



Unincorporated Summit County
Storm Water
Management Plan
2021

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0.0 General Information

0.1 Introduction

The Federal Clean Water Act requires that storm water discharges from certain types of facilities be authorized under storm water discharge Permits. (See 40 CFR 122.26.) The goal of the Utah Division of Water Quality program is to reduce the amount of pollutants entering streams, lakes and rivers as a result of runoff from residential, commercial, industrial and community areas. The original 1990 regulation (Phase I) covered municipal (i.e., publicly-owned) storm sewer systems for municipalities over 100,000 population. The regulation was expanded in 1999 to include smaller municipalities as well over 10,000 population. This expansion of the program to include small MS4s is referred to as Phase II. This Permit serves as a re-issuance or replacement of the previous General Permit for Discharges from Small Municipal Separate Storm Sewers (MS4s), UTR090000, initially issued December 9, 2002. This Permit is intended to cover new or existing discharges composed entirely of stormwater from MS4s required by the State to obtain a Permit.

Unincorporated Summit County was designated a MS4 in a letter dated December 18, 2014 to Summit County from the Department of Environmental Quality (Appendix B). The first step in this process is to submit a Notice of Intent (NOI) to receive confirmation that the MS4 is covered under the general permit. The next step is to prepare a Storm Water Management Plan (SWMP) which should do the following:

1. Reduce the discharge of pollutants from the Summit County Unincorporated MS4;
2. Protect water quality; and
3. Satisfy the appropriate water quality requirements of the General Permit for Discharges from Small Municipal Separate Storm Sewers (MS4s), UTR090000

A SWMP is comprised of six minimum control measures that must be developed and implemented. These measures include:

1. Public Education and Outreach;
2. Public Involvement/Participation;
3. Illicit Discharge Detection and Elimination;
4. Construction Site Stormwater Runoff Control;
5. Long-Term Storm Water Management in New Development and Redevelopment (Post – Construction Storm Water Management); and
6. Pollution Prevention and Good Housekeeping for Municipal Operations.

They are discussed in the order given with the Measurable Goals, Implementation Schedule, and Fiscal Ability for each Best Management Practice (BMP). Fiscal Ability is the ability of the County to properly administer the BMP. The measurable goals are mandated by the EPA. A community must be showing improvement over time with these goals. The Implementation Schedule is also included in the section, indicating when the goals will be reached.

To be in compliance with the Utah MS4 program, Summit County must document all inspections, enforcement actions, and public education activities. Annual reports of financial and employee resources must be submitted to the State of Utah Department of Environmental Quality by or on October 1 of every year.

0.2 Community Information

Summit County is located in the northern part of Utah and occupies a rugged and mountainous area and was named as such due to the presence of 39 of the highest mountain peaks in Utah. As of the 2010 census, the population was 36,234 which are spread across 1,882 square miles. Of this area, approximately 10 square miles is covered by water. Portions of the Ashley National Forest and the Wasatch National Forest are in Summit County and include the Uinta Mountains, home of the highest peak in Utah. Rockport State Park is located within Summit County and is located on the Weber River which feeds Echo Reservoir. Annual precipitation in Summit County is averaged to be approximately 16 inches per year and snowfall averages 73 inches per year with more snowfall in the higher elevations.

History

Summit County was established in 1854 and Coalville was chosen as the County seat. Summit County was the home of the Northern Shoshone Indians hunting grounds until the arrival of the Mormon pioneers in 1847. The first settlers in Summit County chose their first settlement as Parley's Park and then Wanship in 1854. When coal was discovered near Coalville, the Mormon established a settlement there. The mining of coal was soon overshadowed by the discovery of more valuable minerals in the Wasatch Mountains and Park City was established as a mining town. Mining continued until the 1950's and Park City was on the verge of becoming a ghost town. Due to the rugged terrain and deep snow, the area soon rebounded with the introduction of skiing and the Park City area is now a renowned winter sports destination.

There are two distinct areas of Summit County. The Snyderville Basin consists of the land that is bordered by Salt Lake County on the west and Morgan County on the north. The boundary then heads south to the Silver Creek Junction area which is the intersection of Interstate 80 and US-40 and continues south to the Wasatch County boundary. The boundary then heads west along the Wasatch County border to the Salt Lake County border. The Snyderville Basin is illustrated in Figure 1.

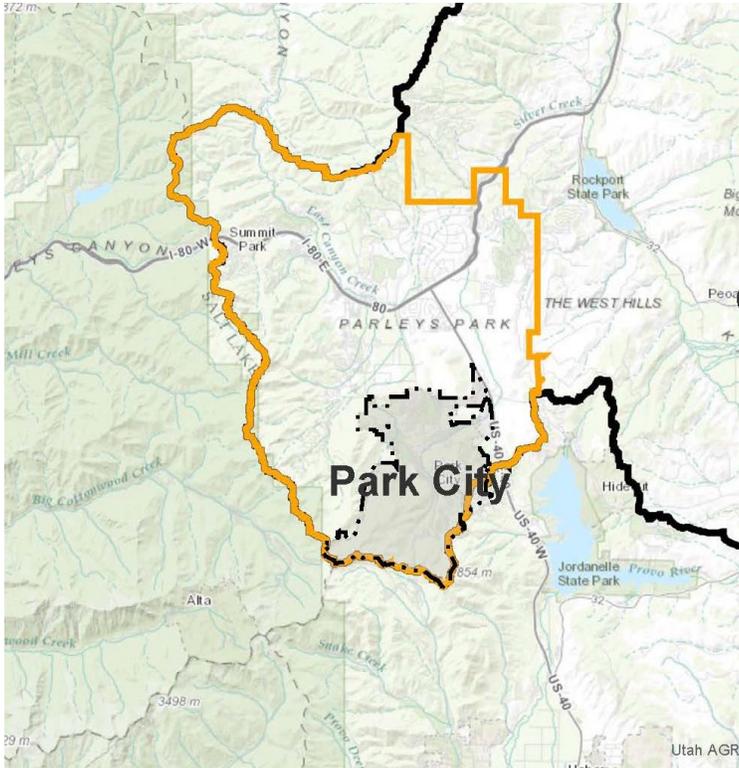


Figure 1: Snyderville Basin Area of Summit County

Eastern Summit County remains very rural with five other municipalities: Francis; Kamas; Oakley; Coalville; and Henefer. Agriculture is the main economic driver in eastern Summit County however recreational opportunities are available with activities such as fly-fishing, cycling, snow-machining, dog-sledding, and other outdoor activities. The high Uintas are part of the Eastern Summit County area and the entire Eastern Summit County is beginning to grow due to the population of the Snyderville Basin wishing for a more rural lifestyle. Eastern Summit County is illustrated in Figure 2.

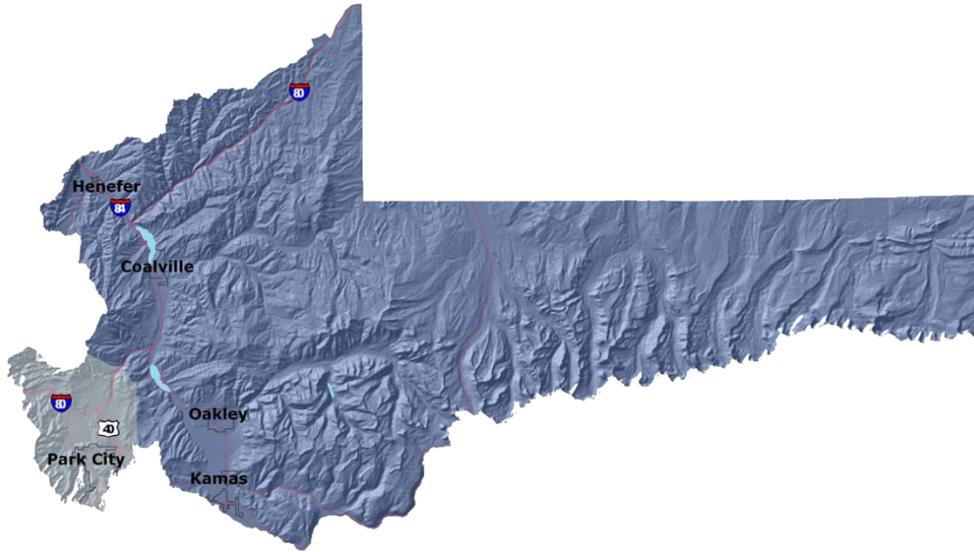


Figure 2: Eastern Summit County

Storm Drain System

The storm drain system consists of swales and ditches in the majority of Summit County. The exceptions are areas of the Snyderville Basin that include neighborhoods such as the Kimball Junction area, Silver Springs and the Canyons Ski Resort. These storm systems are privately owned and maintained by various Homeowners associations. A majority of storm water from the Snyderville Basin eventually flows into East Canyon Creek which joins the Weber River in Morgan. The remaining storm water flows into silver creek which joins the Weber river in Wanship and flows into Echo Reservoir. Storm water from the Kamas Valley and the south side of the Uinta Mountains flows into either the Weber or Provo Rivers. Storm water also flows from the western portion of the Uinta Mountains into Chalk Creek which joins the Weber River near Coalville above Echo Reservoir. Many tributaries of the Bear river flow from the northern slope of the Uinta mountains and are contained mostly in national forest. Small sections of these tributaries and the Bear River enter unincorporated Summit county before crossing the border into Wyoming.

Sanitary Sewer System

Sanitary sewer service is provided to the Snyderville Basin area by the Snyderville Basin Water Reclamation District (SBWRD). They operate two water treatment plants, one near the Jeremy Ranch area and one near Interstate 80 and Highway 40, and treat all the sanitary waste from Park City and unincorporated Summit County within the geographic region of the Snyderville Basin.

In Eastern Summit County, each of the five municipalities offers a sanitary sewer treatment system. In Henefer, Francis, and Kamas, sanitary waste is treated by the use of sewer lagoons. In Oakley, a

membrane bioreactor plant was constructed in 2003 to treat sanitary waste from the City limits, and in Coalville, a mechanical plant is used to treat all sanitary waste generated from areas within the city limits. In unincorporated Summit County, wastewater from resident and commercial areas are treated by septic systems with drain fields.

0.3 Responsible Persons

The responsible persons for the Storm Water System are the current Public Works Director, the Stormwater Management Team, Engineering Department, Health Department, Community Development Department Director and Community Outreach Department:

Derrick Radke, Public Works Director
1775 South Hoytsville Road
Coalville, UT 84017
Office: 435-336-3970

Kelsey Christiansen, Summit County Stormwater Manager
1775 South Hoytsville Road
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Michelle Skrobis, Stormwater Coordinator
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Coalville, UT 84017
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TBD, Stormwater Inspector
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Coalville, UT 84017
Office: 435.XXX.XXXX

Michael Kendall, County Engineer
60 N. Main
Coalville, UT 84017
Office: 435.336.3250

Nathan Brooks, Summit County Health Department
650 Round Valley Dr
Park City, UT 84060
Office: 435.333.1585

Pat Putt, Community Development Department Director
60 N. Main
Coalville, UT 84017
Office: 435.336.3124

Bailey Edelstein, Communications and Public Engagement
650 Round Valley Dr
Park City, UT 84060
Office: 435.333.1585

0.4 Historic Properties

The construction of storm water facilities may result in effects to historic properties. Historic properties may include houses, buildings, ditches, headwalls, or other constructed features that are 50 or more years old. Where historic features are potentially affected, a qualified historian must undertake the following:

- Determine the extent and characteristics of the historic property;
- Determine the effect on the historic property; and
- Coordinate findings with the State Historic Preservation Office.

There are many historic properties in Summit County as listed by the Utah Department of Heritage and Arts. They are listed at the link below:

<http://heritage.utah.gov/apps/history/markers/bycounty.php?county=SU>

If further information is needed, contact the State Historic Preservation Office at the following link:

http://history.utah.gov/state_historic_preservation_office/index.html

0.5 Local Water Quality Concerns

The water quality within Summit County is relatively good. Some of the stream or waterways in the County have been identified as protected under Section 303(d) of the Clean Water Act and the list is provided in the next section. The hope and intent of this SWMP is to possibly improve the water quality.

The storm water in Summit County is transported in swales, ditches, canals, and rivers that allow for large amounts of infiltration. For the most part, the existing system has worked well. Continued growth is expected to put some pressure on canal, ditch and swale capacities. Summit County is currently controlling increased stormwater runoff from development with localized detention and retention facilities as a design standard for all commercial developments and residential developments over one acre.

Based upon the Total Maximum Daily Loads (TMDLs) and of the river and creek listed below, target pollutants for Summit County have been identified as the following:

- Biochemical Oxygen Demand (BOD)
- Nitrate as N
- Total Nitrogen (TN)
- Total Phosphorous (TP)
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- Dissolved metals
- E. coli
- Ammonia
- Oil and Grease
- Turbidity

0.6 Control of Pollutant's of Control and Effectiveness of Summit County's BMP's

Control measures for these pollutants will include Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) necessary for proper stormwater management. The BMPs and SOPs include specific tasks to meet the objective of each particular control measure. The BMPs and SOPs included in this SWMP will be implemented and reviewed throughout the permit term. This SWMP is intended to be a living document with BMPs added or deleted as new BMPs arise or are found to be ineffective. Effectiveness will be measured in a variety of ways including, yielding better answers to the Summit County Stormwater survey each year, increase community participation in events, teaming with Snyderville Water Reclamation district and others to analyze water sample data in the streams, increase the number of reported IDDE's, capturing all construction in the County for stormwater permits. The County will continue to address ways to address the effectiveness of BMP's each year and update with the review of the SWMP.

0.7 Impaired Waters

The water quality within Summit County is relatively good. Some of the streams or waterways in the County have been identified as protected under Section 303(d) of the Clean Water Act. They are listed in the Appendix E (Summit County Water Body Impairments).

1.0 Public Education and Outreach Minimum Control Measure #1

1.1 Overview

The Permittee must implement a public education and outreach program to promote behavior change by the public to reduce water quality impacts associated with pollutants in storm water runoff and illicit discharges:

- Residents;
- Business, institutions (including schools), and commercial facilities;
- Developers and Contractors;
- Industrial Facilities; and
- Summit County staff

1.2 Summary of Existing Measures

Currently, Summit County contracts with Republic Services to provide garbage collection, waste services, and a recycling program. Educational materials are mailed to residents of Summit County informing them of the trash collection and recycling schedule as well as information on the types of recyclables that are accepted. Calendar mailed annually

In cooperation with members of the Summit County Stormwater Coalition, events are planned annually centered on water quality information to the public. Summit County participates in stormwater related movie screenings, volunteering opportunities with non profits, including USU extension office, Swaner Preserve, East Canyon Creek and Silver Creek watershed committees. In addition, Summit County will utilize the website, social media, radio ads, flyers, etc. to educate the general public during events. These events continue to be successful in which participation and attendance is growing.

1.3 Plan and Implementation Measures

The Utah MS4 permit lists items that must be included in the SWMP. These are listed below with information regarding the targeted pollutant, type of BMP that will be used to satisfy the requirement, the targeted audience, how effectiveness will be measured, and a targeted completion date.

The BMPs that are considered to meet the goal of public education and outreach are listed below along with the associated code that is used.

BMP	Code
Educational Materials	EM
Classroom Education on Storm Water	CESW
Use of Media	UM
Employee Training	ET
Public Education and Participation	PEP

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Residents, Institutions, Industrial, Developers, County staff	Stormwater Department	4.2.1 The Permittee must implement a public education and outreach program to promote behavior change by the public to reduce water quality impacts associated with pollutants in storm water runoff and illicit discharges. Outreach and educational efforts shall include a multimedia approach and shall be targeted and presented to specific audiences for increased effectiveness. The educational program must include documented education and outreach efforts for the following four audiences: (1)residents, (2) institutions, industrial, and commercial facilities, (3) developers and contractors (construction), and (4) MS4-owned or operated facilities.	Host events (film series, concerts, etc..) booth with information on stormwater pollutants, solutions; Ongoing survey on community stormwater knowledge; Post information on website and social media. Host contractor trainings and distribute BMP pamphlets at pre-con meetings; Host County events/trainings, Lesson plans on stormwater at local schools	Annually and Ongoing	EM, UM, PEP, and CESW	Increase the amount of people receiving information; increase survey participants; increase traffic to the stormwater website;	Ongoing
Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Residents, Institutions, Industrial, Developers, County staff	Stormwater Department	4.2.1.1 Target specific pollutants and pollutant sources determined by the Permittee to be impacting, or have the potential to impact, the beneficial uses of a receiving water. This includes providing information which describe the potential impacts from stormwater discharges; methods for avoiding, minimizing, reducing and /or eliminating the adverse impacts of storm water discharges; and the actions individuals can take to improve water quality, including encouraging participation in local environmental stewardship activities.	Distribution of pamphlets and other informational products that promote improving water quality through Summit County's Stormwater Coalition (SCSC) targeting 6 key pollutant sources, salt usage, dog waste, household hazard waste, vehicle maintenance, litter	Annually and Ongoing	EM, UM, PEP, and CESW	Increase participation in SCSC events	Ongoing
Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Residents, Institutions, Industrial, Developers, County staff	Stormwater Department	4.2.1.2 Provide and document education outreach given to the general public on the Permittee's prohibitions against illicit discharges and improper disposal of waste and the impacts to water quality associated with these types of discharges. The Permittee must at a minimum consider the following topics: maintenance of septic systems; effects of outdoor activities such as lawn care (use of pesticides, herbicides, and fertilizers); benefits of onsite infiltration of storm water; effects of automotive work and car washing on water quality; proper disposal of swimming pool water; and proper management of pet waste. These topics are not inclusive and the Permittee must focus on those topics most relevant to the community.	Update pamphlets and website to include all noted permit topics and make available to residents, institutions, developers, County staff	Ongoing	EM, UM	Increased website traffic	Ongoing
Illicit discharge; waste, salt, sediment, waste water, lawn maintenance, commercial pollutants	Institutions, Industrial, Developers	Stormwater Department	4.2.1.3 Provide and document education and outreach given to institutions, industrial, and commercial facilities on an annual basis of the Permittee's prohibitions against illicit discharges and improper disposal of waste and the impacts to water quality associated with these types of discharges. The Permittee must at a minimum consider the following topics: proper lawn maintenance (use of pesticides, herbicides and fertilizer); benefits of appropriate onsite infiltration of storm water; building and equipment maintenance (proper management of waste water); use of salt or other deicing materials (cover/prevent runoff to storm system and contamination to groundwater); proper storage of materials (emphasize pollution prevention); proper management of waste materials and dumpsters (cover and pollution prevention); and proper management of parking lot surfaces (sweeping). These topics are not inclusive and the Permittee must focus on those topics most relevant to the community This education can also be a part of the Illicit Discharge Detection and Elimination measure detailed in Part 4.2.3.	Provide annual contractor training; pre-construction meetings where BMP pamphlets emailed with permit approval; address industrial infractions as needed	Annually and Ongoing	EM	Attendance at trainings; number of infractions per year for developers and industrial	Annually and Ongoing

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Engineers, construction contractors, developers, community development dept	Stormwater Department	4.2.1.4 Provide and document education and outreach given to engineers, construction contractors, developers, development review staff, and land use planners concerning the development of storm water pollution prevention plans (SWPPPs) and BMP use, to reduce adverse impacts from storm water runoff from development sites. This education can also be a part of the Construction Site Storm Water Runoff minimum control measure detailed in Part 4.2.4.	Create power point with appropriate information, provide and document annual training	Ongoing, started 2019	EM, ET	Audience has an understanding of SWPPP's and BMPs	Annually and Ongoing
Illicit discharge and waste	County staff	Stormwater Department	4.2.1.5 Provide and document education and training given to employees of Permittee-owned or operated facilities concerning the Permittee's prohibition against illicit discharges and improper disposal of waste and the impacts to water quality associated with these types of discharges. The Permittee must at a minimum consider the following topics: equipment inspection to ensure timely maintenance; proper storage of industrial materials (emphasize pollution prevention); proper management and disposal of wastes; proper management of dumpsters; minimization of use of salt and other deicing materials (cover/prevent runoff to MS4 and ground water contamination); benefits of appropriate onsite infiltration (areas with low exposure to industrial materials such as roofs or employee parking); and proper maintenance of parking lot surfaces (sweeping).	Create power point with appropriate information, provide and document annual training	Ongoing	EM, ET	Audience has an understanding of SWPPP's and BMPs	Annually and Ongoing
Sediment control, Nutrients	County staff	Stormwater Department	4.2.1.6 Provide and document education and training to MS4 engineers, development and plan review staff, land use planners, and other pertinent parties about Low Impact Development (LID) practices, green infrastructure practices, and the specific requirements for post-construction control and the associated Best Management Practices (BMPs) chosen within the SWMP.	Create power point w/ appropriate information, provide and document annual training, update to virtual platform	Ongoing, started 2019	EM, ET	Audience has an understanding of SWPPP's and BMPs, 2021 stormwater virtual training with quiz at the end	Annually and Ongoing
Illicit discharge, Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Residents, Institutions, Industrial, Developers, County staff	Stormwater Department	4.2.1.7 An effective program must show evidence of focused messages and audiences, as well as, demonstrate that the defined goal of the program has been achieved. The Permittee must identify specific messages for each targeted audience. The Permittee must also identify methods that will be used to evaluate the effectiveness of the educational messages and overall education program. Any methods used to evaluate the effectiveness of the program must be tied to the defined goals of the program and the overall objective of changes in behavior and knowledge.	Participation in the SCSC survey on stormwater knowledge; targeted information on stormwater pollutants	Ongoing, started 2006, resumed 2021	EM, ET, UM, PEP	Reference present and future survey data	Ongoing
Trash, yard waste/fertilizers, chemicals, salt, dog waste, vehicle pollutants	Residents, Institutions, Industrial, Developers, County staff	Stormwater Department	4.2.1.8 The Permittee must include written documentation or rationale as to why particular BMPs were chosen for its public education and outreach program.	BMP's were chosen that apply to Summit County community culture	Ongoing, started 2019	ET, PEP	Increase community participation and stormwater awareness	Ongoing

2.0 *Public Involvement and Participation* ***Minimum Control Measure #2***

2.1 Introduction

Involving the public is key to any successful SWMP. Representatives from stakeholder groups need to have the ability to be involved and participate in the program through various means. Groups that may be involved include:

- Residences;
- Commercial, Industrial and Education Businesses/Associations;
- Trade Associations;
- Environmental Groups;
- Homeowner Associations; and
- MS4 Facility Employees.

To involve these groups, Summit County currently post social media announcements stormwater related documents and meetings. In addition to this notice, the County has placed the SWMP on the website for public review and comments. Annually, the County will review any comments on the program operation for the year and implement changes as needed. inconvenience

2.2 Summary of Existing Efforts

The SWMP is updated annually and posted to the website, with a hotline number and stormwater email address for public input. The annual report is also posted to the website each year. Summit County utilizes local social media groups Nextdoor, Facebook pages, and twitter to provide information on where to comment on the program.

2.3 Plan and Implementation Measures

In order to help meet the goals and objectives of the SWMP, Summit County has chosen to adopt the following BMPs for use within our County as applicable. Each BMP is cross referenced alphabetically by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness in the BMP Appendix.

BMP	Code
Community Hotline	CH
Public Education/Participation	PEP
Service Group Participation	SGP

In order to more fully realize the benefit of the BMP, the County has set the following goals. The goals set along with the existing efforts fulfill the requirements of the General Permit for Discharges from Small MS4's.

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All Pollutants	General Public	Stormwater Department	4.2.2 The Permittee must implement a program that complies with applicable State and Local public notice requirements. The SWMP shall include ongoing opportunities for public involvement and participation, but at a minimum two (2) times annually.	Advisory panels, public hearings, watershed committees, stewardship programs, environmental activities, volunteer opportunities, or other similar activities	Ongoing, started 2019	PEP, CH, SGP	Active participation in public events for: East Canyon Creek Watershed committee, Silver Creek Watershed committee, USU Trout Friendly Lawn Program, Leader of SCSC, Swaner volunteering, members of USWAC sub-committee	Ongoing
All Pollutants	General Public	Stormwater Department	4.2.2.1 Permittees shall adopt a program or policy directive to create opportunities for the public to provide input during the decision-making processes involving the development, implementation and update of the SWMP document, including development and adoption of all required ordinances or regulatory mechanisms.	Summit County's website provides a hotline and a stormwater specific email for public input to the SWMP (also posted on website); itemized item present to County Council with Public Comment accepted	Ongoing, Installed 2015	PEP	Hotline and stormwater email utilized by the community, promoted through ads and social media	Ongoing
All Pollutants	General Public	Stormwater Department	4.2.2.2 Renewal Permittees shall make the revised SWMP document available to the public for review and input within 180 days from the effective date of this Permit. New Applicants shall make the SWMP document available to the public for review and input within 180 days of receiving notification from the Director of the requirement for Permit coverage.	Post the SWMP on the County website, update with permit modifications	Ongoing, started 2015	CH, PEP	SWMP is updated and posted on the website, reviewed annually	Ongoing
All Pollutants	General Public	Stormwater Department	4.2.2.3 A current version of the SWMP document shall remain available for public review and input for the life of the Permit. If the Permittee maintains a website, the latest version of the SWMP document shall be posted on the website within 180 days from the effective date of this Permit and shall clearly identify a specific contact person and provide the phone number and/or email address to allow the public to review and provide input for the life of the Permit.	The SWMP, hotline and stormwater email will remain posted on the County website with up to date contact information	Ongoing, started 2015, reviewed annually and updated as needed	CH, PEP	SWMP is updated and posted on the website, reviewed annually	Ongoing

3.0 Illicit Discharge Detection and Elimination Minimum Control Measure #3

3.1 Introduction

Illicit discharges are non-storm water discharges that enter into natural water bodies through various methods and means. The Illicit Discharge Detection and Elimination (IDDE) control measure is intended to prevent illicit connections and discharges to natural drainages by monitoring outfalls, performing inspections of Summit County owned facilities and maintaining inventories of storm water infrastructure.

3.2 Summary of Existing Efforts

An existing County ordinance exists that allows Summit County to charge the negligent party for the cost of cleanup when a hazardous spill occurs.

Currently, reports of spills are handled through 911 Dispatch. When reported to dispatch, spill reports are logged and assessed and addressed by the Summit County Health Department, the Fire District that has jurisdiction in the area of the spill, and other local hazardous material response teams.

The county has not generally experienced problems with individuals or businesses illicitly connecting their sanitary waste water piping to storm drains. More common types of illicit discharges include septic tank overflows, spills from highway accidents, and concrete truck wash out water. Although it has not been documented, it is also suspected that some homeowners unknowingly dump pollutants into stormdrain systems.

3.3 Plan and Implementation Measures

In order to help meet the goals and objectives of the SWMP, Summit County has chosen to adopt the following BMPs for use within our County as applicable. Each BMP is cross referenced alphabetically by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness in the BMP section,

BMP	Code
Community Hotline	CH
Public Education/Participation	PEP
Ordinance Development	OD
Illegal Dumping Controls	IDC
Map Storm Water Drains	MSWD
Employee Training	ET
Standard Operating Procedures	SOP

In order to more fully realize the benefits of the BMPs listed above, Summit County has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Illicit Discharge Detection and Elimination section of the Permit.

Initial enforcement of this rule will be by the Summit County Engineering and Health Departments with support from the Summit County Attorney and Sheriff's Office.

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All pollutants	MS4/County Staff	Stormwater Department	4.2.3.1 Maintain a current storm sewer system map of the MS4, showing the location of all municipal storm sewer outfalls with the names and location of all State waters that receive discharges from those outfalls, storm drain pipes, and other storm water conveyance structures within the MS4.	Develop a GIS map showing permit requirement items	Ongoing, extensive updates upon new hire	MSWD	Track down outfalls using handheld GPS unit, keep updated map of outfalls in GIS software	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.2 Effectively prohibit, through ordinance or other regulatory mechanism, non-storm water discharges to the MS4, including spills, illicit connections, illegal dumping and sanitary sewer overflows (“SSOs”) into the storm sewer system. The Permittee must have a variety of enforcement options in order to apply and escalate enforcement procedures	Ordinance 519	2015	OD	Council approved ordinance	Approval and adaption
All pollutants	All Audiences	Stormwater Department	4.2.3.2.1 The IDDE program must have adequate legal authority to detect, investigate, eliminate and enforce against non stormwater discharges	Ordinance 519	2015	OD	Council approved ordinance	Approval and adaption
All pollutants	All Audiences	Stormwater Department	4.2.3.3 Implement a written plan to address non stormwater discharges to the MS4 including spills, illicit connections, sanitary sewer overflows and illegal dumping.	Flow chart coordinated with Summit County Health Department	October 2020	IDC	Flowchart created, and updated as needed, with all permit requirements and implemented	Ongoing Coordination
All pollutants	All Audiences	Stormwater Department	4.2.3.3.1 Create systematic procedures for locating and listing priority areas, the priority list must be updated annually	Create priority list using permit requirements and maintain list annually, possibly utilizing a GIS system in the future	Annual updates	IDC	List created accurately, reviewed, and maintained annually	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.3.2 Conduct annual field inspections of areas deemed priority	Inspections conducted annually and develop a documentation system	Annual updates	IDC	log inspections annually	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.3.3 Conduct dry weather screening on all outfalls that discharge the Permittees jurisdiction to a water body once during 5 year permit term	Inspections conducted during permit term and develop documentation system	Ongoing, extensive review upon new hire	IDC	Log inspections during permit term	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.3.4 If the Permittee discovers or suspects that a discharger may need a separate UPDES Permit (e.g., Industrial Storm Water Permit, Dewatering Permit), the Permittee shall notify the Director within 30 days	Train staff on who needs UPDES Permit’s and once identified notify UDEQ-DWQ, consistently search for permits in County	Ongoing	IDC	Permits identified and proper permits obtained	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.4 Implement an SOP for tracing the source of an illicit discharge	Create an SOP for tracing procedures of an illicit discharge	June 2020	SOP	SOP utilized for tracing illicit discharges	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.5 Develop and implement standard operating procedures (SOP’s) for characterizing the nature of any illicit discharges found or reported to the Permittee	Create an SOP for characterizing illicit discharges	June 2020	SOP/CH	Compliance with this provision will be achieved by initiating investigation and following SOP	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.5.1 Create and utilize an inspection report for Illicit Discharges	Create and utilize Summit County’s Illicit Discharge inspection report	June 2020	IDC	In coordination with DEQ-DWQ Incident Notification, follow up with Summit County’s inspection report	Ongoing

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All pollutants	All Audiences	Stormwater Department	4.2.3.6 Implement SOP for ceasing illicit discharges and appropriate notifications to agency's	Create SOP/flow chart to be followed with illicit discharges; coordination with Health Dept SOP's to determine who will take the lead	June 2020	SOP	Train appropriate employees and utilize flow chart and Health Dept SOP	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.6.1 Permittee shall require immediate cessation of improper disposal practices	Ordinance 519. Enforcement action to be used as needed	2015	SOP	Train appropriate employees and utilize flow chart and Health Dept SOP	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.6.2 This permit does not impose strict liability on the Permittee	Ordinance 519	2015	SOP	Train appropriate employees and utilize flow chart	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.6.3 All IDDE reports must be retained and available for request by the <i>Director</i>	Currently Illicit Discharge reports stored in the Engineering (S) drive	September 2021	IDC	Properly utilize and store forms	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.7 Permittees shall inform public employees, businesses, and the general public of hazards associated with illicit discharges and improper disposal of waste	Utilize public outreach program to distribute information	Ongoing	PEP/ET	Less illicit discharges in the County	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.8 Permittees shall promote or provide services for the collection of household hazardous waste.	Summit County's Public Works facility and 3 mile landfill accept household hazardous waste; Recycle Utah sponsors semi-annual collections	Ongoing	PEP	Information available on Summit County's website and pamphlets promoted on Social Media platforms	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.9 Permittee must publicly list a hotline for spills and other illicit discharges	Hotline number/email listed under Engineering MS4 page, record kept with Summit County inspection report	September 2018	PEP	Hotline number/email available on website, also in public outreach program	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.9.1 Develop SOP for public referrals of illicit discharges and appropriate agency involvement	Federal, State, and County spill threshold quantities to be listed on the Stormwater website	December 2021	PEP	Website traffic, Social media posts made	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.10 Permittees shall implement procedures for program evaluation which includes maintaining a database for mapping, tracking of the number and type of spills or illicit discharges identified; and inspections conducted.	Summit County currently maintains a data base on the Engineering (S) Drive on Illicit Discharges.	Update Database as needed	IDC	IDDEs tracked and updated in the current system	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.11 The permittee shall train all staff/contractors that may come in contact with illicit discharges All Permittees shall require that all new hires are trained within 60 days of hire date and annually thereafter, at a minimum	Currently updating training system to a digital platform, requiring all new and current employees to use	January 2022	ET	Annual trainings completed	Ongoing
All pollutants	All Audiences	Stormwater Department	4.2.3.6.12 All non stormwater reports must be retained and available for request by the Director	Currently Illicit Discharge reports stored in the Engineering (S) drive; Available to anyone at DEQ-DWQ	September 2018	IDC	Properly utilize and store forms	Ongoing

4.0 Construction Site Runoff Control Minimum Control Measure #4

4.1 Introduction

Runoff from construction sites can be a large contributing factor to storm water pollution. By controlling construction site runoff through planning, design, and construction BMPs, pollution to natural water bodies can be greatly reduced. Review of erosion control plans, Storm Water Pollution Prevention Plans (SWPPP's) and regular site inspections aid in implementation of this control measure to reduce stormwater discharges.

4.2 Summary of Existing Efforts

Summit County has had an erosion control ordinance in place since 2004 for construction site BMP's. This ordinance outlines the requirements of SWPPP's, inspections and acceptable BMP's.

Summit County inspectors routinely visit construction sites in Summit County and have the ability to assess citations and notices of violation if there are storm water violations. Large development projects and homes apart of the common plan of development are visited on a monthly basis with SWPPP inspections being conducted bi-weekly for high priority sites.

Summit County has a website that is located at www.summitcounty.org. This website includes a stormwater MS4 page that includes both general and specific information. The stormwater division page is currently located under Engineering.

4.2 Plan and Implementation Measures

In order to help meet the goals and objectives of the SWMP, Summit County has chosen to adopt the following BMPs for use within our County as applicable. Each BMP is cross referenced alphabetically by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness in the BMP section.

BMP	Code
Erosion Control Plan	ECP
Contractor Certification and Inspector Training	CCIT
Standard Operating Procedure	SOP
Ordinance Development	OD

In order to more fully realize the benefit of the BMP, Summit County has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Phase II Rule for Small MS4's.

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.1 Revise ordinance to require erosion control practices at construction sites	Ordinance in place addresses erosion control practices at construction sites, update as necessary	2003	OD/ PEP	Approved Ordinance	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.1.1 Revise ordinance to require SWPPP at construction sites	Ordinance in place addresses SWPPP's at construction sites, update as necessary	2003	OD/ PEP	Approved Ordinance	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.1.2 Require construction operators to obtain coverage under the Construction General Permit by obtaining an NOI through the State	Track operator coverage through the EPA's Central Data Exchange (CDX) system	Ongoing	OD/ PEP	98% of all required construction sites are currently covered, tracked through CDX	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.1.3 Revise ordinance to include access to inspect construction sites	Ordinance in place to allow access at construction sites, update as necessary	2003	OD/ PEP	Approved Ordinance	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.2 Develop a written enforcement strategy and implement the enforcement provisions of the ordinance or other regulatory mechanism	Create SOP's for enforcement Amend existing ordinance to include escalating enforcement provisions	Ordinance 381-A	OD	SOP's utilized & Council Approved Ordinance	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.2.2 Documentation and tracking of all enforcement actions	Develop and begin using a construction site enforcement action log/database	ComplianceGO May 2020	OD	Create, use, and update log	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.3 Develop and implement checklist for pre- construction SWPPP review for construction sites	Develop checklist and begin to do preconstruction reviews and meetings	August 2019	ECP	Created Checklist and Conduct SWPPP reviews	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.3.1 Conduct a pre-construction meeting	Hold pre-construction meetings on all projects over an acre and common plans of development; utilizing ZOOM	Ongoing	PEP	Conduct and document (ComplianceGO) pre-construction meetings with checklist and inspection form	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.3.4.3.2 Incorporate into the SWPPP review procedures the consideration of potential water quality impacts and procedures for pre-construction review which shall include the use of a checklist	At pre-construction meetings, sites will be identified through checklist as 'High Priority' or not	Checklist updated June 2020 and site copies kept in ComplianceGO	ECP	Documented in ComplianceGO	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.4.1 Inspections of required construction sites at least monthly by qualified personnel	Conduct monthly inspections of required construction sites	October 2019	ECP	98% of required construction sites are inspected monthly	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.4.2 The County must include a procedure for being notified by construction operators/owners of their completion of active construction so that verification of final stabilization and removal of all temporary control measures may be conducted	Train SWPPP inspectors, their supervisors, contractors and any personnel who grant final bond releases and the connection to the NOT process	Training Ongoing	ECP	98% of all construction sites are terminated appropriately	Ongoing

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.4.3 Conduct bi-weekly inspections on high priority construction sites	Inspect high priority sites bi-weekly	Ongoing	ECP	All high priority construction sites are inspected bi-weekly documented in ComplianceGO	Ongoing
4.2.4.4.4 – Not Applicable to Summit County at this time								
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.4.5 Documentation and tracking of all enforcement actions	Develop and begin using a construction site enforcement action log/database	ComplianceGO May 2020	ECP	Create, use, and update log	Ongoing
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.5 Provide training to County staff related to construction planning, permitting, reviews, inspection and enforcement	Documented annual training	Ongoing	CCIT	Documented annually	1st Training February 2020 Ongoing annually
Sediment, Construction Site Debris, Hydrocarbons	Contractors, Developers and County staff	Stormwater Department	4.2.4.6 Maintain a documented program of permitted active construction sites	Establish and utilize a software that can maintain documentation (ComplianceGO)	Ongoing	ECP	Software fully implemented	Ongoing

5.0 Long Term Storm Water Management in New Development and Re-Development

Minimum Control Measure #5

5.1 Introduction

The intent of Long Term Storm Water Management is to maintain post-construction runoff conditions to those of pre-construction runoff. This pertains to both quantity and quality.

