LARGE SYSTEM STORMWATER CREDIT APPLICATION

Eligibility: This credit application is for a property that has a direct (usually piped) connection to Park City's stormwater system, creek, or another waterway. If the property has an indirect connection (no pipe), please complete the small system stormwater credit application.

Please complete the following application and return the information to Christine Williams, PO BOX 1480, Park City UT 84060 or email at christine.williams@parkcity.gov:

Billing Account Number(s): _____

Site Location (Street Address): _____

Residential (Circle): Yes No

Contact Information:

(Name): _____

(Email): _____

(Phone): _____

What is the Primary Activity on the Site: _____

_____

Note: A Credit of 20% per ESU is available to those large systems that complete this form, its attachments, and participates in an onsite consultation. It is anticipated that future credit offers will require further actions to improve water quality or reduce runoff quantity. The information provided here will be used to help shape future credit offerings. All submitted information will become public.

- ☐ *Complete Stormwater Best Management Practices Checklist.*
- ☐ *Complete Green Infrastructure Checklist.*
- ☐ *Provide Map of Stormwater System.*
- ☐ *Provide a narrative statement and budget for Maintenance history over the prior 3 years.*
- ☐ *Provide a narrative statement and anticipated budget for Maintenance over the next 3 years.*

After receiving this information, the City will review the submitted map and schedule a time to come out and walk the system with you. Once completed, your account will be eligible for the 20% discount per ESU.

BEST MANAGEMENT PRACTICES CHECKLIST

Instructions: Place an "X" in the categories that apply to your current operation.

Attach additional sheets if an explanation is needed.

Best Management Practices (BMP) Source Controls	BMP Code	In Place	Will Implement	Will Consider	Not Interested	Does not Apply
Aboveground Tank Leak and Spill Control	ATL					
Buildings and Grounds Maintenance	BGM					
Catch Basin Cleaning	CBC					
Contaminated or Erodible Surface Areas	CESA					
Detention/Infiltration Device Maintenance	DIDM					
Employee Training	ET					
Hazardous Waste Management	HWM					
Housekeeping Practices	HP					
Illegal Dumping Controls	IDC					
Land Use Planning/Management	LUPM					
Leaking Sanitary Sewer Control	LSSC					
Litter Control	LC					
Public Education/Participation	PEP					
Storm Channel/Creek Maintenance	SCCM					
Storm Drain System Signs	SDSS					
Street and Parking Lot cleaning - On site	SC					
Vehicle Use Reduction	VUR					
Best Management Practices (BMP) Treatment Control	**BMP Code**	**In Place**	**Will Implement**	**Will Consider**	**Not Interested**	**Does not Apply**
Chemical Mulch	CM					
Constructed Wetlands	CW					
Double Trench Sand Filter	DTSF					
Extended Detention Basins	EDB					
Infiltration	IN					
Level Spreaders	LS					
Media Filtration	MF					
Minimize Directly Connected Impervious Areas	DCIA					
Oil/Water Separators & Water Quality Inlets	OWS					
Peat-Sand Filter System	PSFS					
Riprap	RR					
Surface Sand Filter System	SSFS					
Trench Sand Filter System	TSFS					
Wet Ponds	WP					

GREEN INFRSTRUCTURE CHECKLIST

Instructions: Place an "X" in the categories that apply to your current operation.

Attach additional sheets if an explanation is needed.

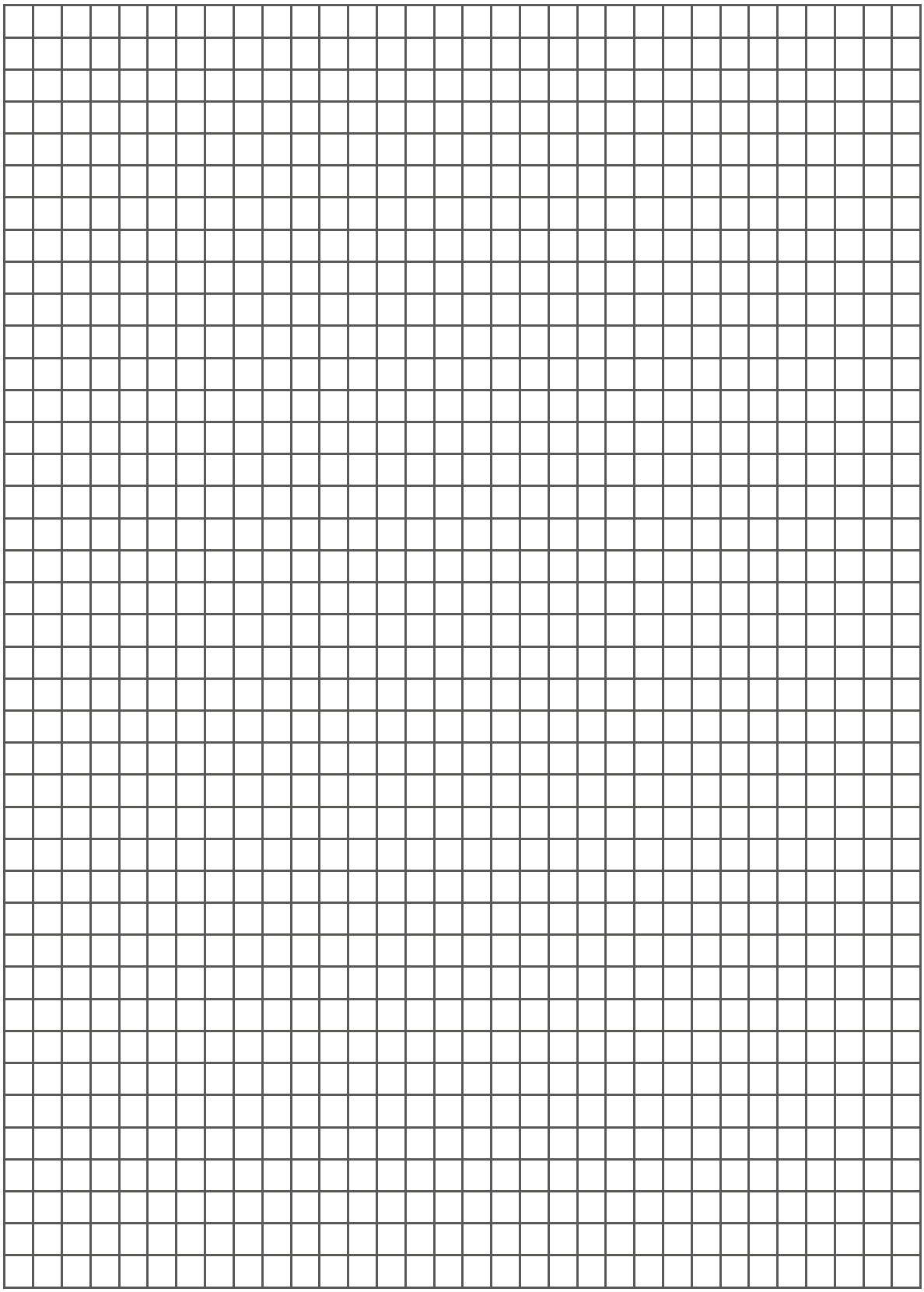
GREEN INFRSTRUCTURE	In Place	Will Implement	Will Consider	Not Interested	Does not Apply
Green Roofs					
Green Parking					
Private Green Streets and Alleys					
Rain Gardens					
Rainwater Harvesting#					
Downspout Disconnects					

Find definitions to the above items by going to: https://www.epa.gov/green-infrastructure

Utah's Rules concerning Rainwater Harvesting can be found at: https://waterrights.utah.gov/forms/rainwater.asp

System Map

Instructions: Sketch out your system on the graph paper below, or submit an existing schematic, or print an aerial image off the internet and sketch over the top of that image, or email stormwater@parkcity.gov and request an areal image of your property and sketch over that image.



