rate such that the water is absorbed in the soil; if excessive amounts of water are used, it may run off, carrying soil with it.

**MAINTENANCE:**

If excess water results from water spraying, dust-contaminated waters should not be allowed to run off site. Areas may need to be resprayed to keep dust from spreading.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

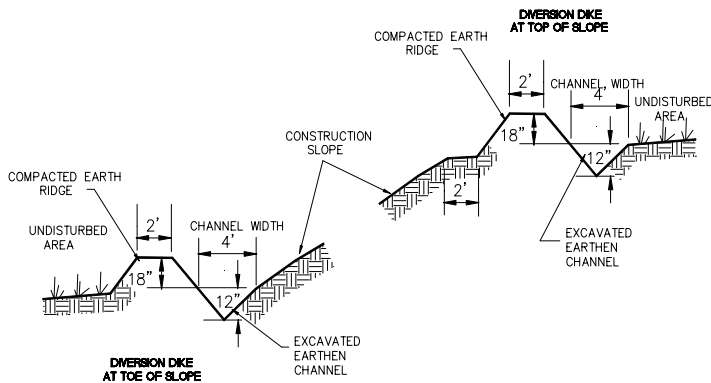
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low

**DESCRIPTION:**

A temporary sediment barrier and storm runoff conveyance consisting of an excavation channel and compacted earth ridge.

**APPLICATION:**

- ▶ Construct along top of construction slope to intercept upgradient runoff and convey around construction site.
- ▶ Construct along toe of construction to divert sediment laden runoff.
- ▶ Construct along midpoint of construction slope to intercept runoff and channel to controlled discharge point.
- ▶ Construct around base of soil stockpiles to capture sediment.
- ▶ Construct around perimeter of disturbed areas to capture sediment.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Clear and grub area for dike construction.
- ▶ Excavate channel and place soil on downgradient side.
- ▶ Shape and machine compact excavated soil to form ridge.
- ▶ Place erosion protection (riprap, mulch) at outlet.
- ▶ Stabilize channel and ridge as required with mulch, gravel, or vegetative cover.

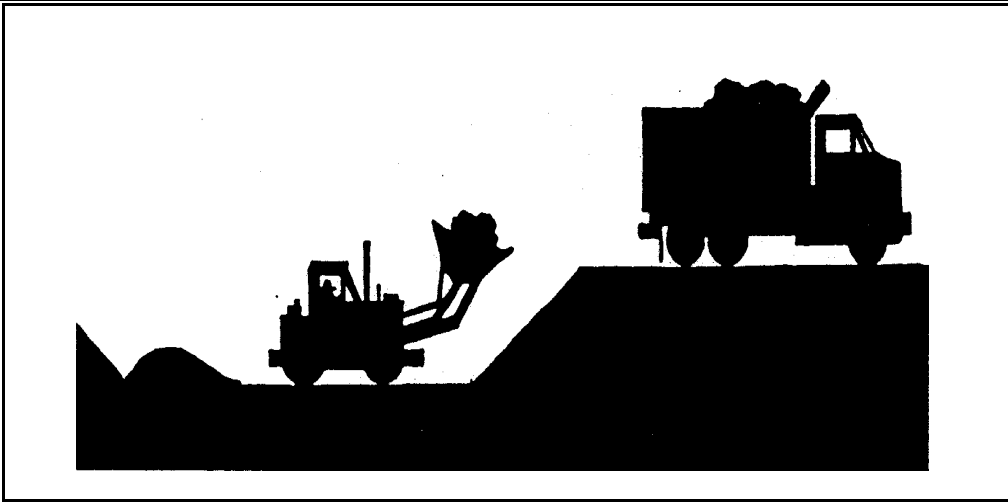
**LIMITATIONS:**

- ▶ Recommended maximum drainage area of 5 acres
- ▶ Recommended maximum sideslopes of 2h:1v (50%)
- ▶ Recommended maximum slope on channel of 1%

**MAINTENANCE:**

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





**DESCRIPTION:**

Proper maintenance and siltation removal is required on both a routine and corrective basis to promote effective storm water pollutant removal efficiencies for wet/dry detention pond and infiltrative devices.

**APPROACH:**

- ▶ Remove silt after sufficient accumulation.
- ▶ Periodically clean accumulated sediment and silt out of pre-treatment inlets.
- ▶ Infiltration device silt removal should occur when the infiltration rate drops below ½ inch per hour.
- ▶ Removal of accumulated paper, trash, and debris should occur every six months or as needed to prevent clogging of control devices.
- ▶ Vegetation growth should not be allowed to exceed 18 inches in height.
- ▶ Mow the slopes periodically and check for clogging, erosion and tree growth on the embankment.
- ▶ Corrective maintenance may require more frequent attention (as required).
- ▶ Create a public education campaign to explain the function of wet/dry detention pond/infiltration devices and their operation requirements for proper effectiveness.
- ▶ Encourage the public to report wet/dry detention pond/infiltration devices needing maintenance.

**LIMITATIONS:**

- ▶ Wet detention pond dredging can produce slurried waste that often exceeds the requirements of many landfills.
- ▶ Frequent sediment removal is labor and cost intensive.

**PROGRAM ELEMENTS**

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

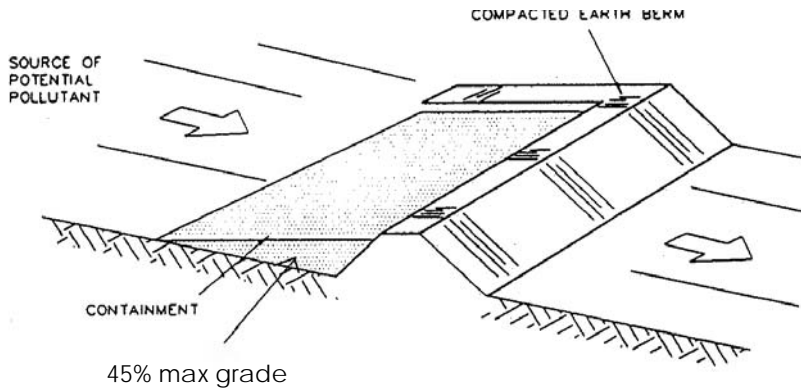
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High     Medium     Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Construction Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

A temporary containment control constructed of compacted soil.

**APPLICATION:**

- ▶ Construct around waste and materials storage area.
- ▶ Construct around staging and maintenance areas.
- ▶ Construct around vehicle parking and servicing areas.

**INSTALLATION/APPLICATION CRITERIA:**

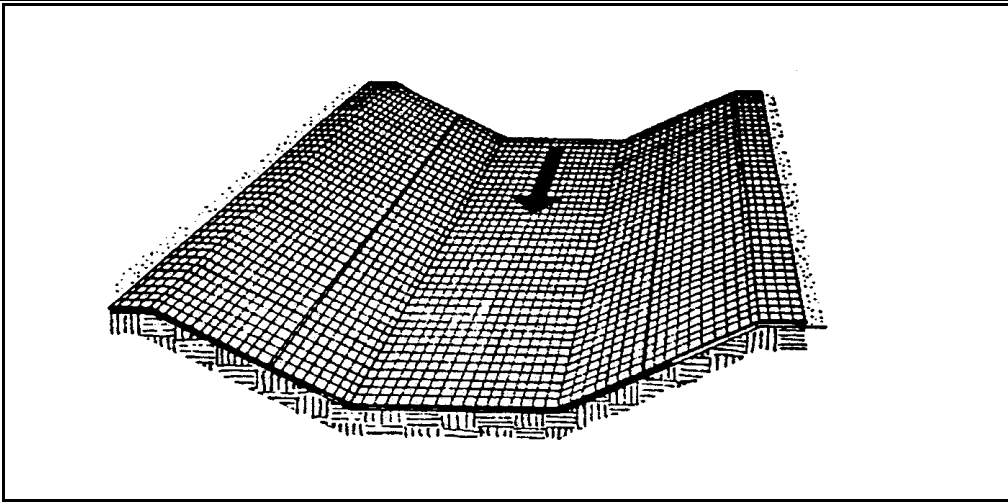
- ▶ Construct an earthen berm down hill of the area to be controlled. The berm should surround fueling facilities and maintenance areas on three sides to provide containment.
- ▶ Berm needs to be a minimum of 1 foot tall by 1 foot wide and be compacted by earth moving equipment.

**LIMITATIONS:**

- ▶ Not effective on steep slopes.
- ▶ Limits access to controlled area.
- ▶ Personnel need to quickly respond to spills with remedial actions.

**MAINTENANCE:**

- ▶ Observe daily for any non-storm water discharge.
- ▶ Look for runoff bypassing ends of berms or undercutting berms.
- ▶ Repair or replace damaged areas of the berm and remove accumulated sediment.
- ▶ Recompect soil around berm as necessary to prevent piping.



**DESCRIPTION:**

Erosion control blankets are used in place of mulch on areas of high velocity runoff and/or steep grade, to aid in controlling erosion on critical areas by protecting young vegetation. See related Geotextiles and Mats BMP Fact Sheet (GM).

**APPLICATIONS:**

- ▶ Where vegetation is likely to grow too slowly to provide adequate cover.
- ▶ In areas subject to high winds where mulch would not be effective.
- ▶ On steep slopes in which planting and mulching alone may not be as effective.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Install erosion control blankets parallel to the direction of the slope.
- ▶ In ditches, apply in direction of the flow.
- ▶ Place erosion control blankets loosely on soil - do not stretch.
- ▶ Ends of blankets should be buried no less than six inches deep.
- ▶ Staple the edges of the blanket at least every three feet.

**LIMITATIONS:**

- ▶ Not recommended in areas which are still under construction.

**MAINTENANCE:**

- ▶ Check for erosion and undermining periodically, particularly after rainstorms.
- ▶ Repair dislocations or failures immediately.
- ▶ If washouts occur, reinstall after repairing slope damage.
- ▶ Monitor until permanently stabilized.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

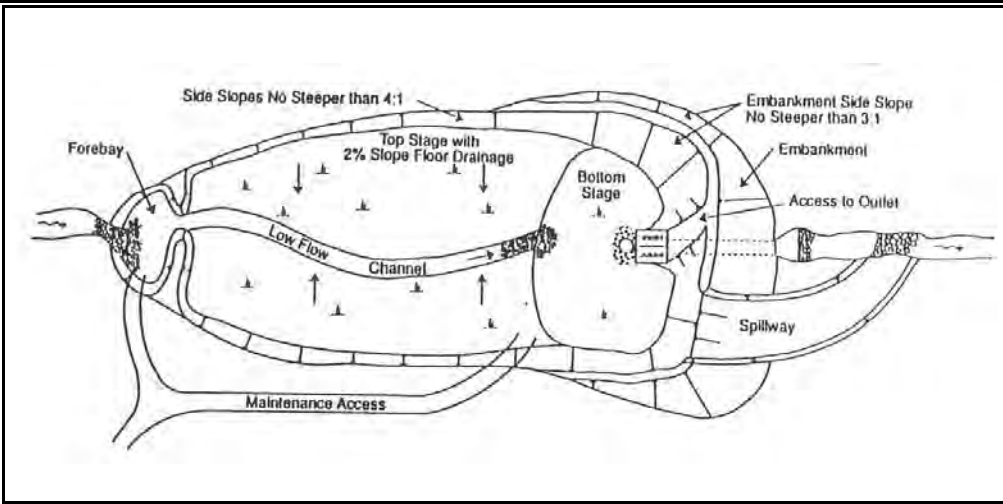
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTIONS:**

Extended detention basins are dry between storms. During a storm the basin fills. A bottom outlet releases the storm water slowly to provide time for sediments to settle.