Long Term Storm Water Management applies to sites over one acre in size and sites less than one acre when part of a common plan of development. Applicability of this minimum control measure also pertains to private and public development sites.

When re-development of an area occurs within the community, considerations to reduce storm water runoff and improve water quality must be applied.

5.2 Summary of Existing Efforts

Currently, Summit County has an existing Ordinance that requires maintenance for long term stormwater management and is currently being updated. Summit County also collects bonds at the time of building permit and holds them until final stabilization of the site is complete.

Summit County is currently implementing the retentions, detention and infiltration of the 80th percentile storm event. Most developments incorporate a retention pond system with some utilizing injection wells.

5.3 Plan and Implementation Measures

In order to help meet the goals and objectives of this SWMP, Summit County has chosen to adopt the following BMPs for use within our County as applicable. Each BMP is cross referenced alphabetically by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness in the BMP section.

BMP	Code
Educational Materials	EM
Ordinance Development	OD
Land Use Planning/Management	LUPM
Standard Operating Procedure	SOP
BMP Inspection and Maintenance	BMPIM
Employee Training	ET
Infrastructure Planning	IPL

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All Pollutants	All Audiences	Stormwater Department	4.2.5.1 Post construction controls: program for new development and redevelopment required to prevent or minimize water quality impacts	Amend ordinance to require post construction controls	Ordinance 381 Appendix E & F in place	IPL	Council approved Ordinance amendments	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.1.1 New development/redevelopment program include non-structural BMP's	Development code 10-4-3 protects critical lands from development	Code amended 2008, Utah Open Lands 1990	LUPM	Protection of lands ongoing	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.1.2 By July 1, 2020 require all new development/redevelopment sites must manage rainfall onsite, prevent discharge of rain event less than/equal to the 80th percentile. For redevelopment, site must disturb more than 10% of impervious surface	All new sites after July 1, 2020 reviewed for standards and develop & record long term stormwater management plans with calculations Common plan HOA's in process of developing (LTSWMP)	Ongoing	IPL	All new plans reviewed for permit compliance	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.1.3 By July 1, 2020 develop a process that requires the evaluation of Low Impact Development (LID) approach for all projects	List of Summit County approved LID practices developed and posted on website	July 2020	IPL	Sites successfully selecting from list	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.1.4 Permittees must meet requirements of Utah Division of Water Rights	If rainwater harvesting used, ensure UDWR and Summit County standards met	July 2020	IPL	All standards met	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.1.5 If meeting retention standards from 4.2.5.2 is infeasible, a rationale must be provided for an alternative	Review and track all infeasible projects	July 2020	IPL	Track infeasible projects in ComplianceGO	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2 Develop and adopt an ordinance or other regulatory mechanism that requires long-term post-construction stormwater controls at new development and re-development sites.	Update ordinance to include the LTSWMP requirement	Ordinance 381 Appendix E & F in place	OD	Ordinance adopted by Council	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2.1 Ordinance must include enforcement provisions for long-term stormwater controls	Update ordinance to include the LTSWMP enforcement requirement	Ordinance 381 Appendix E & F in place	OD	Ordinance adopted by Council	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2.2 All Permittees shall adopt and implement SOPs or similar types of documents for site inspection and enforcement of post-construction storm water control measures	Review and customize SOPs for inspection and enforcement of post-construction control measures	Update as needed, ongoing	SOP	Review, update and utilize SOP's	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2.3 Ordinance must include access to inspect private properties	Update ordinance to access to private property	Ordinance 381 Appendix E & F in place	OD	Ordinance adopted by Council	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2.4 Permanent structural BMP's shall be inspected once during installation and once post construction by qualified personnel	Stormwater team member inspects during construction and bond is not released until final completion inspection	Standard Summit County Engineering practice	BMPIM	Inspections completed and bond released	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.2.5 Annual inspections completed for maintenance need and annual report submitted, once every five years Permittee inspection completed	Develop inspection report template to be utilized if site is failing	Template completed July 2020	BMPIM	template utilized for failing sites	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.3.1 Adopt and implement procedures for site plan review to evaluate water quality impacts	Summit County implemented LTSWMP and agreements for SC Permittees	Template updated September 2021	BMPIM	LTSWMP template utilized	Ongoing

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All Pollutants	All Audiences	Stormwater Department	4.2.5.3.2 Review post construction plans to include long-term stormwater management measures	LTSWMP template utilized, reviewed prior to preconstruction meeting or with HOA doing the LTSWMP	Template updated September 2021	BMPIM	LTSWMP template utilized	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.4 Inventory: Must maintain an inventory of all post-construction structural stormwater control measures	Utilize LTSWMP template and maintain inventory in ComplianceGO	Template updated September 2021	BMPIM	LTSWMP template utilized in ComplianceGO	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.4.1 Each entry to the inventory must include basic information on each project	Utilize LTSWMP template and maintain inventory in ComplianceGO	Template updated September 2021	BMPIM	LTSWMP template utilized in ComplianceGO	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.4.2 Based on inspections pursuant to Part 4.2.5.2.5, update inventory where changes occur	Utilize inventory in ComplianceGO and update as needed	Ongoing	BMPIM	Inventory updated as needed	Ongoing
All Pollutants	All Audiences	Stormwater Department	4.2.5.5 Permittees shall insure all staff involved in post-construction stormwater management receive annual training	Training mechanism utilized annually	Ongoing updates	ET	Document and maintain annual trainings	Ongoing

6.0 Pollution Prevention/Good Housekeeping Minimum Control Measure #6

6.1 Introduction

The intent of the Pollution Prevention/Good Housekeeping control measure is to maintain and construct Summit County owned facilities in such a way to prevent pollutants from entering into the storm water system. This is accomplished by developing and implementing an operation and maintenance program, outlining standard operation procedures (SOPs) and defining roles and responsibilities of staff overseeing the SWMP.

6.2 Summary of Existing Efforts

Summit County currently maintains catch basins, detention ponds, and pipes and culverts as needed. Summit County also participates in a recycling program and provides recycling containers for residents to use at the curb.

Summit County operates with a limited amount of equipment. This equipment is primarily cleaned and maintained at the Public Works Department facility located in Wanship. Equipment is fueled at this location as well. The County also stores equipment and materials at the Wanship facility and other facilities throughout the County. Salt and sand are stored under cover to reduce transport of pollutants during rain events.

Table 6-1 provides a list of activities potential sources of pollutants that result from the activities.

Table 6-1

Activity	Pollutant	Potential Source
Construction	Sediment	Poor erosion control practices on hillsides, undeveloped property, right-of-way for construction sites
Residential and Parks	Nutrients	Yard debris, garbage, fertilizer and pesticide use, rat poison, pyrotechnics
Transportation and Commercial	Metals	Paint, plastics, pottery pigments and glazes, automobile tires, common galvanized coatings, pesticide use, root killer application on sewer lines, old lead paint an glazes, wood preservatives, batteries
Residential	Oxygen demanding Substances	Yard debris, animal wastes, organic chemical use
Parks and Residential	Bacteria and Viruses	Human and animal (pets and aquatic life) waste, sanitary sewer infiltration into storm drain system, decomposing yard waste
Commercial and Residential	Oil, Grease, and Hydrocarbons	Asphalt surface leaching, spills, leaks, construction activities
Residential and Parks	Floatables	Street refuse, industrial yard waste

6.3 Plan and Implementation Measures

In order to help meet the goals and objectives of this SWMP, Summit County has chosen to adopt the following BMPs for use within our County as applicable. Each BMP is cross referenced alphabetically by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness in the BMP section.

BMP	Code
Standard Operating Procedures	SOP
Employee Training	ET
Housekeeping Practices	HP

In order to more fully realize the benefit of the BMP, the County has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Pollution Prevention/Good Housekeeping.

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All pollutants	MS4 Staff	Stormwater Department	4.2.6.2 Permittees shall develop and keep a written inventory current of permittee-owned or operated facilities	Complete listing of MS4 owned/operated facilities	June 2019	HP	List is complete	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.3 All permittees must identify "high-priority" facility owned sites and set up monitoring for control measures	Complete assessments and identify "high priority" facilities	June 2019	HP	Assessments are complete and documentation kept on file	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.4 Each "high priority" facility identified above must develop a SWPPP	Review, customize and update appropriate SWPPP's	May 2019	HP	SWPPP's developed, updated and maintained	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.5.1 At least once per month, a visual inspection of "high- priority" facilities, including all storm water controls, must be performed	Inspections conducted monthly and logged in ComplianceGO	June 2019	HP	Complete inspections logged in ComplianceGO	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.5.2 At least twice per year, the permittee must conduct a comprehensive inspection of "high-priority" facilities	Inspections conducted semi-annually for pollutant generating areas and logged in ComplianceGO	June 2019	HP	Complete inspections logged in ComplianceGO	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.5.3 At least once annually, the permittee must conduct a comprehensive inspection of stormwater discharges	Inspections conducted annually for stormwater discharges and logged in ComplianceGO	June 2019	HP	Complete inspections logged in ComplianceGO	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6 Develop and implement SOP's for facilities	Identify, develop and implement SOP's	June 2019 (Ongoing)	HP	Identify, develop and implement SOP's	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.1 Develop and implement SOP's for protecting water quality	Identify, develop and implement SOP's	June 2019 (Ongoing)	HP	Identify, develop and implement SOP's	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.2 SOP's and schedule for street sweeping and stormwater system maintenance	Develop SOP's and schedule (every other week)	June 2019 (Ongoing)	HP	SOP's being followed and documented	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.3 Ensure proper disposal and documentation of all waste/wastewater for stormwater maintenance	Develop log for documenting proper disposal methods	June 2020	HP	Log being utilized to document disposal	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.4 Ensure vehicle and equipment wash water disposed of properly	Wash area identified, logged in Public Works SWPPP	June 2020	HP	Ensure wash area utilized by all Staff	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.5 Develop a spill prevention plan with local fire department's	Work with Fire Dept to combine elements of Hazardous Plan to specific spill plan	February 2022	HP	Spill prevention plan used, when necessary	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.6.6 Maintain an inventory of floor drains	Inventory kept with facility owned log	June 2020	HP	Train staff on proper stormwater practices, keep eyes on contractor projects	Ongoing

Target			Desired Result	Measurable Goal	Milestone Date	BMP	Measure of Success	Goal Completed
Pollutant(s)	Audience(s)	County Responsibility						
All pollutants	MS4 Staff	Stormwater Department	4.2.6.7 Ensure contractors are using proper stormwater techniques	RSI certified inspectors do site visits throughout the project duration	Ongoing	HP	Train staff on proper stormwater practices, keep eyes on contractor projects	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.8 Implement process for all new flood management structural controls	Currently new development required to design for 100 year flood event, if deemed necessary in the future new structures will be reviewed for functional design standards/water quality	Ongoing	HP	New structures will be reviewed when deemed necessary	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.8.1 Existing flood management structural controls must be assessed to determine whether changes or additions should be made to improve water	No known Summit County owned/maintained structural controls, periodically reviewed	Ongoing	HP	Periodically confirm no Summit County owned structures	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.9 Develop a plan to retrofit existing developed Summit County owned facilities adversely impacting water quality	Facility owned sites identified for need to retrofit, plans kept with facility owned log	June 2020	HP	Plans updated when necessary	Ongoing
All pollutants	MS4 Staff	Stormwater Department	4.2.6.10 Annual training for staff with any impact with stormwater	Annual trainings conducted in April, SOP trainings at monthly safety meetings (few SOP's per meeting)	Goal April 2020; adjusted due to COVID to virtual implementation April 2022	ET	Summit County staff making valuable stormwater contributions	Ongoing

GLOSSARY OF TERMS

Authorized Enforcement Agency: Employees or designees of the director of the municipal agency designated to enforce this ordinance.

Berm: An earthen mound used to direct the flow of runoff around or through a structure.

Best Management Practices (BMPs): Includes schedules of activities, prohibitions of practices, maintenance procedures, design standards, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly into the waters of the United States. BMPs also include treatment requirements, operating procedures, educational activities, and practices to control plant site runoff spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Bio-chemical Oxygen Demand in 5 (BOD5): A measure of the amount of oxygen that is consumed by bacteria as it breaks down organic matter in a sample during a five day period under standardized conditions. It is generally considered to be a measure of organic material in the water.

Capital Improvement Plan (CIP): A plan developed by the County to identify and prioritize improvements that need to be made in upcoming years.

Clean Water Act (CWA): The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Code of Federal Regulations (CFR): Annual edition is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal Regulations.

Construction Activity: Activities subject to the National Pollutant Discharge Elimination System (NPDES) Construction Permits. These include construction projects resulting in land disturbance of 5,000 square feet or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolitions.

Conveyance System: Any channel or pipe for collecting and directing the storm water.

Culvert: A covered channel or large diameter pipe that directs water flow below the ground surface.

Degradation: Biological or chemical degradation is the breakdown of chemical compounds into simpler substances, usually less harmful than the original compound, as with the degradation of a persistent pesticide. Geological degradation is the wearing down by erosion. Water degradation is the lowering of water quality of a watercourse by an increase in the amount of pollutants.

Dike: An embankment to confine or control water, often built along the banks of a river to prevent overflow of lowlands; a levee.

Directly Connected Impervious Areas (DCIA) Impervious surfaces that are directly connected to the storm drainage conveyance system. Directly connected means that there is no chance for infiltration or evapotranspiration before entering the conveyance system.

Discharge: The release of storm water or other substance from a conveyance system or storage container.

Drainage: Refers to the collection, conveyance, containment, and/or discharge of surface and storm water runoff.

Dry Weather Screening (DWS): The act of inspecting a storm drain system during dry weather to evaluate if there are any discharges to the system besides storm water.

Erosion: The wearing away of land surface by wind or water. Erosion control occurs naturally from weather or runoff but can be intensified by land-clearing practices related to farming, residential, or industrial development, road building, or timber cutting.

Fill: A deposit of earth material placed by artificial means.

First Flush: The delivery of a disproportionately large load of pollutants during the early part of storms due to the rapid runoff of accumulated pollutants.

General Permit: A permit issued under the NPDES program to cover a class or category of storm water discharges.

Grading: The cutting and/or filling of the land surface to a desired slope or elevation.

Hazardous Waste: By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possess at least one of four characteristics (flammable, corrosivity, reactivity, or toxicity), or appears on special Environmental Protection Agency (EPA) lists.

Heavy Metals: Metals of high specific gravity, present in municipal and industrial wastes that pose long-term environmental hazards. Such metals include cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

Illicit Connection: Any physical connection to a publicly maintained storm water system allowing discharge of non-storm water which has not been permitted by the public entity responsible for the operation and maintenance of the system.

Illicit Discharge: Any direct or indirect non-storm water discharge to the storm water system, except discharges from firefighting activities and other discharges exempted in this ordinance.

Illicit Discharge Detection and Elimination (IDDE): A program that the County develops to identify and eliminate any illicit discharges they might have within their collection system.

Impervious Surface: A surface which prevents or retards the penetration of water into the ground including, but not limited to, roofs, sidewalks, patios, driveways, parking lots, concrete, and asphalt paving, gravel, compacted native surfaces and earthen materials, and oiled macadam, or other surfaces which similarly impede the natural infiltration of storm water.

Individual Permit: A permit issued under the NPDES program for a specific facility, whereby the unique characteristics of that facility may be addressed through the imposition of special conditions or requirements.

Infiltration: The downward movement of water from the surface to the subsoil. The infiltration capacity is expressed in terms of inches/hour.

Ingress/Egress: The points of access to and from a property.

Inlet: An entrance into a ditch, storm sewer, or other waterway.

Low Impact Development (LID): This term is used to describe means and methods that can be utilized to reduce the impact of development on the environment.

Minimum Control Measure (MCM): The EPA has identified six areas of focus for MS4s in developing a program to minimize the potential for pollutants to leave a jurisdiction and to enter the waters of the United States. The six areas of focus are called Minimum Control Measures (MCMs) and they include:

1. Public Education and Outreach;
2. Public Involvement;
3. Illicit Discharge Detection and Elimination;
4. Construction Site Storm Water Control;
5. Post Construction Storm Water Control; and
6. Pollution Prevention and Good Housekeeping.

Municipal Separate Storm Sewer System (MS4): A municipally owned and operated storm water collection system that may consist of any or all of the following: curb and gutter, drainage swales, piping, ditches, canals, detention basins, inlet boxes, or any other system used to convey storm water that discharges into canals, ditches, streams, rivers, or lakes not owned and operated by that municipality.

Mulch: A natural or artificial layer of plant residue or other materials covering the land surface which conserves moisture, holds soil in place, aids in establishing plant cover, and minimizes temperature fluctuations.

National Pollutant Discharge Elimination System (NPDES): EPA's program to control the discharge of pollutants to waters of the United States.

Non-point Source: Pollution caused by diffuse sources (not a single location such as a pipe) such as agricultural or urban runoff.

NPDES Permit: An authorization, or license, or equivalent control document issued by EPA or an approved state agency to implement the requirements of the NPDES program.

Off-site: Any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.

On-site: The entire property that includes the property development.

Outfall: The point, location, or structure where wastewater or drainage discharges from a sewer pipe, ditch, or other conveyance to a receiving body of water.

Point Source: Any discernible, confined, and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged.

Plat: A map or representation of a subdivision showing the division of a tract or parcel of land into lots, blocks, streets, or other divisions and dedications.

Pollutant: Generally, any substance introduced into the environment that adversely affects the usefulness of a resource. Pollutants may include, but are not limited to: paints, varnishes and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations such that may cause or contribute to pollution floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from construction a building or structure; and noxious or offensive matter of any kind.

Receiving Waters: Bodies of water or surface water systems receiving water from upstream constructed (or natural) systems.

Retention: The holding of runoff in a basin without release except by means of evaporation, infiltration, or emergency bypass.

Riparian: A relatively narrow strip of land that borders a stream or river.

Runon: Storm water surface flow or other surface flow which enters property other than that where it originated.

Runoff: That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water that can carry pollutants from the air and land into the receiving waters.

Sedimentation: The process of depositing soil particles, clays, sands, or other sediments that were picked up by runoff.

Sheet Flow: Runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

Source Control: A practice or structural measure to prevent pollutants from entering storm water runoff or other environmental media.

Stabilization: The proper placing, grading and/or covering of soil, rock, or earth to ensure its resistance to erosion, sliding, or other movement.

Standard Operating Procedure (SOP): A written description of the standard method of performing a given task which can include a step-by-step description. SOPs are developed in an effort to bring consistency to a program and to clearly define the expectations of that program. They should be the basis of training programs for municipal employees.

Storm Drain: A slotted opening leading to an underground pipe or open ditch for carrying surface runoff.

Storm Water: Rainfall runoff, snow melt runoff, and drainage. It excludes infiltration.

Storm Water Management Plan (SWMP): A document which describes the BMPs and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to storm water, storm water conveyance systems, and/or receiving waters.

Storm Water Pollution Prevention Plan (SWPPP): A document which describes the general plan for addressing storm water pollutants at a given site. The plan characterizes the nature of the potential pollutants, describes methods and concepts for controlling those pollutants and identifies those responsible for the plan.

Swale: An elongated depression in the land surface that is at least seasonally wet, is usually heavily vegetated, and is normally without flowing water. Swales direct storm water flows into drainage channels and allow some of the storm water to infiltrate into the ground surface.

Total Maximum Daily Load (TMDL): In this permit, it refers to a study that accomplishes the following:

1. Quantifies the amount of a pollutant in a stream;
2. Identifies the sources of the pollutant; and
3. Recommends regulatory or other actions that may need to be taken in order for the impaired water body to meet water quality standards.

Total Suspended Solids (TSS): An analytical measure of the amount of sediment suspended in water. TSS is typically comprised of larger sediment particles and does not include fine clays and silts that might be dissolved.

Treatment Control BMP: A BMP that is intended to remove pollutants from storm water.

Underground Injection Wells (UIW): A hole receiving storm water whose top dimension is narrower than the depth.

Utah Pollutant Discharge Elimination System (UPDES): The State of Utah's program to control the discharge of pollutants to the water of the United States.

Waters of the State: Surface waters and ground waters within the boundaries of the State of Utah and subject to its jurisdiction.

Waters of the United States: Surface watercourses and water bodies as defined in 40 CFR § 122.2, including all natural waterways and definite channels and depressions in the earth that may carry water, even though such waterways may only carry water during rains and storms and may not carry storm water at and during all times and seasons.

Wetlands: An area that is regularly saturated by surface or ground water and subsequently characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, marshes, and estuaries.

Appendix A Summit County Stormwater SOP Manual

Standard Operating Procedures

Stormwater Specific



This document is meant to serve as a set of general guidelines for standard operations. Each operation and incidents may possess unique circumstances. Procedures should be tailored on a case-by-case basis while attempting to incorporate the general intent of the standard operating procedure.

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Appendix A - MS4 Permit

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OTHER ACRONYMS USED WITHIN THIS DOCUMENT

- BMP Best Management Practices
- DEQ Division of Environmental Quality
- HHW Household Hazardous Waste
- ICFSWPPP Industrial/Commercial Facility Stormwater Pollution Prevention Plan
- IDDE Illicit Discharge Detection and Elimination
- SDS Safety Data Sheet
- MOU Memorandum of Understanding
- NOT Notice of Termination
- NOV Notice of Violation
- PPE Personal Protective Equipment
- RSI Registered Stormwater Inspector
- RSR Registered Stormwater Reviewer
- SLCO HD Salt Lake County Health Department
- SLCO Salt Lake County
- SOP Standard Operating Procedure
- SWMA Stormwater Maintenance Agreement
- TCLP Toxicity Characteristic Leaching Procedure
- UDEQ Utah Department of Environmental Quality
- UPDES Utah Pollutant Discharge Elimination System

DEFINITIONS

1. 40 CFR: Refers to Title 40 of the Code of Federal Regulations, which is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal government.
2. Act: Means the Utah Water Quality Act.
3. Analytical monitoring: Refers to monitoring of water bodies (streams, ponds, lakes, etc.) or of stormwater according to UAC R317-2-10 and 40 CFR 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants," or to State or Federally established protocols for bio monitoring or stream bio assessments.
4. Beneficial Uses: Means uses of the Waters of the State, which include but are not limited to: domestic, agricultural, industrial, recreational, and other legitimate beneficial uses.
5. Best Management Practices (BMPs): Means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of Waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
6. CWA: Means The Clean Water Act of 1987 formerly referred to as the Federal Water Pollution Control Act.
7. Co-Permittee: Means any operator of a regulated small MS4 that is applying jointly with another applicant for coverage under the MS4 permit. A Co-Permittee owns or operates a regulated Small MS4 located within or adjacent to another regulated MS4. A Co-Permittee is only responsible for complying with the conditions of this Permit relating to discharges from the MS4 the Co-Permittee owns or operates. See also § 40 CFR 122.26 (b)(l).
8. Control Measure: Refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to Waters of the State.
9. Common plan of development or sale: Means one plan for development or sale, separate parts of which are related by any announcement, piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, plat, blueprint, contract, Permit application, zoning request, computer design, etc.), physical demarcation (including contracts) that identify the scope of the project. A plan may still be a common plan of development or sale even if it is taking place in separate stages or phases, is planned in combination with other construction activities, or is implemented by different owners or operators.
10. Division: Means the Utah Division of Water Quality.
11. Discharge: For the purpose of the Permit and this document, unless indicated otherwise, refers to discharges from the Municipal Separate Storm Sewer System (MS4).
12. Drinking Water Source Protection Zones: These are hereby established use districts to be known as zones one, two three, and four, of the drinking water source protection area or

alternatively the Management Area. These zones shall have the approval of the State of Utah, Division of Drinking Water as described in R309-600.

- 13.** Dry weather screening: Is monitoring done in the absence of storm events to discharges representing, as much as possible, the entire storm drainage system for the purpose of obtaining information about illicit connections and improper dumping.
- 14.** Eprocess 360 v. 2015: The current database and tracking system used by the Salt Lake County Planning and Development agency.
- 15.** Escalating enforcement procedures: Refers to a variety of enforcement actions in order to apply as necessary for the severity of the violation and/or the recalcitrance of the violator.
- 16.** Entity: Means a governmental body or a public or private organization.
- 17.** EPA: Means the United States Environmental Protection Agency.
- 18.** General Permit: Means a Permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual Permits being issued to each discharger.
- 19.** Ground water: Means water in a saturated zone or stratum beneath the surface of the land or below a surface water body.
- 20.** High quality waters: Means any water, where, for a particular pollutant or pollutant parameter, the water quality exceeds that quality necessary to support the existing or designated uses, or which supports an exceptional use.
- 21.** Illicit connection: Means any man-made conveyance connecting an illicit discharge directly to a municipal separate storm sewer.
- 22.** Illicit discharge: Means any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to a UPDES Permit (other than the UPDES Permit for discharges from the municipal separate storm sewer) and discharges resulting from firefighting activities.
- 23.** Impaired waters: Means any segment of surface waters that has been identified by the Division as failing to support classified uses. The Division periodically compiles a list of such waters known as the § 303(d) list.
- 24.** Large MS4: Large municipal separate storm sewer system means all municipal separate storm sewers that are located in an incorporated place with a population of 250,000 or more as determined by the current Decennial Census by the Bureau of the Census.
- 25.** Low Impact Development (LID): Is an approach to land development (or redevelopment) that works with nature to more closely mimic pre-development hydrologic functions. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat storm water as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bio retention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements.

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- 26.** MS4: is an acronym for "municipal separate storm sewer system".
- 27.** Maximum Extent Practicable (MEP): Is the technology-based discharge standard for Municipal Separate Storm Sewer Systems established by paragraph 402(p)(3)(B)(iii) of the federal Clean Water Act (CWA), which reads as follows: "Permits for discharges from municipal storm sewers shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques, and system, design, and engineering methods, and other such provisions as the Administrator or the State determines appropriate for the control of such pollutants".
- 28.** Medium MS4: Medium municipal separate storm sewer system means all municipal separate storm sewers that re located in an incorporated place with a population of 100,000 or more but less than 250,000, as determined by the 1990 Decennial Census by the Bureau of the Census.
- 29.** Monitoring: Refers to tracking or measuring activities, progress, results, etc.
- 30.** Municipal separate storm sewer system: Means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) pursuant to paragraphs R317-8-1.6(4), (7), & (14), or designated under UAC R317-8-3.9 (l)(a)5:
- a. That is owned or operated by a state, city, town, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of wastes, storm water, or other wastes, including special districts under State Law such as a sewer district, flood control district or drainage district, or similar entity, or a designated and approved management agency under section 208 of the CWA that discharges to Waters of the State;
 - b. That is designed or used for collecting or conveying stormwater;
 - c. Which is not a combined sewer; and
 - d. Which is not part of a Publicly owned Treatment Works (POTW) as defined in 40 CFR 122.2.
- 31.** NOI: Is an acronym for "Notice of Intent" to be covered by this Permit and is the mechanism used to "register" for coverage under a general Permit.
- 32.** Non-analytical monitoring: Refers to monitoring for pollutants by means other than UAC R317-2-10 and 40 CFR 136, such as visually or by qualitative tools that provide comparative or rough estimates.
- 33.** Operator: Is the person or entity responsible for the operation and maintenance of the MS4.
- 34.** Outfall: Means a point source as defined by UAC R317-8-1.5(34) at the point where a municipal separate storm sewer discharges to Waters of the State and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other Waters of the State and are used to convey waters of the State.
- 35.** Owner: Is the party responsible for all operations and meeting all permit requirements.

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- 36.** Priority construction site: Means a construction site that has potential to threaten water quality when considering the following factors: soil erosion potential; site slope; project size and type; sensitivity of receiving water bodies; proximity to receiving water bodies; non-storm water discharges and past record of non-compliance by the operators of the construction site.
- 37.** Redevelopment: Is the replacement or improvement of impervious surfaces on a developed site.
- 38.** Runoff: Is water that travels across the land surface, or laterally through the ground near the land surface, and discharges to water bodies either directly or through a collection and conveyance system. Runoff includes stormwater and water from other sources that travels across the land surface.
- 39.** SWMP: Is an acronym for stormwater management program. The SWMP document is the written plan that is used to describe the various control measures and activities the Permittee will undertake to implement the stormwater pollution prevention plan.
- 40.** SWPPP: Is an acronym for stormwater pollution prevention plan.
- 41.** Small MS4: Is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all Small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the UPDES Permitting authority), and on a case-by-case basis those Small MS4s located outside, or UAs that the UPDES Permitting authority designates.
- 42.** SOP: Is an acronym for standard operating procedure which is a set of written instructions that document a routine or repetitive activity. For the purpose of this Permit, SOPs should emphasize pollution control measures to protect water quality.
- 43.** Stormwater: Means stormwater runoff, snowmelt runoff, and surface runoff and drainage.
- 44.** TMDL: Is an acronym for "Total Maximum Daily Load" and in this Permit refers to a study that:
- a. Quantifies the amount of a pollutant in a stream.
 - b. Identifies the sources of the pollutant; and
 - c. Recommends regulatory or other actions that may need to be taken in order for the impaired water body to meet water quality standards.
- 45.** Urbanized area: Is a land area comprising one or more places and the adjacent densely settled surrounding area that together has a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.
- 46.** Waters of the State: means all streams, lakes, ponds, marshes, water-courses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private which are contained within, flow through, or border upon this state or any portion thereof, except bodies of water confined to and retained within the limits of private property, and which do not develop into or constitute a nuisance, or a public health hazard, or a menace to

fish and wildlife which shall not be considered to be "Waters of the State" under this definition ("UAC" R317-1-1.32).

GOOD HOUSEKEEPING

1. Garbage Storage Standard Operating Procedure

PURPOSE:

To protect stormwater by cleaning and maintaining garbage storage areas.

PROCEDURE:

1. Preparation:
 - a. Locate dumpsters and trash cans with lids in convenient, easily observable areas.
 - b. Provide properly labeled recycling bins to reduce the amount of garbage disposed.
 - c. Provide training to employees to prevent improper disposal of general trash during annual trainings.

2. Process:
 - a. Inspect garbage bins for leaks regularly, and have repairs made immediately by responsible party.
 - b. Locate dumpsters on a flat, impervious surface that does not slope or drain directly into the storm drain system.
 - c. Install berms, curbing or vegetation strips around storage areas to control water entering/leaving storage areas.
 - d. Keep lids closed when not actively filling dumpster.
 - e. Install BMPs in catch basins if directly below dumpsters.

3. Clean-up:
 - a. Keep areas around dumpsters clean of all garbage.
 - b. Have garbage bins emptied as often as needed to keep from overfilling.
 - c. Wash out bins or dumpsters as needed to keep odors from becoming a problem. Wash out in properly designated areas only.

GOOD HOUSEKEEPING

2. Parking Lot Maintenance Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater run-off from parking lots.

PROCEDURE:

1. Preparation:
 - a. Conduct monthly inspections of parking lots
 - b. Conduct annual employee training to reinforce proper housekeeping.
 - c. Restrict parking in areas to be swept prior to and during sweeping.
 - d. Perform regular maintenance and services in accordance with the recommended vehicle maintenance schedule on sweepers to increase and maintain efficiency.
2. Process:
 - a. Sweep parking areas, as needed, or as directed.
 - b. Hand sweep sections of gutter if soil and debris accumulate.
 - c. Pick-up litter as required to keep parking areas clean and orderly.
3. Clean-up:
 - a. Dispose of sweepings at the landfill.
 - b. Street sweepers to be cleaned out in a manner as instructed by the manufacturer at the Public Works Facility where swept materials cannot be introduced into the storm drain.
 - c. Swept materials will not be stored in locations where stormwater could transport it into the storm drain system.
4. Documentation:
 - a. Retain work orders to track swept parking areas for budget documentation.

GOOD HOUSEKEEPING

3. Chemical Application Pesticides, Herbicides, & Fertilizers Standard Operating Procedure

PURPOSE:

To protect stormwater by properly applying pesticides, herbicides & fertilizers.

PROCEDURE:

1. Preparation:
 - a. Make sure your state Chemical Handling Certification (i.e., UT State Non-Commercial Applicator License) is complete and up to date before handling any chemicals.
 - b. Make sure all pesticide application is conducted or supervised by personnel certified by Utah Department of Agriculture.
 - c. Calibrate fertilizer and pesticide application equipment to avoid excessive application.
 - d. Use pesticides only if there is an actual pest problem.
 - e. Time and apply the application of fertilizers, herbicides or pesticides according to the manufacturer's recommendation for best results ("Read the Label").
 - f. Know the weather conditions. Do not use pesticides if rain is expected within a 24-hour period. Apply pesticides only when wind speeds are low (less than 5 mph).

2. Process:
 - a. Follow the manufacturer's recommendations for mixing, applying, and disposing of pesticides ("Read the Label").
 - b. Do not mix or prepare pesticides for application near storm drains, preferably mix inside a protected area with impervious secondary containment (preferably indoors) so that spills or leaks will not contact soils.
 - c. Employ techniques to minimize off-target application (e.g., spray drift, over broadcasting) of pesticides and fertilizers.
 - d. Whenever possible spot treat affected areas only instead of entire location.
 - e. Choose the least toxic pesticides that still achieve results.
 - f. Never apply controlled pesticides unless certified to do so.
 - g. Never apply pesticides before a heavy rainfall.

3. Clean-up:
 - a. Clean up any spilled chemicals (see SOP Spill Cleanup and Response and Petroleum and Chemical Disposal).
 - b. Sweep or blow pavements or sidewalks where fertilizers or other solid chemicals have fallen, back onto grassy areas before applying irrigation water.
 - c. Rinse equipment only when necessary. Triple rinse pesticide and herbicide containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

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- d. Always follow all federal and state regulations governing use, storage and disposal of fertilizers, herbicides or pesticides and their containers ("Read the Label).
 - e. Never discharge rinse water or excess chemicals to storm drain, sewer or ground surface.

4. Documentation:

- a. Retain copies of SDS sheets for all pesticides, fertilizers and other hazardous products.
- b. Record fertilizing and pesticide application activities, including date, individual who performed the application, the amount of product used, and the approximate area covered.

GOOD HOUSEKEEPING

4. Storage and Disposal of Fertilizer and Pesticides Standard Operating Procedure

PURPOSE:

To protect stormwater by properly storing and disposing of fertilizers and pesticides (herbicides and fungicides).

PROCEDURE:

1. Preparation:
 - a. Store fertilizers and pesticides in high, dry locations, according to manufacturer's specifications and application regulations.
 - b. Clearly label secondary containers.
 - c. Properly dispose of fertilizers and pesticides according to manufacturer's specifications and applicable regulations.
 - d. Regularly inspect fertilizer and pesticide storage areas for leaks and spills.
 - e. Clean up spills and leaks of fertilizers and pesticides to prevent the chemicals from reaching the storm drain system (see SOP Spill Cleanup and Response and Petroleum and Chemical Disposal).
2. Whenever Possible:
 - a. Store pesticides in enclosed areas or in covered impervious containment, preferably in a locked cabinet.
 - b. Order fertilizers and pesticides for delivery as close to time of use as possible to reduce amount stored at facility.
 - c. Order only the amount needed to minimize excess or obsolete materials requiring storage and disposal.
 - d. Use ALL fertilizers and pesticides appropriately to minimize the amount of chemicals requiring disposal.
 - e. Conduct annual review of storage areas and dispose of old, unusable or "obsolete" fertilizers or pesticides in accordance with applicable regulations.
3. **Never:**
 - a. Dispose of fertilizers or pesticides in storm drains.
 - b. Leave unlabeled or unstable chemicals in any storage area.

GOOD HOUSEKEEPING

5. Alternative Products Use/Storage/Disposal Standard Operating Procedure

PURPOSE:

To protect stormwater by using alternative products that are more environmentally friendly.