3 Years Maintenance History

20__ Expenses

Category	Amount
E.g. Outfall Cleaning	*$7,000*
Total	

Description of Activities_____

_____

_____

20__ Expenses

Category	Amount
Total	

Description of Activities_____

_____

_____

20__ Expenses

Category	Amount
Total	

Description of Activities_____

_____

_____

Anticipated Future 3 Years Maintenance Budget

20__ Expenses

Category	Amount
E.g. Outfall Cleaning	*$7,000*
Total	

Description of Activities_____

_____

_____

20__ Expenses

Category	Amount
Total	

Description of Activities_____

_____

_____

20__ Expenses

Category	Amount
Total	

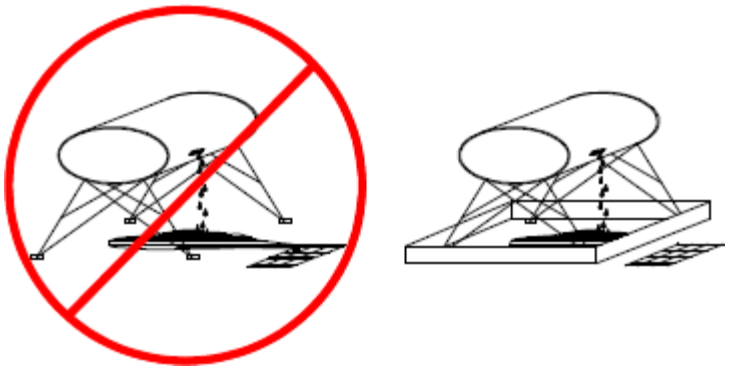
Description of Activities_____

_____

_____

BMP: Aboveground Tank Leak and Spill Control

ATL



Description:

Prevent or reduce the discharge of pollutants to stormwater from aboveground storage tanks by installing safeguards against accidental releases, installing secondary containment, conducting regular inspections, and training employees in standard operating procedures and spill cleanup techniques.

The most common causes of unintentional releases are:

- Installation problems,
- Failure of piping systems (pipes, pumps, couplings, hoses, and valves),
- External corrosion and structural failure,
- Spills and overfills due to operator error, and
- Leaks during pumping of liquids or gases from truck to a storage tank or vice versa.

Approach:

- Integrate efforts with existing aboveground petroleum storage tank programs through the local Fire Department and Health Department, and area and business emergency response plans through the City, County, or Fire District.
- Use engineering safeguards to reduce the chance for spills.
- Perform regular maintenance.

Limitations:

For larger spills, a private spill clean-up company or Hazmat team may be necessary.

Maintenance:

Maintenance is critical to preventing leaks and spills. Conduct routine weekly inspections and:

- Check for external corrosion and structural failure,
- Check for spills and overfills due to operator error,
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves),
- Check for leaks or spills during pumping of liquids or gases from truck to storage facility or vice versa.
- Periodically, integrity testing should be conducted by a qualified professional.

Applications

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

PARK CITY STORMWATER INITIATIVE

TAKING PARK CITY BY STORM

Park City
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Stormwater Division:
www.parkcityutilities.org

Targeted Pollutants

■ High Impact
• Medium Impact
• Low or Unknown Impact

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

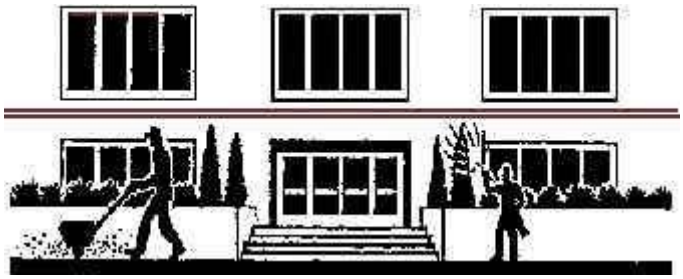
Implementation Requirements

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

■ High • Medium • Low

BMP: Building And Grounds Maintenance

BGM



Description:

Prevent or reduce the discharge of pollutants to stormwater from buildings and grounds maintenance by washing and cleaning up with as little water as possible, preventing and maintaining the stormwater collection system.

Buildings and grounds maintenance includes taking care of landscaped areas around the facility, cleaning of parking lots and pavement other than in the area of industrial activity, and the cleaning of the storm drainage system.

Approach:

- Preserve existing native vegetation to reduce water, fertilizer, and pesticide needs.
- Carefully use pesticides and fertilizers in landscaping.
- Integrate pest management where appropriate.
- Sweep paved surfaces.
- Clean the storm drainage system at appropriated intervals.
- Properly dispose of wash water, sweepings, and sediments.

Limitations:

Alternative pest/weed controls may not be available, suitable or effective in every case.

Maintenance:

The BMPs themselves relate to maintenance and do not require maintenance as they do not involve structures.

Applications

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

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

Implementation Requirements

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

■ High • Medium • Low

BMP: Catch Basin Cleaning

CBC



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

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

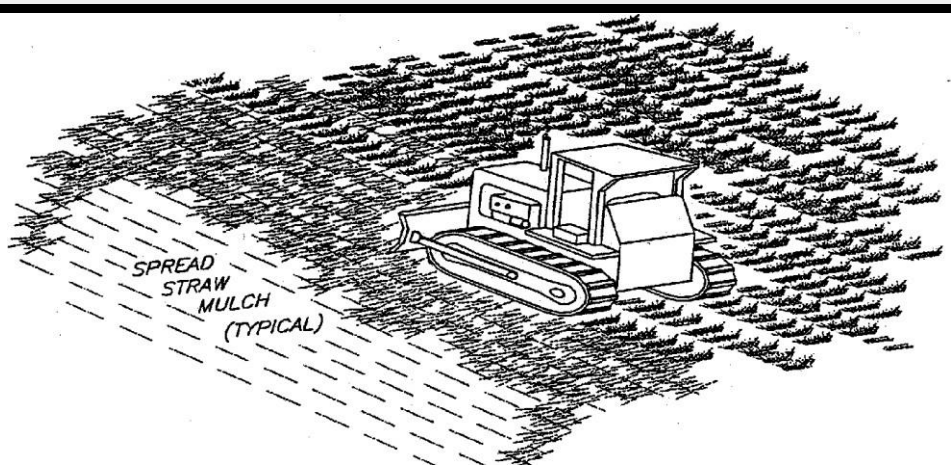
Implementation Requirements

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

■ High • Medium • Low

BMP: Chemical Mulch

CM



Description:

Applying materials such as vinyl, asphalt, plastics, or rubber on an unprotected slope to temporarily stabilize the slope.

Applications:

- As a tacking agent to aid the stabilization of mulches (where matting is not used).
- As a short-term alternative in areas where temporary seeding practices cannot be used because of seasonal condition or climate.
- On steep and rocky slopes where neither mechanical methods or mulches and protective netting can be effectively applied.

Installation/Application Criteria:

- The application rates and procedures recommended by the manufacturer of a chemical stabilization product should be followed to prevent the products from forming ponds and from creating large areas where moisture cannot get through.
- For permanent application, chemical mulches (when used with seed and mulch) should be applied over wood fiber or straw mulch.

Limitations:

- Chemical mulches can create impervious surfaces and impact water quality if not properly applied.
- Some products may not be suitable for use near live streams.

Maintenance:

- Inspect at regular intervals and after each runoff-producing storm event.
- Replace chemical mulch as needed to ensure adequate level of coverage.

Objectives

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

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Targeted Pollutants

■ High Impact
• Medium Impact
• Low or Unknown Impact

■ Sediment
• Nutrients
• Toxic Materials
• Oil & Grease
• Floatable Materials
• Other Waste

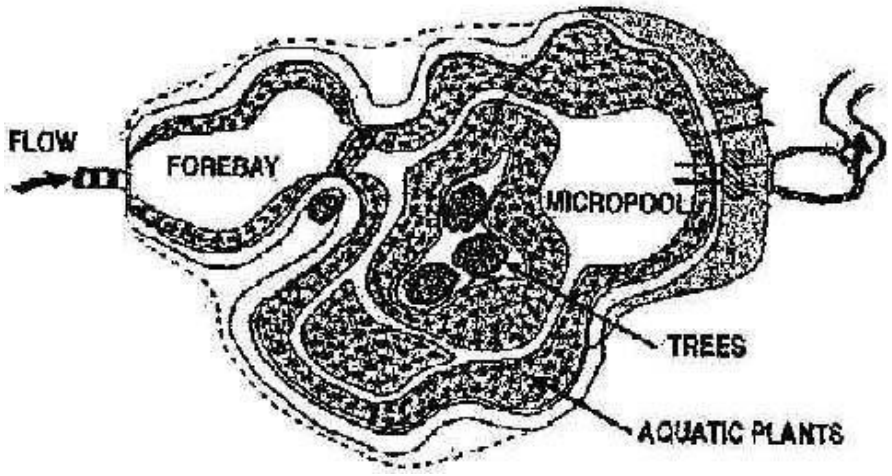
Implementation Requirements

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

■ High • Medium • Low

BMP: Constructed Wetlands

CW



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.
- Involve qualified wetland ecologist to design and install wetland vegetation.
- Establishing wetland vegetation may be difficult.