**APPLICATION:**

- ▶ Objective is to remove only particulate pollutants.
- ▶ Use where lack of water prevents the use of wet ponds, wetlands or biofilters.
- ▶ Use where wet ponds or wetlands would cause unacceptable mosquito conditions.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Basin volume is sized to capture a particular fraction of the runoff.
- ▶ Drawdown time of 24 to 40 hours is required.
- ▶ A shallow basin with large surface area performs better than a deep basin with the same volume.
- ▶ Place energy dissipater at the entrance to minimize bottom erosion and resuspension.
- ▶ Vegetate side slopes and bottom to the maximum extent practical.
- ▶ If side erosion is particularly severe, consider paving or soil stabilization.
- ▶ If floatables are a problem, protect outlet with a trash rack or other device.
- ▶ Provide bypass or pass through capabilities for 100-year storm.

**LIMITATIONS:**

- ▶ May be less reliable than other treatment control BMPs. Inability to vegetate banks and bottom may result in erosion and resuspension.
- ▶ Limitation of the orifice diameter may preclude use in small watersheds.
- ▶ Requires differential elevation between inlet and outlet.

**MAINTENANCE:**

- ▶ Check outlet regularly for clogging.
- ▶ Check banks and bottom of basin for erosion and correct as necessary.
- ▶ Remove sediment when accumulation reaches 6-inches, or if resuspension is observed.

**TARGETED POLLUTANTS**

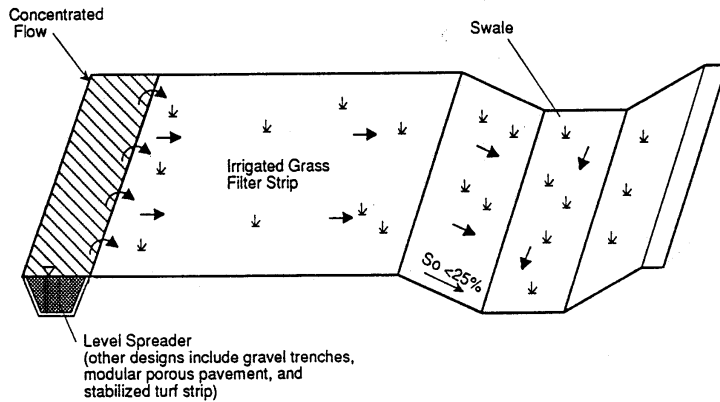
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**GENERAL DESCRIPTION:**

Filter strips are 20-foot-wide strips of natural or planted vegetation around a construction site. They are designed to cause deposition of sediments within the vegetation layer.

**APPLICATIONS:**

- ▶ Suited for areas where the soils are well drained or moderately well drained.
- ▶ Areas where the bedrock and the water table are well below the surface.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Make sure the vegetative cover is dense enough to protect underlying soil while causing sediment to settle.
- ▶ Filter strip must be approximately 20 feet wide to function well.
- ▶ The length should be approximately 50 to 75 feet. Where slopes become steeper the length of the strip must be increased.

**LIMITATIONS:**

- ▶ Only applicable in areas where vegetation is previously established or where sod is added.
- ▶ Vegetated filter strips will not function well on steep slopes, in hilly areas, or in highly paved areas.
- ▶ Sites with slopes of 15 percent or more may not be suitable for filtering storm water flows.

**MAINTENANCE:**

- ▶ Check for channels and repair.
- ▶ Provide rock aprons to aid in slowing flow if necessary.
- ▶ Maintain vegetation at optimal height and thickness.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

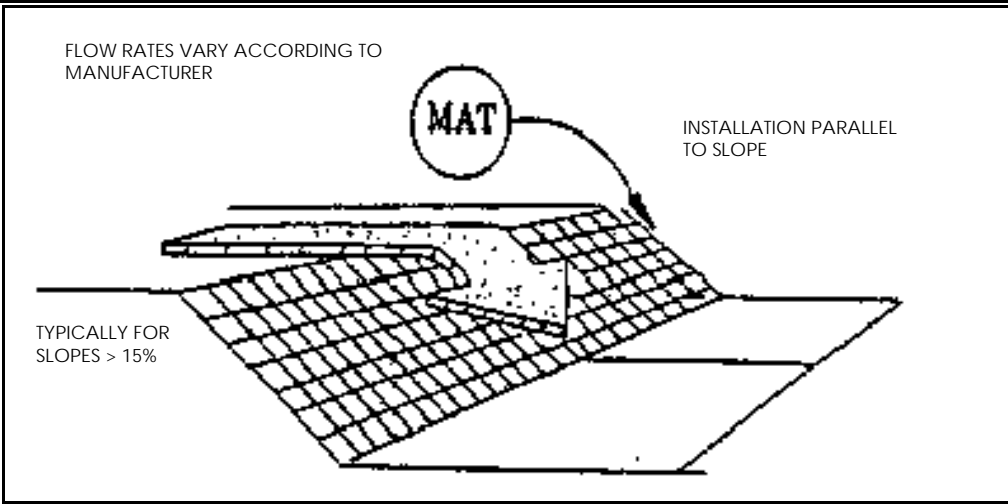
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Mattings made of natural or synthetic material which are used to temporarily or permanently stabilize soil. See the related Erosion Control Blankets BMP Fact Sheet (ECB).

**APPLICATION:**

- ▶ Typically suited for post-construction site stabilization, but may be used for temporary stabilization of highly erosive soils.
- ▶ Channels and streams.
- ▶ Steep slopes.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Mattings may be applied to disturbed soils and where existing vegetation has been removed.
- ▶ The following organic matting materials provide temporary protection until permanent vegetation is established, or when seasonal circumstances dictate the need for temporary stabilization until weather or construction delays are resolved: Jute mattings and straw mattings.
- ▶ The following synthetic mattings may be used for either temporary or post-construction stabilization, both with and without vegetation: excelsior matting, glass fiber matting, mulch matting.
- ▶ Staples are needed to anchor the matting.

**LIMITATIONS:**

- ▶ Mattings are more costly than other BMP practices, limiting their use to areas where other BMPs are ineffective (e.g., channels, steep slopes).
- ▶ May delay seed germination, due to reduction in soil temperature.
- ▶ Installation requires experienced contractor to ensure soil stabilization and erosion protection.

**MAINTENANCE:**

- ▶ Inspect monthly and after significant rainfall.
- ▶ Re-anchor loosened matting and replace missing matting and staples as required.

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**Soils exposed from land grading activities are very vulnerable to erosion**

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

Control soil erosion by minimizing the exposure of bare soil to erosive forces. This is done by

- 1) limiting the amount of land disturbed at one time in preparation for construction
- 2) limiting the amount of time between the disturbance of soil and protection or stabilization of disturbed soils, and
- 3) using grading practices to protect exposed soils susceptible to storm water runoff.

Related practices include construction sequencing, preservation of existing vegetation, erosion control practices and sediment control practices.

**APPROACH:**

- Limit the area of disturbance to those areas requiring grading. This preserves existing vegetation and reduces the vulnerability of soil to erosion.
- Based on erosion potential and sediment control measures on the site, establish what areas are to be graded at one time.
- An undisturbed buffer zone containing vegetation at the lowest elevation of a construction site can reduce the transport of sediment off site.
- Initiate soil protection measures during the course of work to minimize the length of time soil is exposed to erosive forces.
- Conduct work in stages so that construction or soil stabilization occurs promptly after disturbance of soil.
- Establish a schedule governing the stabilization of disturbed slopes, both in terms of passage of time since commencement and completion of disturbance and in terms of planting season.
- Leaving the surface of the disturbed soil graded in a roughened condition (not smooth) can reduce the quantity and velocity of storm water runoff.
- Prevent storm water runoff from running onto steep slopes from above.
- Avoid long, steep cut or fill slopes that allow runoff water of sufficient quantity or velocity to cut into and erode the slope.

**LIMITATIONS:**

- The specific approach to grading on a particular site depends on the conditions of the site and surrounding land; engineering judgment is required to design the approach best suited for each site.

**MAINTENANCE:**

- Practices may need to vary from the approved plan if erosion problems appear when storm water runoff occurs.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**Grassed swales can be used along roadsides and parking lots to collect and treat storm water runoff**

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

A series of vegetated, open channel management practices designed specifically to treat and attenuate storm water runoff. Storm water is treated through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils.

**APPROACH:**

- Grassed swales can be applied in most situations with some restrictions. Swales are very well suited for treating highway or residential road runoff because they are linear practices.
- Grassed swales should be used on sites with relatively flat slopes of less than 4 percent slope; 1 to 2 percent slope is recommended.
- A small fore-bay should be used at the front of the swale to trap incoming sediments. A pea gravel diaphragm, a small trench filled with river run gravel, should be used as pretreatment for runoff entering the sides of the swale.
- Swales should also have the capacity to pass larger storms (typically a 10-year storm) safely.

**LIMITATIONS:**

- Grassed swales cannot treat a very large drainage area.
- Wet swales may become a nuisance due to mosquito breeding.

**MAINTENANCE:**

Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover.



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low





**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

A combination of wood fiber mulch, processed grass, or hay or straw mulch and a tacking agent. It is made into a slurry, then applied to bare slopes or other bare areas to provide temporary stabilization.

**APPLICATIONS:**

- ▶ Small roadside slopes.
- ▶ Large, relatively flat areas.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Legume seeds should be pellet inoculated with the appropriate bacteria.
- ▶ The seed should not remain in the hydromulcher tank for more than 30 minutes.
- ▶ Wood fiber may be dyed to aid in uniform application.
- ▶ Slurry should be uniformly applied until an adequate coverage is achieved.
- ▶ The applicator should not be directed at one location for a long period of time; erosion will occur.

**LIMITATIONS:**

- ▶ Will lose effectiveness after 1 year.
- ▶ Can use only on physically stable slopes (at natural angle of repose, or less).

**MAINTENANCE:**

- ▶ Periodically inspect for damage caused by wind, water, or human disturbance.
- ▶ Promptly repair damaged areas.

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**PROGRAM ELEMENTS**

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Prevent or reduce the discharge of pollutants to storm water from hazardous waste through proper material use, waste disposal, and training of employees. Another important aspect of this BMP is to insure the use of sub-consultants who are properly licensed and trained.

**APPLICATION:**

Many of the chemicals used on-site can be hazardous materials which become hazardous waste upon disposal. These wastes may include:

- ▶ Paints and solvents; petroleum products such as oils; fuels and greases; herbicides and pesticides; acids for cleaning masonry; and concrete curing compounds.

In addition, sites with existing structures may contain wastes which must be disposed of in accordance with federal, state and local regulations, including:

- ▶ Sandblasting grit mixed with lead, cadmium or chromium based paints, asbestos, and PCBs.

**INSTALLATION/APPLICATION CRITERIA:**

The following steps will help reduce storm water pollution from hazardous wastes:

- ▶ Use all of the product before disposing of the container.
- ▶ Do not remove the original product label, it contains important safety and disposal information.
- ▶ Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

**LIMITATIONS:**

Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste collector.

**MAINTENANCE:**

- ▶ Inspect hazardous waste receptacles and areas regularly.
- ▶ Arrange for regular hazardous waste collection.