PROCEDURE:

1. Always:
 - a. Ask product suppliers, peers, or regulatory agents if there is a more environmentally friendly alternative, when ordering any product
2. Whenever Possible:
 - a. Use alternative products when deemed appropriate.
 - i) Instead of solvent-based parts cleaners use citrus-based cleaners or steam/pressure wash to an oil/water separator/holding tank. Use alternative products when deemed appropriate.
 - ii) Instead of herbicides use bark mulch.
 - iii) Instead of fertilizer use compost or manure.
 - iv) Instead of pesticides plant marigolds, onion, or garlic as deterrents; release or attract beneficial insects.
 - v) Instead of synthetic absorbents, use corncob or cellulose products for petroleum spills that can be burned for energy recovery.
 - b. Train employees on the benefits of using alternative products.
 - c. Minimize waste by purchasing recyclable products that have minimal packaging.
 - d. Use less harmful deicers such as calcium magnesium acetate, potassium acetate, or organic deicers.
 - e. Use a pre-mix of 4 to 1 sodium chloride and calcium chloride, which is the most cost-effective alternative to straight salt.
 - f. Substitute synthetic fertilizers with natural compost and organic fertilizers to improve soil pH, texture and fertility, and cause less leaching to groundwater.
 - i) Use no-phosphorus lawn fertilizer.
 - g. Reduce or eliminate mown lawn in areas that are not actively used.
 - i) Consider converting unused turf to meadow or forest.
 - h. Use slow-release nitrogen fertilizers.

GOOD HOUSEKEEPING

6. Chemical Handling/Transporting and Spill Response Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during chemical handling and transportation.

PROCEDURE:

1. Preparation:
 - a. Under MSDS sheets for handling of product.
 - b. Determine proper place of handling.
 - c. Have necessary containment and spill kits at handling place.
2. Process:
 - a. Begin transfer process.
 - b. Discontinue operations if spill levels occur.
 - c. Disconnect and store handling equipment.
3. Clean-up:
 - a. Clean up spills with proper material.
 - b. Dispose of contaminated material at appropriate chemical disposal facility.
4. Documentation:
 - a. Report small spills to Stormwater Manager (435) 400-0016 or Health Department (435) 659-9568 or by email to stormwater@summitcounty.org. After hours or large spills call Summit County Sheriff Dispatch (435) 615-3500.

GOOD HOUSEKEEPING

7. Spill Cleanup and Response

PURPOSE:

To protect storm water by responding to and cleaning up spills which may impact waterways.

THIS SOP IS NOT EXPECTED TO COVER ALL NECESSARY PROCEDURE ACTIONS. OPERATORS ARE ALLOWED TO ADAPT SOPS TO UNIQUE SITE CONDITIONS IN GOOD JUDGMENT WHEN IT IS NECESSARY FOR SAFETY, AND THE PROPER, AND EFFECTIVE CONTAINMENT OF POLLUTANTS. HOWEVER, ANY CHANGES OF ROUTINE OPERATIONS MUST BE AMENDED IN THIS SOP.

PROCEDURE

1. Preparation
 - a. Identify spill substance
 - b. Obtain SDS data sheets for proper cleanup procedures
 - c. Gather proper containment materials
2. Process:
 - a. Priority is to dam and contain flowing spills.
 - b. Use spill kits, booms if available or use any material available; including but not limited to, nearby sand, dirt, landscaping materials, etc.
 - c. For unknown or Hazardous substances Contact Fire Department (911). Remain at scene and provide safety control from a safe distance.
 - d. Priority levels:
 - i) Protect Life
 - ii) Protect Property
 - iii) Protect the Environment
3. Cleanup:
 - a. NEVER **WASH SPILLS TO THE STORM DRAIN SYSTEMS.**
 - b. As per SDS requirements, but generally most spills can be cleaned up according to the following:
 - i) Absorb liquid spills with spill kit absorbent material, sand or dirt until liquid is sufficiently converted to solid material.
 - ii) Remove immediately using dry cleanup methods, e.g., broom and shovel, or vacuum operations.
 - iii) Cleanup with water and detergents may also be necessary depending on the spilled material. However, the waste from this operation must be vacuumed or effectively picked up by dry methods. See Street Sweeping SOP.
 - iv) Repeat process when residue material remains.

v) Dispose of Spill materials at appropriate facility per SDS

4. Documentation:

5. Complete spill response form and send to the Stormwater Coordinator contact information listed on the form. If you are unable to fill out the form, ensure you inform the Stormwater Coordinator of what happened and provide necessary information so they can fill out the form and file it appropriately.

GOOD HOUSEKEEPING

8. Petroleum and Chemical Disposal

PURPOSE:

To prevent pollution of storm water through the proper disposal of petroleum or chemicals.

PROCEDURE:

1. Preparation:
 - a. Review SDS sheets for storage and handling of product.
 - b. Consult Chemical Handling/Transporting and Spill Response Standard Operating Procedure if transportation to off-site disposal facility is needed.
 - c. Have necessary containment and spill kits during transportation or during storage
2. Process:
 - a. Transport product at approved receiving facility.
 - b. If product is being transferred to onsite transportation vessel, follow all Chemical Handling/Transporting and Spill Response Standard Operating Procedures
3. Clean-up:
 - a. Clean-up any spill that occur during transportation or transfer with proper material.
4. Documentation:
 - a. Document substance removed: Date, Quantity, Receiving facility, and method used

GOOD HOUSEKEEPING

9. Open Space Management Standard Operating Procedure

PURPOSE:

To protect stormwater by ensuring open space areas are kept free of trash and debris, stormwater controls are properly maintained and inspected.

PROCEDURE:

1. Preparation:
 - a. Provide a regular observation and maintenance of parks, golf courses, and other public open spaces.
 - b. Identify public open spaces that are used for stormwater detention and verify that detention areas are included on the storm water system mapping, inspection schedules, and maintenance schedules.
Contact Stormwater Coordinator (435) 615-5364 if you have any questions on this.
2. Process:
 - a. Ensure that any stormwater or drainage system components on the property are properly maintained and clean.
 - b. Avoid placing bark mulch (or other floatable landscaping materials) in stormwater detention areas or other areas where stormwater runoff can carry the mulch into the storm drainage system.
 - c. Follow all SOPs related to mowing, planting vegetation, and pet waste management (See SOP Mowing and Trimming, Planting Vegetation – Starters, Planting Vegetation – Seeds, Pet Waste).
3. Clean-up:
 - a. Keep all outdoor work areas neat and tidy. Clean by sweeping instead of washing whenever possible. If areas must be washed, ensure that wash water will enter a landscaped area rather than the stormwater. Do not use soap for outdoor washing.
 - b. Pick up trash on a regular basis.

GOOD HOUSEKEEPING

10. Pet Waste Standard Operating Procedure

PURPOSE:

To protect stormwater from pet waste bacteria.

PROCEDURE:

- 1 Preparation:
 - a. Enforce regulations that require pet owners to clean up pet waste and use leashes in public areas (Municipal Code 7, Animal Control). If public off-leash areas are designated, make sure they are clearly defined. Avoid designating public off-leash areas near streams and water bodies.
 - b. Whenever practical and cost effective, install dispensers for pet waste bags and provide disposal containers at locations such as trail heads or parks where pet waste has been a problem. Provide signs with instructions for proper cleanup and disposal.
- 2 Process:
 - a. Check parks and trails for pet waste as needed.
 - b. Check public open space for pet waste prior to mowing.
 - c. Provide ordinance enforcement as needed.
- 3 Clean-up:
 - a. Remove all pet waste; provide temporary storage in a covered waste container and dispose of properly. Preferred method of disposal is at the landfill.
- 4 Documentation:
 - a. Document problem areas for possible increased enforcement and/or public education signs.

GOOD HOUSEKEEPING

11. Snow Removal and De-Icing Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater from all snow removal and de-icing activities.

PROCEDURE:

1. Preparation:
 - a. Store de-icing material under a covered storage area, or other approved storage method that prevents runoff from entering the storm drain (see SOP Salt and Sand/Aggregate Storage).
 - b. Wash out vehicles (if necessary) in approved washout area at Public Works before preparing them for snow removal.
 - c. Calibrate spreaders to minimize amount of de-icing material used and still be effective.
 - d. Equip supervisor vehicles with spill cleanup kits in case of hydraulic line rupture or other spills.
 - e. Train employees in spill cleanup procedures and proper handling and storage of de-icing materials (See SOP Spill Cleanup and Response).

2. Process:
 - a. Load material into trucks carefully to minimize spillage.
 - b. Periodically dry sweep loading area to reduce the amount of de-icing materials exposed to runoff.
 - c. Distribute the minimum amount of de-icing material to be effective on roads.
 - d. Turn spreader off while loading and any other time the vehicle is not moving in the forward position.
 - e. Park trucks loaded with de-icing material inside when possible.

3. Clean-up:
 - a. Sweep up all spilled de-icing material around loading area.
 - b. Clean out trucks after snow removal duty in approved washout area at Public Works.
 - c. Provide maintenance for vehicles in covered area at Public Works.

GOOD HOUSEKEEPING

12. Snow Disposal Standard Operating Procedure

PURPOSE:

To protect stormwater by minimizing the impact of snow piles which contain sand, salt, and trash which generate concentrated release of pollutants during spring snowmelt conditions. For public Right-of-Way snow disposal, see Public Works, Operations Division Storm Water Protection SOP.

PROCEDURE:

1. Always:
 - a. Identify sensitive ecosystems prior to disposal and avoid disposal in these areas.
 - b. Store snow at least 25 feet from the high-water mark of a surface water.
 - c. Store snow at least 75 feet from any private water supply, at least 200 feet from any community water supply, and at least 400 feet from any municipal wells.
 - d. Clear debris in snow storage area and immediately after snowmelt occurs of each year the storage area is in use.

2. Whenever Possible:
 - a. Select storage locations that do not drain into surface waters, but rather where environmental impacts of spring melt are minimal.
 - b. Store snow on areas that are well above groundwater table on a flat, vegetated slope.
 - c. Avoid disposal on pavement, concrete, and other impervious surfaces.
 - d. Do not pile snow in wooded areas. Around trees or in vegetative buffers.
 - e. Divert water run-off from areas outside the snow piles.
 - f. Use less harmful deicers such as calcium magnesium acetate, potassium acetate, or organic deicers such as Magic Salt.

3. Never:
 - a. Never dispose of snow in wetlands, lakes, streams, rivers, mudflats, or near drinking water sources.
 - b. Never store snow in well-head protection areas (Drinking Water Source Protection Zones).

GOOD HOUSEKEEPING

13. Planting Vegetation - Starters Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater when planting vegetation.

PROCEDURE:

1. Preparation:
 - a. Call the Blue Stakes Center (<http://www.bluestakes.org>) of Utah at 811 or 1-800-662-4111 at least 2 working days before any digging will be done, to reveal the location of any underground utilities.
 - b. Transport spoils to their designated fill or disposal area.

2. Process:
 - a. Dig holes; place spoils on tarps or plastic near the hole where they may easily be placed back around roots. Avoid placing spoils in the gutter.
 - b. Bring each plant near the edge of the hole.
 - c. Check the depth of the hole and adjust the depth if necessary. The depth of the hole for a tree should be 2" less than the root flare to the bottom of the root ball, so that the root flare is 2" above the finish grade.
 - d. Carefully remove pot or burlap.
 - e. Place the plant in the hole.
 - f. Backfill the hole with existing spoils, compost, and a little fertilizer if desired. Do not use excessive amendments.
 - g. Thoroughly water the plant to remove any air pockets that may be in the soil
 - h. Stake the plant, if necessary, to stabilize it.
 - i. Provide erosion control on slopes where necessary using tackifiers, erosion mats, soil stabilizers or other appropriate methods.

3. Clean-up:
 - a. Sweep dirt from surrounding pavement(s) into the planter area.
 - b. Transport spoils to their designated fill or disposal area.

GOOD HOUSEKEEPING

14. Planting Vegetation - Seeds Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater when planting seed.

PROCEDURE:

1. Preparation:
 - a. Call the Blue Stakes Center (<http://www.bluestakes.org>) of Utah at 811 or 1-800-662-4111 at least 2 working days before any digging will be done, to reveal the location of any underground utilities.
 - b. Determine the application rate, method, water source, and ensure adequate materials are on hand.
 - c. Grade and prepare the soil to receive the seed. Place any extra soil in a convenient location to collect.
2. Process:
 - a. Place the seed and any cover using the pre-determined application method (and rake).
 - b. Lightly moisten the seed.
 - c. Ensure that the regular watering method is working properly and limit amount of over spray on paved areas.
 - d. Provide erosion control on slopes where necessary using tackifiers, erosion mats, soil stabilizers or other appropriate methods.
3. Clean-up:
 - a. Sweep dirt, seeds, and any cover material, from surrounding pavement(s), into the planter area.
 - b. Transport spoils to their designated fill or disposal area.

GOOD HOUSEKEEPING

15. VEHICLES – Fueling Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during maintenance of vehicles.

PROCEDURE:

1. Preparation:
 - a. Train employees on proper fueling methods and spill cleanup techniques.
 - b. Where possible, install a canopy or roof over above-ground storage tanks and fuel transfer areas.
 - c. Absorbent spill clean-up materials, drip pans, and spill kits shall be available in fueling areas and on mobile fueling vehicles and shall be disposed of properly after use.

2. Process:
 - a. Shut off the engine.
 - b. Ensure that the fuel is the proper type of fuel for the vehicle.
 - c. Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut off to prevent overfill.
 - d. Fuel vehicle carefully to minimize drips to the ground.
 - e. Fuel tanks shall not be topped off.
 - f. Mobile fueling shall be minimized. Whenever practical, vehicles and equipment shall be transported to the designated fueling area in the facilities area.
 - g. When fueling small equipment from portable containers, fuel in an area away from storm drains and water bodies.

3. Clean-up
 - a. Immediately clean up spills using dry absorbent material (e.g., kitty litter, sawdust, etc.). Sweep up absorbent material and dispose of properly.
 - b. Large spills shall be contained as best as possible and the Summit County Sheriff Dispatch (435) 615-3500) should be notified as soon as possible.

GOOD HOUSEKEEPING

16. VEHICLES – Vehicle and Equipment Storage Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by vehicles and equipment in storage.

PROCEDURE:

1. Preparation:
 - a. Inspect parking areas for stains/leaks on a regular basis.
 - b. Provide adsorbents and/or drip pans for leaking vehicles.

2. Process:
 - a. Whenever possible, store vehicles inside where floor drains have been connected to sanitary sewer system.
 - b. When inside storage is not available, vehicles and equipment shall be parked in the approved designated areas and away from storm drain inlets as much as possible.
 - c. Maintain vehicles to prevent leaks as much as possible.
 - d. Address any known leaks or drips as soon as possible.
 - e. If any leaks are discovered, the vehicle will be scheduled for repairs.
 - f. Clean up all spills using dry methods.
 - g. Never store leaking vehicles over a storm drain.

3. Clean-up
 - a. Any leaks that are spilled on the asphalt will be cleaned up with dry absorbent; the dry absorbent will be swept up and disposed of in the garbage.
 - b. The paved surfaces around the building will be swept as needed, weather permitting.

GOOD HOUSEKEEPING

17. VEHICLES – Washing Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during cleaning of vehicles and equipment.

PROCEDURE:

1. Preparation:
 - a. Trucks, vehicles, and equipment shall be washed in a designated area at Public Works, with a drainage system that is attached to the sanitary sewer system.
 - b. No vehicle washing will be done where wastewater will enter the storm drain system.
2. Process:
 - a. Minimize water and soap use when washing vehicles.
 - b. Never wash vehicles over or near a storm drain.
3. Clean-up
 - a. Clean solids from the settling pits on an as-needed basis.

GOOD HOUSEKEEPING

18. Salt and Sand/Aggregate Storage Standard Operating Procedure

PURPOSE:

To prevent the discharge of pollutants into stormwater through the proper storage and maintenance of salt and aggregate piles.

PROCEDURE:

1. Preparation:
 - a. Keep general area clean and free from general debris and potential hazards.
 - b. Keep salt piles and other aggregate piles well-groomed and consolidated.
 - c. Keep salt piles and other aggregate piles together and away from stormwater controls.
 - d. If piles are covered, ensure that the cover facility is well maintained and in good repair. Cover piles where possible.
 - e. Ensure any drainage from uncovered piles is directed towards a secondary containment system and does not leave the site.

2. Clean-up
 - a. Regularly sweep loading areas and track-out areas to reduce the amount of salt exposed to runoff as required.
 - b. Inspect secondary containment systems following storm events and keep these areas clean and well maintained.

3. Documentation:
 - a. Inspections and maintenance activities will be recorded as per requirements of the applicable SWPPP or MS4 permit.

GOOD HOUSEKEEPING

19. Spare Parts Storage Standard Operating Procedure

PURPOSE:

To protect storm water by properly storing spare parts. Improper storage of materials can result in pollutants and toxic materials entering ground and surface water supplies.

PROCEDURE:

1. Always:
 - a. Store spare parts in a designated area.
 - b. Use drip pans for any parts that are dripping.

2. Whenever Possible:
 - a. Store spare parts inside or under cover.
 - b. Monitor storage areas for staining/leaks on a schedule decided on by the appropriate personnel.
 - c. Clean the majority of petroleum products from the parts that are to be stored.

GOOD HOUSEKEEPING

20. Floor Drain Management Standard Operating Procedure

PURPOSE:

To protect storm water by properly managing floor drains specifically in the Public Works bus barns where precipitation may get inside. Improper management of the floor drains can result in overflow of the drains and pollutants/toxic materials entering storm drains in the parking lot.

PROCEDURE:

1. Preparation:
 - a. Clean floor drains 3x per year to ensure they do not become clogged during large runoff events.
2. Clean-up:
 - a. Use small sump pump to pump water to sewer manhole or working drain. (Never pump onto the concrete pads outside of building.)
 - b. Use wet dry vacuum to remove water and debris. (Dump in waste bin or dumpster)
 - c. Clean out floor drain piping with high pressure hose/ rod tool. (contract if needed)

CONSTRUCTION SITE RUN-OFF CONTROLS

21. Chip Seal Standard Operating Procedure

PURPOSE:

To protect stormwater by protecting stormwater controls from chip seal pollutants entering the storm drain system.

PROCEDURE:

1. Preparation:
 - a. Clean and dry areas where materials are to be applied.
 - b. Apply temporary covers to manholes and catch basins, as needed, to prevent oil and materials from getting inside of them.

2. Process:
 - a. Apply emulsion at recommended rate.
 - b. Spread chips closely behind emulsion distributor, slowly such that the chips do not roll when they hit the surface.
 - c. Roll chips. Rollers follow closely behind the chip spreader. Roll entire surface twice.
 - d. Maximum speed 5 mph.

3. Clean-up:
 - a. All loose aggregate is removed from the roadway by sweeping it up (See SOP Street Sweeping).
 - b. Excessive asphalt applications and spills and removed with shovels and scraping tools.
 - c. Remove the temporary covers from manholes and catch basins. If it appears that any chip seal materials have entered the inlet boxes, remove the material according to the SOP for catch basin cleaning (See SOP Catch Basin Cleaning).
 - d. Properly dispose of, or recycle, any waste material that has been swept and scraped up by taking it to the landfill, or other designated location.

CONSTRUCTION SITE RUN-OFF CONTROLS

22. Crack Seal Standard Operating Procedure

PURPOSE:

To protect stormwater by protecting stormwater controls from chip seal pollutants entering the storm drain system.

PROCEDURE:

1. Preparation:
 - a. Cover manholes, catch basins and valves, as needed, to prevent oil and materials from getting inside the structures or system.
 - b. Remove weeds from the road.
 - c. Air-blast the cracks to remove sediments from the crack to allow for proper adhesion.
 - d. Ensure that surface is clean and dry.

2. Process:
 - a. Proper temperature of material should be maintained.
 - b. Sufficient material is applied to form the specified configuration.

3. Clean-up:
 - a. Use shovels and/or scrapers to remove excessive sealant application or spills and dispose of them properly.
 - b. Sweep all loose debris from the pavement and dispose of it in the local landfill.

CONSTRUCTION SITE RUN-OFF CONTROLS

23. Curb/Pavement Markings Standard Operating Procedure

PURPOSE:

To protect stormwater by properly storing, using, and disposing of paint and preparation materials. For public Right-of-Way curb/pavement markings, see Public Works, Operations Division SOPs.

PROCEDURE:

1. Preparation:
 - a. See SOP Painting.
 - b. Calculate the amount of paint required for the job.
 - c. Use water-based paints whenever possible.
 - d. Determine whether the wastes will be hazardous or not and designate the proper disposal of said wastes.
 - e. Determine locations of storm drain inlets and sewer inlets that may need to be protected.
 - f. Prepare surfaces to be painted without generating wastewater by scraping.
 - g. Thoroughly sweep up all paint scrapings and place them in the appropriate solid waste containers.
 - h. If paint stripping is needed, use a citrus-based paint remover whenever possible, because it is less toxic than chemical strippers.
 - i. If wastewater will be generated, use curb, dyke, etc. around the activity to collect the filter and collect the debris.
2. Process:
 - a. Paint curb/pavement.
 - b. Prevent over-spraying of paints and/or excessive sandblasting.
 - c. Use drip pans and drop clothes in areas of mixing paints and painting.
 - d. Have available absorbent material and other BMPs ready for an accidental paint spill.
3. Clean-up:
 - a. Paint out brushes and rollers as much as possible. Squeeze excess paint from brushes and rollers back into the containers prior to cleaning them.
 - b. Pour excess paint from trays and buckets back into the paint can containers and wipe with cloth or paper towels. Dispose of the towels according to the recommendations on the paint being used.
 - c. Rinse water-based paint brushes in the sink after pre-cleaning. Never pour excess paint or wastewater from cleanup of paint in the storm drains.
 - d. Upon completion of the painting project, a five-gallon bucket of clean water is used to clean the paint sprayer until the water comes out clear. The mixture of sprayed water/paint is directed at a pile of waste material. The material is allowed to dry before it is taken to the landfill.

CONSTRUCTION SITE RUN-OFF CONTROLS

24. Painting Standard Operating Procedure

PURPOSE:

To protect stormwater by properly storing, using, and disposing of paint and preparation materials.

PROCEDURE:

1. Always:
 - a. Store waste paints, brushes, solvents, and rags in sealed containers.
 - b. Perform abrasive blasting and spray painting in accordance with regulations.
 - c. Properly clean, store, and dispose of paint and associated waste materials.
 - d. Train employees on Best Management Practices concerning painting activities, cleanup, and disposal.

2. Whenever Possible:
 - a. Replace solvent-based paint with less toxic paints such as latex or water-based paints.
 - b. Practice "source reduction" – buy only the paint that is needed.
 - c. Use up, donate or recycle unused paint. Dispose of unusable paint at the HHW facility.
 - d. Use drop cloths under any painting or preparation activity such as scraping or sandblasting.
 - e. Use techniques such as brushing and rolling to avoid overspray.
 - f. Use vacuum sanders to collect paint dust.
 - g. Perform abrasive blasting and spray painting in an enclosed or covered area that is safe for personnel.
 - h. If solvent is used to clean equipment, dispose of at the HHW facility.

3. Never:
 - a. Never dispose of paint or waste paint products into the storm drain system, a water body, or onto the ground.
 - b. Never dispose of paint or waste paint products into the garbage unless paint is dry, or there is no longer any paint in the can.
 - c. Never clean paint brushes or equipment outside.

CONSTRUCTION SITE RUN-OFF CONTROLS

25. Concrete Work Standard Operating Procedure

PURPOSE:

To protect stormwater from concrete construction activities and resulting waste products.

PROCEDURE:

1. Preparation:
 - a. Store dry and wet materials under cover, away from drainage areas.
 - b. Remove any damaged concrete that may need to be replaced.
 - c. Prepare and compact sub-base.
 - d. Set forms and place any reinforcing steel that may be required.
 - e. Determine how much new concrete will be needed.
 - f. Locate or construct approved concrete washout facility.

2. Process:
 - a. Install inlet protection as needed.
 - b. Moisten sub-base just prior to placing new concrete. This helps keep the soil from wicking moisture out of the concrete into the ground.
 - c. Place new concrete in forms.
 - d. Consolidate new concrete.
 - e. Strike off surface.
 - f. Let concrete obtain its initial cure.
 - g. Apply appropriate surface finish.
 - h. Remove forms when concrete will not slump.

3. Clean-up:
 - a. Perform washout of concrete trucks and equipment in designated concrete washout areas only.
 - b. Ensure that cement and concrete dust from grinding activities is swept up and removed from the site.
 - c. Sweep dirt or debris from street and gutter and dispose of in appropriate solid waste facilities.

CONSTRUCTION SITE RUN-OFF CONTROLS

26. Overlays and Patching Standard Operating Procedure

PURPOSE:

To prevent stormwater by utilizing proper techniques and controls during overlay and patching activities.

PROCEDURE:

1. Preparation:
 - a. Check weather conditions and avoid working in rain or any precipitation.
 - b. Set up/establish a traffic control for road with necessary detours, etc.
 - c. Measure and mark locations of manholes and valves on the curb.
 - d. Manholes and catch basins are to be covered as needed to prevent oil and material from getting inside the structures or system.
 - e. Cracks should be properly sealed. Alligator cracks and potholes should be removed and patched. Rutting should be milled.
 - f. Surface should be clean and dry.
 - g. Uniform tack coat applied and cured prior to placement of overlay.
 - h. If milling is required, install inlet protection as needed.
2. Process:
 - a. Check hot asphalt mix for proper temperature, asphalt percentage, gradation, air voids and any other agency requirements.
 - b. Raise manhole lids and valves to elevation of new asphalt surface with riser rings.
 - c. Surface texture should be uniform, no tearing or scuffing.
 - d. Rolling should be done to achieve proper in-place air void specification.
3. Clean-up:
 - a. Covering should be removed as soon as the threat of imported materials entering the system is reduced and prior to a storm event.
 - b. After pavement has cooled, sweep gutters to remove loose aggregate.

CONSTRUCTION SITE RUN-OFF CONTROLS

27. Shouldering and Mowing Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during shouldering and mowing.

PROCEDURE:

1. Preparation:
 - a. Set up temporary traffic control devices according to part VI of the MUTCD.
2. Process:
 - a. Place important material as needed and perform grading to achieve proper drainage.
 - b. Mulch clippings to help reduce the amount of supplemental fertilizer required.
3. Clean-up:
 - a. Clean any loose material off asphalt or gutter.
4. Documentation:
 - a. Record location and date on the maintenance database and map.

CONSTRUCTION SITE RUN-OFF CONTROLS

28. Slurry Seal Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater from slurry sealing activities.

PROCEDURE:

1. Preparation:
 - a. Remove weeds from the roads. Sweep areas where materials are to be applied, and allow drying, if necessary. Verify that existing pavement has been inspected for detrimental effects of poor drainage.
 - b. Cover/protect catch basins, manholes, and valves as needed.
2. Process:
 - a. Apply materials in a smooth and uniform manner. Slurry material should not run onto adjacent pavement surface, curb and gutter or waterway.
3. Clean-up:
 - a. If loose aggregate is remaining in street or curb, sweep it up.
 - b. Ensure that excess emulsion materials are removed from the site and stored for later use in an area or container that is not exposed to the weather.
 - c. Remove covers/protection from catch basins, manholes and valves, etc.

CONSTRUCTION SITE RUN-OFF CONTROLS

29. Graffiti Removal Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater from graffiti removal activities (from soaps, paint removal chemicals, paint chips, sand, etc.)

PROCEDURE:

1. Preparation:
 - a. Schedule removal of graffiti during dry weather.
 - b. Cover/protect catch basins, manholes, and valves as needed.
2. Process:
 - a. Whenever there is a ditch or waterway underneath the graffiti, always paint over instead of removal.
 - b. If no soaps or chemicals are used, runoff from sand blasting and high-pressure washing should be directed into landscaped or dirt area.
 - c. If landscaping is not available, then filter runoff to keep sand/particles out of the storm drain.
 - d. Waterless and nontoxic chemical cleaning methods should be used when possible.
 - e. Avoid using cleaning products that contain hazardous substances that can turn the wash water into a hazardous waste.
 - f. Minimize the amount of water used during high pressure washing activities.
 - g. If sand blasting, sweep up impervious areas to collect any waste material and dispose in the trash.
 - h. If using soap and power washing, plug nearby inlets vacuum/pump out.

CONSTRUCTION SITE RUN-OFF CONTROLS

30. Transporting Equipment Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by ensuring proper transporting methods.

PROCEDURE:

1. Preparation:
 - a. Determine equipment needed for transport and method (trailer, truck bed) needed to transport equipment.
 - b. Conduct pre-trip inspection of equipment to ensure any loose material is removed, that there are no leaking fluids, and all equipment is secure.
 - c. Make sure dirt and debris that may fall from equipment is removed before transport.
2. Process:
 - a. Load and secure equipment on trailer or truck
 - b. Load and secure fuel containers for equipment usage.
3. Clean-up:
 - a. Off load equipment.
 - b. Store equipment and trailer in the designated area at the department's facility.
 - c. Conduct post-trip inspection of equipment.
 - d. If equipment needs to be washed, conduct cleaning according to manufacturer's SOP, and only in an approved area at Public Works where there is a sanitary sewer connection.

CONSTRUCTION SITE RUN-OFF CONTROLS

31. Transporting Dry Excavated Materials & Spoils Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by ensuring proper transporting methods.

PROCEDURE:

1. Preparation:
 - a. Utilize truck with proper containment of materials.
 - b. Determine disposal site of excavated materials.
 - c. Determine the path of travel to and from disposal site.

2. Process:
 - a. Load.
 - b. Check truck after loading for possible spillage.
 - c. Transport in manner to eliminate spillage & tracking.
 - d. Utilize one route for transporting.

3. Clean-up:
 - a. Clean loading area.
 - b. Clean transporting route.
 - c. Wash off truck and other equipment in a designated vehicle wash area at Public Works if it is a County vehicle.

CONSTRUCTION SITE RUN-OFF CONTROLS

32. Transporting Soil and Gravel Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by ensuring proper transporting methods.

PROCEDURE:

1. Preparation:
 - a. Dry out wet materials transporting.
 - b. Spray down dusty materials to minimize blowing.
 - c. Make sure you know and understand the SWPPP requirements of the site where work will be performed.
 - d. Determine the location where the truck and other equipment will be cleaned afterwards.
 - e. Check vehicle tailgate to make sure it seals and latches properly.

2. Process:
 - a. Use a stabilized construction entrance to access or leave the site where materials are being transported to/from.
 - b. Cover truck bed with a secured tarp before transporting.
 - c. Follow the SWPPP requirements for the specific site to/from which the materials are being hauled.
 - d. Make sure not to overfill materials when loading trucks.

3. Clean-up:
 - a. Use sweeper to clean up any materials tracked out on the roads from site.
 - b. Wash out truck and other equipment when needed in properly designated vehicle wash areas at Public Works.

CONSTRUCTION SITE RUN-OFF CONTROLS

33. Transporting Wet Excavated Materials & Spoils Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by ensuring proper transporting methods.

PROCEDURE:

1. Preparation:
 - a. Utilize truck with containment for materials.
 - b. Determine disposal site of excavated materials.
 - c. Determine the path of travel to and from disposal site.

2. Process:
 - a. Load and transport in manner to minimize spillage & tracking of material.
 - b. Check truck after loading for possible spillage.
 - c. Utilize one route for transporting.

3. Clean-up:
 - a. Clean route of transport to provide cleaning of any spilled material.
 - b. Wash out equipment truck and other equipment in designated vehicle wash area at Public Works.

CONSTRUCTION SITE RUN-OFF CONTROLS

34. Pre-Construction, Pre SWPPP & SWPPP Review Standard Operating Procedure

Purpose:

This section contains information and guidelines for protecting and preparing a construction site with BMPs and a SWPPP and enforcement of the SWPPP Program according to the Summit County Code.

Preparation:

1. Ensure all involved staff is trained on Pre SWPPP and SWPPP Review Procedures.

Process:

- a. A building permit is submitted to Summit County's E360 system to appropriate departments. The SWPPP Reviewer in the Stormwater Department is responsible for the determination of if the project requires State Permit coverage and a SWPPP based on MS4 Permit requirements.
- b. The SWPPP Reviewer provides comments on required SWPPP documentation needed for building permit approval through the Stormwater Department.
- c. Contractor submits SWPPP to E360 for review. The SWPPP should plan which BMPs they are going to implement during construction to manage runoff created from the site, as well as a set of procedures that will protect water quality impacts. The SWPPP will include opportunities for low impact design (LID) and green infrastructure when opportunities exist. The SWPPP should be developed using the applicable permit's requirements (CGP or CPP) with Permit coverage attached to the SWPPP. The SWPPP Reviewer should utilize the SWPPP Review Checklist stored in ComplianceGO and send back comments to the contractor until they are able approve the SWPPP.
- d. During the SWPPP Review process the SWPPP reviewer will determine whether the Site/project is a "Priority Construction Site" based on the following factors:
 - i. identify priority construction sites considering the following factors at a minimum:
 - ii. Soil erosion potential.
 - iii. Site slope.
 - iv. Project size and type.
 - v. Sensitivity of receiving waterbodies (impaired or high-quality waters).
 - vi. Proximity to receiving waterbodies; and,

vii. Non-storm water discharges and past record of non-compliance by the Operators of the construction site.

If the SWPPP Reviewer determines that a construction site is "Priority" they should let the Stormwater Manager know so that they can schedule the SWPPP inspections for that site biweekly (every two weeks) rather than the monthly minimum. This designation should be noted in ComplianceGO.

- e. Pre-construction meeting is held via online meeting platform or on site and the SWPPP, BMPs, and inspection/Permit requirements are reviewed with the contractor. Preconstruction documentation saved in ComplianceGO with other permit documentation.
- f. The Stormwater Coordinator creates a new site in ComplianceGO and assists the contractors in setting up a login to perform their SWPPP inspections.

Documentation

- g. Record all construction sites that disturb greater than or equal to one acre or are part of a Common Plan of Development. These will be documented in ComplianceGO with the SWPPP Reviews, Preconstruction documentation, and inspections.
- h. Keep any notes or comments of any problems for future reference in ComplianceGO with the other permit documents.

CONSTRUCTION SITE RUN-OFF CONTROLS

35. Site Inspections & Enforcement Response Standard Operating Procedure

Purpose:

This section contains information and guidelines for the SWPPP inspector to follow to protect a construction site with BMPs and a SWPPP Inspections during and after the construction of a project.

Procedure:

1. Preparation
 - a. Stormwater Coordinator stay in communication with Stormwater Inspector on new SWPPP required projects coming into the County.
 - b. Stormwater Coordinator logs new site information and applicable contact information and documents into ComplianceGO program, gets contractor set up in ComplianceGO, and assigns site inspections to the Summit County SWPPP inspector.
 - c. Summit County SWPPP Inspectors are required to be a Registered Stormwater Inspector (RSI) with the State of Utah.
 - d. SWPPP Inspectors take annual training on SWPPP inspection procedures and State MS4 requirements.
2. Process
 - a. Inspect assigned construction site and surrounding area monthly at a minimum. Note that some construction sites will be scheduled biweekly (every two weeks) if the SWPPP Reviewer determines that the site is priority.
 - b. Before inspecting the Site, review their SWPPP to ensure they are following their Plan. Report an action item if they need to update their SWPPP or if it is not accessible.
 - c. Follow SWPPP inspection checklist in ComplianceGO SWPPP inspection form to verify that standards are met.
 - i. Refer to the Registered Stormwater Inspector Manual and the Construction General Permit/Common Plan Permit for Site requirements.

-
- d. If actions are required by the contractor, ensure that they are documented and are sent to the project manager on Site through the SWPPP Inspection form on ComplianceGO. If there are personnel on site, try and speak with them and have the deficiencies taken care of right away.
 - i. Include photos and descriptions of the action items and deficiencies.
 - e. Check back on the sites after the allotted time frame assigned in ComplianceGO for the required corrective action.
 - i. If the issue has been resolved, close out the action item.
 - ii. If it has not been resolved, Code Enforcement will issue a Notice of Violation.
 - 1. If the corrective action still has not been resolved after a Notice of Violation and Citation, the County will issue a Stop Work Order.

3. Documentation

- a. Log inspection report in ComplianceGO program.
- b. Notice of Violations and Stop Work Orders will be logged by the logging sheet.

POST CONSTRUCTION STORMWATER CONTROLS

36. VAC Truck Catch Basin Cleaning Standard Operating Procedure

PURPOSE:

To protect stormwater by maintaining the ability of catch basins to trap sediments, organic matter and litter. This reduces clogging in the storm drain system as well as the transport of sediments and pollutants into receiving water bodies.

PROCEDURE:

1. Preparation:
 - a. Annually inspect catch basins for structural integrity and evidence of illicit discharges.
 - b. Conduct visual inspection on outside of grate.
 - c. Make sure nothing needs to be replaced.
 - d. Conduct inside visual inspection to verify what needs to be cleaned.