LIMITATIONS:
- Concern for mosquitos.
- 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.

CONSIDERATIONS

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

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TARGETED POLLUTANTS

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

IMPLEMENTATION REQUIREMENTS

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

■ High • Medium • Low

BMP: Contaminated or Erodible Surface Areas

CESA



Description:

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

Approach:

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

Contaminated or erodible surface areas can be controlled by:

- Preservation of natural vegetation,
- Re-vegetation,
- Chemical stabilization,
- Removal of contaminated soils, or
- 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.

Disadvantages of chemical stabilization include:

- Creation of impervious surfaces.
- May cause harmful effects on water quality.
- Is usually more expensive than vegetative cover.

Maintenance:

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

Applications

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

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Targeted Pollutants

■ High Impact
• Medium Impact
• Low or Unknown Impact

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

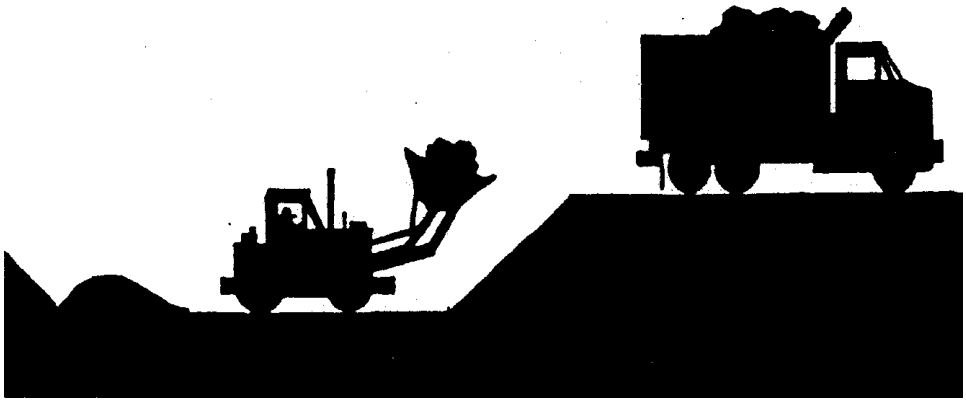
Implementation Requirements

■ Capital Costs
• O&M Costs
• Maintenance
• Training

■ High • Medium • Low

BMP: Detention/Infiltration Device Maintenance

DIDM



Description:

Proper maintenance and siltation removal is required on both a routine and corrective basis to promote effective stormwater 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/infilitration 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

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

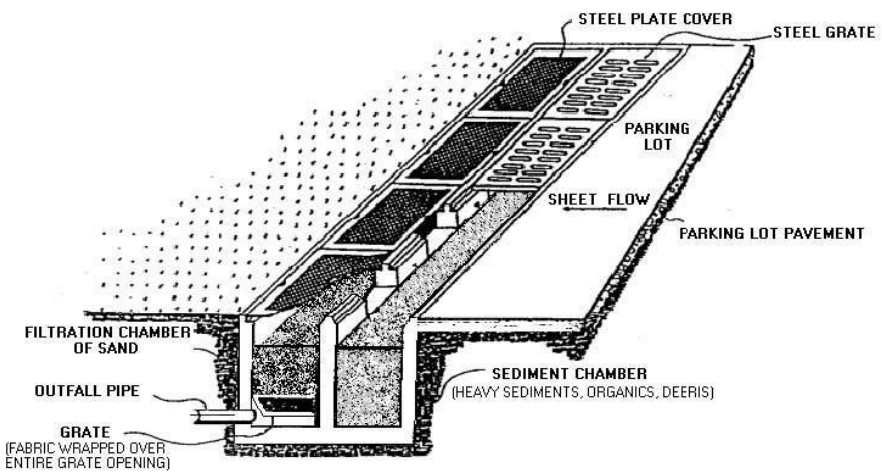
Implementation Requirements

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

■ High • Medium • Low

BMP: Double Trench Sand Filter

DTSF



Description:

The double trench sand filter (AKA Delaware sand filter) is a BMP consisting of parallel sedimentation and sand filter trenches connected by a series of level weir notches to assure sheet flow onto the filter. Filtered runoff is conveyed to a storm sewer by gravity flow or by pumping.

Application:

- Commercial and institutional parking lots, small shopping centers, infill developments.
- Smaller redevelopment sites where the use of conventional BMPs is not practical.

Installation/Application Criteria:

- Requires very little hydraulic head.
- Need to consider structural design with traffic load.

Limitations:

- Will not prevent small floatable debris from entering through the grate openings.
- Disposing of petroleum-contaminated sand may require expertise in hazardous waste disposal.
- Sand filter may clog sooner than other BMPs requiring more frequent maintenance.

Maintenance:

- System should be inspected yearly and after storm events to assess the filtration capacity of the filter.
- Filter sand should be replaced every few years to maintain pollutant removal efficiency.

Considerations

- Soils
- Area Required
- Slope
- Water Availability
- Aesthetics
- Hydraulic Head

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

Implementation Requirements

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

■ High • Medium • Low

BMP: Employee Training

ET



DESCRIPTION:
Employee training, like equipment maintenance, is a method by which to implement BMPs. Employee training should be used in conjunction with all other BMPs as part of the facility's SWPPP.

The specific employee training aspects of each of the source controls are highlighted in the individual information sheets. The focus of this information sheet is more general, and includes the overall objectives and approach for assuring employee training in stormwater pollution prevention. Accordingly, the organization of this information sheet differs somewhat from the other information sheets in this chapter.

OBJECTIVES:
Employee training should be based on four objectives:

- Promote a clear identification and understanding of the problem, including activities with the potential to pollute stormwater;
- Identify solutions (BMPs);
- Promote employee ownership of the problems and the solutions; and
- Integrate employee feedback into training and BMP implementation.

APPROACH:

- Integrate training regarding stormwater quality management with existing training programs that may be required for other regulations.
- Employee training is a vital component of many of the individual source control BMPs included in this manual.

PROGRAM ELEMENTS

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

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TARGETED POLLUTANTS

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

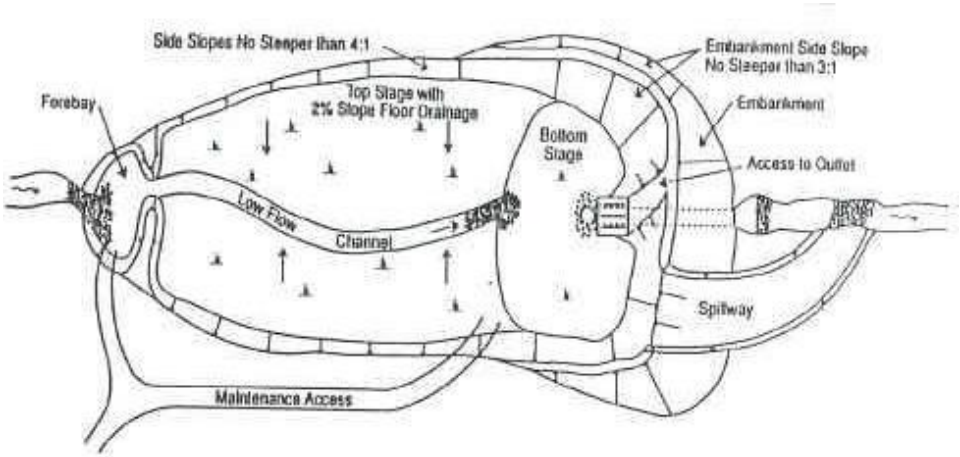
IMPLEMENTATION REQUIREMENTS

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

■ High • Medium • Low

BMP: Extended Detention Basins

EDB



Descriptions:

Extended detention basins are dry between storms. During a storm the basin fills. A bottom outlet releases the stormwater 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.
- Shallow basin with large surface area performs better than deep basin with same volume.
- Place energy dissipators 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 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.