**TARGETED POLLUTANTS**

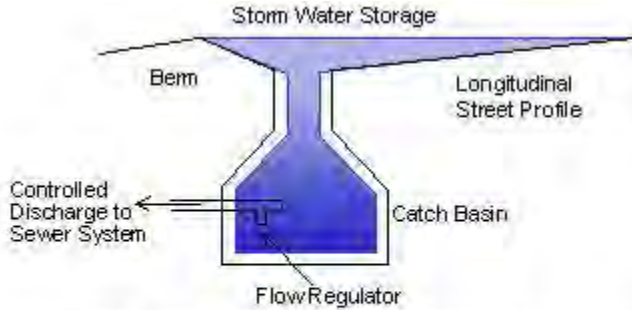
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High
- Medium
- Low



Note: Not to scale and great vertical exaggeration

**Catch basins can be equipped with flow restrictors to temporarily detain storm water in the conveyance system**

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

In-line storage refers to a number of practices designed to use the storage within the storm drain system to detain flows. While these practices can reduce storm peak flows, they are unable to improve water quality or protect downstream channels. Devices can slow the rate of flow by backing up flow, as in the case of a dam or weir, or through the use of vortex valves, devices that reduce flow rates by creating a helical flow path in the structure.

**APPROACH:**

- In-line storage practices serve the same purpose as traditional detention basins
- These practices can act as a surrogate for aboveground storage when little space is available for aboveground storage facilities.

**LIMITATIONS:**

- In-line storage practices only control flow, and thus are not able to improve the water quality of storm water runoff.
- If improperly designed, these practices may cause upstream flooding.
- Flow regulators cannot be applied to all storm drain systems. In older cities, the storm drainpipes may not be oversized, and detaining storm water within them would cause upstream flooding.

**MAINTENANCE:**

- Flow regulators require very little maintenance, because they are designed to be "self-cleaning," much like the storm drain system.
- For some designs, such as check dams, regulations will require only moderate construction in order to modify the structure's design.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

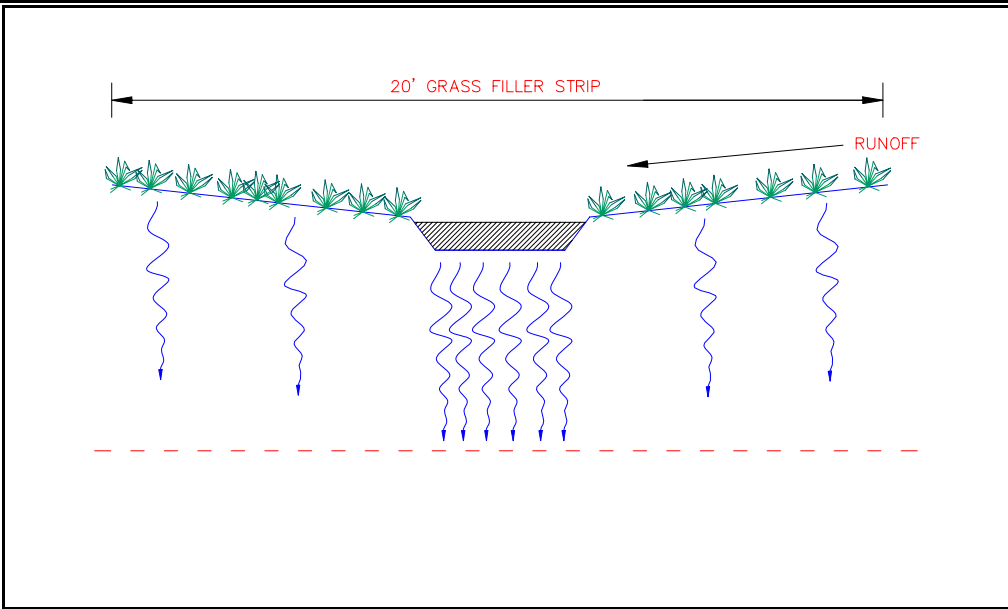
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

A family of systems in which the majority of the runoff from small storms is infiltrated into the ground rather than discharged to a surface water body. Infiltration systems include: ponds, vaults, trenches, dry wells, porous pavement, and concrete grids.

**APPLICATION:**

Suitable site soils and geologic conditions; low potential for long-term erosion in the watershed.

**INSTALLATION/APPLICATION CRITERIA:**

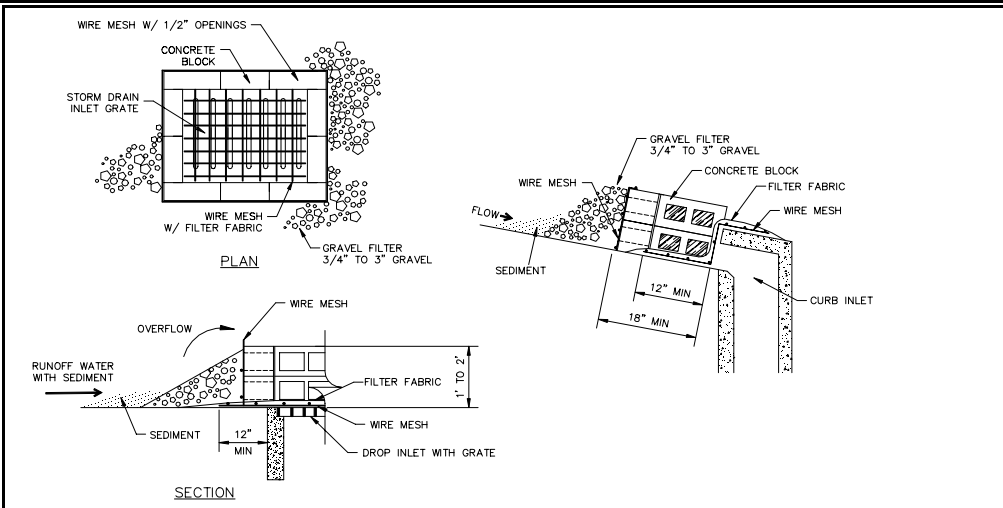
- ▶ Volume sized to capture a particular fraction of annual runoff.
- ▶ Pretreatment is necessary in fine soils.
- ▶ Emergency overflow or bypass for larger storms is needed.
- ▶ Observation wells are required in trenches.
- ▶ Infiltration surface must be protected during construction.
- ▶ Pond sides need vegetation to prevent erosion.
- ▶ During construction frequent inspection for clogging is necessary.
- ▶ Line sides of trench with permeable filter fabric
- ▶ Trench should be filled with clean washed stone or gravel. (1.5-3.0 in.)
- ▶ A six inch sand filter layer; cloth lines the bottom of trench.

**LIMITATIONS:**

- ▶ Loss of infiltrative capacity and high maintenance cost in fine soils.
- ▶ Low removal of dissolved pollutants in very coarse soils.
- ▶ Not suitable on fill sites or steep slopes.
- ▶ The risk of ground water contamination in very coarse soils, may require ground water monitoring.

**MAINTENANCE:**

- ▶ Remove sediment at a frequency appropriate to avoid excessive concentrations of pollutants and loss of infiltrative capacity.
- ▶ Frequent cleaning of porous pavements is required.
- ▶ Maintenance is difficult and costly for underground trenches.



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

Concrete block and gravel filter placed over inlet to storm drain system.

**APPLICATION:**

Construct at inlets in paved or unpaved areas where upgradient area is to be disturbed by construction activities.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Place wire mesh (with 1/2 inch openings) over the inlet grate extending one foot past the grate in all directions.
- ▶ Place concrete blocks around the inlet with openings facing outward. Stack blocks to minimum height of 12-inches and maximum height of 24-inches.
- ▶ Place wire mesh around outside of blocks.
- ▶ Place gravel (3/4" to 3") around blocks.

**LIMITATIONS:**

- ▶ Recommended for maximum drainage area of one acre.
- ▶ Excess flows may bypass the inlet requiring down gradient controls.
- ▶ Ponding will occur at inlet.

**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.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

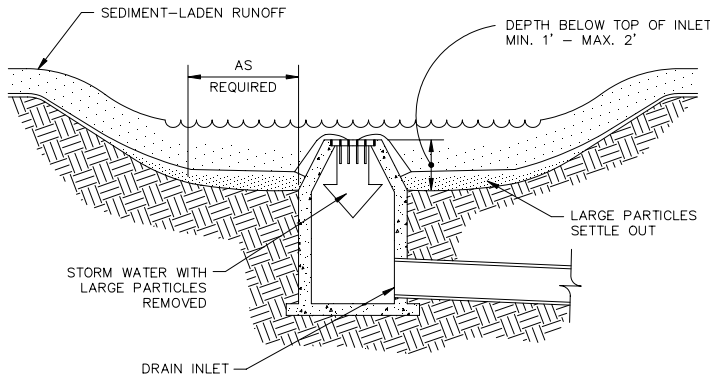
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

An area excavated around a storm drain inlet to impound water below the inlet.

**APPLICATION:**

Construct at storm drainage inlets located downgradient of areas to be disturbed by construction (for inlets in paved areas see other information sheets for inlet protection).

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Provide upgradient sediment controls, such as silt fence during construction of inlet.
- ▶ When construction of inlet is complete, excavate adjacent area 1 to 2 feet lower than the grate elevation. Size of excavated area should be based on soil type and contributing acreage.

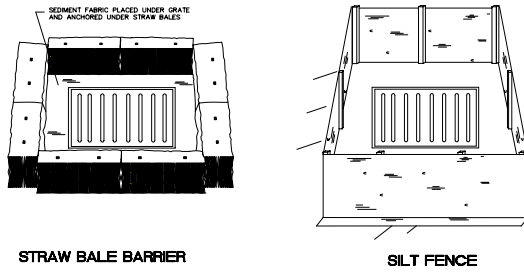
**LIMITATIONS:**

- ▶ Recommended maximum contributing drainage area of one acre.
- ▶ Limited to inlets located in open unpaved areas.
- ▶ Requires flat area adjacent to inlet.

**MAINTENANCE:**

- ▶ Inspect inlet protection following storm event and at a minimum of once monthly.
- ▶ Remove accumulated sediment when it reaches one half of the excavated sump below the grate.
- ▶ Repair side slopes as required.

**INLET PROTECTION**



SEE INDIVIDUAL BMP INFORMATION SHEETS FOR INSTRUCTIONS FOR CONSTRUCTION OF STRAW BALE BARRIER AND SILT FENCE..

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Sediment barrier erected around storm drain inlet.

**APPLICATION:**

Construct at storm drainage inlets located downgradient of areas to be disturbed by construction (for inlets in paved areas see other information sheets for inlet protection)

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Provide upgradient sediment controls, such as silt fence during construction of inlet.
- ▶ When construction of inlet is complete, erect straw bale barrier or silt fence surrounding perimeter of inlet. Follow instructions and guidelines on individual BMP information sheets for straw bale barrier and silt fence construction.

**LIMITATIONS:**

- ▶ Recommended maximum contributing drainage area of one acre.
- ▶ Limited to inlets located in open unpaved areas.
- ▶ Requires shallow slopes adjacent to inlet.

**MAINTENANCE:**

- ▶ Inspect inlet protection following storm event and at a minimum of once monthly.
- ▶ Remove accumulated sediment when it reaches 4-inches in depth.
- ▶ Repair or realign barrier/fence as needed.
- ▶ Look for bypassing or undercutting and recompact soil around barrier/fence as required.