 2. Process:
 - a. Inspect for hazardous waste:
 - b. If suspected hazardous waste is detected obtain sample if possible.
 - c. If minor amounts of petroleum waste are detected:
 - i. Contact supervisor and follow IDDE procedure when illegal dumping is suspected.
 - ii. Apply absorbent material (B-WH-144 or Y Pillow1818, beware of detergents which will reduce absorbent effectiveness).
 - d. If major amounts of petroleum waste are detected:
 - i. Contact supervisor and follow IDDE procedure when illegal dumping is suspected.
 - ii. Schedule hazardous waste removal contractor: Select from Utah Registered Hazardous Waste Handlers Lists.
 - e. If hazardous or unknown waste are detected (**Do not vacuum hazardous waste**)
 - Emergency HAZMAT 911, contact supervisor and follow IDDE procedure: Emergency constitutes flowing uncontained waste.
 - Emergency SCHED Phil Bondurant 435-333-1584: Emergency constitutes potential for waste to be carried by water.
 - Non-Emergency SCHED 435-333-1500: Not exposed to water and no immediate threat to storm water
 - Schedule hazardous waste removal contractor.
- B. Non-Hazardous waste:**
- f. Clean using a high-powered vacuum truck to start vacuuming standing water and sediment.
 - g. Use a high-pressure washer to break up any remaining material in the catch basin, while capturing the slurry with the vacuum. Sweep parking areas, as needed, or as directed.
 - h. After catch basin is clean, clean out any sediment that might have entered the pipe.
 - i. Systematically clean catch basins per maintenance plan.
 - j. If cleaning by hand (shovel, etc.), stockpile and cover catch basin residuals on an impermeable

surface until it can be disposed of at the landfill.

- k. Dispose of solids in a sealed waste container that will be transferred to the permitted, lined solid waste landfill. Fluids collected during catch basin cleaning shall be taken to the County decant facility.

3. Clean-up:

- a. When the vacuum truck is full of sediment, take it to the County decant facility to dump all sediment out of the truck and into the drying bed.
- b. Wash down area before leaving the decant facility.

POST CONSTRUCTION STORMWATER CONTROLS

37. Creek Management Standard Operating Procedure

PURPOSE:

To protect creeks from sediment and pollution resulting from creek maintenance activities.

PROCEDURE:

1. Preparation:
 - a. Check creek channels prior to spring runoff annually and identify potential problem areas.
 - b. Monitor creeks on a regular basis.
 - c. Check culverts and crossings before spring runoff and after every storm.
 - d. Identify areas requiring maintenance.
 - e. Employ best management practices (e.g., check dams, waddles, gravel socks, silt fences) as required to prevent sediments, organic material, from releasing further downstream.
 - f. Properly remove and dispose of material collected when maintenance activities are completed
 - i. Garbage to dumpsters
 - ii. Wet material to Summit County's decant facility
 - iii. Dry material to landfill
2. Process:
 - a. Clean debris as necessary from channels and culverts.

POST CONSTRUCTION STORMWATER CONTROLS

38. Pond Cleaning Standard Operating Procedure

PURPOSE:

To protect stormwater by removing trash and debris from detention ponds.

PROCEDURE:

1. Preparation:
 - a. Schedule the pond cleaning work for a time when dry weather is expected.
 - b. Remove any sediment and trash from grates, placing it in a truck for disposal.
 - c. Conduct a visual inspection to make sure any grates, structures, manholes, boxes, and pipes are in good working order. Remove manhole covers and grates as necessary for inspecting.

2. Process:
 - a. Provide outlet protection where feasible to minimize the amount of debris that might leave the basin during cleaning process.
 - b. Clean basin by using backhoe or front-end loader to remove debris and sediment from the bottom.
 - c. Continue cleaning structures and pond bottom as necessary by sweeping and shoveling.
 - d. Put all material removed from the pond into a dump truck.
 - e. Some structures may require use of a vactor truck. If so, use the same procedures described for cleaning catch basins.

3. Clean-up:
 - a. After cleaning basins, clean off the concrete pads using dry methods (sweeping and shoveling).
 - b. Make sure they are swept and clean.
 - c. Take the material that was removed to the landfill, or decant facility at Gordo's for wet material, for final disposal.

POST CONSTRUCTION STORMWATER CONTROLS

39. Sumps and Injection Wells (Includes Underground Stormwater Detention Structures) Standard Operating Procedure

PURPOSE:

To protect stormwater by cleaning of sumps and injection wells.

PROCEDURE:

1. Preparation:
 - a. Clean sediment and trash off inlet to sump/injection well.
 - b. Determine how water is supposed to drain from the structure and assess the ability of the structure to allow water to drain as designed.
 - c. If possible, do visual inspection of inside of sump/injection well.
 - d. Look for cracks, missing or broken pieces in the walls/sides of structure.
 - e. Do inside visual inspection to see what needs to be cleaned.
2. Process:
 - a. Clean using high powered vacor truck, cleaning the sides of the structure and sucking out the sediment on the bottom.
 - b. Remove fine sediments that might inhibit the drainage of water if the structure is designed such that the water drains out the bottom.
 - c. Clean those places where water drains if the structure is designed to drain out the sides of the sump/injection well.
 - d. Clean inlets and overflow outlets.
3. Clean-up:
 - a. When vacor truck is full of sediment take it to Gordo's to dump all the sediment out of the truck into holding basin.
 - b. When dry, clean it up with a backhoe, put it into a dump truck and take it to the landfill.
4. Documentation:
 - a. Keep logs of culverts/storm water pipes wells cleaned.
 - b. Record the amount of waste collected.
 - c. Keep any notes or comments of any problems.

POST CONSTRUCTION STORMWATER CONTROLS

40. Culvert and Stormwater Pipe Cleaning Standard Operating Procedure

PURPOSE:

To protect stormwater by cleaning out culverts and stormwater pipes.

PROCEDURE:

1. Preparation:
 - a. Perform Culvert and Stormwater Pipe Cleaning during the Summer months. Refer to Appendix B for schedule.
 - b. Perform maintenance from the top of the system to the bottom, in other words the highest to the lowest point in order to achieve the highest level of maintenance and lowest impact to water quality.**
 - c. Clean sediment and trash off inlet to culvert/stormwater pipe.
 - d. If possible, do visual inspection of inside of culvert/stormwater pipe.
 - e. Look for cracks, missing or broken pieces in the walls/sides of structure.
 - f. Do inside visual inspection to see what needs to be cleaned.

2. Process:
 - a. Clean using high powered vector truck, cleaning the sides of the structure and sucking out the sediment on the bottom.
 - b. Send high powered hose down culvert and pull back any sediment.
 - c. Clean inlets and outlets.
 - d. Move truck down to next storm drain.

3. Clean-up:
 - a. When vector truck is full of sediment take it to Gordo's to dump all the sediment out of the truck into the holding basin.
 - b. When dry, clean it up with a backhoe, put it into a dump truck and take it to the landfill.

4. Documentation:
 - a. Keep logs of culverts/storm water pipes wells cleaned.
 - b. Record the amount of waste collected.
 - c. Keep any notes or comments of any problems.

POST CONSTRUCTION STORMWATER CONTROLS

41. Canal/Ditch Maintenance Standard Operating Procedure

PURPOSE:

To protect stormwater by maintaining and preserving canals or irrigation ditches.

PROCEDURE:

1. Preparation:
 - a. Monitor canals on a regular basis. Refer to Appendix B for schedule.
 - b. Establish maintenance responsibilities with irrigation company boards and operators.
 - c. Create a maintenance schedule with the irrigation company.
 - d. Identify areas requiring maintenance with irrigation company.
 - e. Identify access and easements to canal area.
 - f. Establish procedures for removal of material from canal maintenance. Including stockpiling of material removed or hauling methods.
 - g. Check canal/ditch crossings on schedule, including during and after storm events.
 - h. Determine what manpower or equipment will be required.
2. Process:
 - a. Perform maintenance as outlined in agreement with irrigation company.
 - b. Install clean materials free of pollutants and contaminants.
 - c. Place removed materials in an area upland of the watercourse to prevent them from reentering the channel.
 - d. Haul material away as outlined in agreements with irrigation company.
3. Clean-up:
 - a. Stabilize all disturbed soils.
 - b. Haul all debris or sediment removed from area to the landfill.
 - c. Remove all tracking from paved surfaces near maintenance site, if applicable.
4. Documentation:
 - a. Keep log of actions performed including date and individuals involved.
 - b. Keep any notes or comments of any problems.
 - c. Use "before" and "after" photographs to document activities as applicable.

POST CONSTRUCTION STORMWATER CONTROLS

42. Mowing and Trimming Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater from shouldering and mowing activities.

PROCEDURE:

1. Preparation:
 - a. Locate all storm drain collection structures and inlets in the right-of-way.
 - b. Place import material as needed and perform grading to achieve proper drainage.
 - c. Mulch clippings to help reduce the amount of supplemental fertilizer required.
 - d. Install temporary catch basin protection as required.

2. Clean-up:
 - a. Clean any loose material off asphalt or gutter in order to prevent material from entering the storm drain.
 - b. Transport to and dispose of materials at the landfill.
 - c. Wash equipment at either Public Works where all County vehicles are washed, or wash equipment on the grass or areas where the runoff will not enter the gutters, storm drains, or impervious areas.

POST CONSTRUCTION STORMWATER CONTROLS

43. Street Sweeping and Vac Truck Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater by establishing effective street sweeping procedures.

PROCEDURE:

1. Preparation:
 - a. **Prioritize cleaning routes with the highest frequency usage and in areas with the highest pollutant loading to minimize impact to water quality.**
 - b. **Increase sweeping frequency just before the rainy season to minimize impact to water quality via runoff.**
 - c. Perform preventative maintenance and services on sweepers to increase and maintain their efficiency.
 - d. Streets are to be swept as needed or specified by the County. Street maps will be used to ensure all streets are swept at a specified interval of monthly.
2. Process:
 - a. Drive street sweeper safely and pick up debris.
 - b. When full, take the sweeper to the Gordo's Dump Site.
3. Clean-up:
 - a. Street sweepers are to be cleaned in a manner that does not allow debris to enter the storm drain system.
 - b. Street sweeping cleaning stations will separate the solids from the liquids.
 - c. Once solids have dried, haul them to the local landfill.
 - d. Decant water is to be collected and routed to Summit County's approved decant collection area at Gordo's only.
 - e. Haul all dumped material to the landfill.
4. Documentation:
 - a. Keep accurate logs to track streets swept and streets still requiring sweeping using the integrated GPS system on the County sweeper.

POST CONSTRUCTION STORMWATER CONTROLS

44. Inspection Reporting Post Construction Private Stormwater BMP

PURPOSE:

To ensure the functionality of storm water BMPs through routine inspection, assessment and cleaning.

Procedure

1. Preparation:
 - a. Obtain Storm drain network plans
 - b. Review prior inspection to establish historic or site-specific Information.
 - c. Obtain BMP specific design criteria for maintenance intervals and maintenance procedure.

2. Process:
 - a. Inspect storm drain network and BMPs for signs of damage and functionality every other year.
 - b. Observe during storm event if possible.
 - c. Observe downstream locations or Outfalls to determine effectiveness of BMP's.
 - d. Mark findings in Post Construction BMP Inspection form.

3. Clean-up
 - a. Schedule Vac truck cleaning or other appropriate cleaning method and dump all the sediment into a drying pond landfill.

4. Documentation
 - a. Complete Post Construction BMP Inspection form and
 - b. Record the amount of waste collected and condition of BMP's
 - c. Schedule follow up inspection if necessary or next routine inspection.

ILLCIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

45. For Staff Receiving Calls of Incidents Standard Operating Procedure

PURPOSE:

To follow a procedure for dispatching IDDE incidents to the proper authority so the issue can be quickly identified, traced, ceased and cleaned to prevent further contamination and protect receiving waters.

PROCEDURE:

Incident Report Standard Operating Procedures for PCMC staff receiving first report phone calls/emails of an incident:

1. First, use your judgement to determine if the call is an emergency. If the spill is large, a threat to the environment and/or human health, if it has entered a waterway, and is unable to be stopped and contained by PCMC streets/stormwater/personnel. If it is an emergency call 911 Summit County Sheriff Dispatch (435) 615-3500. In addition, notify the stormwater coordinator (435) 400-0016.
 - a. Fill out the IDDE Incoming Call Report Form (Attachment 1) to collect all incoming information from the person reporting the spill.
2. If the call is not an emergency, continue as described below.
 - a. Fill out the IDDE Incoming Call Report Form (Attachment 1) to collect all incoming information from the person reporting the spill.
 - b. Utilize the IDDE Spill Response Flowchart (Figure 1)
 - i. Contact the Stormwater Coordinator and Code Enforcement, then Streets using the IDDE Contact list (Attachment 2). If unable to reach someone, leave a message and/or send an e-mail.

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

46. Opportunistic Illicit Discharge Observation Standard Operating Procedure

PURPOSE:

To be alert for potential illicit discharges to the municipal stormwater system while going about normal work activities.

PROCEDURE:

1. Preparation:
 - a. Be alert for potential illicit discharges to the municipal stormwater system while going about normal work activities.
2. Process:
 - a. Call the appropriate authority (Stormwater Coordinator) if you see evidence of an illicit discharge.
 - b. Assess the general area of the illicit discharge to see if you can identify its source.
 - c. Whenever possible, take photographs of the suspected illicit discharge.
 - d. Responding stormwater department personnel or code enforcement officer will complete the following:
 - i. Use the IDDE Incident Tracking Sheet to document observations.
 - ii. Obtain sample for visual observation and complete an Outfall Inspection Form, if applicable.
 - iii. Follow the procedure of SOP IDDE – Tracing Illicit Discharges.
3. Clean-up:
 - a. Clean catch basin, clean storm drain, or initiate spill response as needed. Follow relevant SOPs.
4. Documentation:
 - a. File all completed forms (i.e., Incident Tracking Form, Outfall Inspection Form, Catch Basin Cleaning Form, and Storm Drain Cleaning Log).
 - b. Document any further action taken.

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

47. Dry Weather Screening

PURPOSE:

To perform non-analytical stormwater monitoring at MS4 outfall locations to both Silver and McLeod Creeks in order to detect and trace hazardous spills, illicit connections, and dumping. (Permit Requirement 4.2.3.3.3)

PROCEDURE:

1. Preparation:
 - a. Know the past and present weather conditions. Conduct the inspections during dry weather periods.
 - b. Gather all necessary equipment: tape measure, clear container, computer or device to record inspections, flashlight, camera/smartphone for photos.
 - c. Obtain maps showing outfall locations and identifiers.
 - d. Obtain outfall descriptions from previous inspections so the outfalls can be accurately identified, and observations can be compared.
2. Procedure:
 - a. Monitor all MS4 outfalls at least once per year.
 - b. Identify the outfall you are inspecting with a consistent and unique identifier. Use maps and previous inspection reports to confirm the outfall identifier and location.
 - c. If dry weather flow is present at the outfall, then document and evaluate the discharge by completing the following steps:
 - i. Collect field samples in a clean, clear container for visual observation ensure that you collect the sample in a manner that avoids stirring up sediment in the outfall that may distort the observation.
 - ii. Characterize and record observations on basic sensory and physical indicators (outfall condition, flow, odor, color, oil sheen, etc.) on the outfall inspection form.
 - iii. Compare observations to previous inspections.
 - iv. If the flow does not appear to be an obvious illicit discharge (e.g., the flow is clear, odorless, etc.) attempt to identify the source of the flow (groundwater, intermittent stream, etc.)
 - v. If an illicit discharge (such as sewage, petroleum, paint, etc.) is encountered or suspected, follow the IDDE SOP – Tracing Illicit Discharges.
3. Cleanup – as necessary
4. Documentation
 - a. File outfall inspection forms in ArcGIS and include photos if taken.
 - b. Update maps if new outfalls are inspected.

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

48. Tracing an Illicit Discharge

PURPOSE:

To trace known or potential illicit discharges that pose a threat to Summit County's Stormwater conveyance system and its receiving water bodies. Tracing the course is the first line of defense in preventing a pollution hazard to sensitive water bodies and surrounding areas.

PROCEDURE:

5. Preparation:
 - a. Understand areas of the County that may be more susceptible to illicit discharges than others
 - b. Have a record of past illicit discharges to identify higher priority areas.
 - c. Have a map of the stormwater conveyance system and outfall locations (GIS)
6. Procedure:
 - a. Identify the illicit discharge:
 - i. When called to or discover an illicit discharge, inspect the contaminated area.
 - ii. Have an idea of the drainage network or have a map handy to refer to.
 - iii. When observing a particular outfall, check the upstream outfall to observe if the illicit discharge is present.
 - iv. Note contaminated outfall for obvious illicit discharges (dumping of concrete washout, oils, solvents, chemicals, wash water, suds, odor, sewage).
 1. Note odor (sulfide, natural gas, sewage, sour smell, food oil smell, petroleum)
 2. Note appearance (oil sheen, cloudiness, suds, floatables, or "normal")
 - v. Remember only stormwater should be entering the storm drain
 - b. Trace the stormwater network to the source
 - i. Utilize dye testing,
 - ii. Observe staining on pavement
 - iii. Look around for restaurants, construction sites, or other sources
 - c. Prevent further contamination
 - i. Once identified, the discharge should be stopped immediately and violator should be spoken to based on the situation.
7. Cleanup – as necessary
 - a. If the illicit discharge is the result of a third party, the Stormwater Coordinator and Streets Department will facilitate the responsible party in necessary cleanup.
8. Documentation
 - a. File IDDE documentation in the shared drive tracking system and include photos if taken.

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

49. Characterizing the Nature of an Illicit Discharge

PURPOSE:

To ensure the discharge is documented and characterized to assist the Stormwater team prevent future occurrences.

PROCEDURE:

9. Preparation:
 - a. Prepare a spill report and ensure Summit County employees have access to it.
 - b. Ensure Summit County employees receive training on illicit discharge response.
 - c. Have a map of the stormwater conveyance system and outfall locations (GIS)
10. Procedure:
 - a. When a call or report of an illicit discharge comes through to the County, ask the following questions:
 - i. How much was discharged? (Greater than 10 gallons?)
 - ii. Did the discharge reach the storm drain?
 - iii. Responsible party?
 - iv. Suspected type of material?
 - b. If a large amount of hazardous material was spilled, Summit County Dispatch is called to contain the spill, and Summit County Health should be notified. Report to the State if the spill meets reporting requirements.
 - c. If a smaller amount of material was spilled, or if the hazard is unknown, the Stormwater Coordinator and/or Streets/Stormwater Ops. Should follow the Tracing and Illicit Discharge SOP to investigate the spill.
11. Cleanup (and containment)
 - a. If the illicit discharge is the result of a third party, the Stormwater Coordinator and Streets Department will facilitate the responsible party in necessary cleanup.
 - b. Once the discharge has been identified, it is necessary to disconnect the source from the storm drain, specific to the discharge that has occurred.
 - i. Service lateral disconnection, reconnection – lateral is connected to the wrong line; needs to be disconnected and reconnected to the right line
 - ii. Cleaning – line needs to be cleaned using flushing and a vac truck to dispose of the wash water
 - iii. Excavation and replacement.
 - iv. Manhole repair
 - v. Corrosion control coating
 - vi. Grouting
 - vii. Pipe repair
12. Documentation
 - a. File IDDE documentation in the share drive tracking system and include IDDE Report, Correspondence, and photos.

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

50. Ceasing Illicit Discharge and Prevention

PURPOSE:

After an illicit discharge has been identified and characterized, it is necessary to contain and clean up the spill.

PROCEDURE:

13. Preparation:
 - a. Prepare a spill report and ensure Summit County employees have access to it.
 - b. Ensure Summit County employees receive training on illicit discharge response.
 - c. Have a map of the stormwater conveyance system and outfall locations (GIS)
14. Procedure:
 - a. Assess the damage
 - i. Assess the impact of the illicit discharge to the storm drain system and the environment.
 - ii. Take water samples if necessary
 - iii. Notify public if health hazard is present
 - b. Identify responsible party
 - i. When the responsible party has been identified, they are immediately responsible for the damage and cleanup that has been done to the stormwater network (based on Summit County Municipal Code).
 - ii. Stormwater Coordinator will assist in facilitating the responsible party in the necessary cleanup.
 - iii. Summit County Code enforcement will intervene if necessary and collect insurance information if necessary.
 - iv. If the spill is an emergency and the responsible party has not been identified yet, Summit County may clean up, and invoice the responsible party after the incident to protect human health and the environment.
15. Prevent Future Discharges
 - a. Education to residents and businesses
 - b. Phone number on website to call – Stormwater Manager and Spills Phone number
 - c. County employee training
16. Documentation
 - a. File IDDE documentation in the share drive tracking system and include IDDE Report, Correspondence, and photos.

MISCELLANEOUS

51. Emergency Waterline Excavation Repair/Replacement Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during unplanned waterline repairs.

PROCEDURE:

1. Preparation:
 - a. Make sure service trucks are equipped with, and workers are able to deploy wattles, gravel bags, de-watering bag, or other materials for inlet protection and sediment control.

2. Process:
 - a. Slow the discharge.
 - b. Inspect flow path of discharged water.
 - c. Protect water inlet areas by placing inlet protection devices around or up stream of inlet.
 - d. Follow planned repair procedures.
 - e. Haul off spoils of excavation.
 - f. Use dewatering bags on pumps and check hourly for effectiveness.

3. Clean-up:
 - a. Repair eroded areas as needed.
 - b. Follow planned repair procedures.
 - c. Remove any inlet protection and dewatering bags and discard appropriately.
 - d. Clean up the travel path of trucked excavated material.

MISCELLANEOUS

52. Planned Waterline Excavation Repair/Replacement Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater from water line repair/replacement activities.

PROCEDURE:

1. Preparation:
 - a. Determine where discharge flow will go.
 - b. Place inlet protection at nearest downstream storm drain inlet.
 - c. Clean gutters leading to inlet.
 - d. Isolate waterline to be worked on.
 - e. Neutralize any chlorine residual before discharging water.

2. Process:
 - a. Make efforts to keep pipeline water from entering the excavation.
 - b. Direct any discharge to pre-determined area.
 - c. Backfill and compact excavation.
 - d. Haul off excavated material or stockpile nearby.

3. Clean-up:
 - a. Clear gutter/waterway where water flowed.
 - b. Clean up all areas around excavation.
 - c. Remove any inlet protection and discard appropriately.
 - d. Clean up travel path of trucked material.

MISCELLANEOUS

53. Waterline Flushing After Construction/System Disinfection with Discharge to Storm Drain (Public Utilities & Contractors) Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during waterline flushing activities.

PROCEDURE:

1. Preparation:
 - a. Determine chlorine content of discharged water and select de-chlorination equipment to be used.
 - b. Determine flow path of discharge.

2. Process:
 - a. Protect inlets in flow path.
 - b. Install de-chlorination equipment.
 - c. Sweep and clean flow path.
 - d. Use diffuser to reduce velocities.

3. Clean-up:
 - a. Pick up inlet protection.
 - b. Clean flow paths.
 - c. Remove equipment from flush point.

MISCELLANEOUS

54. Waterline Flushing After Construction/System Disinfection with Discharge with Haul Off (Used for Dust Control/Compaction) Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during waterline flushing activities.

PROCEDURE:

1. Preparation:
 - a. Determine chlorine content of discharged water.
 - b. Determine appropriate construction activity for treatment.

2. Process:
 - a. Flush to tanker and use for dust control or compaction on unpaved construction activity.
 - b. Confirm that application of water is in appropriate location.

3. Clean-up:
 - a. Remove equipment from flush point.

MISCELLANEOUS

55. Waterline Flushing for Routine Maintenance Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater during waterline flushing activities.

PROCEDURE:

1. Preparation:
 - a. Determine flow path of discharge to inlet of waterway.

2. Process:
 - a. Clean flow path.
 - b. Protect inlet structures.
 - c. Use diffuser to dissipate pressure to reduce erosion possibilities.

3. Clean-up:
 - a. Clean flow path.
 - b. Remove inlet protection.

MISCELLANEOUS

56. Swimming Pools and Spas Discharge to Stormwater System Standard Operating Procedure

PURPOSE:

To prevent pollution of stormwater when draining swimming pools and spas into a storm drain or sanitary sewer system.

General Guidelines:

- District owned manholes cannot be opened by unauthorized personnel.
- Unapproved connections to the sewer system are not allowed.
- Discharges to the sewer system of toxic substances are prohibited.
- Excess flow, if deemed to be a hazard to the treatment plant and sewer system can become regulated and/or permitted.

PROCEDURE:

1. Preparation:
 - a. With the help of code enforcement determine the best place to discharge the water from the pool/spa.
 - b. A pool or spa may be emptied into the storm water system ONLY if the chlorine content is less than one part per million and free of other chemicals.
 - i. A pool or spa may be emptied into the sanitary sewer system ONLY if permission and assistance is given by **Snyderville Basin Water Reclamation District (435) 649-7993**.
 - c. The pH level of the water must be tested prior to discharge and must fall within a range of 7 or 8.
 - d. The water must not be cloudy or discolored and must be free of algae or other contaminants.
 - e. Do a visual inspection of the pathway the water will take to ensure contaminants, trash, or soils or other sediments will not be washed into the storm water system. Clean as needed.
2. Process:
 - a. Clean, as needed, any storm water structure that will be used to convey the water into and through the storm water system.
 - b. Drain the pool or spa to the location determined by Public Works officials using the pool system's pumps or by gravity.
 - c. Carefully always watch the draining process to ensure the water flow is going as planned and does not overload the system.
 - d. Water being discharged may not cause erosion and may not go into a neighbor's property.
3. Documentation:
 - a. Keep logs of pools and spas drained.
 - b. Record the amount of water drained and where the water was drained to.
 - c. Keep any notes or comments of any problems.

MISCELLANEOUS

57. Floor Drain Discharges from Public Drinking Water Well Houses & Pump Houses

PURPOSE:

To minimize contaminant discharges into floor drains in well houses and pump houses.

PROCEDURE:

1. Preparation:
 - a. Conduct regular training to reinforce proper housekeeping.
 - b. Locate and map all drains at each facility.
 - c. Ensure proper PPE is available and worn prior to handling chemicals, as necessary.
 - d. Understand and follow SDS for handling of chemicals and other hazardous products.

2. Process:
 - a. Remove or shelf any chemicals unrelated to water supply treatment distribution in the well/pump house.
 - b. Use secondary containment or protective barriers for the storage of water supply treatment chemicals.
 - c. Install berms around all areas with pumps or engines that require periodic oil/fluid changes
 - d. Temporarily isolate and protect all floor drains during work that uses potential contaminants.

3. Clean-up:
 - a. Immediately clean all potential contaminant spills/leaks to the well/pump house floor using dry cleaning methods (i.e., rags, absorbents).
 - b. Properly dispose of the collected wastes.
 - c. Keep the well/pump house floor clean.
 - d. Floors should be dry-cleaned by sweeping to remove dirt and debris.
 - e. Water should be used for cleaning only, when necessary, at which time floor drains must be temporarily sealed/isolated and wash water contained, collected and properly disposed.

58. Industrial and Commercial Facilities Storm water Pollution Prevention Program and Inspection

PURPOSE:

To ensure the functionality of storm water BMPs through routine inspection, assessment and cleaning.

Procedure

1. Preparation:
 - a. Obtain Storm drain network plans and SWPPP plan.
 - b. Review prior inspection to establish historic or site-specific information.
 - c. Obtain BMP specific design criteria for maintenance intervals and maintenance procedure.
 - d. Review industrial and commercial operations at site and identify any potential pollutant sources.

2. Process:
 - a. Inspect storm drain network and BMPs for signs of damage and functionality
 - b. Observe during storm event if possible.
 - c. Observe downstream locations or Outfalls to determine effectiveness of BMP's.
 - d. Mark findings in Post Construction BMP Inspection form.

3. Clean-up
 - a. Schedule vac truck cleaning or other appropriate cleaning method and dump all the sediment into a drying pond landfill.

4. Documentation
 - a. Complete Post Construction BMP Inspection form and
 - b. Record the amount of waste collected and condition of BMP's
 - c. Schedule follow up inspection if necessary or next routine inspection.
 - d. Notify state DEQ if activity at site falls into specific SIC codes for further permitting.

MUNICIPAL PRACTICES

59. Provide Training to Employees Standard Operating Procedure

PURPOSE:

To inform municipal employees who are likely to work/impact stormwater quality.

PROCEDURE:

1. Preparation:
 - a. Map out storm drain system in GIS so that each employee can be aware of the network.
 - b. Implement and operations and maintenance program (O&M)
2. Process:
 - a. Train employees on how to reduce pollutant run off from operated facilities and operations using Brainier.
 - b. Train employees who have primary construction operation, or maintenance job roles about standard operating procedures.
 - c. Keep and inventory of operated facilities and storm water controls.
 - d. Provide follow-up training as needed to address changes and procedures.
3. Clean-up
 - a. None.
4. Documentation
 - a. Keep record of those who have been trained.
 - b. Keep any notes or comments of any problems.

MUNICIPAL PRACTICES

60. Monthly, Semi-Annual, and Annual Inspections Standard Operating Procedure

PURPOSE:

To inform about the types of inspections that need to be done on a regular basis. Inspection of stormwater and drainage systems.

PROCEDURE:

1. Preparation:
 - a. Map out existing storm drain system.
 - b. Watch for possible storm drain system contaminates.
 - c. Train employees at High Priority Facilities on inspection requirements.

2. Process:
 - a. Perform Monthly visual inspections of “high priority” facilities to minimize the potential for pollutants. Perform a visual inspection based on performance of Stormwater BMPs. Record deficiencies and corrective actions in ComplianceGO
 - b. Perform Semi-Annual comprehensive inspections of “high priority” facilities, including all stormwater controls, waste storage areas, dumpsters, vehicle and equipment maintenance areas, and similar pollutant generating areas using the semi-annual inspection form, and store on ComplianceGO
 - c. Annual visual observations of stormwater discharge at “high priority” facilities; by looking for any possible contaminants to the storm drain system. Observe for issues (color, foam, sheen, turbidity) that can be associated with pollutant sources or controls, and remedy. Record deficiencies and corrective actions in ComplianceGO
 - d. Look for evidence of spills and immediately clean them to prevent contact with runoff.

3. Clean-up
 - a. None.

4. Documentation
 - a. Keep any notes, photos, or comments of any problem areas in ComplianceGO

60. a) Monthly High Priority Inspections Standard Operating Procedure

PREPARATION

- Identify "High Priority" facilities and a map of the location.
- Become familiar with potential pollutants at the site from the SWPPP and utilize appropriate PPE when cleaning up spills, garbage, and debris.

PROCESS

- Follow SOP and complete visual inspection at least monthly.
- Walk the perimeter of the facility and inspect areas of the facility where industrial materials or activities could be exposed to stormwater, specifically:
 - Is the parking area free of sediment/dirt/erosion leaving site boundaries?
 - Are chemicals/materials properly stored, and closed/contained if outside?
 - Are there leaks or spills from equipment, drums, tanks, sediment?
 - Are there any failed control measures that need replacement?
 - Are waste areas clean and secure with no leaks?
- Look for evidence of spills at the site. If found, assess the area to identify the source.
- Check to ensure the storage areas are clean.

CLEAN-UP

- If a spill is found, clean up spill immediately to prevent contact with precipitation or runoff.
- Remedy deficiencies when found.
- If a large spill or discharge, fill out spill report form and contact the Stormwater Coordinator listed on the form, and initiate spill response.

DOCUMENTATION

- Fill out Monthly High Priority Inspection Log for facility and mark that the monthly inspection has been completed logged in ComplianceGO.
- If a deficiency was found, make note on the Monthly High Priority Inspection Log located in the folder above.
- Whenever possible take photographs of the suspected illicit discharge and file in the appropriate folder noted above.

60. b) Semi-Annual High Priority Inspections Standard Operating Procedure

PREPARATION

- Identify "High Priority" facilities and map of location
- Become familiar with potential pollutants at the site and utilize appropriate PPE when cleaning up spills, garbage, and debris.

PROCESS

- Follow the Semi-Annual Comprehensive Inspections form checklist at least two times a year
- Pay specific attention to:
 - Waste storage areas,
 - Dumpsters,
 - Vehicle and equipment maintenance areas,
 - Vehicle and equipment wash areas,
 - Fueling areas,
 - Material handling areas,
 - Chemical storage areas, and
 - Similar pollutant generating areas
- Look for evidence of spills at the site. If found, assess the area to identify the source.

CLEAN-UP

- If a spill is found, clean up spill immediately to prevent contact with precipitation or runoff, and ensure corrective action is taken to prevent from occurring again.
- If a large spill or discharge, fill out spill report form and contact the Stormwater Coordinator listed on the form, and initiate spill response.

DOCUMENTATION

- Fill out a Semi-Annual comprehensive inspection sheet for facility and save in ComplianceGO
- Mark that the semi-annual comprehensive inspection has been completed in the log located in ComplianceGO
- Whenever possible take photographs of the suspected illicit discharge and save in appropriate folder.

60. c) Annual High Priority Visual Inspections of Stormwater Discharges Standard Operating Procedure

PREPARATION

- Identify "High Priority" facilities and map of location
- Become familiar with potential pollutants at the site and utilize appropriate PPE when cleaning up spills, garbage, and debris.

PROCESS

- At least once per year during a rain or snow melt event, walk the perimeter of the facility and inspect all stormwater inlets/stormwater discharges.
- Visually observe the quality of storm water discharge during the first half hour of a storm, paying specific attention to:
 - Color
 - Smell
 - Sheen
 - Foaming
 - Turbidity
 - Soil build-up

CLEAN-UP

- If evidence of illicit discharge, investigate source and remedy as soon as possible, but at a minimum before the next storm event.
- If a spill is found, clean up spill immediately to prevent contact with precipitation or runoff, and ensure corrective action is taken to prevent from occurring again.
- If a large spill or discharge, fill out spill report form and contact the Stormwater Coordinator listed on the form, and initiate spill response.

DOCUMENTATION

- Mark that the Annual Rain Event Visual inspection has been completed in ComplianceGO
- Mark any identified deficiencies observed, if investigation was required to determine the source, and the corrective actions taken to remedy the deficiencies.
- Whenever possible take photographs of the suspected illicit discharge and save in appropriate folder.

MUNICIPAL PRACTICES

61. Flood Control and Water Quality Impacts Standard Operating Procedure

PURPOSE:

Even though the County does not have any flood controls and does not anticipate any in the future. If the County ever does need to install flood controls, we will assess water quality at that time.

PROCEDURE:

1. Preparation:
 - a. Even though it is not anticipated, the City should utilize the following process to assess water quality impacts:.
2. Process:
 - a. Review Storm Drain Master Plan for opportunities to include water quality projects or water quality aspects to Capital Improvement Projects.
 - b. Update Master Plan to include water quality issues.
 - c. During conceptual design review meetings – ask the questions –
 - i. *a. Is there opportunity to include water quality aspects to this project?*
 - ii. *Are there any highly impacted areas?*
 - iii. *Are there low-impact development concepts and ideas that might work for this project?*
 - iv. *Can we limit directly connected impervious areas (DCIA) on this project?*
 - v. *What could be done to minimize runoff?*
3. Train all employees, contractors and developers on SOP's and BMP's for all projects.
4. Include SWPPP discussion as part of the agenda for preconstruction meetings for all projects.
5. Look for “green money” funding options for water quality aspects of all projects.
6. Follow normal SWPPP review process/checklist review for all projects.

MUNICIPAL PRACTICES

62. Retrofitting of existing Summit County sites and Water Quality Impacts Standard Operating Procedure

PURPOSE:

To assess water quality impacts in the retrofitting of existing sites the County owns.

PROCEDURE:

1. Preparation:
 - a. When retrofitting of a facility is necessary, assess existing County sites and management devices to determine whether changes or additions should be made to improve water quality.
2. Process:
 - a. Incorporate a ranking of the County owned facilities based on:
 - i. Proximity to waterbody
 - ii. Current assessment of closest waterbody to site
 - iii. Hydrologic condition of receiving waterbody
 - iv. Proximity to sensitive areas
 - v. Site further enhanced by retrofitting
3. Clean-up:
 - a. Incorporate a SWPPP, which will include cleanup practices during construction
4. Documentation:
 - a. Keep log of ranking of facility and enhanced improvements.
 - b. Keep a copy of the SWPPP used for re-construction.
 - c. Use “before” and “after” photographs to document activities as applicable.

MUNICIPAL PRACTICES

63. Summit County Event Clean-up Standard Operating Procedure

PURPOSE:

To ensure that debris from Events in Summit County are cleaned up directly after the event.

PROCEDURE:

1. Preparation:
 - a. Ensure staff is scheduled or contracted out to be available following Municipally- sponsored events such as large outdoor festivals, parades, or street fairs for cleanup.
2. Process:
 - a. Clean up debris directly following event.
3. Clean-up
 - a. Dispose of trash into appropriate containment.
 - b. If not cleaned up directly following the event, inform the responsible party and clean up as soon as found.

MUNICIPAL PRACTICES

64. Green Waste Management Standard Operating Procedure

PURPOSE:

To ensure that residents have an appropriate location to dispose of green waste after emergency weather situations.