Considerations

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

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

Implementation Requirements

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

■ High • Medium • Low

BMP: Hazardous Waste Management

HWM



Description:

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

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 stormwater 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.

Program Elements

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

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TAKING PARK CITY BY STORM

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Targeted Pollutants

- ■ High Impact
- • Medium Impact
- • Low or Unknown Impact

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

Implementation Requirements

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

■ High • Medium • Low

BMP: Housekeeping Practices

HP



Description:

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals.

Approach:

- Pattern a new program after the many established programs from municipalities around the country. Integrate this best management practice as much as possible with existing programs at your municipality.
- This BMP has two key audiences: municipal employees and the general public.
- For the general public, municipalities should establish a public education program that provides information on such items as storm water pollution and beneficial effects of proper disposal on water quality; reading product labels; safer alternative products; safe storage, handling, and disposal of hazardous products; list of local agencies; and emergency phone numbers. The programs listed below have provided this information through brochures or booklets that are available at a variety of locations including municipal offices, household hazardous waste collection events or facilities, and public information fairs.

Municipal facilities should develop controls on the application of pesticides, herbicides, and fertilizers in public right-of-ways and at municipal facilities. Controls may include:

- List of approved pesticides and selected uses.
- Product and application information for users.
- Equipment use and maintenance procedures.
- Record keeping and public notice procedures.

Limitations:

There are no major limitations to this best management practice.

Program Elements

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

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- ■ Oil & Grease
- • Floatable Materials
- • Bacteria & Viruses

Implementation Requirements

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

■ High • Medium • Low

BMP: Illegal Dumping Controls

IDC



Description:

Implement measures to detect, correct, and enforce against illegal dumping of pollutants on streets, into the storm drain system, and into creeks. Substances illegally dumped on streets, into the storm drain system, and into creeks includes paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes can cause storm water and receiving water quality problems as well as clog the storm drain system.

Approach:

One of the keys to success is increasing the general public's awareness of the problem and to at least identify the incident, if not correct it. There are a number of ways of accomplishing this:

- Train municipal staff from all departments to recognize and report incidents.
- Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act.
- Educate the public.
- Provide the public with a mechanism for reporting such as a hot line.

Establish system for tracking incidents which will identify:

- Illegal dumping "hot spots",
- Types and quantities (in some cases) of wastes,
- Patterns in time of occurrence (time of day/night, month, or year),
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accident/spills), and
- Responsible parties.

A tracking system also helps manage the program by indicating trends, and identifying who, what, when, and where efforts should be concentrated.

Limitations

The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal.

Program Elements

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

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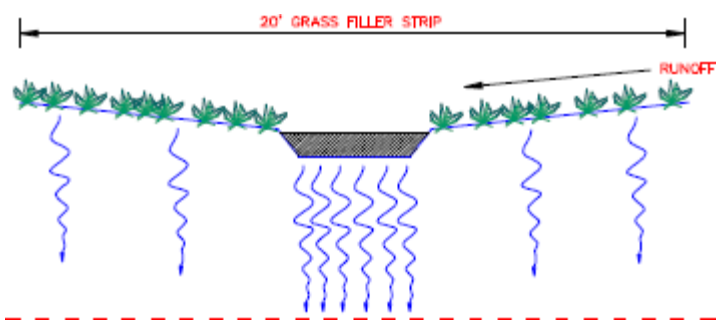
Implementation Requirements

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

■ High • Medium • Low

BMP: Infiltration

IN



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:
- Need to achieve high level of particulate and dissolved pollutant removal.
- Suitable site soils and geologic conditions; low potential for long-term erosion in the watershed.
- Multiple management objectives (e.g., ground water recharge or runoff volume control).

INSTALLATION/APPLICATION CRITERIA:
- Volume sized to capture a particular fraction of annual runoff.
- Pretreatment in fine soils.
- Emergency overflow or bypass for larger storms.
- Observation well in trenches.

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.
- Risk of ground water contamination in very coarse soils, may require ground water monitoring.
- Should not use until upstream drainage area is stabilized.
- Infiltration facilities could fall under regulations regarding waste disposal to land.

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

CONSIDERATIONS

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

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■ Floatable Materials
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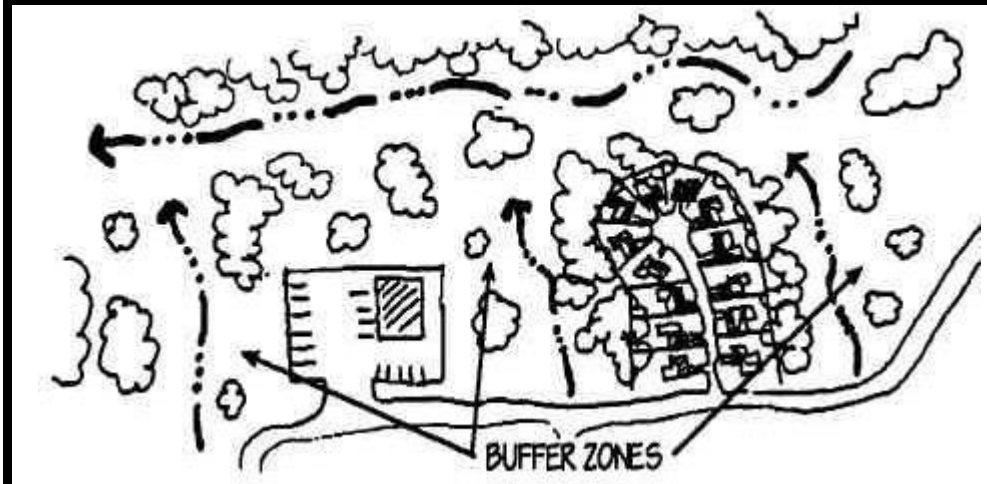
IMPLEMENTATION REQUIREMENTS

• Capital Costs
• O&M Costs
• Maintenance
• Training

■ High • Medium • Low

BMP: Land Use Planning/Management

LUPM



Description:

This BMP represents an important opportunity to reduce pollutants in stormwater runoff by using a comprehensive planning process to integrate water quality concerns into the development and redevelopment process. It is applicable to all types of land use and represents one of the most effective pollution prevention practices.

Approach:

The land use planning process need not be complex. A basic schematic model involves:

- Phase I - Goals: Determine clear-cut water quality goals.
- Phase 2 - Study: Identify planning area, gather pertinent data, and write a description of the planning area and its associated problems.
- Phase 3 - Analysis and Synthesis: Determine and prioritize the water quality needs as they relate to land use.
- Phase 4 - Recommendations: Future courses of action are developed to address the identified problems and needs determined previously.
- Phase 5 - Adoption: The recommendations are presented to a political body for acceptance and implementation.
- Phase 6 - Implementation: Recommendations adopted by the political body are implemented by the locality.

Limitations:

- Land use planning/management frequently addresses sensitive public issues. Restrictions on certain land uses for the purpose of mitigating stormwater pollution may be politically unacceptable.
- The use of land use controls and planning for water quality improvements may be limited by the lack of staff to enforce various aspects of local zoning and building codes.
- The planning process addresses many public needs and legal requirements which often are in conflict with one another. It is difficult but extremely important to integrate and balance these sometimes competing programs.