**TARGETED POLLUTANTS**

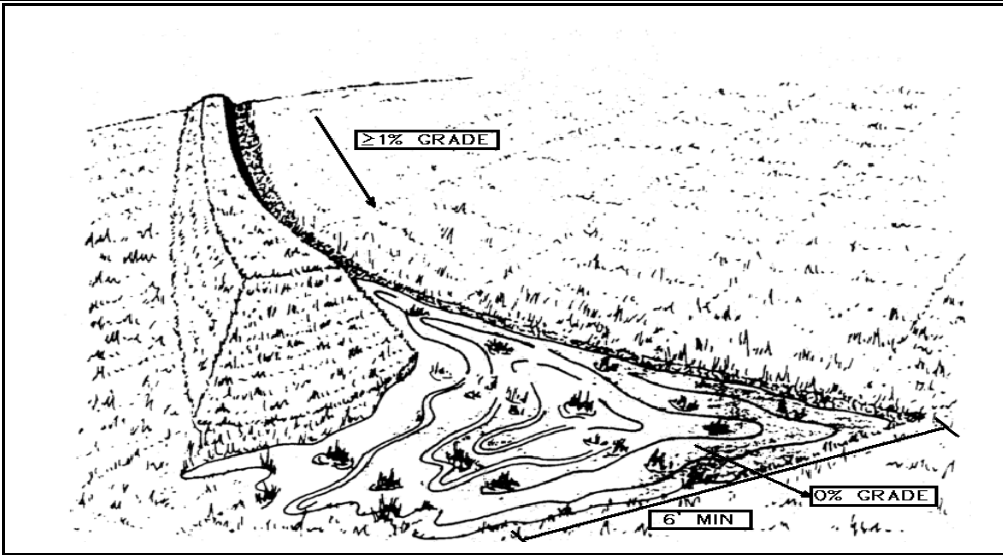
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

Level spreaders are devices used at storm water outlets to spread out collected storm water flows into sheet flow (runoff that flows over ground surface in a thin, even layer). Typically, a level spreader consists of a depression in the soil surface that spreads the flow onto a flat area across a gentle slope. Level spreaders then release the storm water flow onto level areas stabilized by vegetation to reduce speed and increase infiltration.

**APPLICATION:**

Level spreaders are most often used as an outlet for temporary or permanent storm water conveyances or dikes. Runoff that contains high sediment loads should be treated in a sediment trapping device prior to release into a level spreader.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ The length of the spreader depends upon the amount of water that flows through the conveyance.
- ▶ Larger volumes of water need more space to even out.
- ▶ Level spreaders are generally used with filter strips (see Filter Strips BMP).
- ▶ The depressions are seeded with vegetation (see Permanent & Temporary Seeding BMP).
- ▶ Level spreaders should be constructed on natural soils and not on fill material.
- ▶ The entrance to the spreader should be level so that the flow can spread out evenly.
- ▶ Level Spreader should have a grade of 0%; minimum width should be 6'.

**LIMITATIONS:**

- ▶ Can easily develop "short circuiting" (concentration of flows into small streams instead of sheet flow over the spreader) because of erosion or other disturbance.
- ▶ Cannot handle large quantities of sediment-laden storm water.

**MAINTENANCE:**

- ▶ The spreader should be inspected after every storm event to check for damage.
- ▶ If ponding or erosion channels develop, the spreader should be regraded.
- ▶ Dense vegetation should be maintained and damaged areas reseeded as needed.

**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

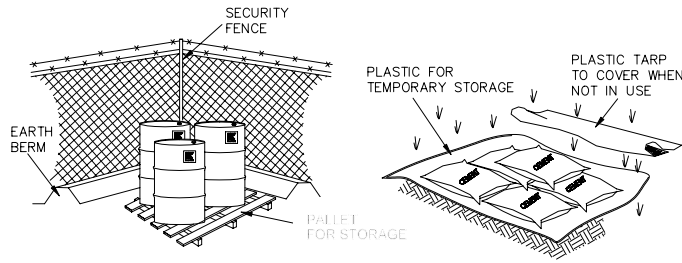
- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low





- ▶ CONTROLLED STORAGE LOCATION
- ▶ BERMED PERIMETER IMPOUNDMENT
- ▶ STORAGE OFF GROUND
- ▶ COVER WHEN NOT IN USE

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

Controlled storage of on-site materials.

**APPLICATION:**

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

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Designate a secured area with limited access as the storage location. Ensure no waterways or drainage paths are nearby.
- ▶ Construct compacted earthen berm (See Earth Berm Barrier Information Sheet), 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 utilized 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.

**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 controlled location.

**MAINTENANCE:**

- ▶ Inspect daily and repair any damage to perimeter impoundment or security fencing.
- ▶ Verify 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.



Adapted from Salt Lake City BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

**DESCRIPTION:**

Placement of material such as straw, grass, woodchips, woodfibers or fabricated matting over open area.

**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.

Material	Application	Depth	Comments
<u>Gravel:</u> Washed 1/4" to 1-1/2"	9 cy/1000 sf	3 inches	Good for traffic areas Good for short slopes
<u>Straw:</u> Air-dried, free of seeds and coarse material	2-3 bales/1000 sf	2 inches min.	Subject to wind blowing Tack down or keep moist
<u>Wood Fiber Cellulose:</u> Free from growth inhibitors; dyed green	35 lb/1000 sf	1 inch	For critical areas, double application rate; Limit to slopes < 3% and < 150 feet

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Roughen area to receive mulch to create depressions that mulch material can settle into.
- ▶ Apply mulch to required thickness and anchor as necessary.
- ▶ Ensure material used is weed free and does not contain any constituents that will inhibit plant growth.

**LIMITATIONS:**

- ▶ Anchoring may be required to prevent migration of mulch material.
- ▶ Downgradient control may be required to prevent mulch material being transported to storm water system.

**MAINTENANCE:**

- ▶ Inspect mulched areas after every rainfall event and at a minimum of monthly.
- ▶ Replace mulch on any bare areas and reanchor as necessary.
- ▶ Clean and replace downgradient controls as necessary.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

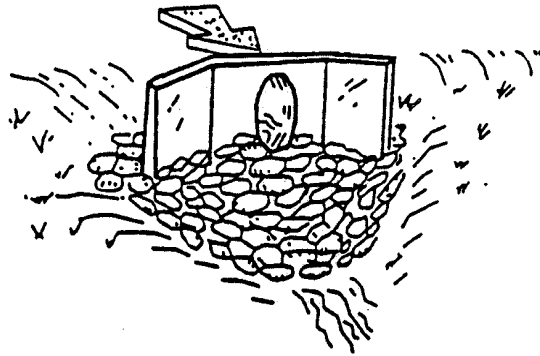
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**DESCRIPTION:**

A rock outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble which is placed at the outlet of a pipe to prevent scour of the soil caused by high pipe flow velocities, and to absorb flow energy to produce non-erosive velocities.

**APPLICATIONS:**

- ▶ Wherever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach.
- ▶ Rock outlet protection is best suited for temporary use during construction because it is usually less expensive and easier to install than concrete aprons or energy dissipators.
- ▶ A sediment trap below the pipe outlet is recommended if runoff is sediment laden.
- ▶ Permanent rock riprap protection should be designed and sized by the engineer as part of the culvert, conduit or channel design.
- ▶ Grouted riprap should be avoided in areas of freeze and thaw because the grout will break up.

**INSTALLATION/APPLICATION CRITERIA:**

Rock outlet protection is effective when the rock is sized and placed properly. When this is accomplished, rock outlets do much to limit erosion at pipe outlets. Rock size should be increased for high velocity flows. Best results are obtained when sound, durable, angular rock is used.

**LIMITATIONS:**

- ▶ Large storms often wash away the rock outlet protection and leave the area susceptible to erosion.
- ▶ Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- ▶ Outlet protection may negatively impact the channel habitat.

**MAINTENANCE:**

- ▶ Inspect after each significant rain for erosion and/or disruption of the rock, and repair immediately.
- ▶ Grouted or wire-tied rock riprap can minimize maintenance requirements.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low

# BMP: Parking Lot Sweeping/Vacuuming

PLSV



### PROGRAM ELEMENTS

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



### DESCRIPTION:

Reduce the discharges of pollutants to stormwater from parking lot surfaces by conducting parking lot cleaning on a regular basis.

### APPROACH:

- ▶ Restrict parking prior to and during sweeping.
- ▶ Establish frequency of sweeping based on anticipated need and observations of debris or sediment accumulation
- ▶ Increase sweeping frequency just before the rainy season.
- ▶ Lots that generate greater amounts of debris or sediment must be swept more frequently. These include lots associated with or adjacent to recreational, commercial, or industrial areas, or other areas of high vehicle or pedestrian traffic.
- ▶ Manually remove debris from corners or other areas of the parking lot that equipment cannot reach
- ▶ Keep accurate operation logs to track programs.
- ▶ Equipment selection can be key for this particular BMP. There are two types used, the mechanical broom sweepers (more effective at picking up large debris and cleaning wet streets), and the vacuum sweepers (more effective at removing fine particles and associated heavy metals). It may be useful to have the ability to use both kinds.

### LIMITATIONS:

- ▶ Conventional sweepers are not able to remove oil and grease.
- ▶ Mechanical sweepers are not effective at removing finer sediments.
- ▶ Effectiveness may also be limited by parking lot conditions, presence of parked vehicles, presence of construction projects, climatic conditions and condition of curbs.

### MAINTENANCE:

- ▶ Acquisition and maintenance of equipment is generally handled by the company hired to perform the sweeping/vacuuming.

### TARGETED POLLUTANTS

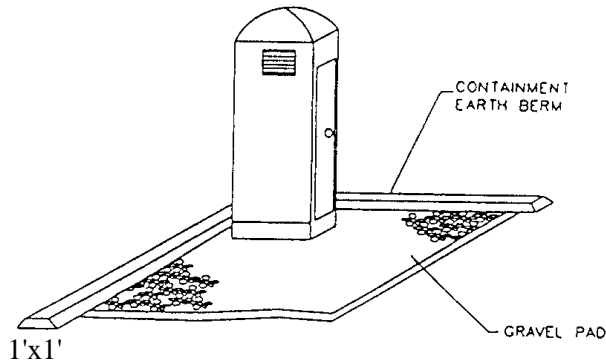
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

### IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High     Medium     Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Temporary on-site sanitary facilities for construction personnel.

**APPLICATION:**

All sites with no permanent sanitary facilities or where permanent facility is too far from activities.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Locate portable toilets in convenient locations throughout the site.
- ▶ Prepare level, gravel surface and provide clear access to the toilets for servicing and for on-site personnel.
- ▶ Construct earth berm perimeter (See Earth Berm Barrier Information Sheet), control for spill/protection leak.
- ▶ Stake toilets to prevent them from tipping.

**LIMITATIONS:**

No limitations.

**MAINTENANCE:**

- ▶ Portable toilets should be maintained in good working order by licensed service with daily observation for leak detection.
- ▶ Regular waste collection should be arranged with licensed service.
- ▶ All waste should be deposited in sanitary sewer system for treatment with appropriate agency approval.