PROCEDURE:

1. Preparation:
 - a. Watch for large storms in the forecast that will likely cause green waste (trees, branches, leaves, etc.)
 - b. Prepare after the holidays for Christmas tree green waste.
 - c. Post on social media about the opportunity for residents to bring waste, free of charge.

2. Process:
 - a. After a storm event, or Christmas a dump shall be set up for residents to dispose of their green waste.
 - b. The green waste will be chipped and taken to Summit County 3 Mile Landfill for disposal.

APPENDIX A

Utah Pollutant Discharge Elimination System (UPDES) General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) No. UTR090000 (Updated May 12th, 2021, expires May 11th, 2026)

<https://documents.deq.utah.gov/water-quality/facilities/general-storm-water-permit-common-plan/DWQ-2021-008110.pdf>

APPENDIX B

STORMWATER MANAGEMENT BMP SCHEDULE OF LONG-TERM MAINTENANCE IN SUMMIT COUNTY

Activity	Frequency	Notes
Inlet and Catch basin Structures Inspection	Annually	Inspect inlets and catch basins for Structural integrity, pollutants and proper functionality. This is also done to establish a baseline for cleaning schedule. Perform annual maintenance in the fall months from the top of the system to the bottom, in other words the highest to the lowest point to achieve the highest level of maintenance and lowest impact to water quality.
Outlet and Outfall Structures	Annually	Outlet structures should be inspected during dry weather season for signs of damage or reduced functionality from previous winters.
Catch basin Cleaning	As Needed	Cleaning should be done annually to remove seasonally accumulated pollutant loads. Catch basins which have a higher frequency of pollutants or reduced load capacities require more frequent cleaning.
Pond Inspection and Cleaning	As Needed	Detention or Retention ponds should be inspected for accumulated sediment levels. Pond cleaning will vary depending on yearly precipitation.
Vegetation clearing and removal	As Needed	Vegetation that is reducing the effectiveness of storm water management structures should be cut or removed seasonally to ensure functionality. Vegetation that is part of a BMP should be cut or removed in accordance with BMP design.
Trash and Debris removal	As Needed	Trash and Debris should be removed on a regular basis. Trash removal may be more frequent depending on weather conditions.
Conveyance structure cleaning	As Needed	Conveyance structures such as ditches and swales should be inspected for accumulating sediment of foreign objects. Areas with higher sediment loads may need more frequent inspection and cleaning.

Appendix B BMP Design Specifications

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List of Temporary and Permanent Erosion/Sediment Controls

This list is not to be construed to be the limit of available BMPs, only as a partial list, and as examples which may be employed.

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

(21) Material Storage

(22) Waste Disposal

REVEGETATION

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

Temporary Seeding

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

Permanent Seeding

- Grade and shape the area to be seeded so that it will drain properly and accommodate seeding equipment. If slopes are steeper than 3:1, the use of hydraulic seeding equipment is encouraged.
- Loosen compacted soil by racking, or discing where hydraulic seeding will not be used, to provide for seed retention and germination.

C1-3

- Spread at least 3 inches of topsoil, if required, before seeding. If topsoil is required, the subsoil should be serrated or disced to provide an interface.
- Apply seed and fertilization suitable for the area and season. The seed species and fertilization requirements must be developed by a professional or the local Soil Conservation Service Office.

MAINTENANCE :

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

MULCHING

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS :

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

INSTALLATION :

- Rough area to revive mulch to create depressions that mulch material can settle into.

C1-4

- Apply mulch to required thickness and anchor as necessary.

Recommended Application Rates:

Straw: 2-3 bales/1000 square feet (90-120 bales/acre)

Wood Fiber: 25-30 pounds/1000 square feet (1000-1500 pounds/acre)

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

MAINTENANCE:

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

Recommended Application Rates for Mulching.

Material	Application	Depth	Comments
<u>Gravel</u> : Washed 3/4" to 1 1/2"	9 cu yd/1000 sq ft	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 sq ft	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 sq ft	1 inch (Min.)	For critical areas, double application rate; Limit to slopes <3% and < 150 feet

GEOTEXTILES

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS:

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

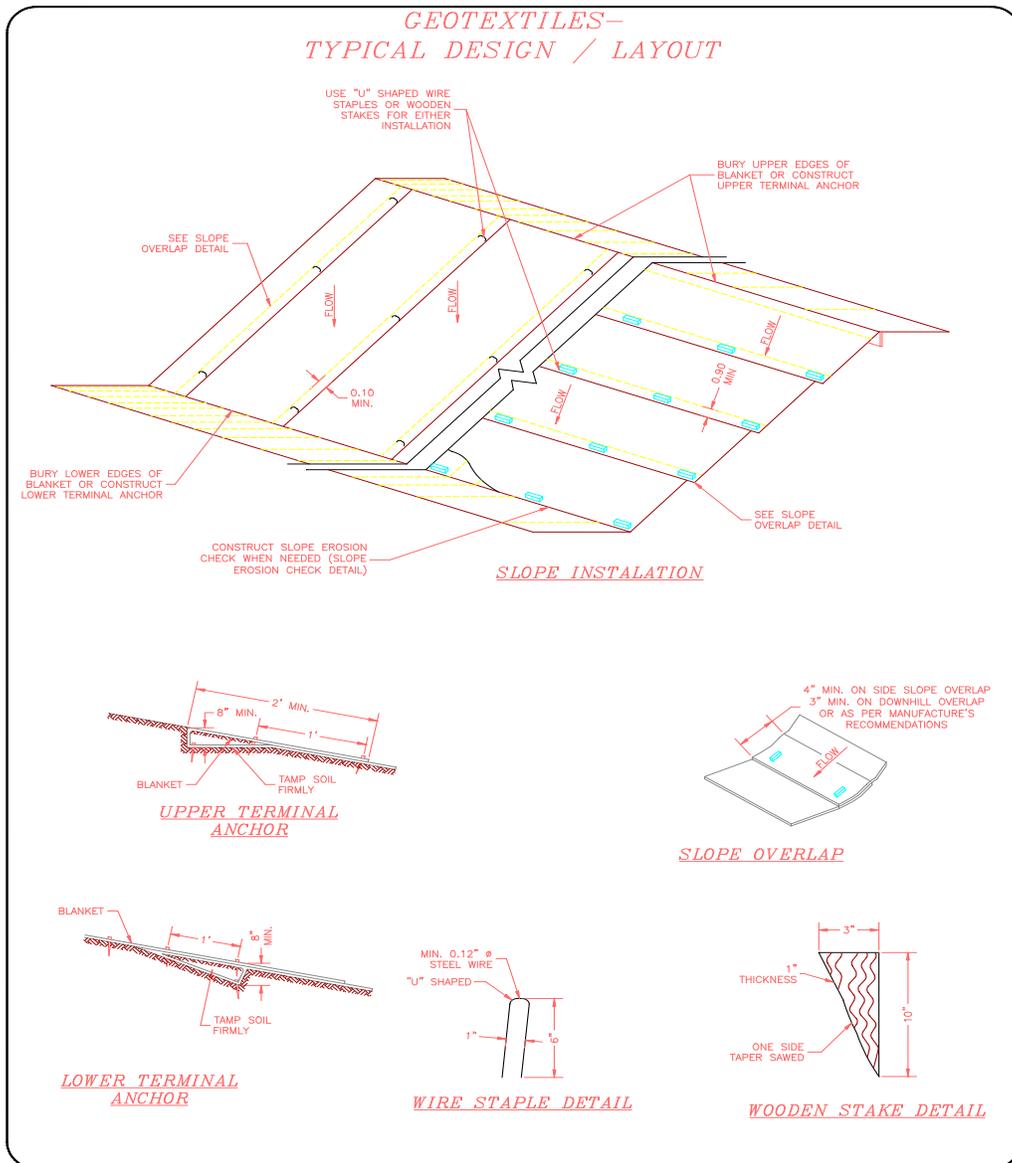
INSTALLATION:

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

C1-6

MAINTENANCE:

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



SURFACE ROUGHENING

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

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

APPLICATION:

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

LIMITATIONS:

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

CONSTRUCTION:

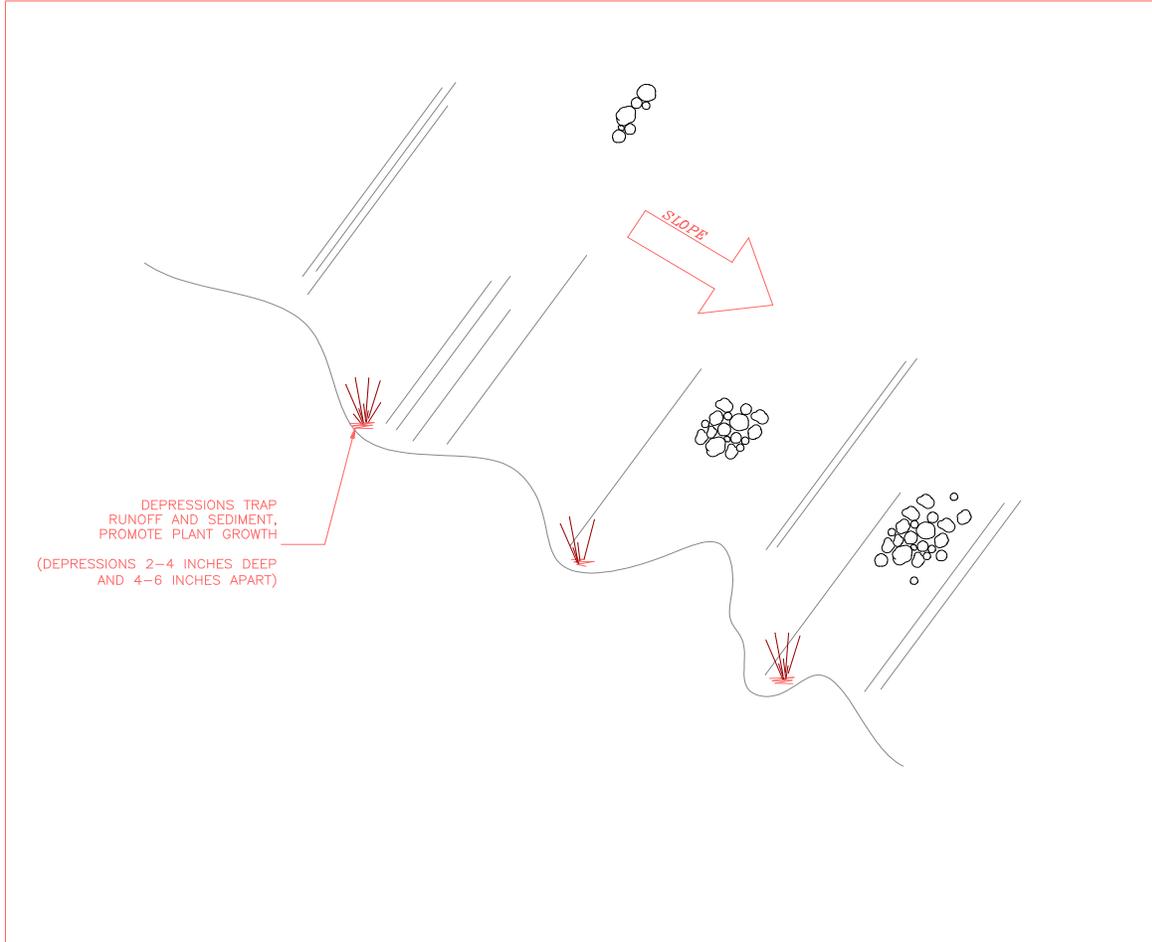
- Surface should be left in rough condition during initial earthwork activity.
- Surfaces that have become smoothed or compacted due to equipment traffic should be roughened by use of disks, spring harrows, teeth on front end loader, or similar, operating along the contour of the slope. Tracking (by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

MAINTENANCE:

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

SURFACE ROUGHENING

*TYPICAL
DESIGN LAYOUT*



SILT FENCE

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION :

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

MAINTENANCE :

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

STRAW BALE BARRIER

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

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

APPLICATION :

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

LIMITATIONS :

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

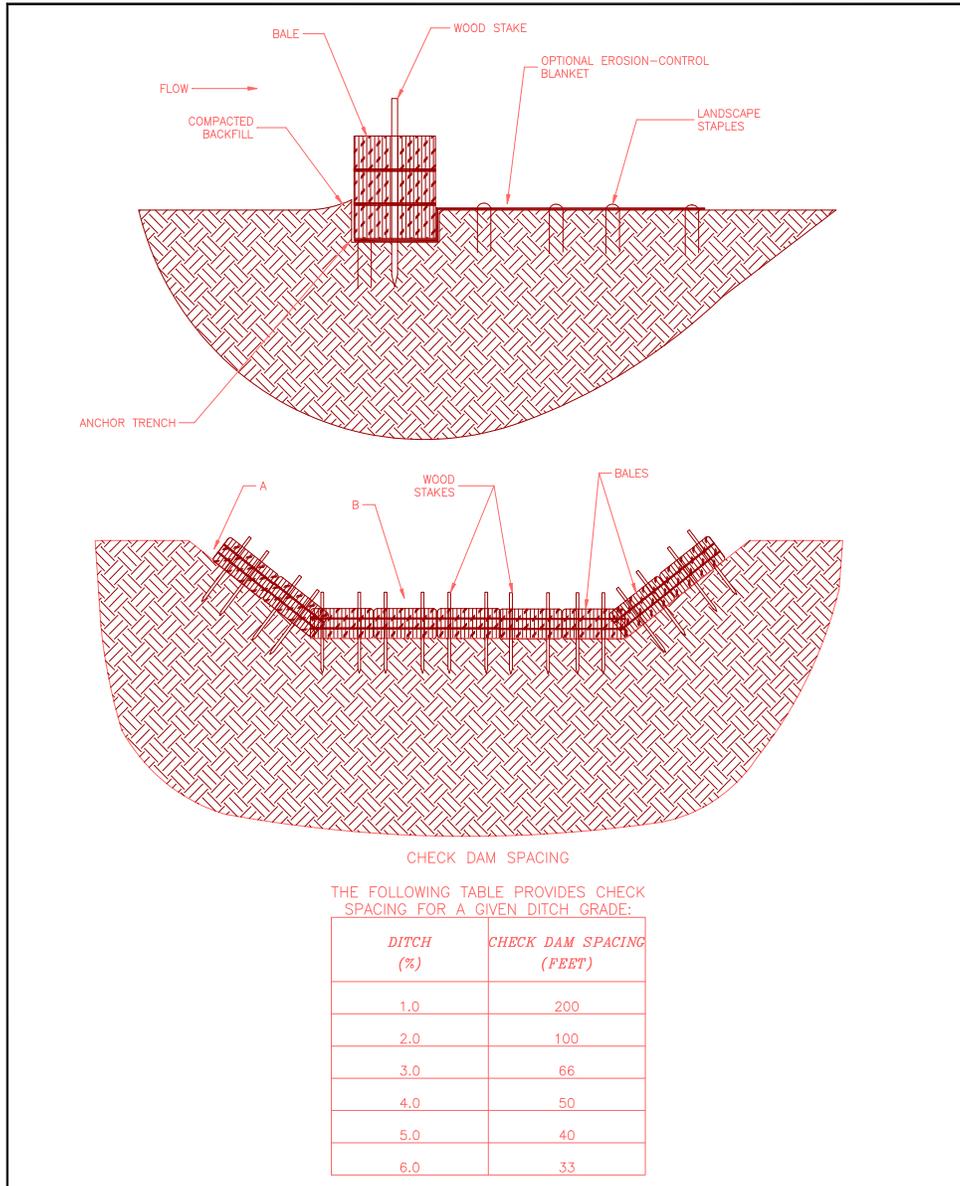
INSTALLATION :

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

MAINTENANCE :

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

*STRAW BALE CHECK DAM
TYPICAL DESIGN
LAYOUT*



STABILIZED CONSTRUCTION ENTRANCE

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

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

APPLICATION:

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

LIMITATIONS: Not listed.

INSTALLATION:

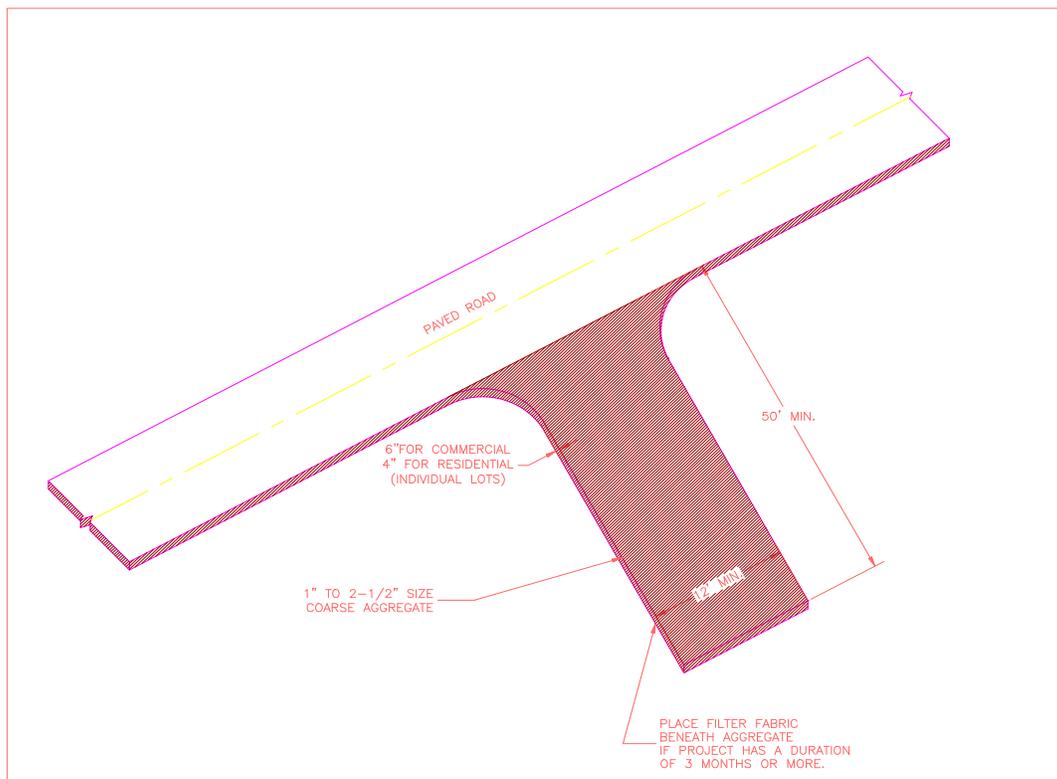
- Clear and grub area and grade to provide slope shown for driveway, or access/intersection. If adjacent to waterway, use a maximum slope of 2%.
- Compact subgrade and place filter fabric if required.
- Place coarse aggregate, 1 to 2 ½ inches size, to a minimum depth of 6 inches for commercial projects,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

MAINTENANCE:

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

STABILIZED CONSTRUCTION ENTRANCE

*TYPICAL DESIGN
LAYOUT*



DIVERSION DITCH/DIKE

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

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

APPLICATION :

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

LIMITATIONS :

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

INSTALLATION :

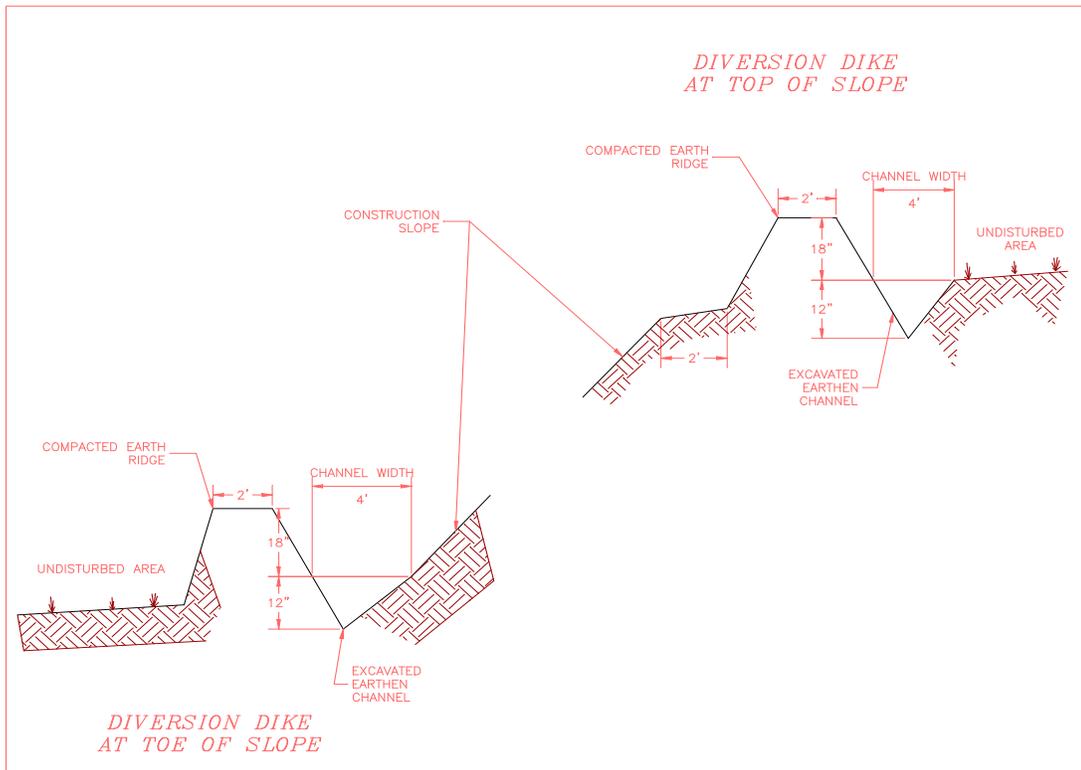
- Clear and grub area for ditch/dike construction.
- Excavate channel and place soil on down gradient side.
- Shape and machine compact excavated soil to form ditch/ridge.
- Place erosion protection (Riprap, mulch, appropriate geotextiles) at outlet.
- Stabilize channel and ridge as required with mulch,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

MAINTENANCE :

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

DIVERSION DIKE

TYPICAL DESIGN LAYOUT



WATER BAR

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

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

APPLICATION:

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

LIMITATIONS:

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

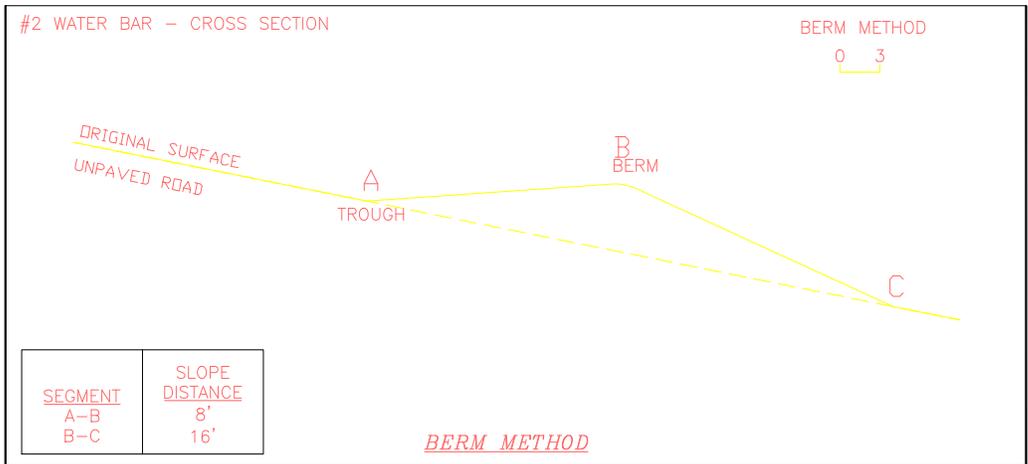
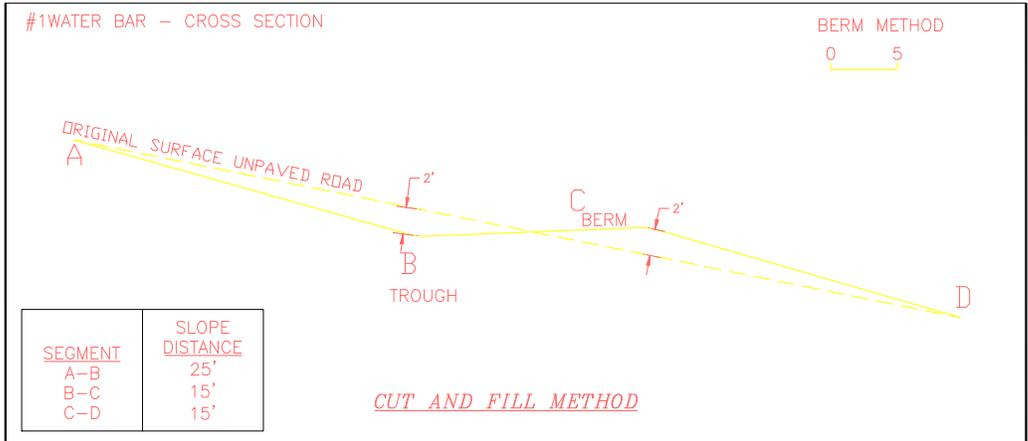
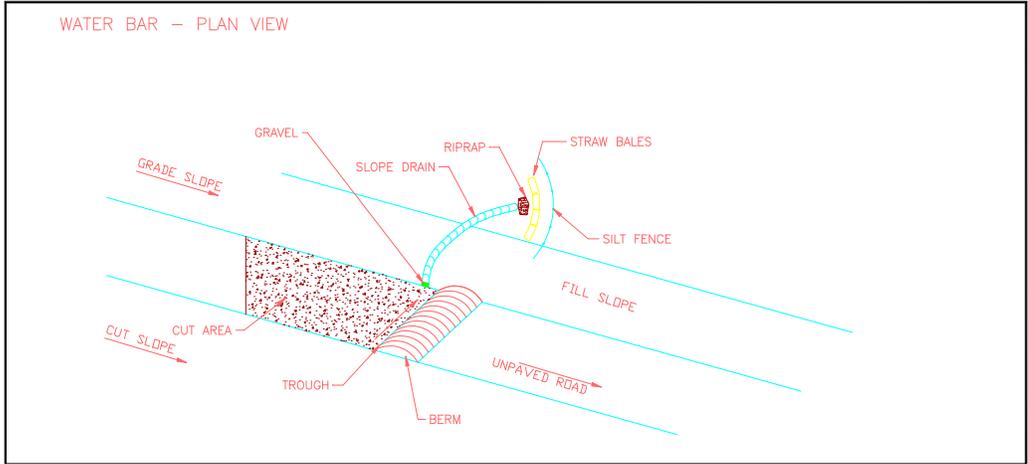
INSTALLATION:

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

MAINTENANCE:

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

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STORM DRAIN INLET PROTECTION

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

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

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

LIMITATIONS:

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

INSTALLATION:

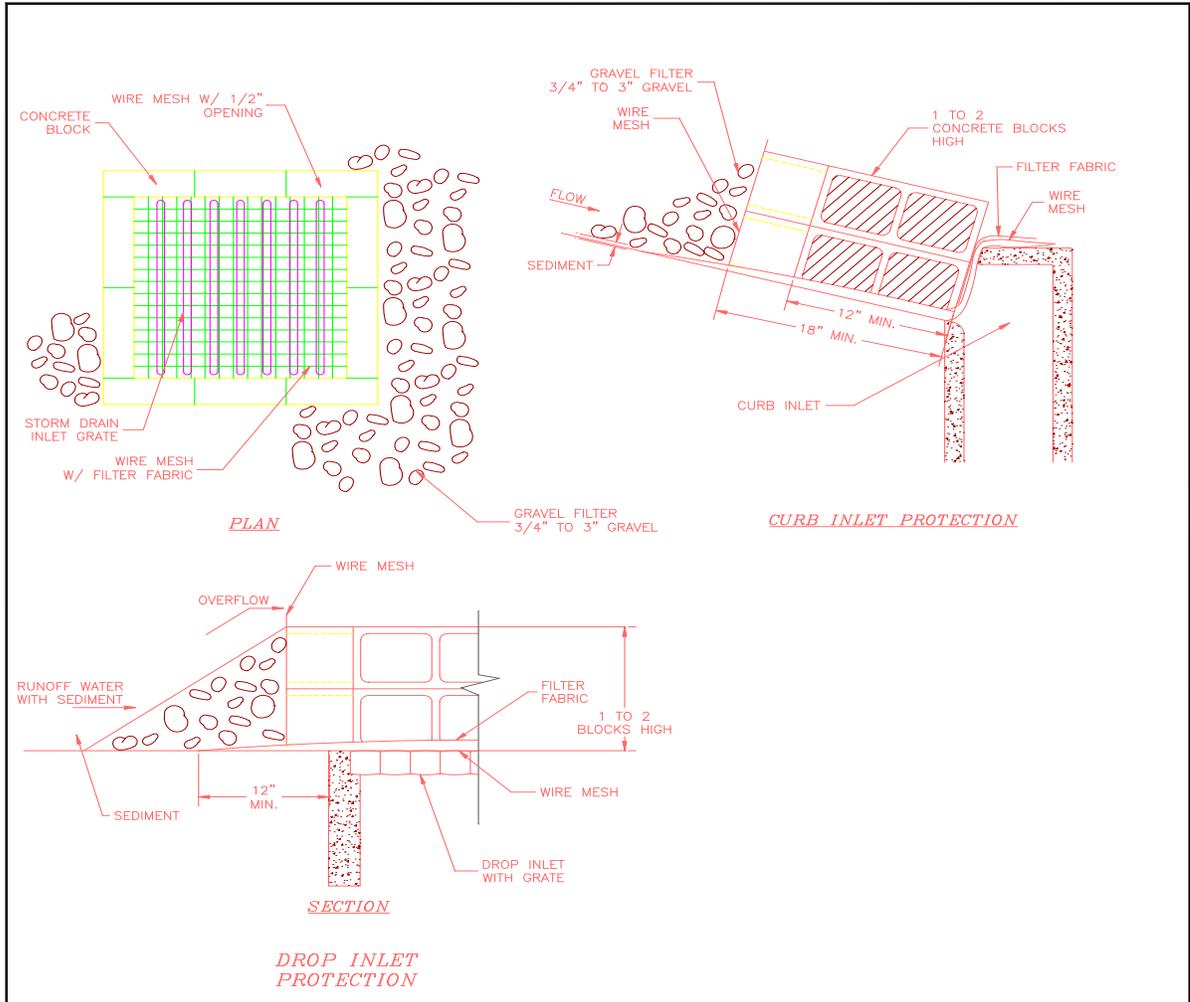
- Place wire (with ½ inch openings) over the inlet extending 12-inches past inlet opening. Place filter fabric over mesh.
- Place concrete blocks around the inlet with openings facing outward. Stack blocks to minimum height of 12-inches and a maximum height of 24-inches.
- Place wire mesh around outside of blocks. Place gravel (¾ inch to 3 inches) around blocks.

MAINTENANCE:

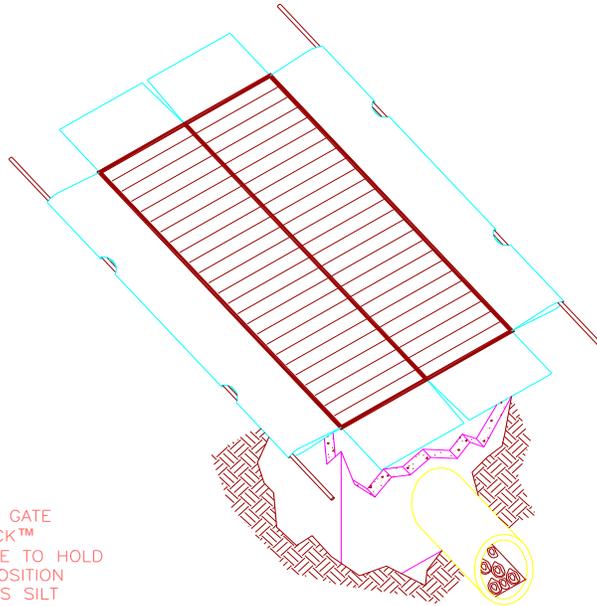
- Inspect inlet protection after every large storm event and at a minimum of once monthly.
- Remove sediment accumulated when it reaches 4-inches in depth.
- Replace filter fabric and clean or replace gravel if clogging is apparent.

INLET PROTECTION

TYPICAL DESIGN LAYOUT



SILTSACK™



- REMOVE DRAIN GATE
- INSERT SILTSACK™
- REPLACE GRATE TO HOLD SILTSACK IN POSITION
- SILTSACK TRAPS SILT
- REMOVE FILLED SILTSACK (WITH FRONT-LOADER OR OTHER EQUIPMENT)
- LIFT DUMP STRAPS
- CLEAN AND REUSE OR DISCARD AND REPLACE
- SIZED TO FIT ANY SIZE OR SHAPE CATCH BASIN
- ALL SEAMS DOUBLE STICHED
- PERMEABILITY- REGULAR FLOW SILTSACK -40 GAL./MIN./FT²
- HIGH FLOW SILTSACK-200GAL./MIN./FT²
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1801-A WILLIS ROAD
RICHMOND, VA 23237

STRAW BALE DROP-INLET BARRIER

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

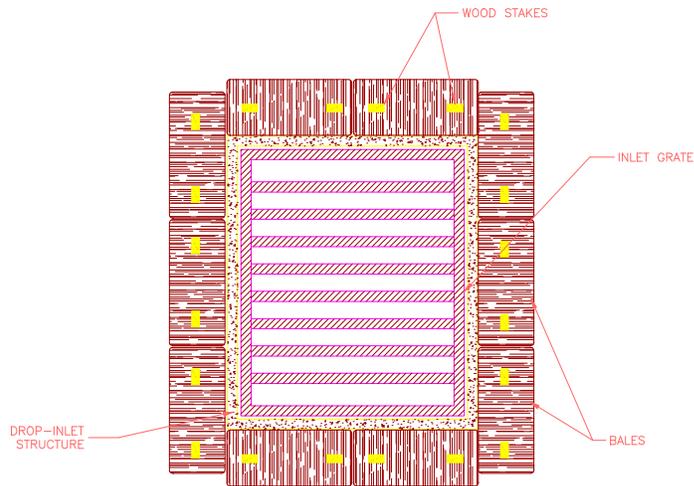
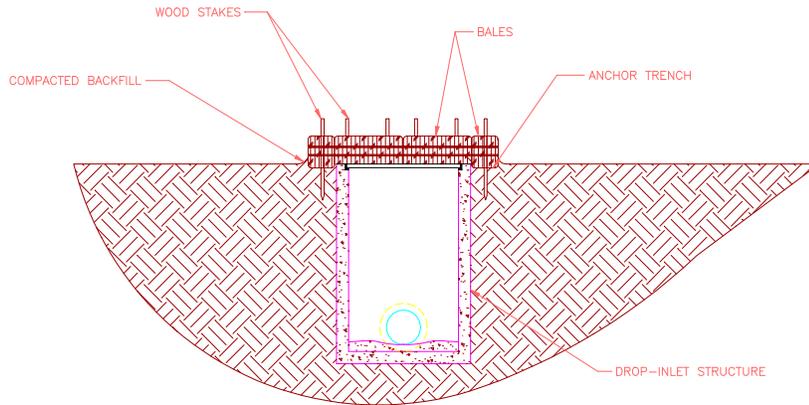
MAINTENANCE:

- Inspect inlet protection after every large storm event and at a minimum of once weekly.

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- Remove sediment accumulated when it reaches half the height of the bale.
- Replace bales which become damaged.
- Replace filter sack (if used) if clogging is apparent.

*STRAW BALE DROP-INLET BARRIER
INSTALLATION*



BRUSH BARRIER

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

PURPOSE: To trap sediment and filter construction runoff.