Program Elements

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

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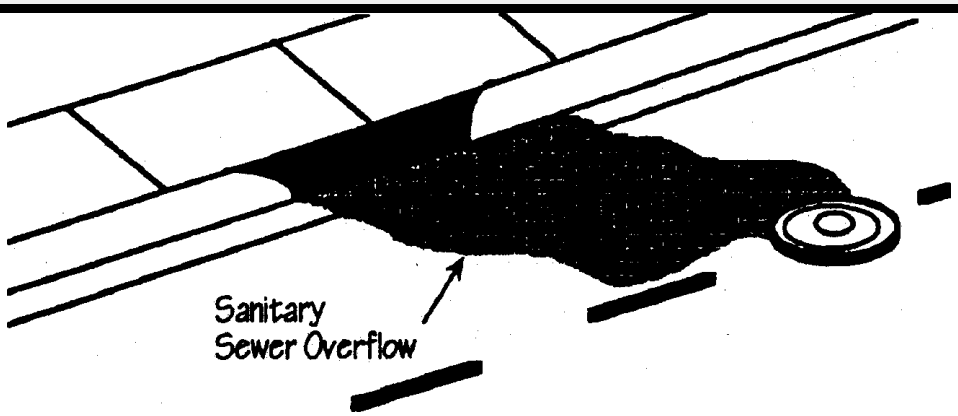
Implementation Requirements

• Capital Costs
• O&M Costs
■ Regulatory
• Training
• Staffing
• Administrative

■ High • Medium • Low

BMP: Leaking Sanitary Sewer Control

LSSC



DESCRIPTION:
Implement control procedures for identifying, repairing, and remediating sewer blockages, infiltration, inflow, and wet weather overflows from sanitary sewers into the storm drain conveyance system. Procedures include field screening, follow-up testing, and complaint investigation.

APPROACH:
- Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.
- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques.
- Coordinate with ongoing infiltration and inflow (I & I) program to locate sources of exfiltration during I & I inspections.
- Design, site, operate, and maintain on-site sewage disposal systems to prevent nutrient/pathogen loadings to surface waters and to reduce loadings to groundwater.

Leaking sanitary sewer detection techniques include:
- Field screening program (including field analytical testing),
- Fluorometric dye testing,
- Zinc chloride smoke testing,
- Television camera inspection,
- Nessler Reagent test kits for ammonia detection,
- Citizens' hotline reporting of wet weather sanitary overflows.

LIMITATIONS:
- Private property access rights needed to perform field screening/testing along storm drain right-of-ways.
- Requirements of municipal ordinance authority for suspected source verification testing necessary for guaranteed rights of entry.

PROGRAM ELEMENTS

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

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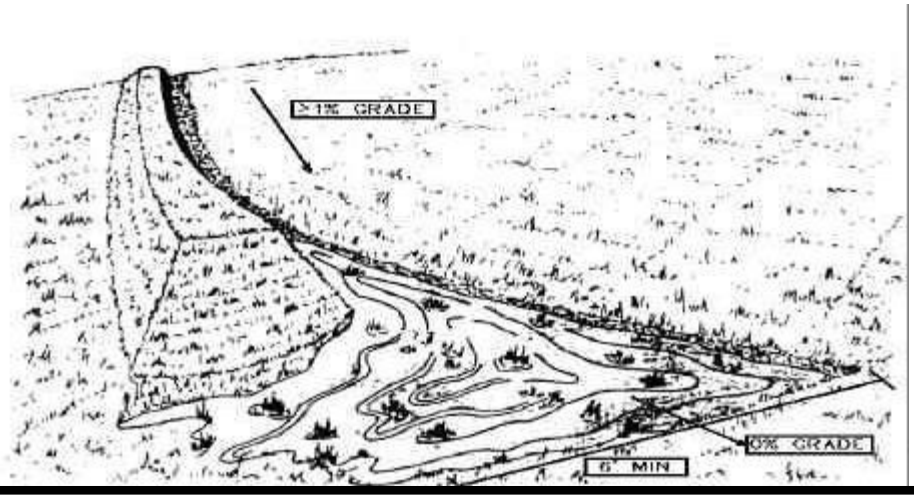
IMPLEMENTATION REQUIREMENTS

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

■ High • Medium • Low

BMP: Level Spreaders

LS



Description:

Level spreaders are devices used at stormwater outlets to spread out collected stormwater flows into sheetflow (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 stormwater 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 stormwater 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.

Limitations:

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

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

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- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

Implementation Requirements

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

■ High • Medium • Low

BMP: Litter Control

LC



Description:

Litter control involves the removal of litter from streets and other surfaces before runoff or wind moves these materials to surface waters. This practice will prevent litter from becoming pollution as well as improving the aesthetics of the area.

Approach:

There are two categories of litter control programs: source reduction and removal programs.

Source reduction:

- Litter containers should be conveniently placed and emptied frequently to prevent overflow.
- Recycling programs should be promoted.
- Public education programs should be developed since litter control programs depend upon public support.

Litter removal programs:

- Litter control program include refuse and leaf collection, street cleaning, and catch basin cleaning.
- Educational programs that explain the environmental benefit of leaf collection to water quality are helpful.
- Municipal leaf collection is usually accomplished with street sweepers (see Street Cleaning BMP) or mechanical lawn sweepers.

Limitations:

No limitations.

Program Elements

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

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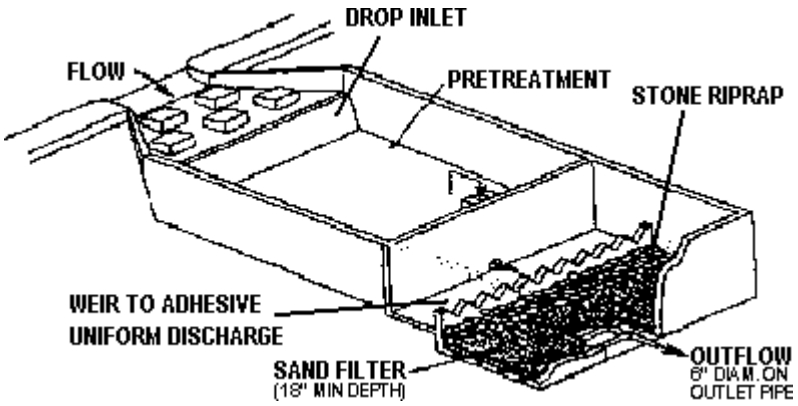
Implementation Requirements

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

■ High • Medium • Low

BMP: Media Filtration

MF



DESCRIPTION:
Consists of a settling basin followed by a filter. The most common filter media is sand; some use a peat/sand mixture.

APPLICATION:
- Objective is to remove only sediment (particulate pollutants).
- Use where unavailability of water prevents the use of wet ponds, wetlands, or biofilters.
- Can be placed underground.
- Suitable for individual developments and small tributary areas up to about 100 acres.
- May require less space than other treatment control BMPs.

INSTALLATION/APPLICATION CRITERIA:
- Settling basin smaller than wet or extended detention basin.
- Spread flow across filter.
- Place filter offline to protect from extreme events.
- Minimize erosion in settling basin.

LIMITATIONS:
- Filter may require more frequent maintenance than most of the other BMPs.
- May experience significant head loss.
- Dissolved pollutants are not captured by sand.
- Severe clogging potential if exposed soil surfaces exist upstream.

MAINTENANCE:
Clean filter surface twice annually; or more often if watershed is excessively erosive.

CONSIDERATIONS

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

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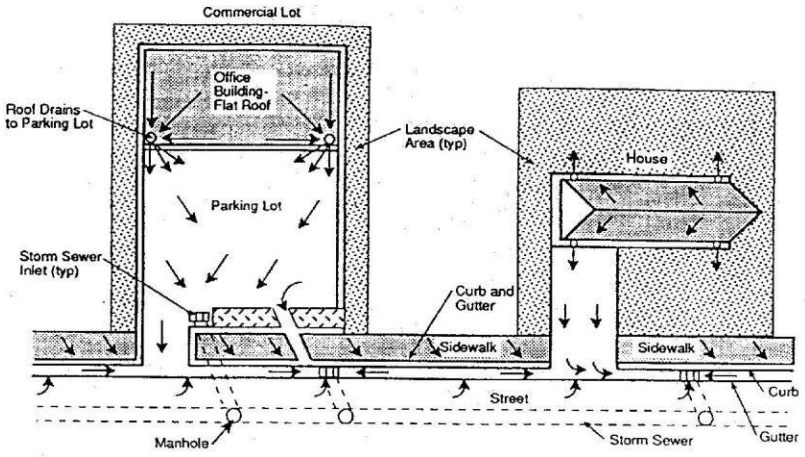
IMPLEMENTATION REQUIREMENTS

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

■ High • Medium • Low

BMP: Minimizing DCIAs

DCIA



Description:

Minimizing directly connected impervious areas (DCIAs) is a structural BMP strategy that requires a basic change in drainage design philosophy. The basic principle is to direct stormwater runoff to landscaped areas, grass buffer strips, and vegetated swales to slow down the rate of runoff, reduce runoff volumes, attenuate peak flows, and encourage filtering and infiltration of stormwater.