**TARGETED POLLUTANTS**

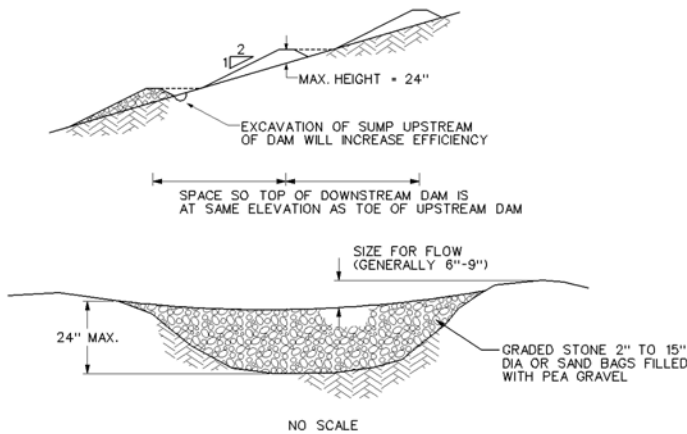
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



**DESCRIPTION:**

A small, temporary dam constructed across a drainage ditch to reduce velocity of concentrated storm water flows, thereby reducing the erosion of the ditch.

**APPLICATION:**

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

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ 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

**LIMITATIONS:**

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

**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 sideslopes
- ▶ Remove accumulated sediment when it reaches one half the height of the dam

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Riprap is a permanent, erosion-resistant protective layer made of loose stones. It is intended to protect soil from erosion in areas of concentrated runoff. Riprap may also be used to stabilize slopes that are unstable because of seepage problems.

**APPLICATION:**

- ▶ Riprap is normally used at locations where erosive forces from water flow exceed the ability of the soil or vegetative cover to resist those forces.
- ▶ Riprap can be used for pipe outlet protection, channel lining, scour protection, etc.
- ▶ Riprap is commonly used for wave protection on lakes.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ For slopes steeper than 2:1, consider using materials other than riprap for erosion protection.
- ▶ If riprap is being planned for the bottom of a permanently flowing channel, the bottom can be modified to enhance fish habitat. This can be done by constructing riffles and pools which simulate natural conditions.
- ▶ When working within flowing streams, measures should be taken to prevent excessive turbidity and erosion during construction. Bypassing base flows or temporarily blocking base flows are two possible methods. Work should be done during a period of low flow.

In designing riprap consider the following:

- ▶ Use durable rock, such as granite, and a variety of rock sizes.
- ▶ The thickness of riprap layers should be at least 1.25 times the max. stone diameter.
- ▶ Filter material is usually required between riprap and the underlying soil surface.

**LIMITATIONS:**

- ▶ Riprap may be unstable on very steep slopes.
- ▶ The placement of a riprap in streams requires a state stream alteration permit.

**MAINTENANCE:**

- ▶ Riprap should be inspected annually and after major storms.
- ▶ If riprap has been damaged, repairs should be made promptly to prevent a progressive failure.
- ▶ If repairs are needed repeatedly at one location, the site should be evaluated to see if original design conditions have changed.

**TARGETED POLLUTANTS**

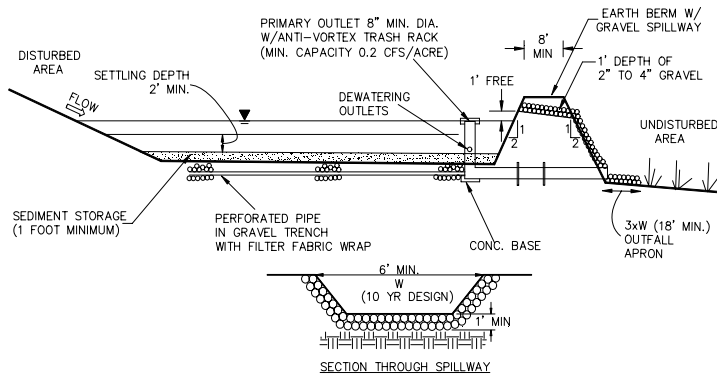
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

A pond created by excavation or construction of an embankment, and designed to retain or detain runoff sufficiently to allow excessive sediment to settle.

**APPLICATION:**

- ▶ At the outlet of all disturbed watersheds 10 acres or larger.
- ▶ At the outlet of smaller disturbed watersheds, as necessary.
- ▶ Where post construction detention basins will be located.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Design basin for site specific location, maintain effective flow length 2 times width.
- ▶ Excavate basin or construct compacted berm containment, ensure no downgradient hazard if failure should occur. (Provide minimum of 67 cy. per acre of drainage area).
- ▶ Construct dewatering and outfall structure and emergency spillway with apron.

**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.
- ▶ May require safety fencing to prevent public access.
- ▶ Height restrictions for embankment regulated by Utah Division of Dam Safety.

**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 2/3 height of available storage.
- ▶ Check outlet for sedimentation/erosion of downgradient area and remediate as necessary. Install silt fence if sedimentation apparent.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

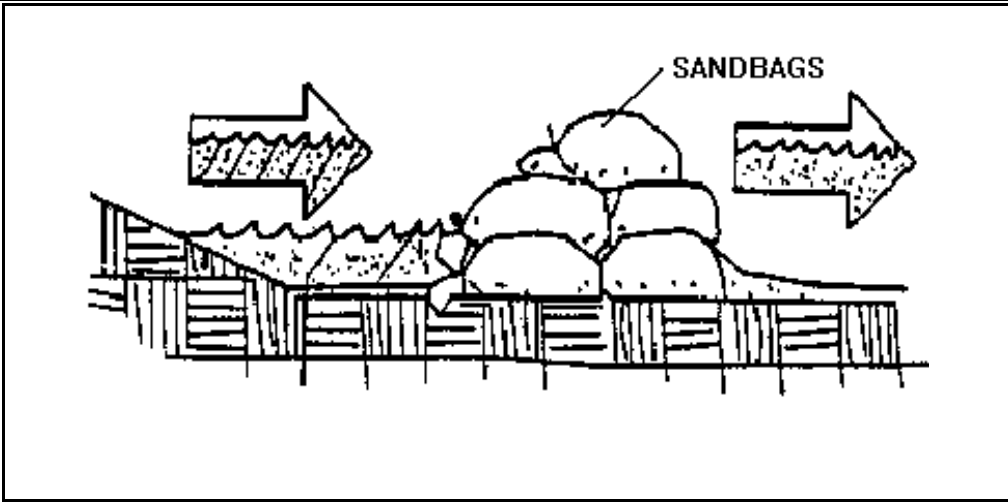
- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low





**DESCRIPTION:**

Stacking sand bags along a level contour creates a barrier which detains sediment-laden water, ponding water upstream of the barrier and promoting sedimentation.

**APPLICATION:**

- ▶ Along the perimeter of the site.
- ▶ May be used in drainage areas up to 5 acres.
- ▶ Along streams and channels
- ▶ Across swales with small catchments.
- ▶ Around temporary spoil areas.
- ▶ Below the toe of a cleared slope.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Install along a level contour.
- ▶ Base of sand bag barrier should be at least 48 inches wide.
- ▶ Height of sand bag barrier should be at least 18 inches high.
- ▶ 4 inch PVC pipe may be installed between the top layer of sand bags to drain large flood flows.
- ▶ Provide area behind barrier for runoff to pond and sediment to settle.
- ▶ Place below the toe of a slope.

**LIMITATIONS:**

- ▶ Sand bags are more expensive than other barriers, but also more durable.
- ▶ Burlap should not be used.

**MAINTENANCE:**

- ▶ Inspect after each rain.
- ▶ Reshape or replace damaged sand bags immediately.
- ▶ Replace sediment when it reaches six inches in depth.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**PROGRAM ELEMENTS**

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges

**DESCRIPTION:**

Reduce the discharges of pollutants to stormwater from street surfaces by conducting street cleaning on a regular basis.

**APPROACH:**

- ▶ Prioritize cleaning to use the most sophisticated sweepers, at the highest frequency, and in areas with the highest pollutant loading.
- ▶ Restrict street parking prior to and during sweeping.
- ▶ Increase sweeping frequency just before the rainy season.
- ▶ Proper maintenance and operation of sweepers greatly increase their efficiency.
- ▶ Keep accurate operation logs to track programs.
- ▶ Reduce the number of parked vehicles using regulations.
- ▶ Sweepers effective at removing smaller particles (less than 10 microns) may generate dust that would lead to concerns over worker and public safety.
- ▶ Equipment selection can be key for this particular BMP. There are two types used, the mechanical broom sweepers (more effective at picking up large debris and cleaning wet streets), and the vacuum sweepers (more effective at removing fine particles and associated heavy metals). Many communities find it useful to have a compliment of both types in their fleet.

**LIMITATIONS:**

- ▶ Conventional sweepers are not able to remove oil and grease.
- ▶ Mechanical sweepers are not effective at removing finer sediments.
- ▶ Effectiveness may also be limited by street conditions, traffic congestion, presence of construction projects, climatic conditions and condition of curbs.

**MAINTENANCE:**

- ▶ Replace worn parts as necessary.
- ▶ Install main and gutter brooms of the appropriate weight.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

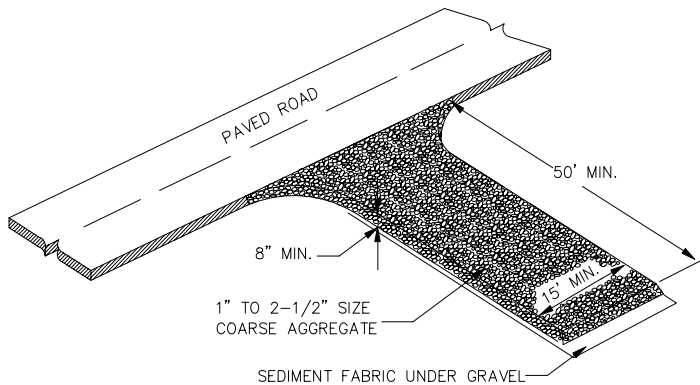
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

A stabilized pad of crushed stone located where construction traffic enters or leaves the site from or to paved surface. The area can be used to spray off vehicles before they leave the site.

**APPLICATIONS:**

At any point of ingress or egress at a construction site where adjacent traveled way is paved. Generally applies to sites over 2 acres unless special conditions exist.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Clear and grub area and grade to provide maximum slope of 2%.
- ▶ Compact subgrade and place filter fabric if desired (recommended for entrances to remain for more than 3 months).
- ▶ Place coarse aggregate, 1 to 2-1/2 inches in size, to a minimum depth of 8 inches.
- ▶ Provide water to the area that can be used to spray off vehicles as needed to prevent the tracking of mud off of the construction site. This may not be needed during dry periods of work, but is needed when construction is proceeding under wet conditions.
- ▶ Provide berming as needed to prevent sediment laden wash water from entering storm water facilities or other water bodies, or leaving the site.

**LIMITATIONS:**

- ▶ Requires periodic top dressing with additional stones.
- ▶ Should be used in conjunction with street sweeping on adjacent public right-of-way.
- ▶ Must be situated such that waste water does not run off site.

**MAINTENANCE:**

- ▶ Inspect daily for loss of gravel or sediment buildup.
- ▶ Inspect adjacent roadway for sediment deposit and clean by shoveling and sweeping.
- ▶ Repair entrance and replace gravel as required to maintain control in good working condition.
- ▶ Expand stabilized area as required to accommodate traffic and prevent erosion at driveways.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

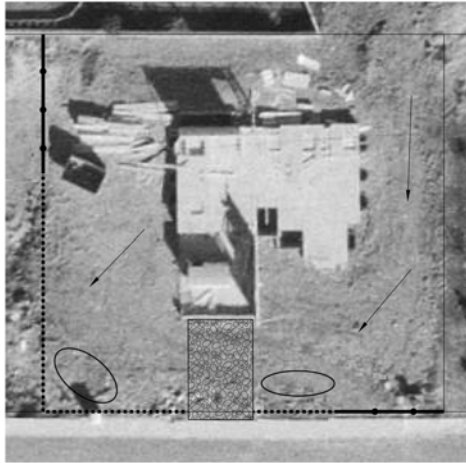
**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

# BMP: Sediment Control on Small Construction Sites

SCSCS



## APPLICATIONS

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

## DESCRIPTION:

Control the perimeter, vehicular access, and the delivery of materials to small construction sites so that sediment, landscaping materials and other construction debris is not in the street. This BMP is intended to be applied to residential construction sites and small nonresidential sites.