APPLICATION:

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

LIMITATIONS :

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

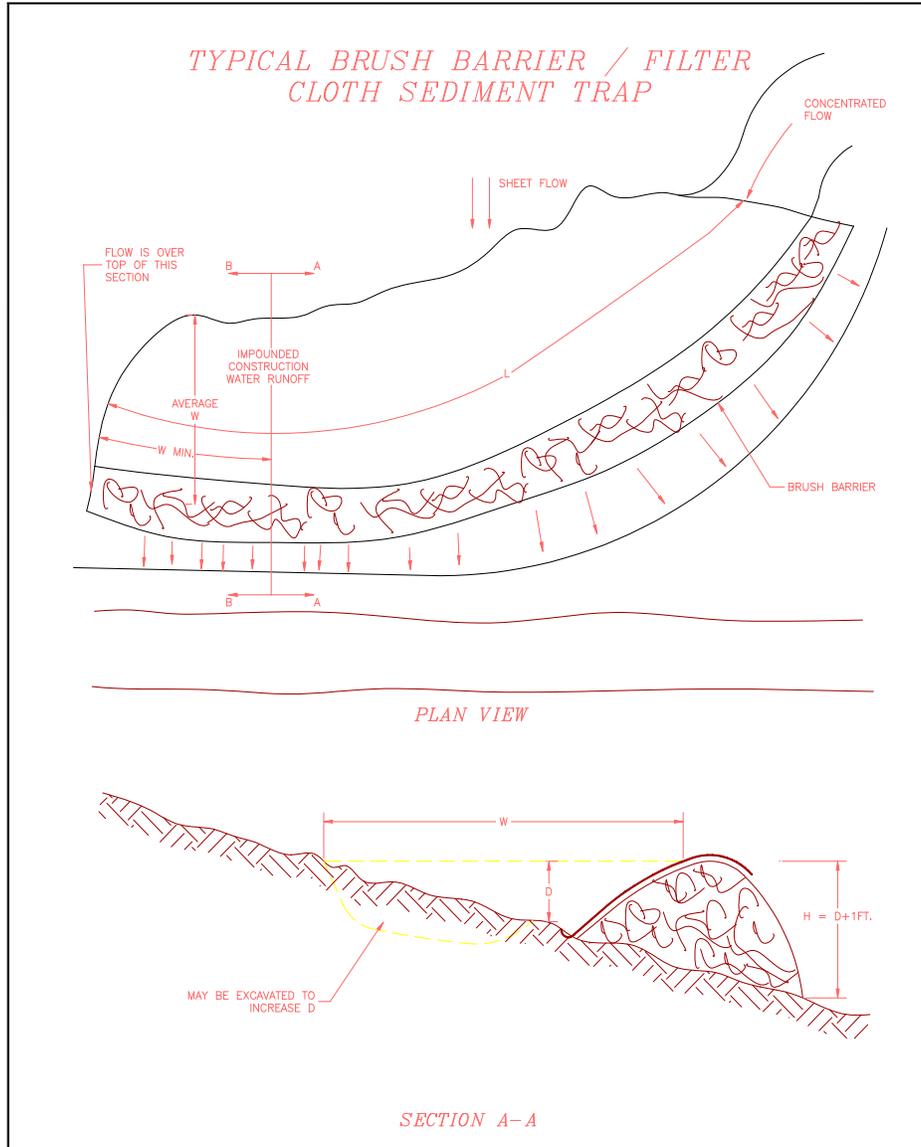
INSTALLATION:

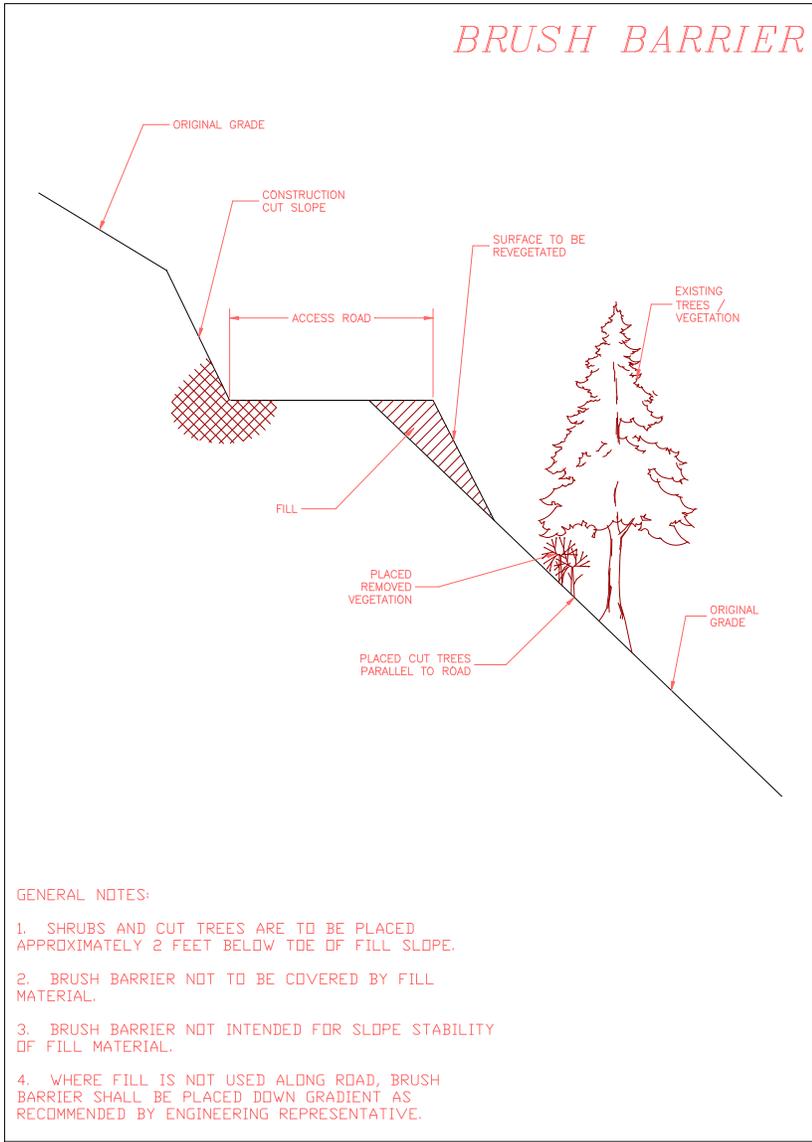
- Construct barrier with trimmings, limbs, and brush and perform necessary trimming.
- Construct small trench (8 inches wide and 8 inches deep) on front side of barrier.
- Cut filter cloth to proper size and place over brush.
- Bury the filter cloth to prevent undermining.
- Attach filter cloth to brush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

MAINTENANCE:

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

*BRUSH BARRIER
TYPICAL DESIGN
LAYOUT*





GRAVEL CHECK DAMS

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

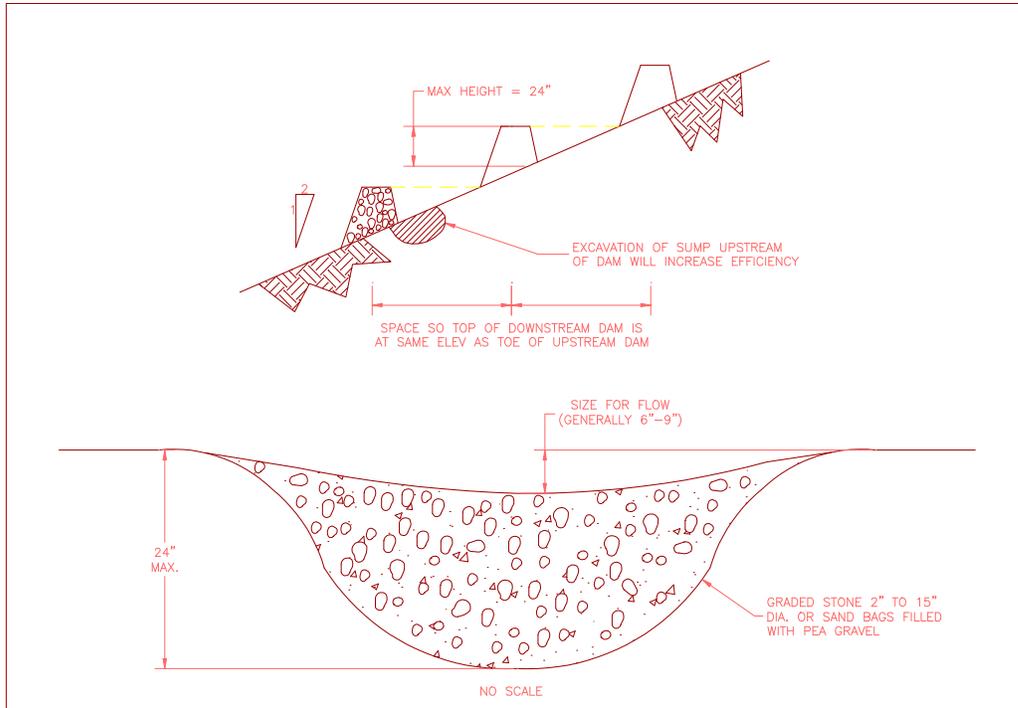
- Prepare location of dam by removing any debris and rough grading any irregularities in channel bottom.
- Place rocks by hand or with appropriate machinery, do not dump.
- Construct dam with center lower to pass design flow.
- Construct 50% side slopes on dam.

MAINTENANCE:

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

GRAVEL CHECK DAMS

TYPICAL DESIGN LAYOUT



<i>DITCH GRADE (%)</i>	<i>CHECK DAM SPACING (FEET)</i>
5.0	60
6.0	50
7.0	43
8.0	36
9.0	33
10.0	30

STRAW BALE CHECK DAMS

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

MAINTENANCE:

- Inspect dams daily during prolonged rainfall, after each major rain event and at a minimum

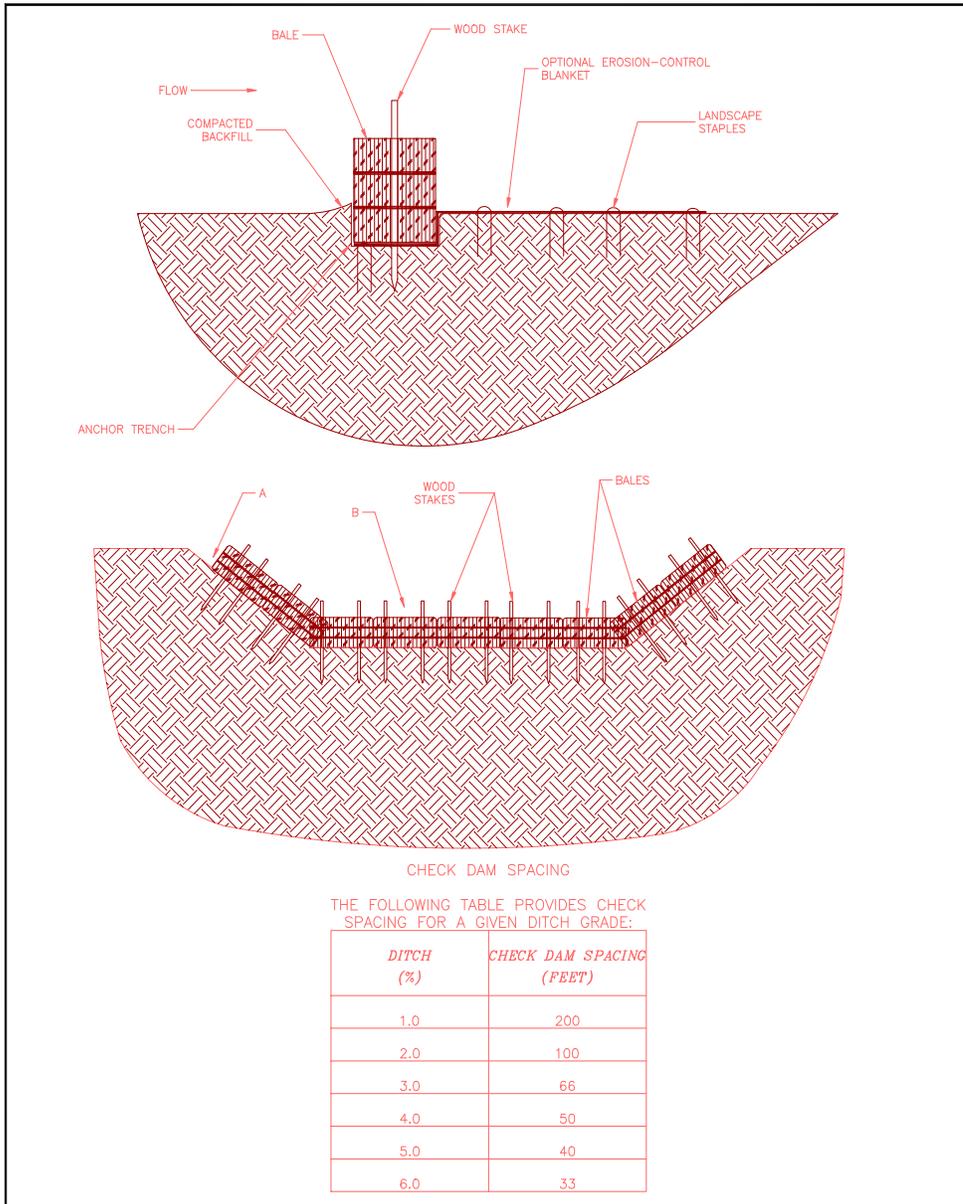
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of once monthly.

- Remove any large debris and repair any damage to dam, channel, or side slopes.
- Remove accumulated sediment when it reaches one half the height of the dam.

STRAW BALE CHECK DAM

TYPICAL DESIGN LAYOUT



SLOPE DRAIN

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

PURPOSE:

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

APPLICATION:

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

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

INSTALLATION:

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

Maximum Drainage Area (Acres)	Pipe Diameter (inches)
0.50	12
0.75	15
1.00	18

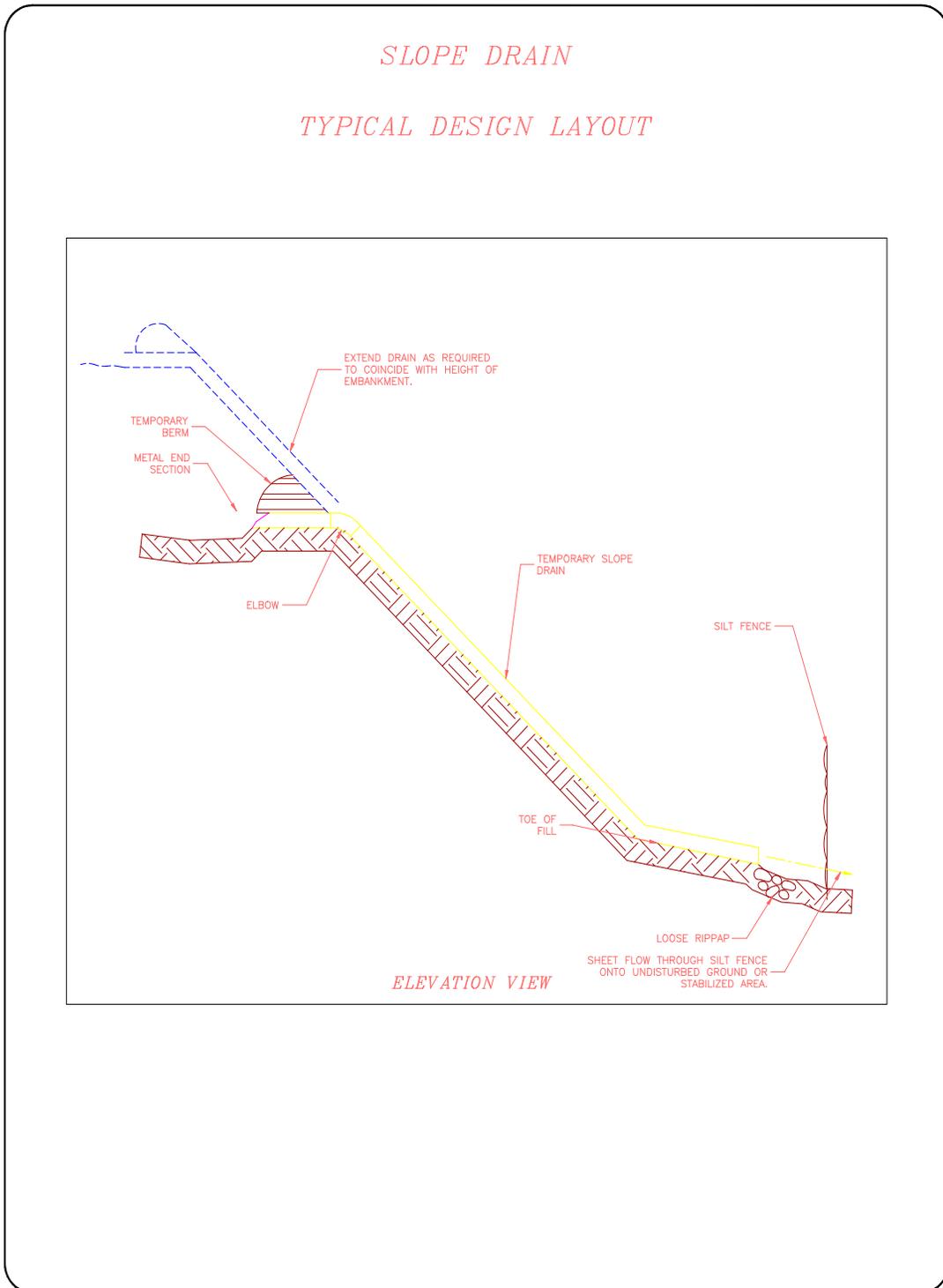
- Place slope drain on undisturbed or well-compacted soils.
- Place filter cloth under the inlet, extend it to 3 to 6 feet in front of the inlet, and key it in 6 to 8 inches on all sides to prevent erosion. A 6 to 8 inches metal toe plate may also be used for this purpose.
- Securely stake the drain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

MAINTENANCE:

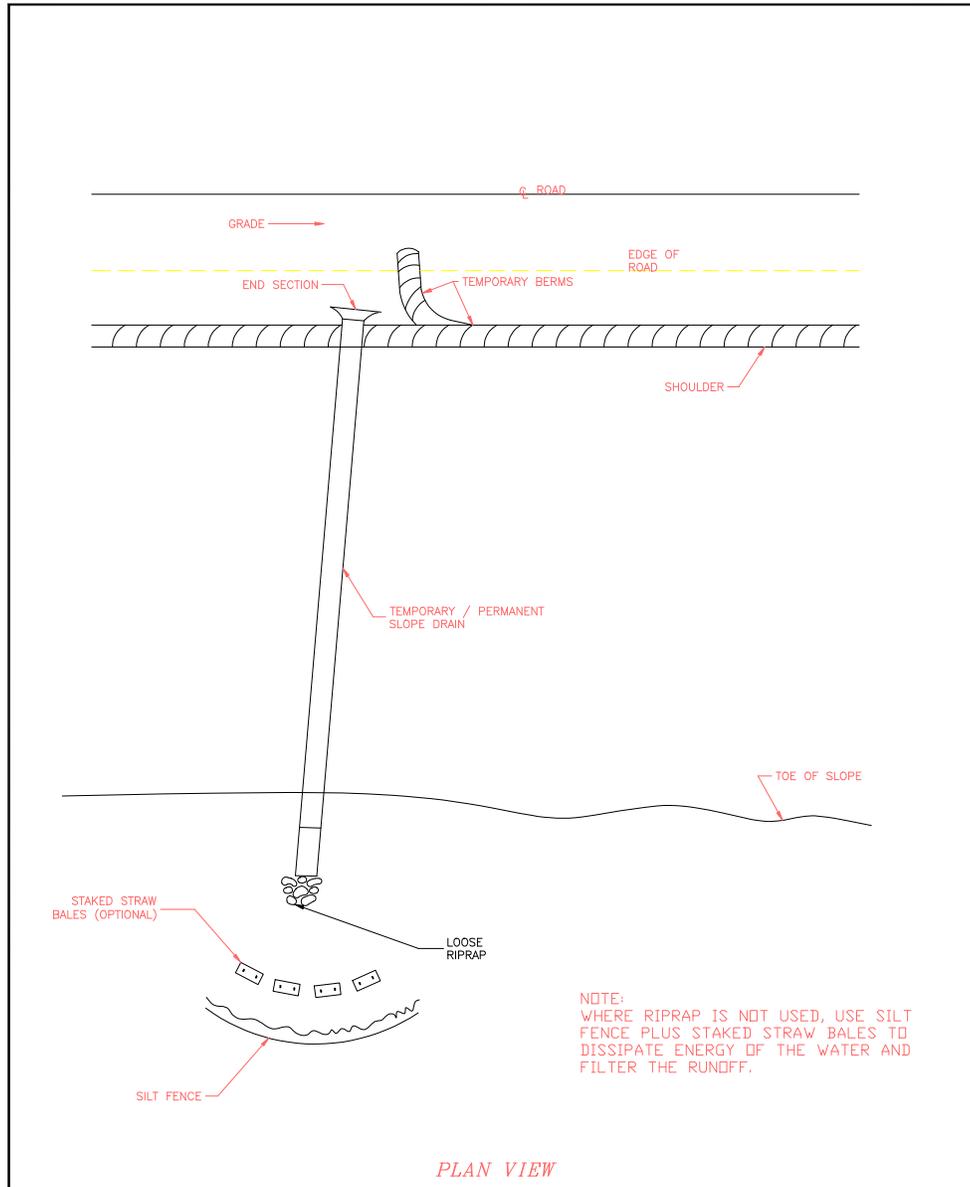
- Inspect the slope drain regularly and after every storm. Check to see if water is bypassing the inlet or undercutting the inlet or pipe. If necessary, install head walls or sandbags to

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- prevent bypass flow.
- Check for erosion at the outlet point and check the pipe for breaks or clogs.



*SLOPE DRAIN
TYPICAL DESIGN
LAYOUT*



OPEN CHUTE DRAIN

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

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

APPLICATION:

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

LIMITATIONS:

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

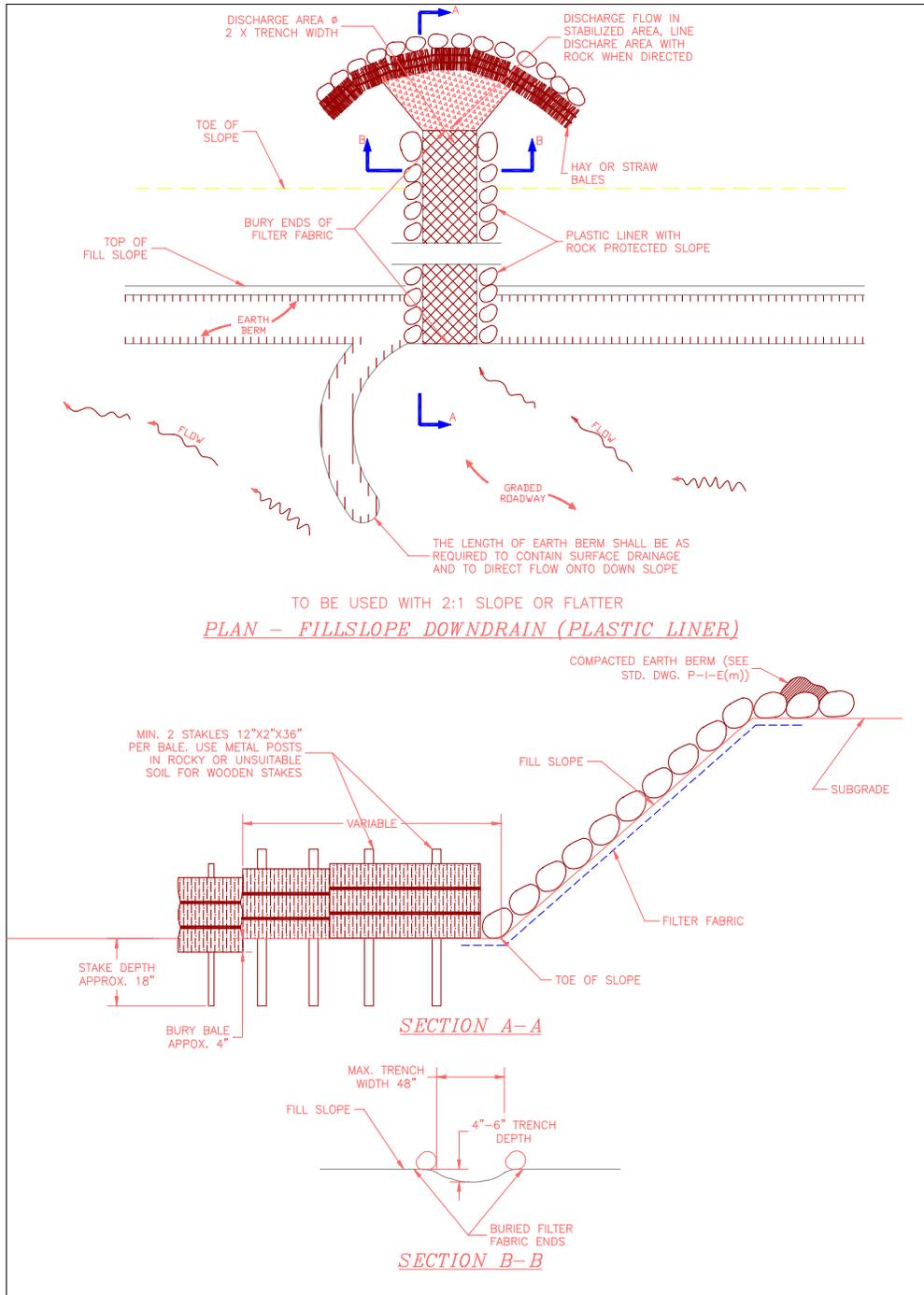
INSTALLATION:

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

MAINTENANCE:

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

*OPEN CHUTE DRAIN
TYPICAL DESIGN LAYOUT*



ROCK-LINED (RIP RAP) DITCHES

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

MAINTENANCE:

- Inspect after major storms. Look for undermining failures.
- Repair any damage promptly.

GRASSED/MATTED SWALES

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

MAINTENANCE:

- Inspect after major storms. Look for undermining failures.
- Repair any damage promptly.

TEMPORARY EXCAVATED SEDIMENT TRAP

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS:

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

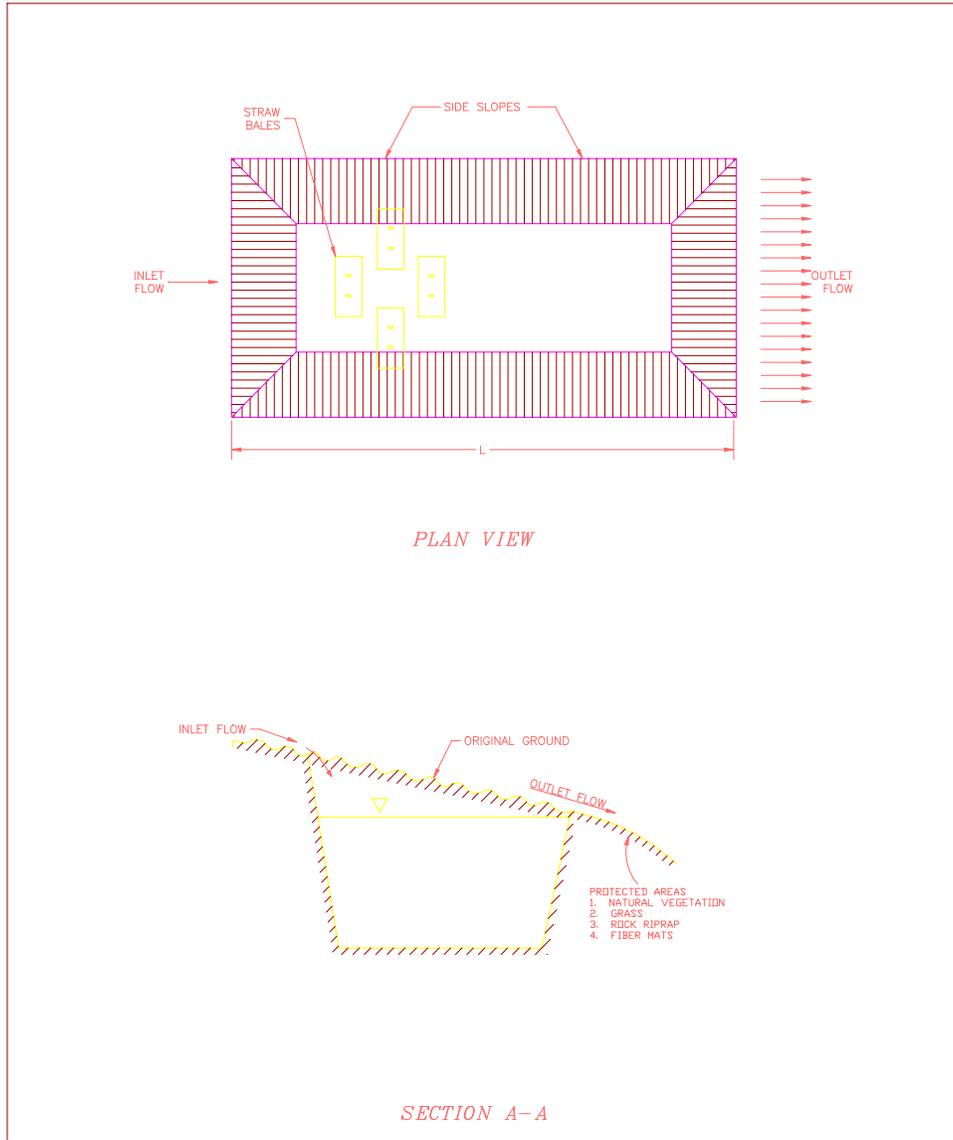
INSTALLATION:

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

MAINTENANCE:

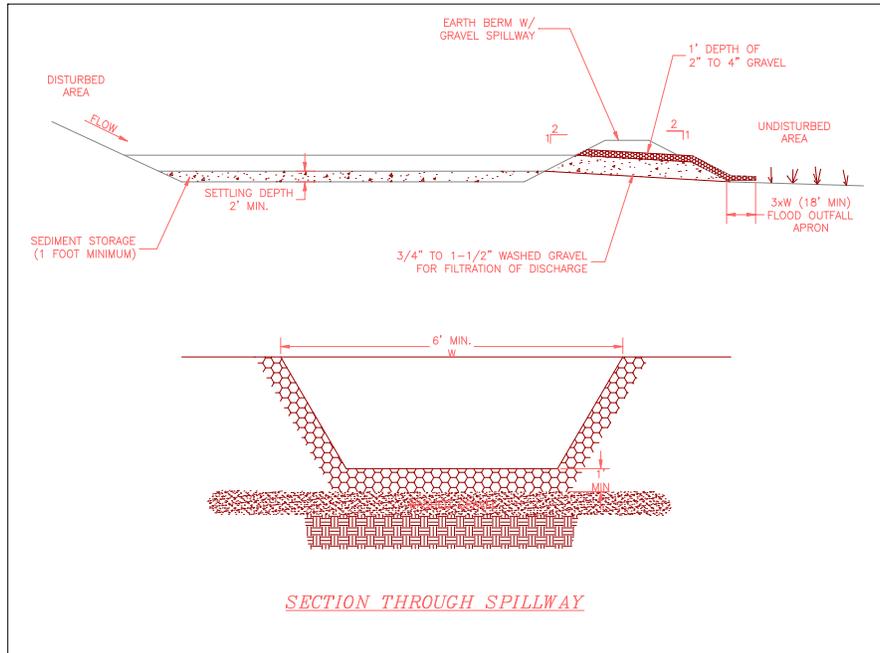
- Inspect after each rainfall event and at a minimum of monthly.
- Repair any damage to berm, spillway or sidewalls.
- Remove accumulated sediment as it reaches 50% height of available storage.
- Check outlet for sediment/erosion of down-gradient area and remediate as necessary.
Install silt fence if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

*TEMPORARY EXCAVATED
SIDEWENT TRAP
TYPICAL DESIGN LAYOUT*



C1-43

*TEMPORARY EXCAVATED SEIMENT TRAP
TYPICAL DESING LAYOUT*



EQUIPMENT AND VEHICLE WASH DOWN AREA

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

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

APPLICATION:

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

LIMITATIONS:

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

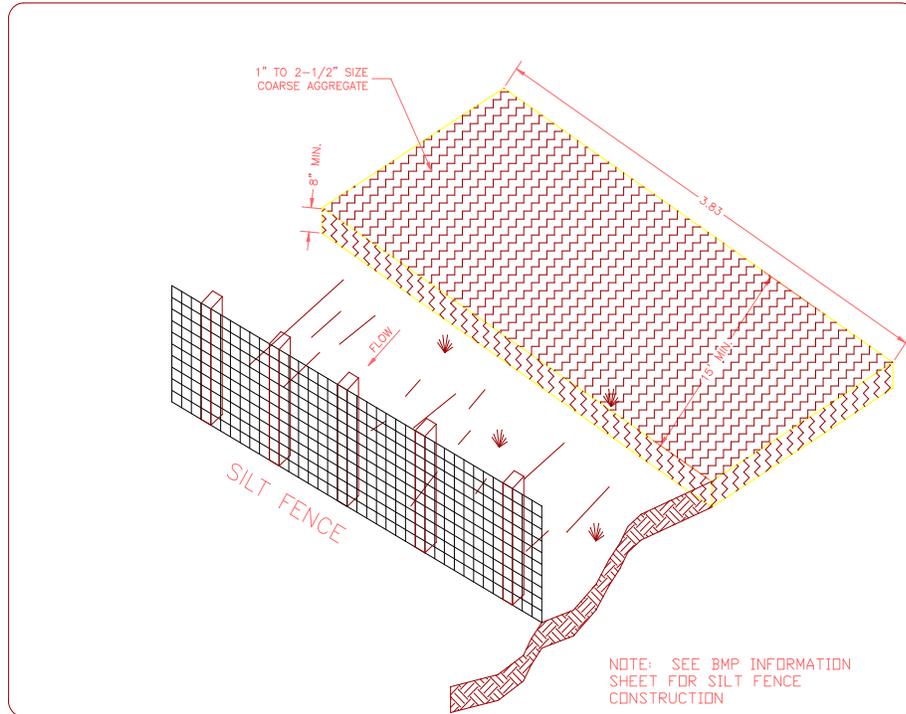
INSTALLATION:

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

MAINTENANCE:

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

EQUIPMENT AND VEHICLE
WASH DOWN AREA
TYPICAL DESIGN LAYOUT



MATERIAL STORAGE

DEFINITION: Controlled storage of on-site materials.

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

APPLICATION:

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

LIMITATIONS:

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

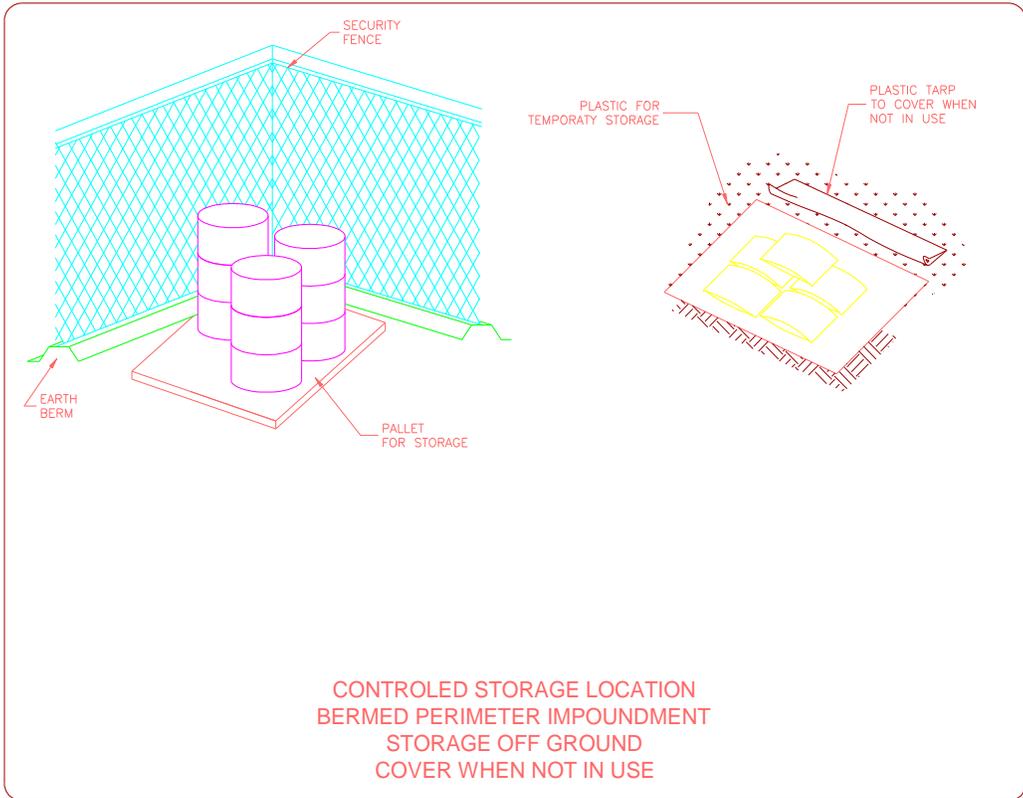
INSTALLATION:

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

MAINTENANCE:

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

MATERIAL STORAGE
TYPICAL DESIGN LAYOUT



WASTE DISPOSAL

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

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

APPLICATION: All construction sites.