Application:

It can be made an integral part of drainage planning for any development.

Installation/Application Criteria:

- Use on sites with general terrain slopes flatter than 3-4%.
- Design the site drainage flowpath to maximize flow over vegetated areas before leaving a site.
- Minimize ground slopes to limit erosion and slow down water flow.
- Select vegetation that will not only survive, but also enhance water quality.

Limitations:

- Potential increase in site open space requirements over the traditional development systems.
- Introduction of a nonconventional development design strategy.
- Infiltration of water near building foundations and parking lots is a concern.
- Will likely result in increased maintenance along the swales.

Maintenance:

- Maintain grass and other vegetation.
- Pick up debris.
- Conduct ongoing inspections for potential erosion problems and changes in drainage patterns.
- Remove sediment buildup and replace damaged grass cover.

Considerations

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

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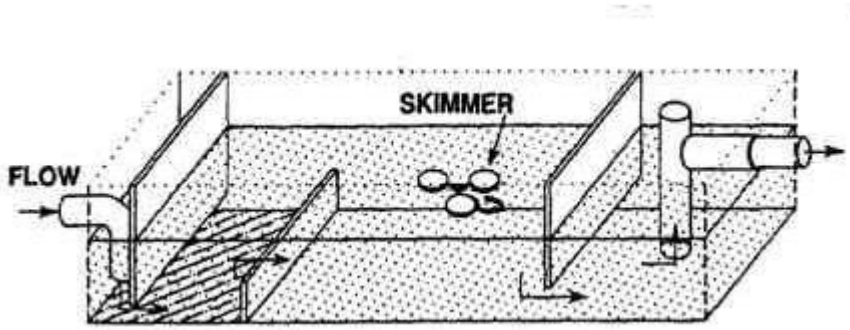
Implementation Requirements

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

■ High • Medium • Low

BMP: Oil/Water Separators And Water Quality Inlets

OWS



Description:

Oil/Water separators are designed to remove specific contaminants: petroleum compounds and grease. However, separators will also remove floatable debris and settleable solids. Two general types of oil/water separators are used: conventional gravity separator and the coalescing plate interceptor (CPI).

Application:

- Applicable to situations where the concentration of oil and grease related compounds will be abnormally high and source control cannot provide effective control. The general types of businesses where this situation is likely are truck, car and equipment maintenance and washing businesses, as well as businesses that perform maintenance on their own equipment and vehicles.
- Public facilities where separators may be required include marine ports, airfields, fleet vehicle maintenance and washing facilities, and mass transit park-and-ride lots.
- Conventional separators are capable of removing oil droplets with diameters equal to greater than 150 microns.
- CPI separators should be used if smaller droplets must be removed.

Installation/Application Criteria:

- Sizing related to anticipated influent oil concentration, water temperature and velocity, and the effluent goal.
- To maintain reasonable separator size, it should be designed to bypass flows in excess of first flush.

Limitations:

- Little data on oil characteristics in stormwater leads to considerable uncertainty about performance.
- Air quality permit may be required.

Maintenance:

Clean frequently of accumulated oil, grease, and floating debris.

Considerations

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

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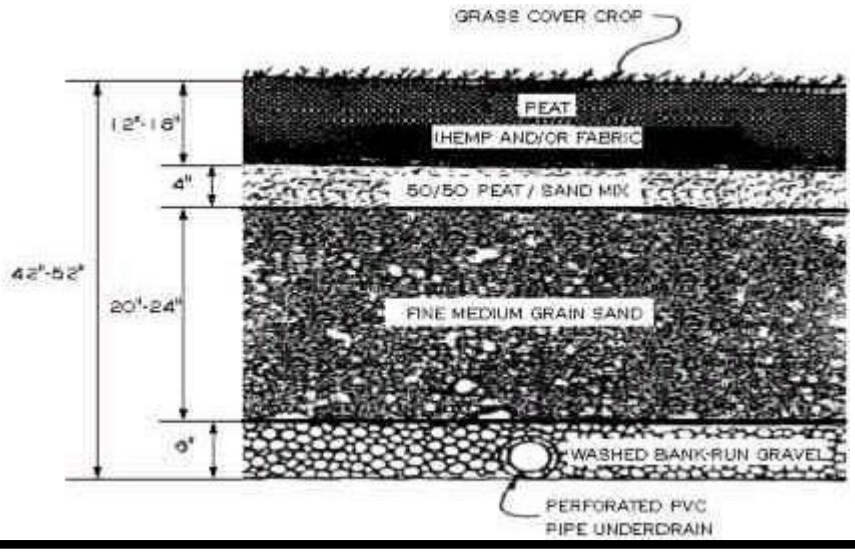
Implementation Requirements

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

■ High • Medium • Low

BMP: Peat-Sand Filter System

PSFS



DESCRIPTION:
A filter system containing fibric or hemic peat and consisting of a sedimentation chamber or pond, a surface vertical filter system, a grass cover crop, and alternating layers of peat and sand all underlain by collector pipes in a gravel bed.

APPLICATION:
- Development where insufficient space exists for a wet pond.
- Development where higher rates of pollutant removal are preferred.

INSTALLATION/APPLICATION CRITERIA:
- Use only fibric or hemic peat. Sapric peat will result in system failure.
- Can be used in high water table areas.
- Peat will not remove pollutants if it becomes oxygen depleted.

LIMITATIONS:
- Suitable peat material may not always be available.
- System must be shut down during the winter months.
- Sites with little or no gradient may prevent sufficient gravity flow through the system.
-

MAINTENANCE:
During dry seasons or periods of drought the cover crop may require irrigation.
- Remove silt when accumulation exceeds 6" (15.2 cm).
- Remove accumulated trash and debris every 6 months or as necessary.

CONSIDERATIONS

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

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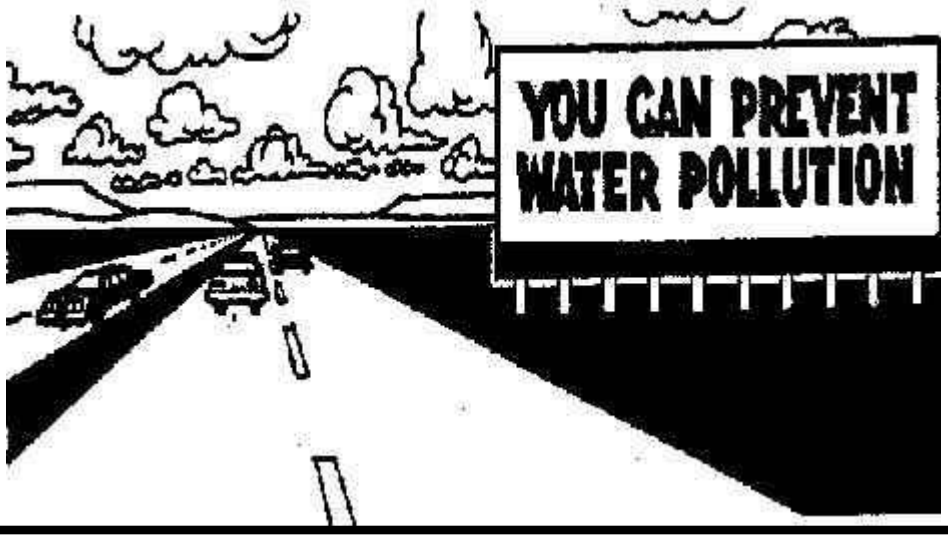
IMPLEMENTATION REQUIREMENTS

■ Capital Costs
• O&M Costs
• Maintenance
• Training

■ High • Medium • Low

BMP: Public Education/Participation

PEP



DESCRIPTION:

Public education/participation, like an ordinance or a piece of equipment, is not so much a best management practice as it is a method by which to implement BMPs. This information sheet highlights the importance of integrating elements of public education and participation into a municipality's overall plan for stormwater quality management.