## APPROACH:

- Prior to any building construction on a site, identify the point of access to the property. This should generally be the location of the future driveway. Fence the remainder of the street frontage of the property, as well as side lot lines (as far as necessary to prevent access) with temporary fencing (silt fence may be used where silt fence is needed). This fencing is to remain in place until all construction or landscape material deliveries are complete. **No access is to be made at any point other than the designated point of access.**
- Control the perimeter of the site so that sediment-laden storm water does not leave the site during construction. This may involve sediment control measures such as silt fences, drainage swales or berms, straw or hay bale barriers, or rock check dams.
- Either utilize the curb cut or leave the curb, gutter and sidewalk in place (and replace it if needed when work is complete). **Do not place anything in the gutter, including dirt ramps.**
- Excavate for and place a bed of gravel or drain rock the full width of the future driveway (16' minimum), a distance of 27 feet back from the back of sidewalk. Place the rock to the depth necessary to prevent material delivery vehicles from contacting the on-site soils.
- At the proper time, the gravel or rock bed can be modified to serve as the base for concrete driveway placement. At that point, the concrete driveway will prevent delivery and other vehicles from coming into contact with on-site soils.

## LIMITATIONS:

- It may be necessary to pump concrete to locations away from the bed of gravel or rock.
- Parking of workers' vehicles may require that the bed of gravel or rock be enlarged to make space for vehicle parking that keeps the vehicles from contacting the on-site soils.
- Builders, subcontractors, material suppliers, vendors and other visitors to the site must be educated to adhere to the practices outlined.
- Landscaping and construction materials must be placed on the lot, not the street or walk.

## MAINTENANCE:

- Repair fencing as needed to maintain control of access.
- Repair sediment control measures as needed during construction.
- Replenish and dress up the gravel/rock area as needed during the course of construction.
- Any tracking of soil onto the adjacent street indicates inadequate performance of this BMP. Remove soil tracked onto the street at the end of any day that it occurs and take corrective measures to prevent soil tracking onto the street from recurring.



## TARGETED POLLUTANTS

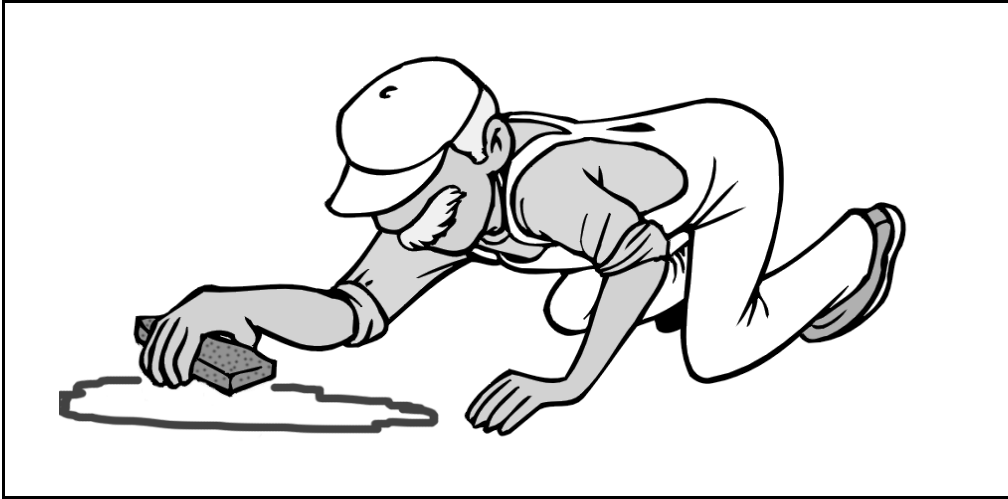
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

## IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

Practices to clean-up leakage/spillage of on-site materials that may be harmful to receiving waters.

**APPLICATION:**

All sites

**GENERAL:**

- ▶ Store controlled materials within a storage area.
- ▶ Educate personnel on prevention and clean-up techniques.
- ▶ Designate an Emergency Coordinator responsible for employing preventative practices and for providing spill response.
- ▶ Maintain a supply of clean-up equipment on-site and post a list of local response agencies with phone numbers.

**METHODS:**

- ▶ Clean-up spills/leaks immediately and remediate cause.
- ▶ Use as little water as possible. **NEVER HOSE DOWN OR BURY SPILL CONTAMINATED MATERIAL.**
- ▶ Use rags or absorbent material for clean-up. Excavate contaminated soils. Dispose of clean-up material and soil as hazardous waste.
- ▶ Document all spills with date, location, substance, volume, actions taken and other pertinent data.
- ▶ Contact local Fire Department and State Division of Environmental Response and Remediation (Phone #801-536-4100) for any spill of reportable quantity.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

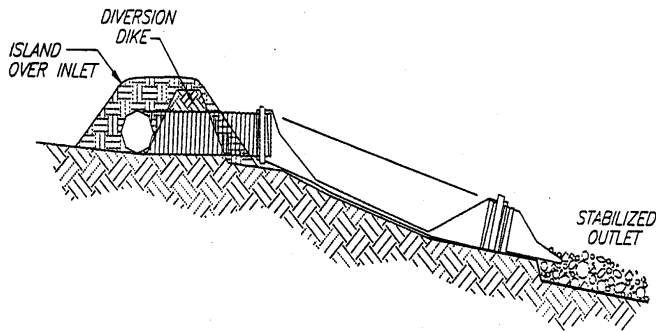
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

A temporary pipe or lined channel that drains the top of a slope to a stable discharge point at the bottom of a slope without causing erosion.

**APPLICATIONS:**

- ▶ Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- ▶ Drainage for top slope diversion dikes or swales.
- ▶ Emergency spillway for a sediment basin.
- ▶ Drainage for top of cut/fill slopes where water can accumulate.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Secure inlet and surround with dikes to prevent gully erosion, and anchor pipe to slope.
- ▶ Size to convey at least the peak of a 10-year, storm event.
- ▶ Stabilize outlet. (See Outlet Protection BMP).

**LIMITATIONS:**

- ▶ Maximum drainage area per slope drain is 5 acres.
- ▶ Clogged slope drains will force water around the pipe and cause slope erosion.
- ▶ Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.
- ▶ Failure can result in flooding and severe erosion.

**MAINTENANCE:**

- ▶ Structure must be inspected weekly and after storms.
- ▶ Inlet must be free of undercutting and no water should circumvent the entry.
- ▶ Outlet should not produce erosion; velocity dissipaters must be maintained.
- ▶ Pipe anchors must be checked to ensure that the pipe remains anchored to the slope.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

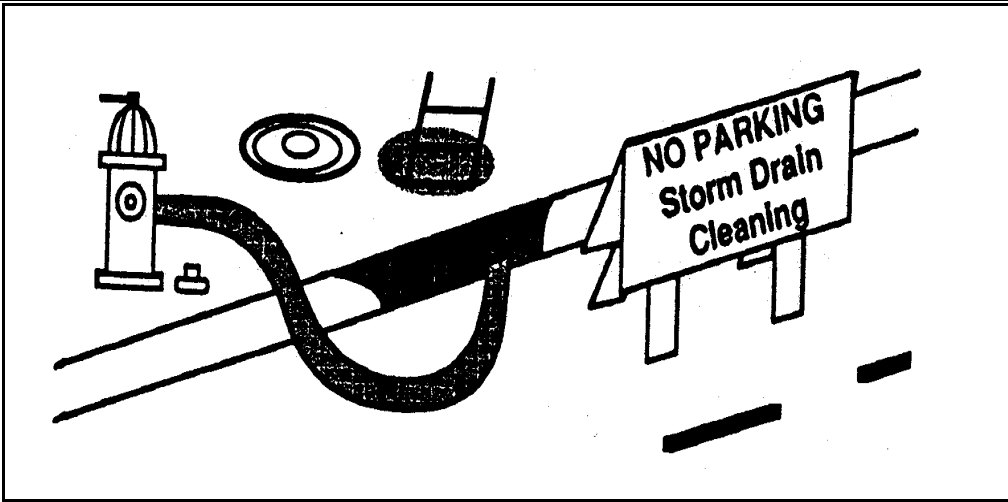
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

A storm drain is “flushed” with water to suspend and remove deposited materials. Flushing is particularly beneficial for storm drain pipes with grades too flat to be self-cleansing. Flushing helps ensure pipes convey design flow and remove pollutants from the storm drain system.

**APPROACH:**

- ▶ Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- ▶ Whenever possible, flushed effluent should be collected, decanted, evaporated, and disposed of in a landfill.

**LIMITATIONS:**

- ▶ Most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity).
- ▶ Water source must be available.
- ▶ May have difficulty finding downstream area to collect sediments.
- ▶ Requires liquid/sediment disposal.

**PROGRAM ELEMENTS**

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

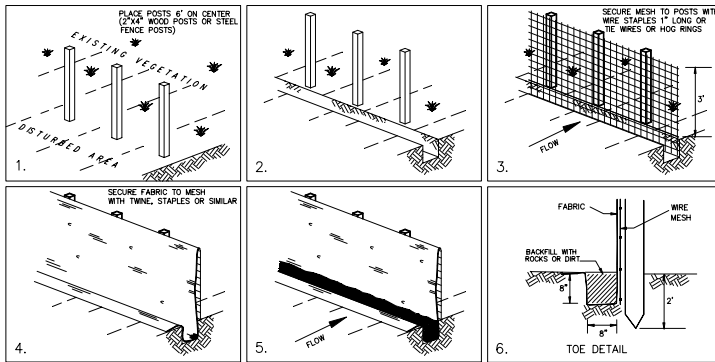
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative

- High     Medium     Low



**DESCRIPTION:**

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

**APPLICATION:**

- ▶ Perimeter control: place barrier at downgradient limits of disturbance
- ▶ Sediment barrier: place barrier at toe of slope or soil stockpile
- ▶ Protection of existing waterways: place barrier near top of stream bank
- ▶ Inlet protection: place fence surrounding catchbasins

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Place posts 6 feet apart on center along contour (or use preassembled unit) and drive 2 feet minimum into ground. Excavate an anchor trench immediately upgradient of posts.
- ▶ Secure wire mesh (14 gage min. With 6 inch openings) to upslope side of posts. Attach with heavy duty 1 inch long wire staples, 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.