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

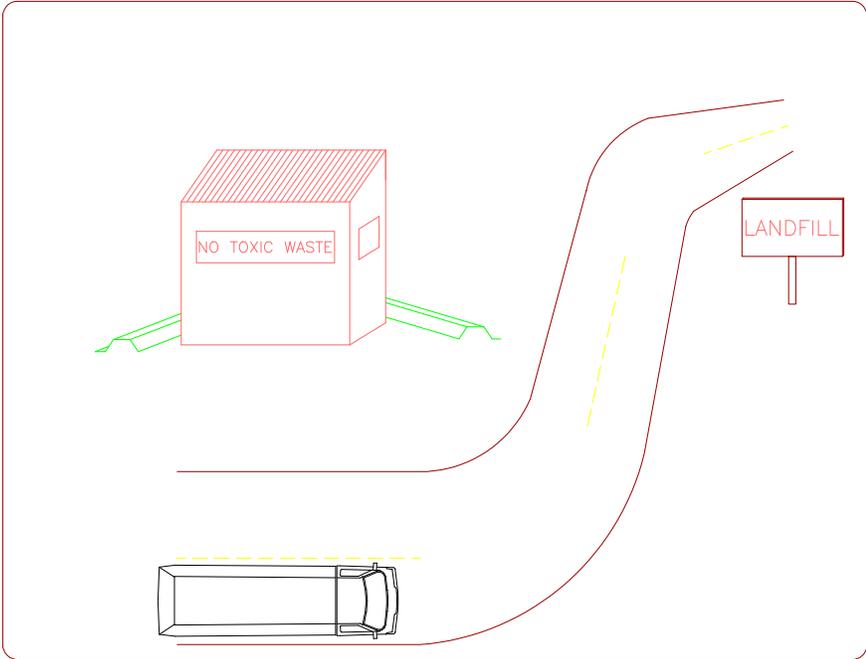
INSTALLATION:

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

MAINTENANCE:

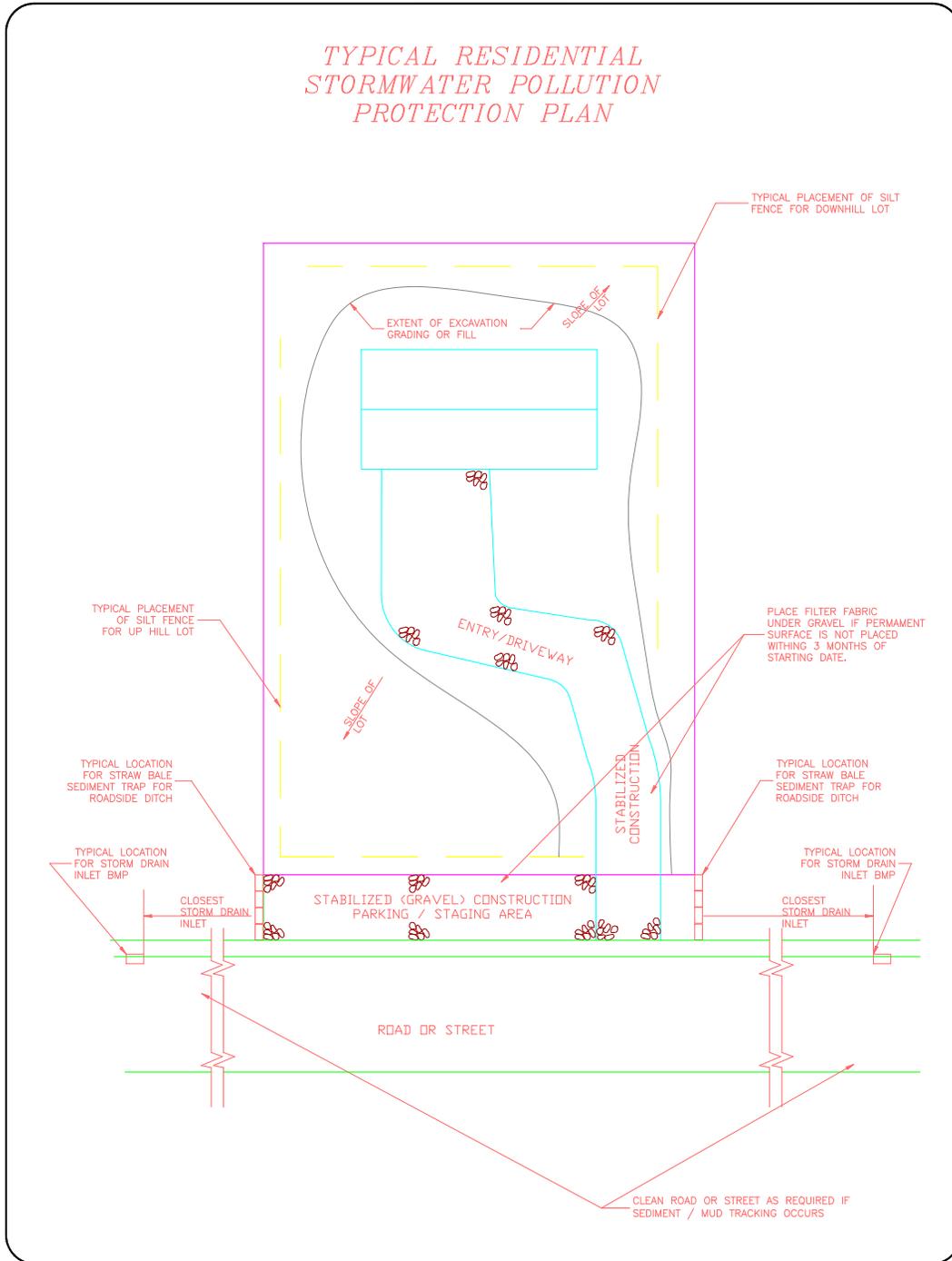
- Discuss waste management procedures at progress meetings.
- Collect site trash daily and deposit in covered containers at designated collection area.
- Check containers for leakage or inadequate covers and replace as needed.
- Randomly check disposed materials for any unauthorized waste (e.g., toxic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

*WASTE DISPOSAL
TYPICAL DESIGN LAYOUT*



C1-51

TYPICAL RESIDENTIAL STORM WATER POLLUTION PREVENTION PLAN



C2-1

SELECTED NONSTRUCTURAL POST-CONSTRUCTION BMPS

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Introduction

Summit County requires that proposed developments utilize nonstructural stormwater control BMPs to the maximum extent practicable in order to meet the required criteria for long-term runoff control. This appendix provides a list and description of appropriate nonstructural BMPs that a permit applicant could choose to utilize in their design. This list is not intended to be comprehensive, and alternative nonstructural controls may be selected subject to approval by Summit County. A nonstructural BMP checklist is included in this Appendix. This checklist is intended for planners, designers and/or developers to utilize during the site planning, design, and construction phases of all developments. Additional information and detailed examples of nonstructural controls and environmentally-sensitive design principles can be obtained online at :

http://www.cwp.org/better_site_design.htm

<http://www.georgiastormwater.com/vol2/1-4.pdf>

<http://www.stormwatercenter.net/>

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

BMP 1: Preservation of Undisturbed Natural Areas

This BMP involves formally designating appropriate undisturbed natural areas within the site as preservation areas. These areas must be specified in the maintenance covenant and recorded by the County in the land record to ensure they remain undeveloped in perpetuity. These areas must be clearly marked and remain undisturbed (i.e., no clearing, grubbing, or construction traffic) during construction. Areas that provide the greatest stormwater benefits through their preservation include:

- wetlands & meadows
- riparian buffers
- forested areas
- areas with high infiltration rates (e.g., hydrologic group A and B soils)
- groundwater recharge zones
- streams and natural drainageways

BMP 2: Minimization of Disturbance

This BMP involves using careful construction sequencing, well-designated limits of disturbance, and well-defined construction entrances/exits to minimize the total area of disturbance (e.g., excavation, grading, clearing, grubbing) and reduce soil compaction from construction traffic. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection. Site layouts and roadway patterns should be designed to conform with or “fit” the natural landforms and topography of a site. This helps to preserve the natural hydrology and drainageways on the site, as well as reduce the need for grading and disturbance of vegetation and soils.

BMP 3: Reduction of Impervious Cover

This BMP involves modifying the designs of permanent structures to reduce the overall area of impervious surfaces while still achieving development objectives. Specific modifications may include:

- reducing roadway lengths and widths to the minimum size needed to meet traffic and safety needs
- reducing building footprints (e.g., build up rather than out)
- reducing the parking footprint (build underground parking or multi-level parking decks; size a proportion of stalls for compact vehicles; use grass or alternative paving for overflow parking areas)
- reducing lot setbacks and frontages
- using fewer or alternative cul-de-sacs (e.g., install pervious vegetated islands in cul-de-sacs; reduce radius of cul-de-sacs; use alternatives such as T-shaped turnarounds)
- integrating porous areas such as landscaped islands, swales, filter strips, and bioretention areas into parking lot designs
- using alternative paving techniques (e.g., use loose gravel, coarse sand, wood or bark chips, or disconnected pavers for all or parts of driveways and walkways)
- using vegetated swales instead of curb and gutter to convey road runoff

BMP 4: Routing of Runoff to Pervious Areas/disconnection of Runoff

This BMP involves routing the runoff from impervious areas to pervious areas such as natural areas, buffers, lawns, landscaping, filter strips and vegetated channels. In this way, the runoff is “disconnected” from other impervious areas and paved collection/conveyance systems (e.g., curb and gutter) that do not allow for groundwater recharge or uptake of pollutants. Some of the methods for disconnecting impervious areas include:

- designing roof drains to flow to vegetated areas
- directing flow from paved areas such as driveways to stabilized vegetated areas
- breaking up flow directions from large paved surfaces and rooftops
- carefully locating and grading impervious areas and landscaped areas to achieve sheet flow runoff to the vegetated pervious areas

BMP 5: Pollution Prevention/Source Reduction

This BMP involves implementing measures to reduce or contain potential sources of contamination at a site. Specific measures include:

- controlling litter (providing adequate numbers of trash receptacles, emptying receptacles regularly, keeping dumpster lids closed, etc.)
- sweeping streets and paved areas rather than hosing them down or using pressurized washers
- reducing rainfall contact with potential pollution sources by installing roofs/canopies over gas station fueling areas, salt/sand piles, hazardous material storage areas, etc.
- providing secondary spill containment (e.g., berms) for hazardous liquid storage containers
- clearly marking storm drains “No Dumping- Drains to Live Stream”

Checklist for Nonstructural BMPs

Project name:

Site area
(total acres):

Project location:
Contractor/builder information:
name:

Temporarily disturbed area (acres):
Permanently disturbed area (acres):

Undisturbed natural areas or preservation
areas (acres):

address:

email:
phone/fax:

Best Management Practices (BMPs)	Yes/No	Comments (If applicable, describe actions taken or give explanation of no action)
Preservation of Undisturbed Natural Areas		
Specification of natural areas in maintenance covenant.		
Preservation is recorded in the land record.		
Clear demarcation of undisturbed areas during construction.		
Minimization of disturbance		
Construction sequence reduces the amount of land disturbed at one time.		
Well-defined construction access points.		
Limited site clearing.		
Site layout and roadway patterns conform to topography.		
Reduction of impervious cover		
Appropriate road sizing.		
Reduced building footprint.		

Best Management Practices (BMPs)	Yes/No	Comments (If applicable, describe actions taken or give explanation of no action)
Reduction of impervious cover (Cont.)		
Reduced parking footprint.		
Reduced lot setbacks and frontages.		
Alternative cul-de-sac design.		
Integration of porous or infiltration areas (islands, swales etc.).		
Alternative paving.		
Use of vegetated swales in place of curb and gutter.		
Routing of runoff to pervious areas/Disconnection of runoff		
Drains and runoff are directed to vegetated areas.		
Runoff from large impervious surfaces (including pavement and rooftops) is broken into several flow paths.		
Design so that impervious areas direct runoff to vegetated areas.		
Pollution prevention/Source reduction		
Litter/trash control.		
Dry sweep rather than washing or hosing off areas.		
Provide secondary spill containment for hazardous liquid if stored on- site.		
Stencil storm drains.		

SELECTED STRUCTURAL POST-CONSTRUCTION BMPS

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GENERAL

A. Introduction

This appendix provides a list and description of appropriate structural BMPs that a permit applicant could select from to meet the stormwater treatment requirements described in Appendix A. This list is not intended to be comprehensive, and alternative structural controls may be selected subject to approval by Summit County. Additional information and detailed examples of long-term post-construction stormwater BMPs can be found online at:

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>
http://www.deq.state.id.us/water/stormwater_catalog/index.asp

All structural post-construction BMPs shall be inspected regularly (at least every six months or as otherwise noted) to determine maintenance needs.

For the purposes of meeting the water quality treatment requirements outlined in Appendix A, the sliding scale and TSS design removal rates shown in Tables 1 and 2 should be used. TSS removal rates for alternative structural controls will be determined by the applicant and approved by the County Engineer. Credible references justifying/documenting the removal rates used shall be submitted by the permit applicant.

For sites where newly-developed impervious areas lie within 50 feet of a live water body (perennial or intermittent stream, lake, pond, spring, or reservoir), the Table 1 sliding scale does not apply and the default 80% TSS removal standard must be met. The less-stringent removal efficiencies listed in Table 1 apply only to sites that refrain from creating new impervious cover near live water bodies.

B. Location of Structural BMPs

Structural BMPs should never be constructed in natural streams (perennial or intermittent) or wetlands. BMPs should be designed to only intercept and capture storm water runoff, not natural stream channel runoff.

Table 1.1 Sliding Scale for Required TSS Removal Efficiency (adapted from City of Boise).

% of parcel area that is impervious	% TSS removal efficiency required^a
≤ 30	40
35	47
40	53
45	59
50	62
55	66
60	68
65	70
70	72
75	74
80	75
85	77
90	78
95	79
100	80

^afor sites where newly-developed impervious cover lies within 50 feet of a live water body, the values in Table 1 do not apply and instead a removal efficiency of 80% must be met, even if the total site imperviousness % is less than 100%.

Table 2.1 TSS Removal Rates for Selected BMPs (adapted from Schueler 1997, Winer 2000, & EPA 1993).

BMP	Design Removal Rate (%)	Comments
Dry Detention Ponds	15	Quantity control pond
Wet Detention Ponds	60	Quantity control pond
Dry Extended Detention Pond	45	Sediment forebay included
Wet Extended Detention Pond	80	Sediment forebay included
Evaporation Pond	100	Designed to evaporate or retain
Bioinfiltration Swale	70	
Sand Filter	80	Pretreatment, includes Austin, underground, pocket, and Delaware designs
Organic Filter	80	Pretreatment, includes compost and peat/sand
Catch Basin Insert	25	Off-line only
Infiltration Facilities	95*	*removal rate only valid with adequate maintenance and pre-treatment
Sediment Trap	25	
Grass Buffer Strip	85	Minimum width of 10'
Oil/Water Separator	15	

BMP1: OIL/WATER SEPARATORS

A. Introduction

This section includes standards for oil/water separators to be installed to treat runoff from gas stations and parking lots. These systems can be used to intercept and remove contaminants from storm water runoff. They can also be used during redevelopment to retrofit an existing system in order to provide water quality treatment. Oil/water separators and catch basin inserts should not be used alone to treat storm water runoff but rather in combination with other BMPs to improve water quality.

B. Description

These structures are used to capture floatables, oil and grease, and sediment found in runoff. Two types of oil/water separators are discussed in this section: coalescing plate interceptor (CP) (Figure 1.1) and the conventional gravity separator, or API (Figure 1.2). The CP and API separators can function as pre-treatment systems if regularly maintained. A third system, the spill control (SC) separator should be considered for sites where there is a risk of leaks and small spills, such as gas station sand chemical storage areas. It is not considered a pre-treatment system.

C. Sizing

The contributing area to any individual oil/water separator should be limited to one acre of impervious cover. The maximum allowable velocity through the throat of the separator (0.5 fps) will also limit the size of the area served. Separators, boxes, or vaults are sized based on the contributing runoff area, sedimentation rates of particles, and maximum velocities through the throat of the separator.

Certain developments such as fuel farms or gas stations should consider properly sized facilities to capture floatables such as oil and grease. The American Petroleum Institute (API) standards related to oil rise rates and turbulence should be used to design these facilities.

D. Access

Provide access for inspection, proper maintenance, and monitoring activities, including clearance from structures to allow for equipment to clean out devices. Provide access to each compartment. If the length or width of any compartment exceeds 15', an additional access point for each 15' is required.

E. Design Life

The system shall be designed either to the manufacturer's specifications or 50 years, whichever is greater.

All metal parts should be corrosion-resistant. Acceptable materials include parts made of aluminum and stainless steel, fiberglass, or plastic. Metal parts that come in contact with storm water runoff should not be painted because the paint tends to wear off.

Vault baffles should be made of concrete, stainless steel, fiberglass reinforced plastic, or other acceptable material and should be securely fastened to the vault. Apply the HS-20 traffic loading standard when locating the API and CP systems in parking lots.

F. Maintenance

Clean accumulated oil, grease, sediments and floating debris every two years, unless inspections show that more frequent maintenance is necessary. Oil/water separators should be inspected monthly to insure proper maintenance.

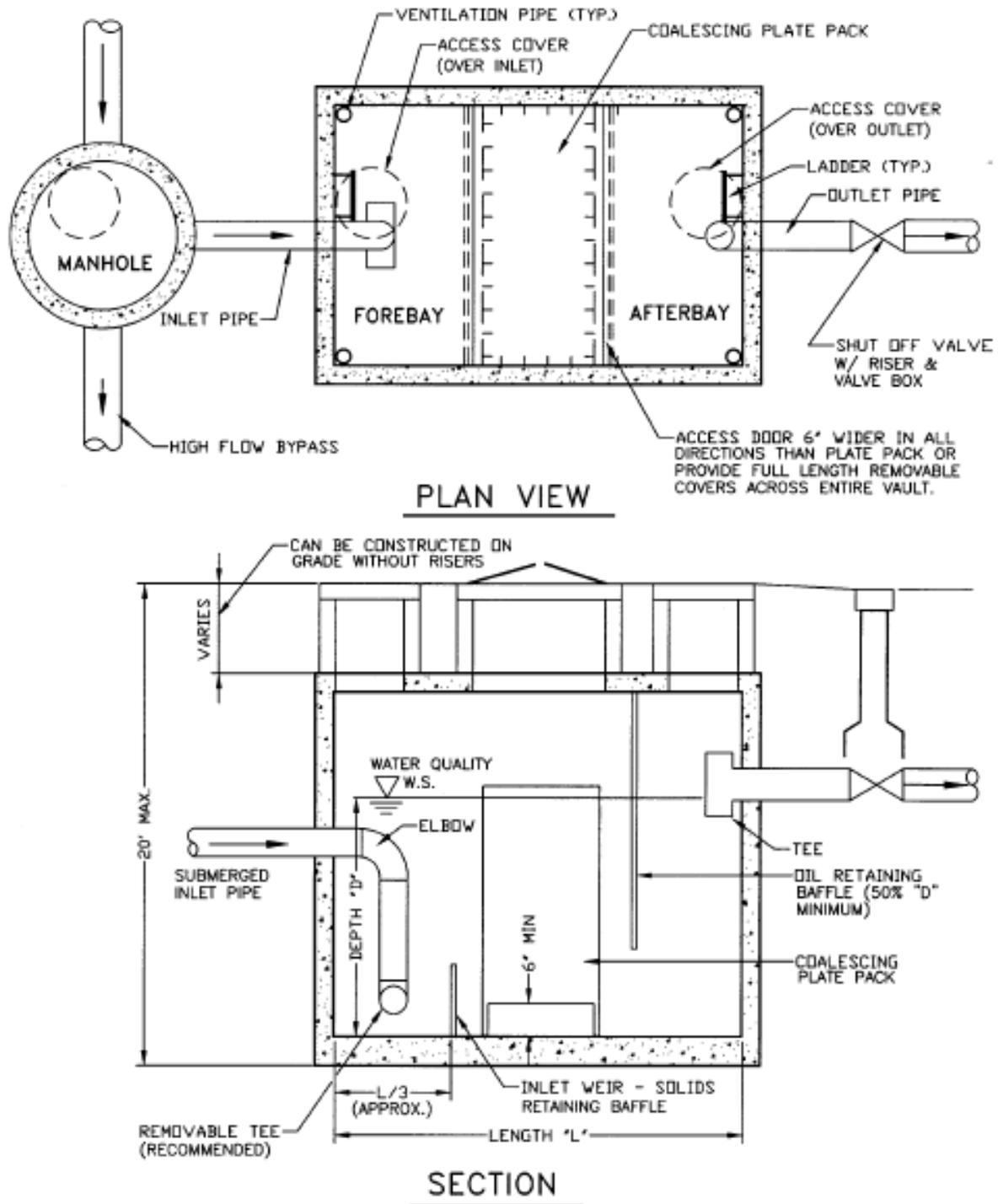


Figure 1.1. Coalescing Plate Oil/Water Separator.

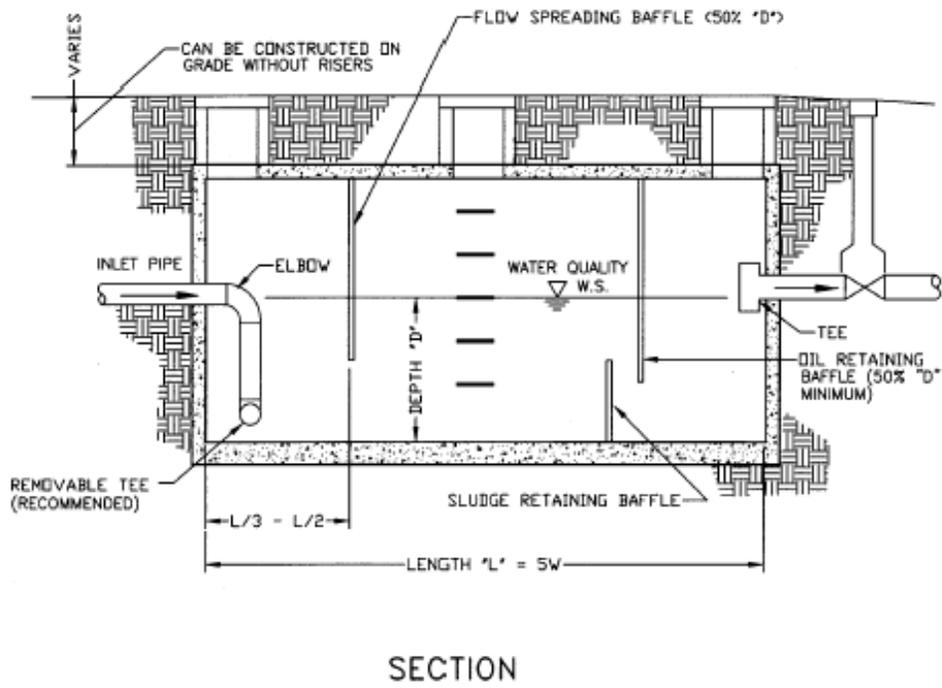
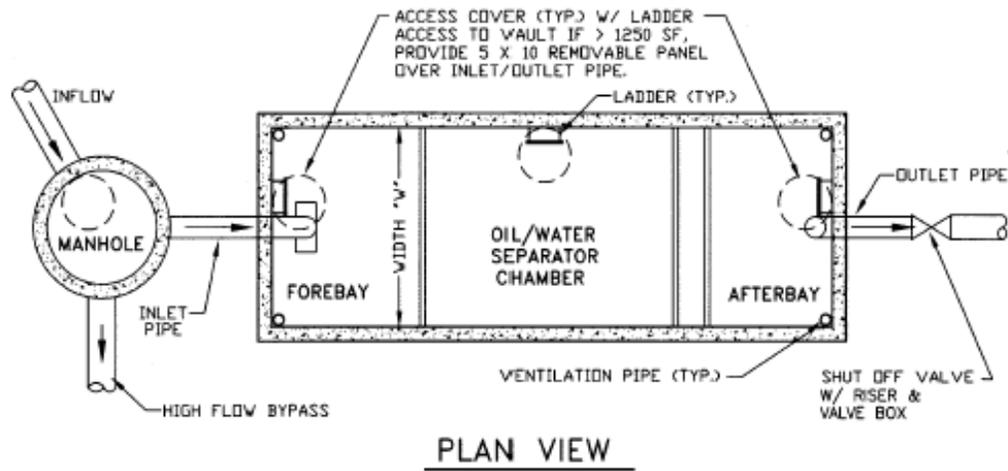


Figure 1.2. Conventional Gravity Oil/Water Separator.

BMP2: CATCH BASIN INSERTS

A. Introduction

A catch basin insert is a device installed underneath a catch basin inlet that treats storm water through filtration, settling, absorption, adsorption, or a combination of these mechanisms.

A variety of catch basin inserts are commercially available from various different manufacturers. Summit County does not endorse any single product or manufacturer over any other; however, each selected product will be subject to review by the County and must be approved prior to installation.

Because they have limited capacity and limited sediment removal capabilities, catch basin inserts should NOT be used alone to treat storm water runoff but rather as pretreatment to another storm water management BMP or series of BMPs.

B. Installation

The insert must be fitted with oil-absorbent/adsorbent filter media. The filter must be changed monthly or when the filter media surface is covered with sediment. If the insert is installed in an existing catch basin, the insert shall be demonstrated to fit properly so that there is a positive seal around the grate to prevent low-flow bypass. If the insert is installed in a new or redevelopment project, it shall be installed according to the manufacturer's recommendations. The insert should be installed in the catch basin after the site has been paved or stabilized (for new development) or after completion of construction (for a redevelopment site that is already paved).

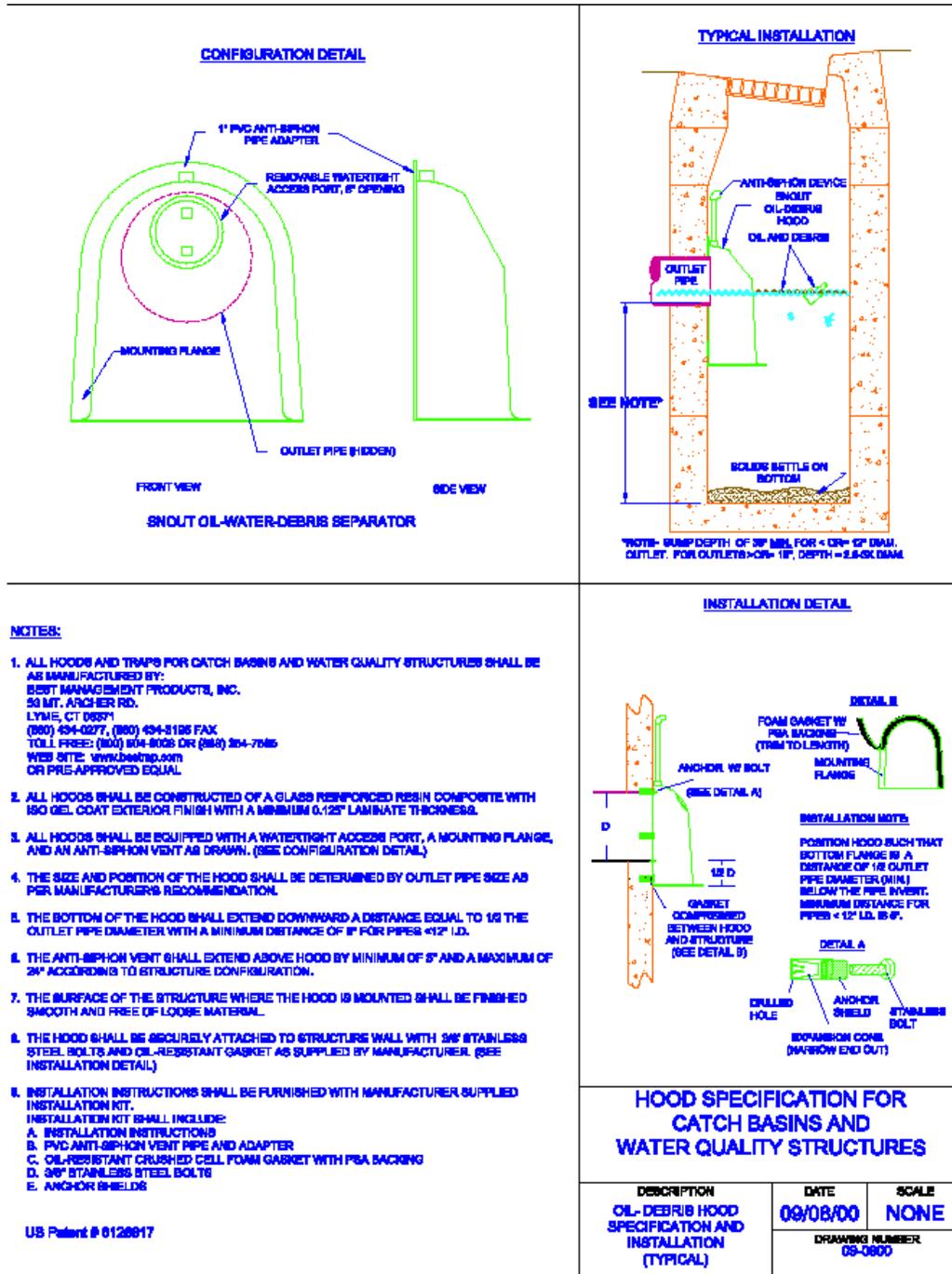
C. Access

The catch basin insert shall be located in an easily-accessible area for maintenance activities. It should not be placed in an area with continuous vehicle parking. Consequently, redevelopment projects may have to modify a parking stall in order to provide access to a catch basin insert.

D. Maintenance

Catch basin inserts shall be maintained at a frequency recommended by the manufacturer. Inspections should occur at least monthly during wet months and during periods of high runoff and once every 2 months during the remainder of the year. Full replacement or renewal of oil absorbent/adsorbent material shall be part of maintenance activities. In addition, the catch basin sump should be inspected for sediment accumulation. Filter media shall be disposed of in accordance with applicable regulations. In most cases, dewatered filter media may be disposed of

as solid waste. To insure proper maintenance of the catch basin inserts inspections should occur



monthly.

Figure 2.1. Sample Detail of One Type of Catch Basin Insert (SNOUT brand). Summit County does not endorse this brand over any other.

BMP3: INFILTRATION FACILITIES (GENERAL)

A. Introduction

This section contains requirements for facilities that manage storm water by subsurface disposal through infiltration. Requirements are included for seepage beds (infiltration trenches), infiltration basins, and infiltration swales. A seepage bed (Figure 3.1) receives runoff in a shallow excavated trench that has been backfilled with stone to form a below-grade reservoir. Seepage beds are typically located beneath landscaped or parking areas. A seepage bed can also be open to the surface and covered with landscaping rock. This type of system is referred to as an open trench. An infiltration basin (Figure 3.2) impounds water in a surface pond until it infiltrates the soil. Infiltration basins do not maintain a permanent pool between storm events and should drain within 48-72 hours after a design storm event. Infiltration swales (Figure 3.3) are vegetated channels designed to retain/detain, treat and infiltrate stormwater runoff.

B. Plan Submittal

For each infiltration facility, the applicant will be required to submit the general information listed in Section 3.A.1 of Appendix A as well as the following additional information:

- site characteristics that pertain to the proposed infiltration system (site evaluation information) soils report and geologic report with boring logs
- written opinion of site suitability by a hydrologist, geologist, soil scientist or engineer
- recommended design infiltration rate
- infiltration test data and results

C. Construction

Before the site is disturbed, the area selected for the infiltration system shall be secured to prevent heavy equipment from compacting the underlying soils. Runoff should be diverted away from the completed infiltration system during all phases of construction, until the site is completely stabilized. Excessive sediment loading during construction can severely impact the long-term performance of infiltration systems.

D. Setbacks and Separation Distances

- Infiltration facilities shall be located 100' from surface water supplies and tributaries used as drinking water and 50' from surface waters not used as drinking water, excluding drainage and irrigation water delivery systems.
- Infiltration facilities shall be located 100' from public and private drinking water wells.
- Infiltration facilities shall be located 5' from bedrock or basalt (vertical distance from bottom of facility to bedrock). Infiltration facilities must not be used on slopes >20%.

E. Infiltration Rate

The infiltration rate shall be measured at a depth equal to the proposed bottom grade of the facility. Appropriate soil types are those that have an infiltration rate of 0.5"/hour or greater, as initially determined from NRCS Soil Textural Classification and subsequently confirmed by field geotechnical tests. Maximum soil percolation rates shall generally not exceed 8" per hour.

F. Maintenance

Systems should be inspected and cleaned during regular semi-annual inspections. This inspection schedule applies to all of the infiltration facilities unless otherwise noted. The maximum depth of sediment allowed should be stated in the O&M Plan with an estimate of impact on infiltration rate. Sediments shall be removed and disposed of properly.

BMP3.1: SEEPAGE BEDS**A. Limitations**

Seepage beds are prohibited in the following situations:

- where hazardous or toxic materials greater than SARA Title III “reportable quantities” are stored or handled, including loading and unloading areas
- where there is existing soil and/or ground water contamination
- in fill material, where there is the possibility of creating an unstable grade and potential for movement at the interface between the fill and in-situ soils

Vadose zone characteristics and depth to water will determine where seepage beds will be prohibited. A final determination regarding the use of seepage beds is based on evaluating the natural, unaltered characteristics of the proposed location for the system. Table 3.1 illustrates how restrictions may be applied.

Table 3.1. Restrictions for Seepage Beds.

Depth to groundwater (below ground surface)	Vadose Zone			
	Gravels, pebbly gravels, pebbles	Sands, sands interbedded with silt and or clays, silty clays	Rhyollite or Granitics	Basalts
< 15 feet ^a	seepage beds prohibited	seepage beds prohibited	seepage beds prohibited	seepage beds prohibited
15-30 feet	additional treatment required	no additional restrictions ¹	subject to further evaluation	subject to further evaluation
31-100 feet	additional treatment required	no additional restrictions ¹	subject to further evaluation	subject to further evaluation
>100 feet	additional treatment required	no additional restrictions ^b	subject to further evaluation	subject to further evaluation

^a Assumes bottom of seepage bed is 5' below ground surface.

^b Assumes the separation distance between the bottom of the seepage bed and ground water is 10'.

B. Setbacks and Separation Distances

- Seepage beds must be separated a minimum of 10' from ground water (vertical distance from bottom of facility to seasonal high ground water level). A test boring shall be drilled to a sufficient depth to verify that a 10' separation distance between the proposed bottom of the facility and seasonal high ground water table is met. Each facility shall have one test boring, unless prior approval is obtained from Public Works.
- Seepage beds must be separated 10' from structures (foundations, septic systems, other seepage beds).
- Seepage beds must be separated 20' from basements.
- Seepage beds must be separated 10' from property boundaries.

C. Design

- Seepage beds should be designed to provide a direct method for removal of contaminants and sediments before direct discharge into the vadose zone. If the bed has a surface inlet, the system must be designed to capture sediment either through a grass buffer strip, bio filtration swale, or sediment trap. Depending on the expected site activities, a pretreatment system, such as an oil/water separator should also be considered.
- A vegetated buffer (20' minimum) is recommended for open trenches.
- A stone aggregate of clean, washed drain rock, 1.5- 2" in diameter should be used. This size of aggregate will give a void ratio of 30-40%. Aggregate between .5-2.0" may be used but the void ratio must be certified.
- The bottom of the seepage bed shall be covered with a 6-12" layer of clean, washed sand that meets either specification: ASTM C-33 or ITD Standard 703.02, "Fine Aggregate for Concrete".
- The seepage bed aggregate must be lined on the sides by an appropriate geotextile fabric. If the trench is an open trench, it should also be lined at the top and the top fabric layer should be located 1' below the surface to prevent surface sediment from passing through into the stone aggregate. Filter fabric can be placed on the bottom of the trench. Filter fabric should have a minimum weight of at least 4 oz./yd², a filtration rate of 0.08"/second, and an equivalent opening size of 30 for non-woven fabric.

- Seepage beds must have observation wells to determine how quickly the seepage bed drains after a storm. Wells shall be placed every 2000 SF, with a minimum of 1 well/seepage bed. The observation well should be a perforated PVC pipe, 4-6" in diameter, extending to the bottom of the bed where it is connected to a foot plate. It should be capped and locked to prevent vandalism or tampering.
- If the seepage bed is located in a landscaped area, the bed should be constructed in one of the following ways: the bed should be covered with native soils and planted in grass, or if the seepage bed is an open trench, covered with stone aggregate and protected from sediment build-up with a vegetated buffer strip 20-25' wide on either side of the bed.

D. Operation and Maintenance

The system should be located so that it can be easily accessed by equipment necessary to maintain the pretreatment system and trench. The buffer and surface vegetation must be maintained by reseeding bare spots and mowing as frequently as needed to preserve aesthetics.

When ponding occurs at the surface or in the bed, corrective maintenance is required immediately. Ponding indicates the bed is clogged. Stripping off the top layer of soil, replacing the clogged filter fabric, and then replacing the top foot of aggregate or soil will correct the problem. Ponded water inside the trench (as visible from the observation well) after 24 hours or several days can indicate that the bottom of the trench is clogged. If this problem has occurred, then it is necessary to remove all of the layers and replace them.

E. Closure or Replacement

The owner is required to repair, replace, or reconstruct the infiltration system if it fails to operate as designed. A system fails to operate as designed when water is standing 24 hours or longer following the design storm. The maintenance and operation schedule for an infiltration system shall include such a provision. The owner is required to notify Summit County if the owner plans to close or replace the infiltration system. Additional studies may be required for all facilities depending on the land use of the site.