A public education and participation plan provides the municipality with a strategy for educating its employees, the public, and businesses about the importance of protecting stormwater from improperly used, stored, and disposed of pollutants. Municipal employees must be trained, especially those that work in departments not directly related to stormwater but whose actions affect stormwater. Residents must become aware that a variety of hazardous products are used in the home and that their improper use and disposal can pollute stormwater. Increased public awareness also facilitates public scrutiny of industrial and municipal activities and will likely increase public reporting of incidents.

APPROACH:

- Pattern a new program after the many established programs around the country.
- Implement public education/participation as a coordinated campaign in which each message is related to the last.
- Present a clear and consistent message and image to the public regarding how they contribute to stormwater pollution and what they can do to reduce it.
- Utilize multi-media to reach the full range of audiences.
- Translate messages into the foreign languages of the community to reach the full spectrum of your populace and to avoid misinterpretation of messages.
- Create an awareness and identification with the local watershed.
- Use everyday language in all public pieces. Use outside reviewers to highlight and reduce the use of technical terminology, acronyms, and jargon.
- Make sure all statements have a sound, up-to-date technical basis. Do not contribute to the spread of misinformation.
- Break complicated subjects into smaller more simple concepts. Present these concepts to the public in a metered and organized way to avoid "overloading" and confusing the audience.

PROGRAM ELEMENTS

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

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TARGETED POLLUTANTS

■ High Impact
• Medium Impact
• Low or Unknown Impact

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

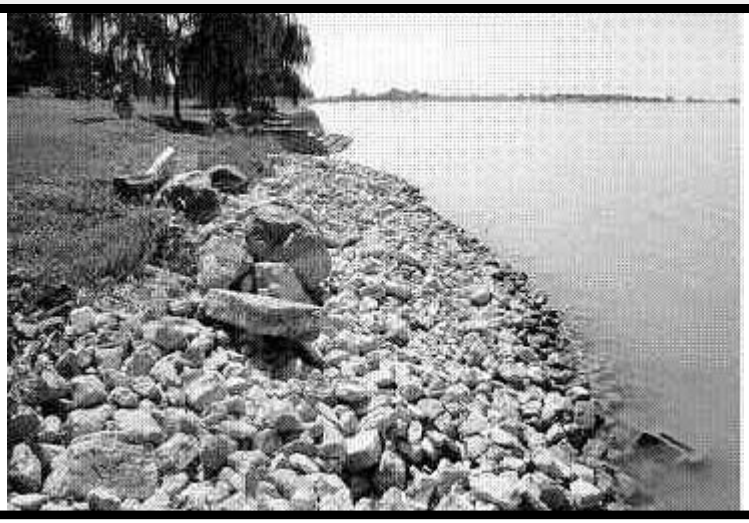
IMPLEMENTATION REQUIREMENTS

■ Capital Costs
• O&M Costs
• Regulatory
• Training
• Staffing
• Administrative

■ High • Medium • Low

BMP: Riprap

RR



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.

Considerations

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

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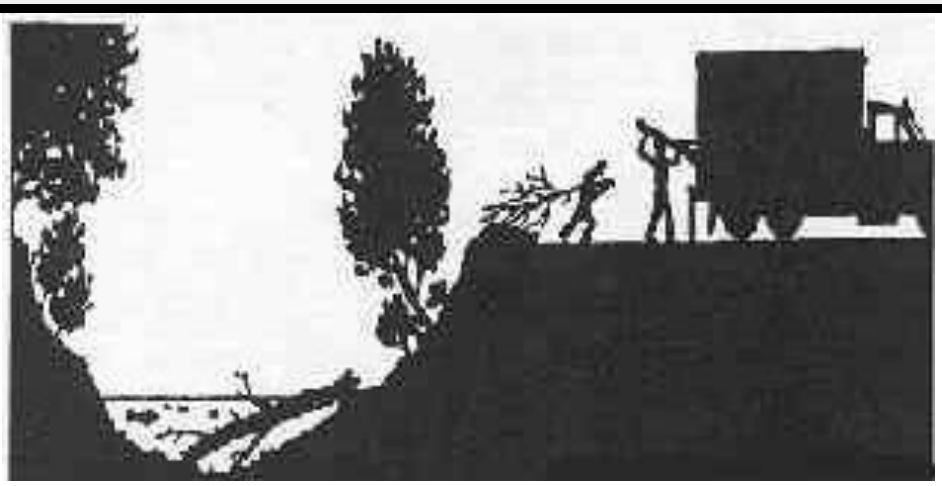
Implementation Requirements

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

■ High • Medium • Low

BMP: Storm Channel/Creek Maintenance

SCCM



Description:

Reduce pollutant levels in stormwater by removing illegally dumped items and material from storm drainage channels and creeks. Modify channel characteristics to enhance pollutant removal and/or hydraulic capacity.

Approach:

- Identify illegal dumping hot spots; regular inspection and clean up of hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Post "No Littering" signs with a phone number for reporting a dumping in-progress.
- Adopt and enforce substantial penalties for illegal dumping and disposal.
- Modify storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetics and habitat value.
- Maintain accurate logs to evaluate materials removed and improvements made.

Limitations:

- Clean-up activities may create a slight disturbance for local aquatic species.
- Access to items and material on private property may be limited.
- Trade-offs may exist between channel hydraulics and water quality/riparian habitat.
- Worker/public safety may be at risk in crime-ridden areas.
- If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation.

Program Elements

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

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Targeted Pollutants

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• Heavy Metals
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• Oil & Grease
■ Floatable Materials
• Bacteria & Viruses

Implementation Requirements

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

■ High • Medium • Low

BMP: Storm Drain System Signs

SDSS



DESCRIPTION:

Stenciling of the storm drain system (inlets, catch basins, channels, and creeks) with prohibitive language/graphic icons discourages the illegal dumping of unwanted materials.

APPROACH:

- Create a volunteer work force to stencil storm drain inlets.
- An important aspect of a stenciling program is the distribution of informational flyers that educate the neighborhood (business and residential) about stormwater pollution, the storm drain system, and the watershed. The flyers should also provide information on alternatives such as recycling, household hazardous waste disposal, and safer products.
- Because a stenciling program primarily involves volunteer services, liability release forms and volunteer identification notices should also be administered.
- Readability of stencils is critical to their effectiveness. Wherever possible stencils should be painted on a smooth surface such as cement, as opposed to asphalt.
- Use municipal staff to erect signs near drainage channels and creeks.
- An effectively implemented stenciling program encourages change in personal behavior and helps minimize non-point source pollutants from entering the storm drain system. An additional benefit is that waste and catch basin maintenance is minimized through the reduction of disposed materials into storm drain inlets. Finally a well-implemented stenciling program encourages the use of household hazardous waste collection and used oil recycling programs.

LIMITATIONS:

- Private property access limits stenciling to publicly-owned areas.
- Program is highly dependent on volunteer response.
- Storm drain inlets that are physically blocked will be missed or require follow-up.
- High traffic/commercial/industrial zones are the responsibility of city staff.
- Ongoing maintenance is needed to maintain readable signs.

PROGRAM ELEMENTS

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

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■ Oil & Grease
■ Floatable Materials
• Bacteria & Viruses

IMPLEMENTATION REQUIREMENTS

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

■ High • Medium • Low

BMP: Street and Parking Lot Cleaning

SC



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.