**LIMITATIONS:**

- ▶ Recommended maximum drainage area of 0.5 acre per 100 feet of fence
- ▶ Recommended maximum upgradient slope length of 150 feet
- ▶ Recommended maximum uphill grade of 2:1 (50%)
- ▶ Recommended maximum flow rate of 0.5 cfs
- ▶ Ponding should not be allowed behind fence

**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.
- ▶ Reanchor fence as necessary to prevent shortcutting.
- ▶ Remove accumulated sediment when it reaches 1/2 the height of the fence.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

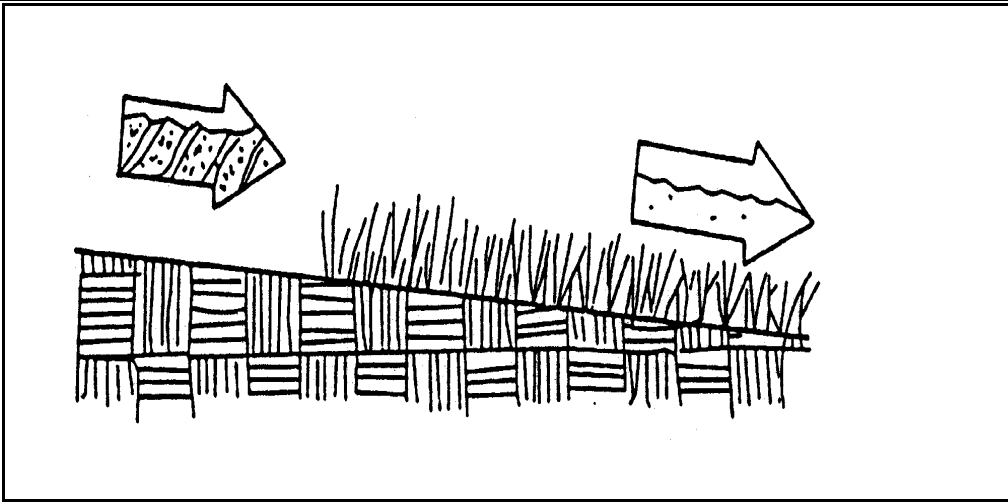
- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low





**DESCRIPTION:**

Seeding of grass and plantings of trees, shrubs, vines and ground covers provide long-term stabilization of soil. Grasses can be planted for temporary stabilization.

**APPLICATION:**

- ▶ Appropriate for site stabilization both during construction and post-construction.
- ▶ Any graded/cleared areas where construction activities have ceased.
- ▶ Open space cut and fill areas.
- ▶ Steep slopes, spoil piles, vegetated swales, landscape corridors, stream banks.

**INSTALLATION/APPLICATION CRITERIA:**

Type of vegetation, site and seedbed preparation, planting time, fertilization and water requirements should be considered for each application.

Grasses:

- ▶ Ground preparation: fertilize and mechanically stabilize the soil.
- ▶ Tolerant of short-term temperature extremes and waterlogged soil composition.
- ▶ Appropriate soil conditions: shallow soil base, good drainage, slope 2:1 or flatter.
- ▶ Mowing, irrigating, and fertilizing are vital for promoting vigorous grass growth.

Trees and Shrubs:

- ▶ Selection criteria: vigor, species, size, shape & wildlife food source.
- ▶ Soil conditions: select species appropriate for soil, drainage & acidity.
- ▶ Other factors: wind/exposure, temperature extremes, and irrigation needs.

Vines and Ground Covers:

- ▶ Ground preparation: lime and fertilizer preparation.
- ▶ Use proper seeding rates.
- ▶ Appropriate soil conditions: drainage, acidity and slopes.
- ▶ Generally avoid species requiring irrigation.

**LIMITATIONS:**

- ▶ Permanent and temporary vegetation may not be appropriate in dry periods without irrigation.
- ▶ Fertilizer requirements may have potential to create stormwater pollution.

**MAINTENANCE:**

- ▶ Shrubs and trees must be adequately watered and fertilized and if needed pruned.
- ▶ Grasses may need to be watered and mowed.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

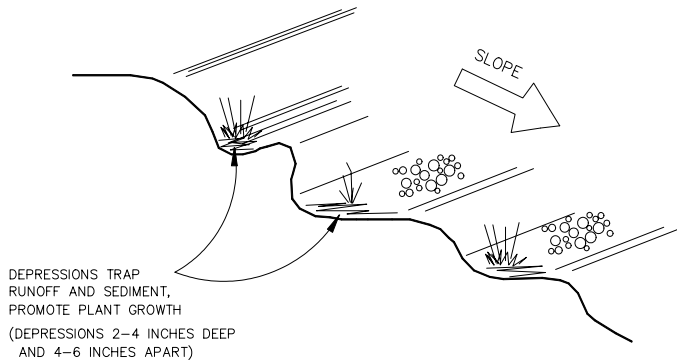
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

Rough preparation of working areas leaving depressions and uneven surface. Depressions should be done parallel to contours.

**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).

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ 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 contours 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 (See Dust Control BMP Fact Sheet).

**LIMITATIONS:**

- ▶ Will not withstand heavy rainfall.
- ▶ Slopes steeper than 2:1 (50%) should be benched (See Benching BMP Fact Sheet).

**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.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

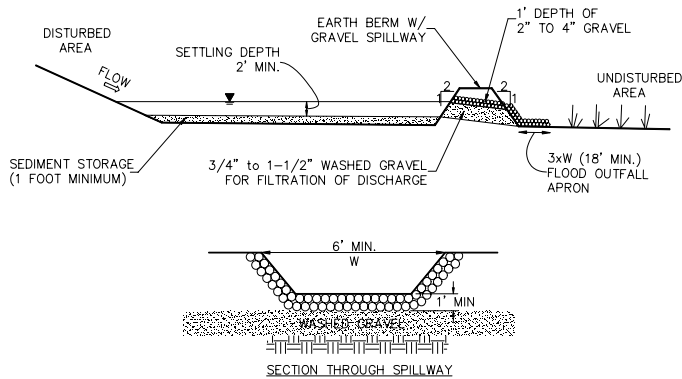
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

A sediment trap is a small excavated or bermed area where runoff from small drainage areas is detained and sediment can settle.

**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.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Design basin for site specific location.
- ▶ Excavate basin or construct compacted berm containment.
- ▶ Construct outfall spillway with apron.
- ▶ Provide downstream silt fence if necessary.

**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.

**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 2/3 height of available storage.
- ▶ Check outlet for sedimentation/erosion of downgradient area and remediate as necessary. Install silt fence if sedimentation apparent.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

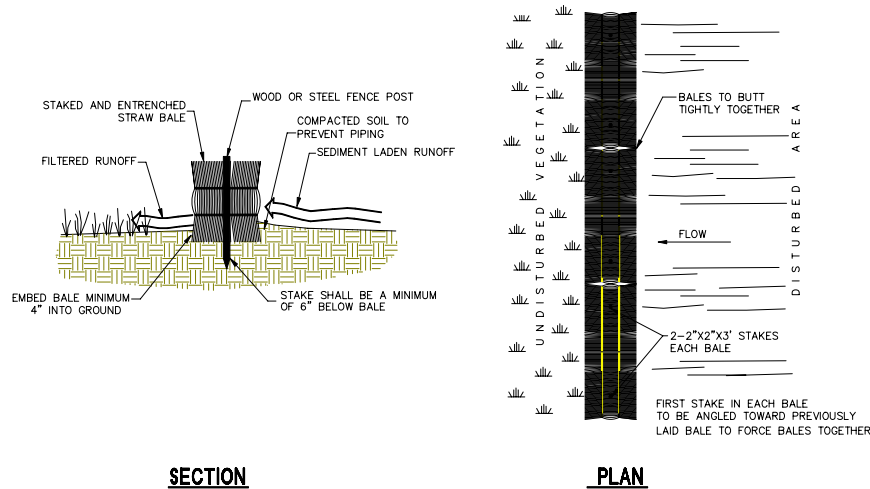
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

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

**APPLICATION:**

- ▶ Perimeter Control: place barrier at downgradient limits of disturbance.
- ▶ Sediment barrier: place barrier at toe of slope or soil stockpile.
- ▶ Protection of existing waterways: place barrier near top of stream bank.
- ▶ Inlet Protection.

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ 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.
- ▶ Backfill around bale and compact to prevent piping, backfill on uphill side to be built up 4-inches above ground at the barrier.

**LIMITATIONS:**

- ▶ Recommended maximum area of 0.5 acre per 100 feet of barrier
- ▶ Recommended maximum upgradient slope length of 150 feet
- ▶ Recommended maximum uphill grade of 2:1 (50%)

**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.
- ▶ Recompect soil around barrier as necessary to prevent piping.

**TARGETED POLLUTANTS**

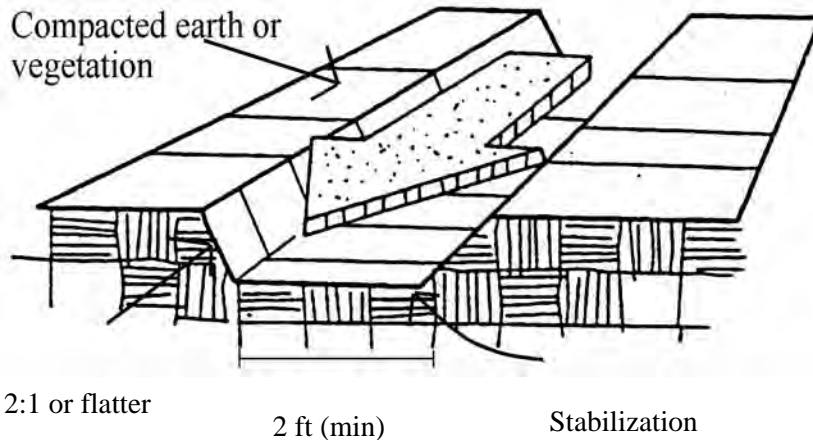
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

Temporary drains and swales are used to divert off-site runoff around the construction site, divert runoff from stabilized areas around disturbed areas, and direct runoff into sediment.

**APPLICATIONS:**

- ▶ Temporary drains and swales are appropriate for diverting any upslope runoff around unstabilized or disturbed areas of the construction site.
- ▶ Prevent slope failures. Prevent damage to adjacent property. Prevents erosion and transport of sediments into water ways. Increases the potential for infiltration. Diverts sediment-laden runoff into sediment basins or traps.

**INSTALLATION/APPLICATION:**

- ▶ Temporary drainage swales will effectively convey runoff and avoid erosion if built properly:
- ▶ Size temporary drainage swales using local drainage design criteria. A permanent drainage channel must be designed by a professional engineer (see the local drainage design criteria for proper design).
- ▶ At a minimum, the drain/swale should conform to predevelopment drainage patterns and capacities.
- ▶ Construct the drain/swale with an uninterrupted, positive grade to a stabilized outlet. Provide erosion protection or energy dissipation measures if the flow out of the drain or swale can reach an erosive velocity.

**LIMITATIONS:**

- ▶ Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- ▶ Temporary drains and swales must conform to local floodplain management requirements.

**MAINTENANCE:**

- ▶ Inspect weekly and after each rain.
- ▶ Repair any erosion immediately.
- ▶ Remove sediment which builds up in the swale and restricts its flow capacity.



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DEFINITION:**

Temporary seeding - establishment of short term cover by application of rapidly germinating seed mix (alternatively hydroseeding may be utilized).

Permanent seeding - establishment of final term cover by application of perennial seed mix (alternatively sod may be utilized).

**APPLICATION:**

Disturbed areas that are at final grade and which will not be disturbed by continuing activities on site. Also areas that are not at final grade but which will be left untouched in excess of one year.

**RECOMMENDED SEED MIX:**

The recommended seed mix will be dependent on site specific information such as elevation, exposure, soils, water available and topography. Check with the County Extension Service for recommended mixes for site specific conditions:

Utah State University Extension Service  
 51 South University Avenue, Suite 206  
 Provo, Utah 84601  
 phone (801) 370-8460

**LIMITATIONS:**

- ▶ Limited to areas that will not be subject to traffic or high usage.
- ▶ May require irrigation and fertilizer which creates potential for impacting runoff quality.
- ▶ May only be applied during appropriate planting season, temporary cover required until that time.

**INSTALLATION:**

- ▶ Roughen soil to a depth of 2 inches. Add fertilizer, manure, topsoil as necessary.
- ▶ Evenly distribute seed using a commonly accepted method such as broadcast seeding, drilling or hydroseeding.
- ▶ Use a seed mix appropriate for soil and location that will provide rapid germination and growth. Check with County Extension Service for recommended mix and application rate.
- ▶ Cover area with mulch if required due to steep slopes or unsuitable weather conditions.

**MAINTENANCE:**

- ▶ Provide irrigation as required to establish growth and to maintain plant cover through duration of project.
- ▶ Reseed as necessary to provide 75% coverage
- ▶ Remediate any areas damaged by erosion or traffic.
- ▶ When 75% coverage is achieved inspect monthly for damage and remediate as necessary.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

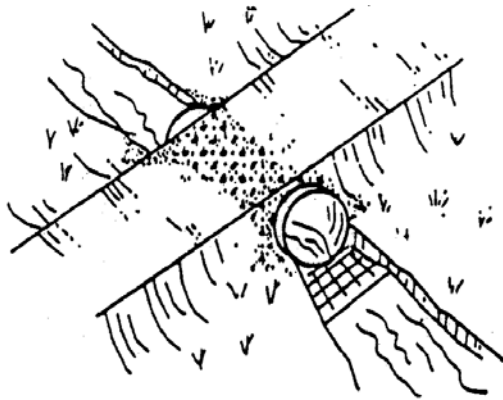
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

A temporary access stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to be used to maintain traffic for the general public.

**APPLICATIONS:**

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels which may be significantly eroded by construction traffic.

**INSTALLATION/APPLICATION:**

Requires knowledge of stream flows and soil strength and should be designed under the direction of a Utah registered engineer with knowledge of both hydraulics and construction loading requirements for structures.

**LIMITATIONS:**

- ▶ May be expensive for a temporary improvement.
- ▶ Requires other BMP's to minimize soil disturbance during installation and removal.
- ▶ Fords should only be used in dry weather.
- ▶ A Stream Alteration Permit may be required, contact the Utah Division of Water Rights before implementation.

**MAINTENANCE:**

- ▶ Inspect weekly and after each significant rainfall, including assessment of foundations.
- ▶ Periodically remove silt from crossings.
- ▶ Replace lost aggregated from inlets and outlets of culverts.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

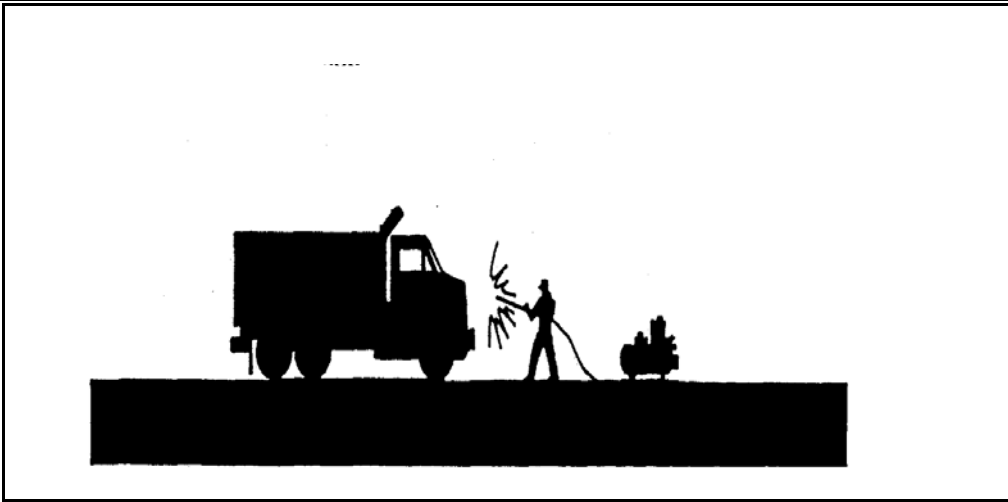
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**DESCRIPTION:**

Prevent or reduce the discharge of pollutants to storm water from vehicle and equipment cleaning by using off-site facilities, washing in designated, contained areas only, eliminating discharges to the storm drain by infiltrating or recycling the wash water, and/or training employees and subcontractors.

**INSTALLATION/APPLICATION:**

- ▶ Use off-site commercial washing businesses as much as possible. Washing vehicles and equipment outdoors or in areas where wash water flows onto paved surfaces or into drainage pathways can pollute storm water. If you wash a large number of vehicles or pieces of equipment, consider conducting this work at an off-site commercial business. These businesses are better equipped to handle and dispose of the wash waters properly. Performing this work off-site can also be economical by eliminating the need for a separate washing operation at your site.
- ▶ If washing must occur on-site, use designated, bermed wash areas to prevent wash water contact with storm water, creeks, rivers, and other water bodies. The wash area can be sloped for wash water collection and subsequent infiltration into the ground.
- ▶ Use as little water as possible to avoid having to install erosion and sediment controls for the wash area. Use phosphate-free biodegradable soaps. Educate employees and subcontractors on pollution prevention measures. Do not permit steam cleaning on-site. Steam cleaning can generate significant pollutant concentrations.

**LIMITATIONS:**

- ▶ Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades.
- ▶ Sending vehicles/equipment off-site should be done in conjunction with Stabilized Construction Entrance.

**MAINTENANCE:**

- ▶ Minimal, some berm repair may be necessary.

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

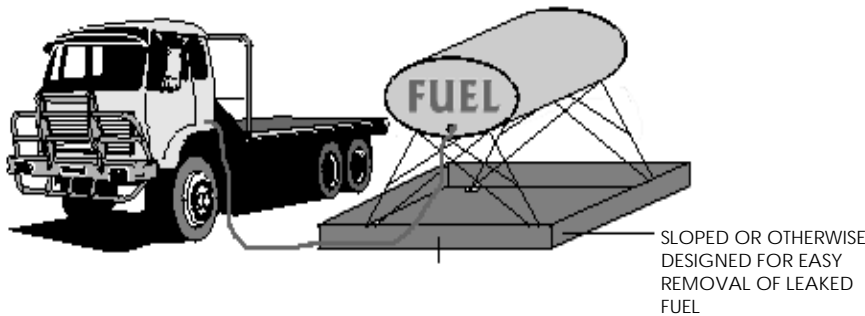
- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low





**DESCRIPTION:**

Prevent fuel spills and leaks, and reduce their impacts to storm water by using off-site facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors.

**INSTALLATION/APPLICATION:**

- ▶ Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute storm water. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These businesses are better equipped to handle fuel and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- ▶ If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the runoff of storm water and the runoff of spills. Discourage "topping-off" of fuel tanks.
- ▶ Always use secondary containment, such as a drain pan or drop cloth, when fueling to catch spills/leaks. Place a stockpile of spill cleanup materials where it will be readily accessible. Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- ▶ Carry out all Federal and State requirements regarding stationary above ground storage tanks.(40 CF Sub. J) Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and perhaps forklifts, most vehicles should be able to travel to a designated area with little lost time. Train employees and subcontractors in proper fueling and cleanup procedures.

**LIMITATIONS:**

Sending vehicles/equipment off-site should be done in conjunction with Stabilized Construction Entrance.

**MAINTENANCE:**

- ▶ Keep ample supplies of spill cleanup materials on-site.
- ▶ Inspect fueling areas and storage tanks on a regular schedule.

**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion



Adapted from Salt Lake County BMP Fact Sheet

**TARGETED POLLUTANTS**

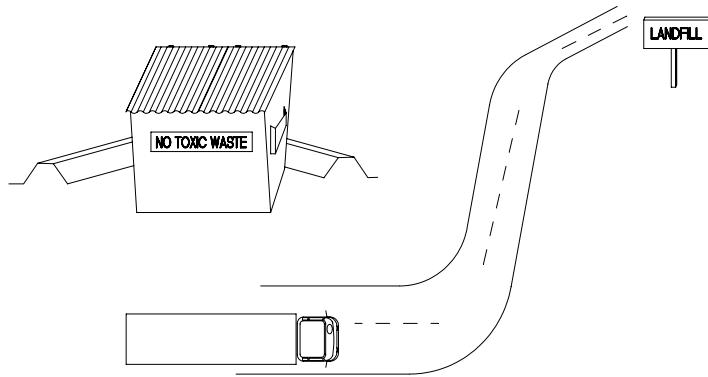
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**OBJECTIVES**

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

**DESCRIPTION:**

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

**APPLICATION:**

All construction sites.

**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 (See Earth Berm Barrier BMP Fact Sheet), 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 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 an authorized disposal location. Include regular Porto-potty service in waste management activities.

**LIMITATIONS:**

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

**MAINTENANCE:**

- ▶ Discuss waste management procedures at progress meetings.
- ▶ Collect site trash daily and deposit in covered containers at designated collection areas.
- ▶ 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).



Adapted from Salt Lake City BMP Fact Sheet

**TARGETED POLLUTANTS**

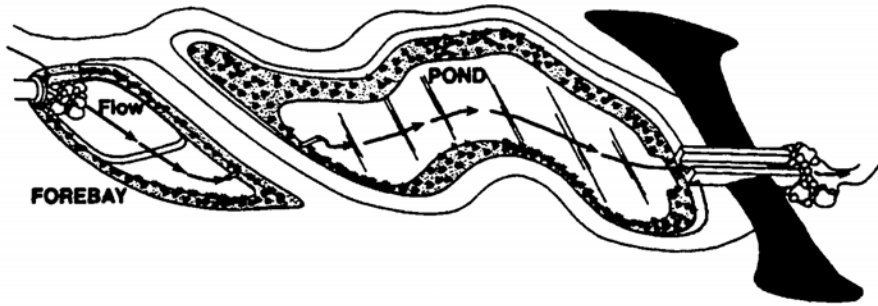
- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Waste

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**CONSIDERATIONS**

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head
- Environmental Side Effects



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**DESCRIPTION:**

A wet pond has a permanent water pool to treat incoming stormwater. An enhanced wet pond includes a pretreatment sediment forebay.

**APPLICATION:**

- ▶ Need to achieve high level of particulate and some dissolved contaminant removal.
- ▶ Ideal for large, regional tributary areas.
- ▶ Multiple benefits of passive recreation (e.g. bird watching, wildlife habitat).

**INSTALLATION/APPLICATION CRITERIA:**

- ▶ Water depth of 3 to 9 feet.
- ▶ Wetland vegetation, occupying 25-50% of water surface area.
- ▶ Design to minimize short-circuiting.
- ▶ Bypass storms greater than two year storm.
- ▶ Establishing wetland vegetation may be difficult.

**LIMITATIONS:**

- ▶ Concern for mosquitoes and maintaining oxygen in ponds.
- ▶ Cannot be placed on steep unstable slopes.
- ▶ Need base flow or supplemental water if water level is to be maintained.
- ▶ Infeasible in very dense urban areas.
- ▶ May require permits from various regulatory agencies, e.g., Corps of Engineers.

**MAINTENANCE:**

- ▶ Remove floatables and sediment build-up.
- ▶ Correct erosion spots in banks.
- ▶ Control mosquitoes.

**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High     Medium     Low