Program Elements

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

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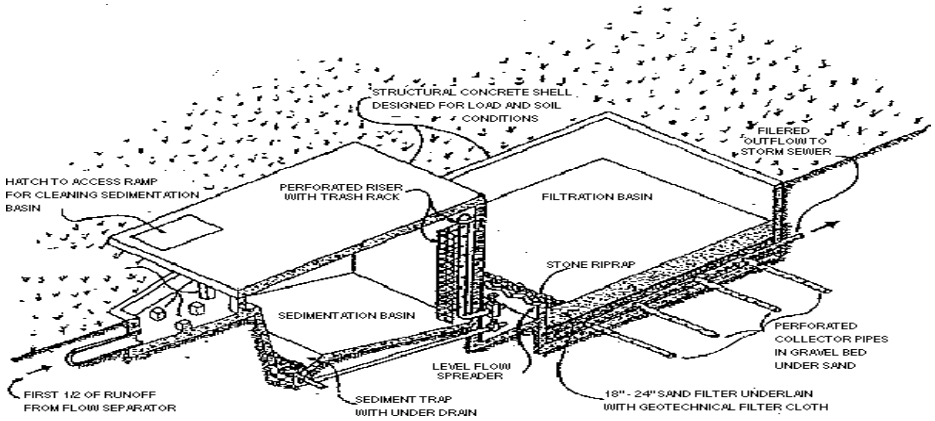
Implementation Requirements

■ Capital Costs
■ O&M Costs
• Regulatory
• Training
■ Staffing
• Administrative

■ High • Medium • Low

BMP: Surface Sand Filter System

SSFS



Description:

The surface sand filter system (aka Austin sand filter) consists of a sedimentation chamber or pond followed by a surface sand filter with collector under drains in a gravel bed. Filtered runoff is conveyed to a storm sewer or channel by gravity flow or by pumping.

Application:

- Commercial and institutional parking lots, small shopping centers, and infill development.
- Smaller redevelopment sites where the use of conventional BMPs is not practical.

Installation/Application Criteria:

- Filter bed chambers that are too shallow could freeze, causing the filter to become ineffective.
- Pretreatment may be necessary to protect the filter media from excessive sediment loading.
- System should be designed for easy maintenance.

Limitations:

- Sites with little to no gradient may prevent sufficient gravity flow through the system.
- Extended periods of cold weather could affect pollutant removal efficiency.

Maintenance:

- System should be inspected yearly and after storm events to assess the filtration capacity of the filter.
- Filter sand should be replaced every few years to maintain pollutant removal efficiency.

Considerations

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

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Targeted Pollutants

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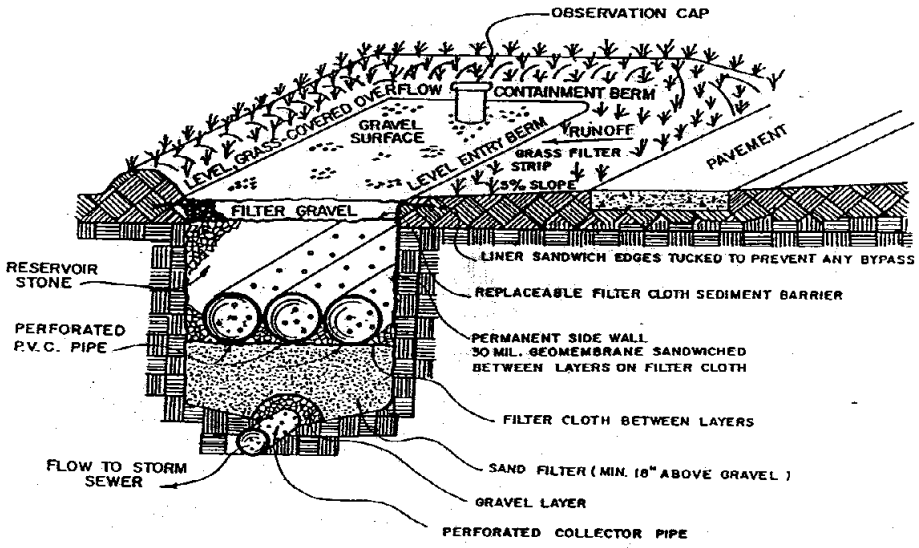
Implementation Requirements

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

■ High • Medium • Low

BMP: Trench Sand Filter System

TSFS



Description:

An adaptation of the surface sand filter system. The trench sand filter system has two variations. One variation consists of a trench sand filter system with a stone reservoir. The other variation consists of a trench sand filter system with a small sedimentation pond.

Application:

Townhouse developments or small commercial redevelopments.

Installation/Application Criteria:

- Topography should offer sufficient relief to allow the system to function by gravity flow.
- Design for easy maintenance accessibility.
- Design for safety barriers which prevent children from entering the sedimentation pond.

Limitations:

- Sites with little or no gradient may prevent sufficient gravity flow through the systems.
- Not recommended for parking lots.

Maintenance:

- Stone reservoirs will require periodic replacement of the upper filter cloth and gravel layer.
- Sedimentation ponds will require periodic removal of accumulated sediment.

Considerations

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

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• Bacteria & Viruses

Implementation Requirements

■ Capital Costs
• O&M Costs
• Maintenance
• Training

■ High • Medium • Low

BMP: Vehicle Use Reduction

VUR

UTA RIDESHARE

533-RIDE

DESCRIPTION:
Reduce the discharge of pollutants to stormwater from vehicle use by highlighting the stormwater impacts, promoting the benefits to stormwater of alternative transportation, and integrating initiatives with existing or emerging regulations and programs.

APPROACH:
- Integrate this best management practice as much as possible with efforts being developed and implemented by government agencies and businesses to reduce vehicle use and improve air quality. Integration will help avoid redundant and/or conflicting programs and be more effective and efficient.
- Establish trip reduction programs at major employers (government, large businesses).
- Reducing vehicle use begins with land use planning. Frequently used public services (post offices, government offices, etc.) and private businesses (banks, restaurants, retail stores, etc.) should be located in "service hubs" near transportation corridors. Multiple, small service hubs should be established as opposed to fewer, large hubs to reduce travel time and thus promote alternative transportation.
- Municipalities and large businesses with significant numbers of employees working in the same location should be encouraged to establish trip reduction programs. These programs encourage alternative transportation such as carpooling, buses, bicycles, walking, etc. through incentives including monetary compensation, increased parking fees, and subsidized public transit passes.
- Public education should highlight the benefits to stormwater in public outreach pieces and campaigns. The benefits to water quality of reduced vehicle usage are second only to the benefits to air quality.

LIMITATIONS:
The use of alternative transportation is highly dependent on its convenience and relative cost.

PROGRAM ELEMENTS

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

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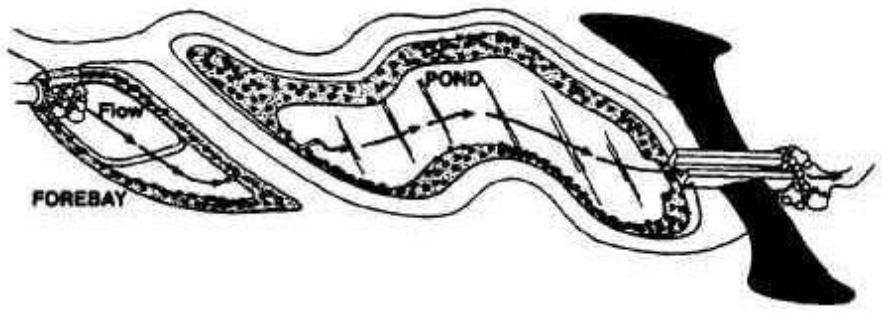
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- Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- Oxygen Demanding Substances
- ■ Oil & Grease
- Floatable Materials
- Bacteria & Viruses

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

■ High • Medium • Low

BMP: Wet Ponds

WP



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.
- Be careful when installing wetland vegetation.

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.

MAINTENANCE:
- Remove floatables and sediment build-up.
- Correct erosion spots in banks.
- Control mosquitoes.
- May require permits from various regulatory agencies, e.g. Corps of Engineers.

CONSIDERATIONS

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

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IMPLEMENTATION REQUIREMENTS

■ Capital Costs
• O&M Costs
• Maintenance
• Training

■ High • Medium • Low