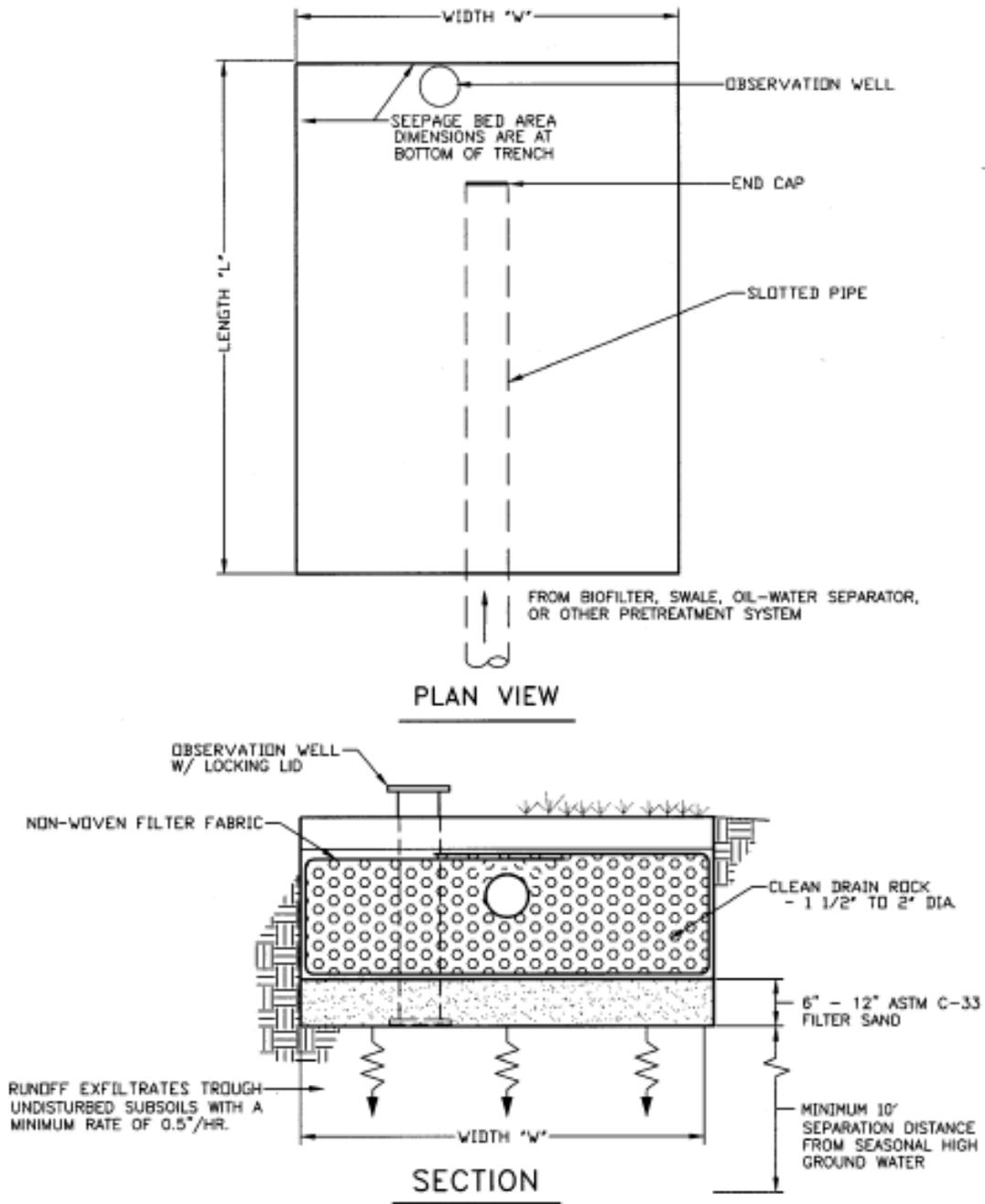


Figure 3.1. Seepage Bed.

BMP3.2 INFILTRATION BASIN

A. Applicability

An infiltration basin is suitable in residential and commercial developments. Infiltration basins should not be placed in locations where the basin could cause flooding to downstream properties or in natural drainages such that the basin would restrict inflows to the point of causing upstream flooding.

B. Sizing

In determining the size of the basin, the critical parameters are the storage capacity and the maximum rate of runoff released from the basin. In addition the basin size should be based on expected sediment accumulation and frequency of maintenance.

C. Forebay/Sediment Trap

A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1. The forebay/sediment trap shall have a treatment volume equal to 0.75 times the runoff from the mean annual storm (0.23").

D. Construction Requirements

Infiltration basins shall be constructed in appropriate soil types. Infiltration basins should be excavated in a manner that will minimize disturbance and compaction of the basin. The basin bottom should be sloped to maximize infiltration. In addition, infiltration basins should not be constructed in highly erodible contributing areas, on slopes > 15%, or within fill soils. Inlet and outlet channels must be stabilized.

E. Separation Distance

The bottom of the infiltration basin should be separated by at least 3' vertically from the bedrock layer or seasonal high water table, as indicated by on-site geotechnical test results. Within the 3' separation distance, there must be at least a 2' layer of soil that conforms to infiltration rate requirements.

F. Pretreatment

Each infiltration basin shall have additional pretreatment. One of the following techniques can be used:

- construct grass channel
- construct grass filter strip
- install bottom sand layer
- install upper filter fabric with 6" sand layer
- use washed cobble rock as aggregate
- vegetate basin with deep-rooted turf

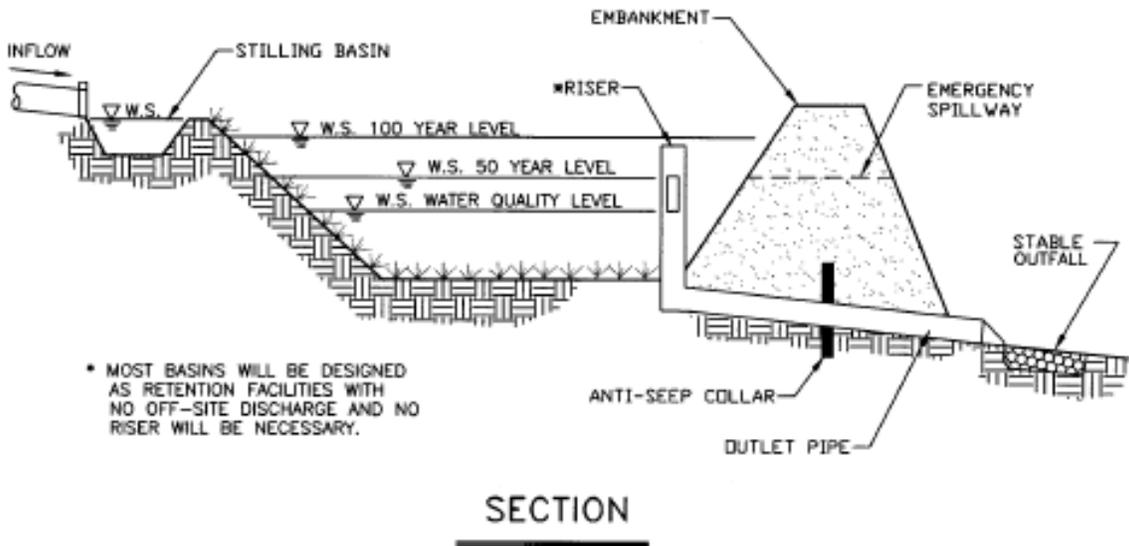
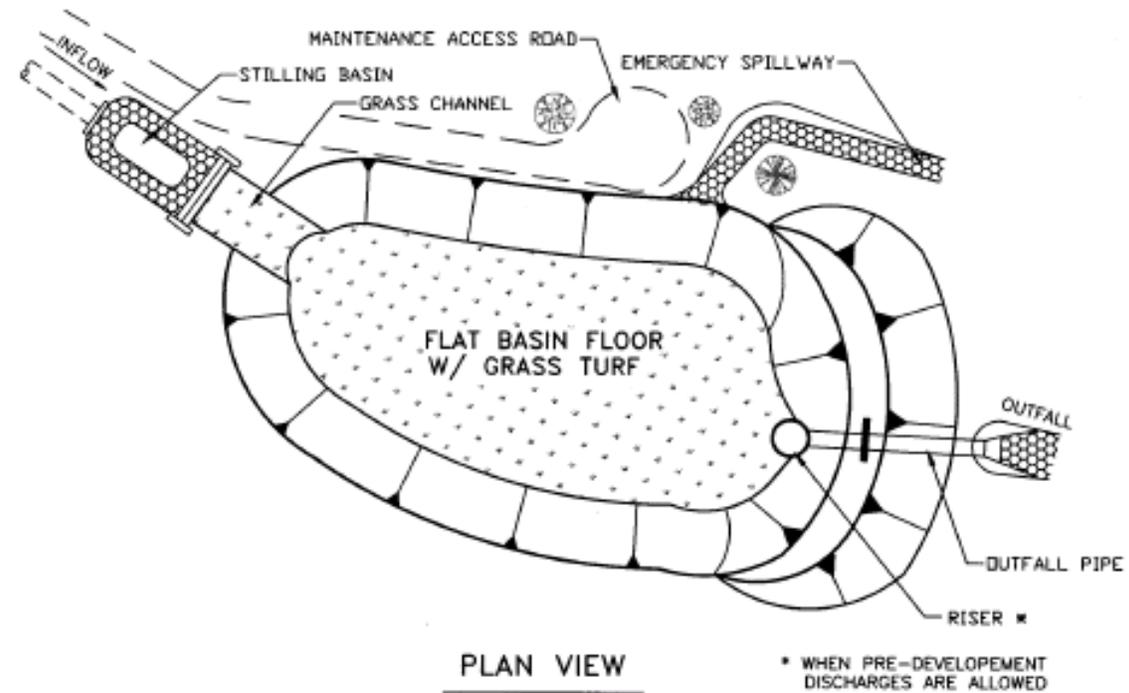


Figure 3.2. Infiltration Basin.

BMP3.3 INFILTRATION SWALE

A. Design

- Swale bottom slopes shall be between 1-4%.
- Curb cut pavement shall be installed at a maximum height of 6" above the swale if curb cuts will be used to introduce flow to the swale. Curb cuts shall be between 12-36" wide.
- A flow spreading device at the swale inlet shall be installed. Appropriate devices include shallow weirs, stilling basins, and perforated pipes. Provide a sediment clean-out area.
- Energy dissipation shall be provided at the inlet. Appropriate means are stilling basins and rip rap pads. If rip rap is used, it should be sized for the expected runoff velocity. A drainage window may be provided to direct the storm water runoff from events larger than the quantity design storm to the free draining material in the under drain. The top of the drainage window should be placed at an elevation above the water surface of the quantity design storm and should be located at the lower end of the swale.
- The swale side slopes shall be no more than 3:1.
- The swale bottom width shall be no greater than 8'.
- Swale shall be a maximum of 1.5' deep.
- The swale shall be grass-covered. Uniformly fine, close-growing, water-tolerant grasses should be used. Landscaping rock may also be used with an open trench.
- The swale under drain shall be constructed using clean 2" drain rock. The rock shall be wrapped in geotextile filter fabric, with a weight of greater than 4 ounces per square yard. The under drain will be a minimum depth of 12".
- A 6-12" layer of clean, washed sand that meets either specification: ASTM C-33 or ITD Standard 703.02, "Fine Aggregate for Concrete" shall be placed below the under drain.

B. Setbacks and Separation Distances

- Swale perimeter slope must be a minimum of 2' from the property line.
- There shall be at least 3' of separation between the bottom of the swale or under drain and the seasonal high ground water table.

C. Landscaping

Vegetate swales uniformly with fine, close-growing, water-tolerant grasses that can withstand seasonally saturated soils. Swales shall not be used until the vegetation is established. The side slopes above the swale treatment area should be vegetated to prevent erosion. Additional grass or nonaggressive ground covers are appropriate.

Barrier shrubs, such as barberry, planted around the swale should be considered when there is a possibility that the public could damage the swale or hinder its function. Other plant materials are appropriate if recommended by a landscape professional.

Trees and shrubs should be planted high on the side slopes or above the water line elevation for the design storm. Avoid using bark, mulch, fertilizers, and pesticides in swale bottoms or sides. These materials tend to run off the planted area and into the swales reducing its treatment effectiveness. When storm water control and landscaping are integrated, the following standards apply:

- Up to 15% of the total area of the swale designated for storm water infiltration may be covered with ground cover plants other than grass.
- Up to 10% of the total area of the swale designated for storm water infiltration may be elevated above the bottom of the swale to allow the planting of trees and shrubs.

The decrease in swale area resulting from this action will be compensated for by infiltration of runoff that occurs during the storm. If trees and shrubs will be used, plant them on the top perimeter of swale side slopes. Minimize shading the vegetation in the swale treatment area. A spacing of at least 20' (6 meters) is appropriate for trees planted close to a swale. Avoid planting trees that would continuously shade the entire length of the swale. In addition, avoid using bark, mulch, fertilizers, and pesticides in these areas. These materials tend to run off the planted area and into the swale reducing its treatment effectiveness.

D. Pretreatment

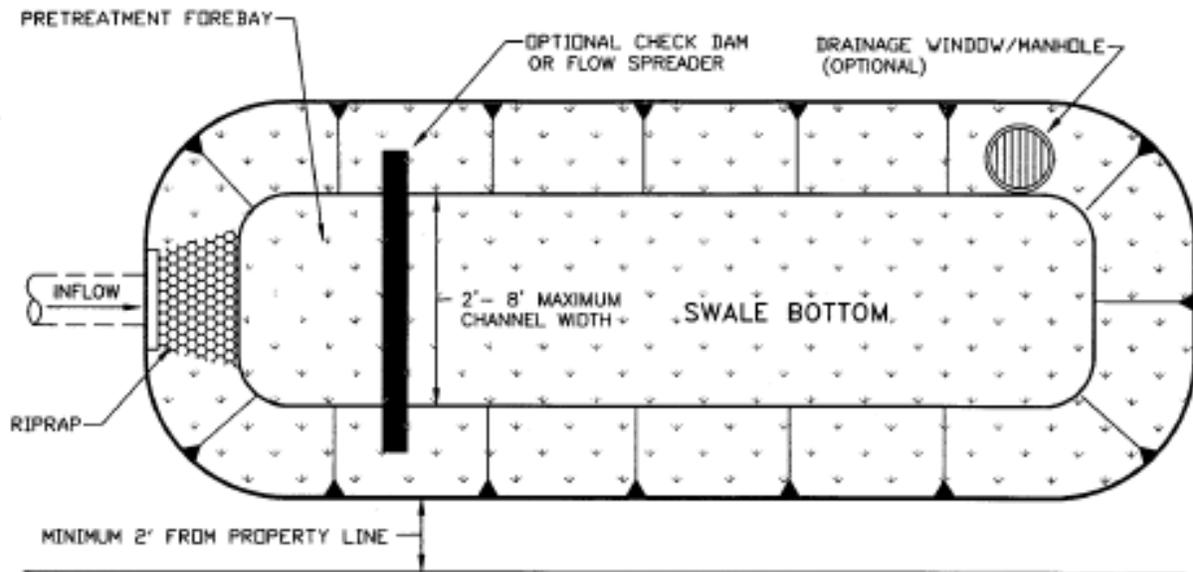
To protect ground water from possible contamination, runoff cannot be infiltrated without proper pretreatment. Pretreatment shall be provided by a grass buffer strip, sediment forebay, bio filtration swale, oil/water separator, or sediment trap.

E. Operation and Maintenance

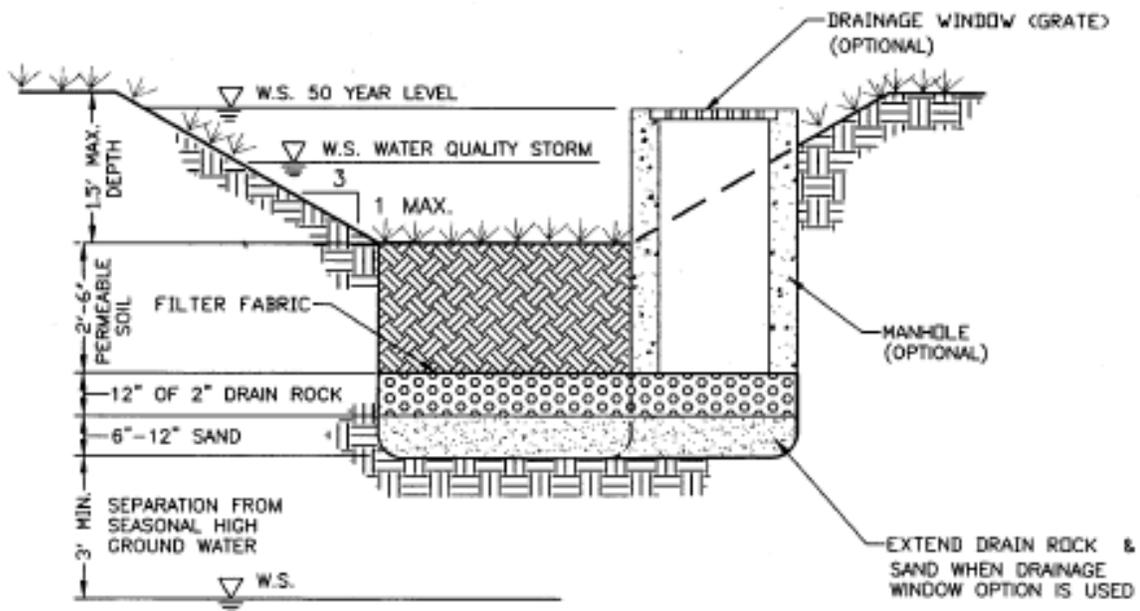
Grass should be mowed to maintain an average grass height between 3"-9", depending on site characteristics. Monthly mowing is needed from May through September to maintain grass vigor. Grass clippings should be removed from the swale and composted on site or disposed of properly off site.

Sediment deposition at the head of the swale should be removed if grass growth is being inhibited for more than 10% of the swale length or if the sediment is blocking the even spreading or entry of water to the rest of the swale. Annual sediment removal and spot reseeding should be anticipated.

The swale should be regraded to produce a flat bottom width then reseeded if flow channelization or erosion has occurred. Regrading should not be required every year.



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SECTION

Figure 3.3. Infiltration Swale.

BMP4: PONDS (GENERAL)**A. Definitions**

A detention pond (water quantity) (Figure 4.1) is a pond designed to collect and temporarily hold surface and storm water runoff from a site and release it at a slower rate than it is collected. The water should drain within 24 hours. Detention ponds are traditionally used to mitigate downstream impacts and alleviate flooding problems.

An extended detention pond (water quality) (Figure 4.2) is a pond designed to treat and release surface and storm water runoff from a site. Extended detention ponds are designed to provide water quality treatment and may be used to provide peak flow attenuation. The water is held for at least 48-72 hours to allow for treatment of pollutants by settlement, nutrient absorption, and filtering by plant materials.

B. Requirements for All Ponds

- Design Life

The system should be designed for at least a 50-year life.

- Location

Ponds should not be constructed in natural streams or wetlands. Ponds should be located off-channel and should only hold storm water runoff, not natural runoff.

- Site Evaluation/Site Suitability

Sites should be evaluated for soils, depth to bedrock, and depth to water table. Requirements will depend on pond type. Ponds may be used at sites where a receiving body or structure can accept pond discharges. Ponds designed to meet on-site detention requirements shall not be located in regulatory flood plains. Also, ponds should not be used in areas where storm water has the potential to contain soluble metals, toxic organics, or where high sediment loads may occur.

- Design

The design of any detention pond requires consideration of several factors. Balancing the requirements is done by developing an inflow hydrograph, a depth-storage relationship, and a depth-outflow relationship. The inflow/storage/outflow relationships should be based on a storm duration that identifies a peak detention pond volume for the storm interval required. Refer to Appendix A, Section 3.B(6) for water quantity and quality design criteria.

The factors to be considered include:

- basin size
- minimum free board
- maximum allowable depth of temporary ponding
- recurrence interval of the storm being considered
- storm duration
- timing of the inflow
- allowable outflow rate
- the length of time water remains in the facility.

- **Maximum Outflow Rate**

The maximum outflow rate shall not be more than the pre-development rate of runoff for each storm return interval. The receiving system must be shown to be capable of accommodating the pre-development flow.

- **Outlets**

Outlet pipes shall be at least 12" in diameter. If riser pipes are used, they shall be 1 1/2 times the cross sectional area of the outfall pipe. Trash racks or anti-vortex devices shall be installed. All pipe joints are to be watertight. Anti-seep cutoff walls, 8" thick, or other seepage control methods are to be installed around outlet pipes. The channel immediately below the pond outfall shall be protected against erosion and shall transition to natural drainage conditions in the shortest distance possible.

- **Dam Safety Requirements**

If a pond is categorized as a dam by the State of Utah, the relevant sections of the Utah Code will apply. Contact the Utah Division of Water Rights for more information on dam safety requirements.

- **Vegetative Buffers**

Vegetative buffer strips shall be established around the perimeter of the pond for erosion control and additional sediment and nutrient removal. Buffer strips should include all areas between the normal pond water surface elevation to the top of the pond embankment.

- Side Slopes/Safety

Take all practical safety precautions. Side slopes should not exceed 4:1 (3:1, if the pond will normally remain dry).

- Soils

A soils investigation is required on all ponds. At a minimum, it shall include information along the centerline of the proposed dam in the emergency spillway location and the planned borrow area. It should include recommendations on cutoff trenches, compaction, and any other special design requirements.

- Freeboard and Emergency Spillway

All open surface facilities shall be designed with adequate freeboard above the maximum design water elevation. Emergency spillways are required on all ponds. The spillway shall be sized to safely pass the 100-year developed peak flow.

- Maintenance Access

Direct access to the pond bottom, inlet sedimentation area, and control structure is required. A right-of-way maintenance easement from a road to the pond (if not accessible from the public right-of-way), shall be provided.

- Inspection

Detention ponds should be inspected during regular semi-annual inspections to determine maintenance needs.

BMP4.1: DETENTION PONDS**A. Definition**

Detention ponds are designed to detain a volume of water to attenuate peak flows. A wet pond has a permanent pool and provides temporary storage of storm water runoff. A dry detention pond does not maintain a permanent pool between storm events.

B. Applicability

Detention ponds are suitable in residential, commercial, and industrial sites.

C. Pond Geometry

The pond can be any shape provided that it has sufficient capacity to meet general design requirements.

D. Outlet Design

At the peak flow rate, pond volume shall be equal to the difference between pre and post-development storm volumes. The outlet structure shall be designed in accordance with the water quantity and quality requirements of Appendix A, Section 3.B(6). The outlet design shall incorporate a multi-stage riser that will allow water (above the permanent pool, in a wet pond) to be drained over 24 hours. The outlet shall be designed to mimic pre-development flow rates. The outlet structure shall be designed to prevent clogging and plugging.

E. Construction Requirements

Detention ponds shall be excavated in a manner that will minimize disturbance and compaction of the pond. Sediment measuring devices shall be installed at opposite ends of the bottom of the basin or sediment trap to measure sediment accumulation.

F. Sediment Storage

Ponds shall be designed to contain computed storage volume plus 15% of the computed storage volume to adequately accommodate sediment deposition.

G. Forebay/Sediment Trap

Each pond shall have a sediment forebay or equivalent upstream pretreatment. The forebay shall have a separate cell formed by an acceptable barrier. A fixed vertical sediment depth marker shall be installed in the forebay to measure sediment accumulation.

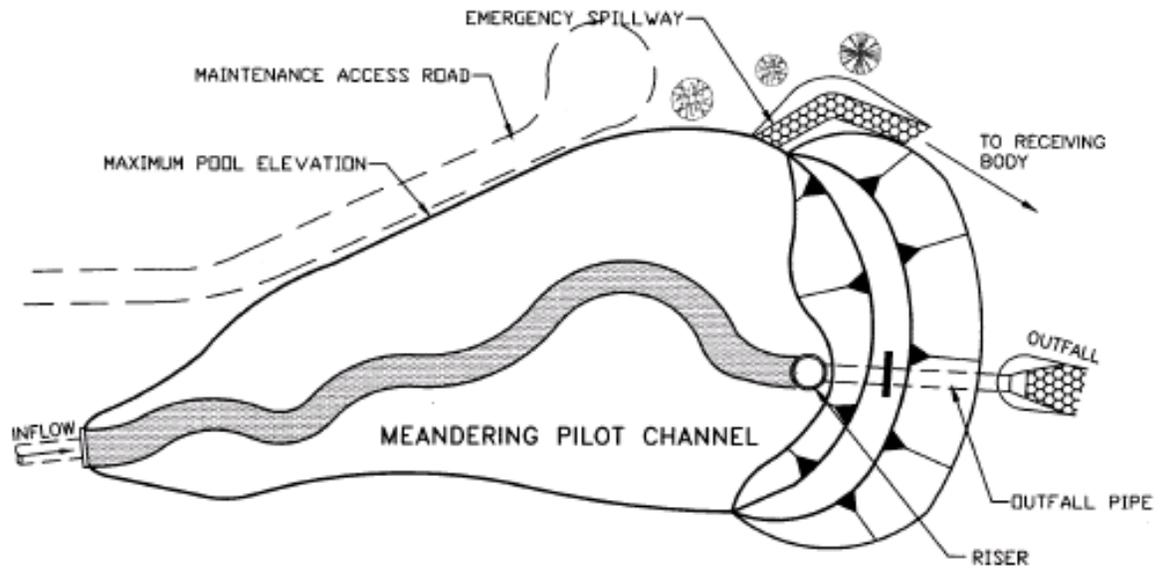
Minimum forebay size shall be equal to 15% of the water quality treatment volume. Optimal volume should be equal to 25% of the water quality treatment volume. Forebay volume shall be in addition to permanent pool volume, where applicable, and shall be separated from permanent pool, if possible. A weir flow structure or physical separation with pipes may be utilized. A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1 to provide separation from the permanent pool. A drainpipe should be included in the forebay to dewater the pool area for maintenance purposes.

H. Inlet Protection

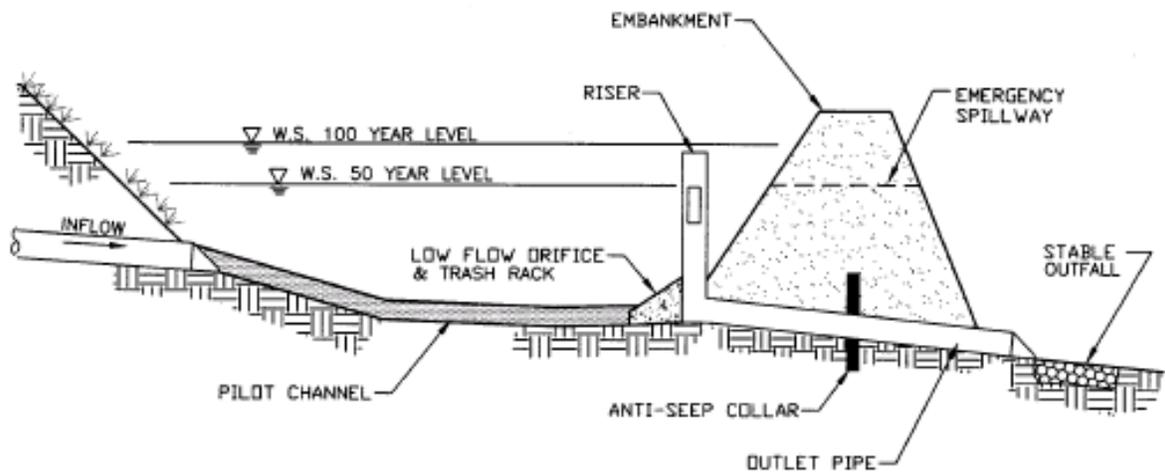
The inlet shall be protected against erosion or scour. Riprap or other material may be required at the inlet to provide for energy dissipation.

I. Stabilization

Wet detention ponds shall be stabilized with vegetation to control dust and improve pond aesthetics. A landscaping plan for a pond and surrounding area should be prepared to indicate how aquatic and terrestrial areas will be vegetatively stabilized, established, and maintained. Whenever possible, wetland plants should be used in a pond design, either along the aquatic bench or within shallow areas of the pool.



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Figure 4.1. Detention Pond.

BMP4.2: EXTENDED DETENTION PONDS**A. Definition**

An extended detention pond is a constructed pond designed to detain a volume of water for a minimum time to allow for the settling of particles and associated pollutants. This type of pond can also be utilized for flood control by including additional temporary storage for peak flows. A wet extended detention pond incorporates both a permanent pool and extended detention. Dry extended detention ponds do not maintain a permanent pool between storm events.

B. Applicability

Ponds should not be used where storm water has the potential to contain soluble metals or toxic organics. In addition, ponds placed in areas where high sediment loads may occur, require frequent maintenance but still may be the most cost-effective treatment method. A wet extended detention pond is suitable in residential, commercial, and industrial sites. It is appropriate in areas where nutrient loadings are expected to be high. Dry extended detention ponds do not maintain a permanent pool between storm events.

C. Pond Geometry

The pond shall be designed to lengthen the flow path, thereby increasing detention time and limiting peak flow rates to pre-development rates. Shallow basins with large surface areas also provide better removal efficiencies than small deep basins. The pond geometry shall meet the following criteria:

- Permanent pool depth shall not exceed 12' with an average depth between 4-6'.
- Length from inlet to outlet should be as far apart as possible.
- Length to width ratio should be approximately 3:1 and side slopes should be 4:1.

D. Sizing

Size the pool according to the design storm criteria in Appendix A, Section 3.B(6). The critical parameters in determining the size of the basin are the storage capacity and the maximum rate of runoff released from the basin. The design shall provide an average of 48-72 hours detention time. This design objective can be achieved by setting the maximum detention time for the greatest runoff volume at approximately 40 hours. The average detention time for very small storms should be at least 6 hours.

E. Forebay

Each pond shall have a sediment fore bay or equivalent upstream pretreatment. The fore bay shall have a separate cell formed by an acceptable barrier. A fixed vertical sediment depth marker shall be installed in the fore bay to measure sediment accumulation.

Minimum fore bay size shall be equal to 15% of the water quality treatment volume. Optimal volume should be equal to 25% of the water quality treatment volume. Forebay volume shall be in addition to permanent pool volume, where applicable, and shall be separated from permanent pool, if possible. A weir flow structure or physical separation with pipes may be utilized. A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1 to provide separation from the permanent pool. A drainpipe should be included in the fore bay to dewater the pool area for maintenance purposes.

F. Outlet Design for a Wet Extended Detention Pond

The outlet shall be designed to pass a flow rate necessary for extended quantity attenuation. The outlet design shall incorporate a multi-stage riser that will allow water to be drained over a minimum of 48-72 hour period depending upon the design storm.

Ponds may be constructed with safety benches. The perimeter of all deep permanent pool areas (at least 4' deep) shall be surrounded by two safety benches with a combined minimum width of 15'. The benches should be designed as follows:

- A safety bench that extends landward from the normal water level edge to the toe of the pond side slope. The maximum slope of the safety bench shall be 12%.
- An aquatic bench that extends from the normal shoreline and has a maximum depth of 18" below the normal pool water surface elevation. Pond slope between the top of the bank and bench shall not exceed 2:1.

G. Outlet Design for a Dry Extended Detention Pond

A perforated riser can be used to slowly release the water over a prolonged period. A cutoff collar should be considered for the outlet pipe to control seepage.

H. Construction Guidelines

Wet extended detention ponds should be excavated in a manner that will minimize disturbance and compaction of the pond. Sediment measuring gauges should be installed at opposite ends of the bottom of the basin to measure sediment accumulation.

I. Stabilization

A landscaping plan for a wet extended detention pond and its buffer shall be submitted to indicate how aquatic and terrestrial areas will be vegetatively stabilized and established. Whenever possible, wetland plants should be used in a pond design, either along the aquatic bench or within shallow areas of the pool. Bottom and banks of all dry extended detention ponds shall be stabilized with gravel, rock, vegetation, or other acceptable material to control dust and prevent erosion.

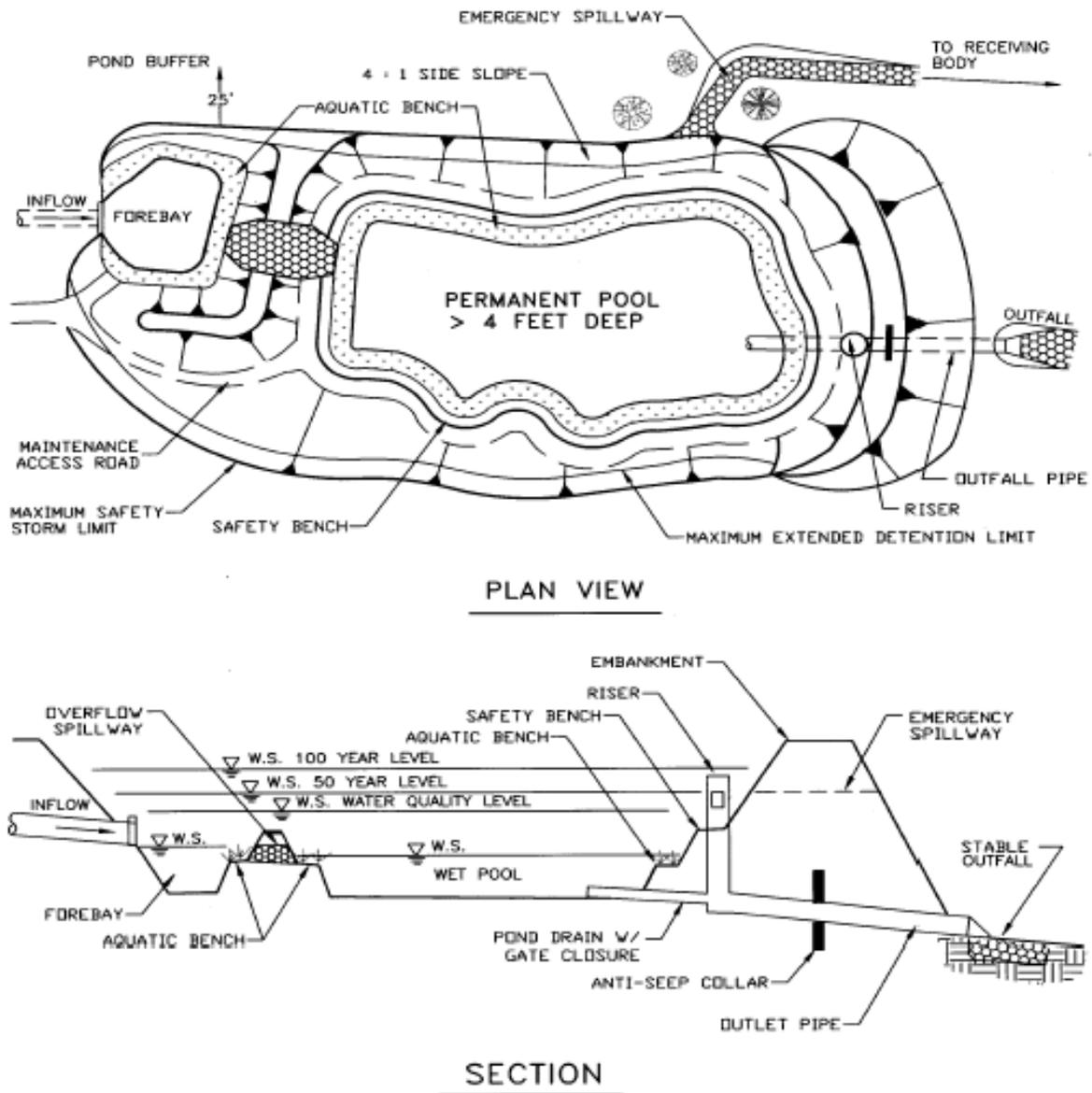


Figure 4.2. Extended Detention Pond.

BMP5: BIOFILTRATION SYSTEMS

A. Introduction and Purpose

This section includes requirements that apply to bio filtration swales (Figure 5.1) and grass buffer strips (Figure 5.2). These BMPs are pre-treatment systems that utilize plant materials for various physical and biological processes in the water quality treatment of runoff. These systems should not be used alone to treat storm water runoff. Rather, they should be used in combination with other structural and nonstructural BMPs to improve water quality.

B. Plan Submittal Requirements

The applicant will be required to provide a written report that includes the Plan Submittal Requirements and a Landscape Plan.

C. Sizing

Unless a bypass is included, the bio filter must be sized as both a treatment device and to pass the peak hydraulic flows. The depth of the storm water should not exceed the height of the grass.

D. Landscaping

Vegetate bio filters with fine, close-growing, water-tolerant grasses that can withstand seasonally saturated soils. Bio filters shall not be used to manage storm water until the vegetation is established. The side slopes of a bio filter should be vegetated to prevent erosion. Barrier shrubs, such as barberry, planted around the bio filter should be considered when there is a high potential for people to damage the bio filter or hinder the bio filter's function. Other grasses or nonaggressive ground covers are appropriate if recommended by a landscape professional.

If trees will be planted near the bio filter, then minimize shading the vegetation in the bio filter treatment area. A spacing of at least 20' (6 meters) is appropriate for trees planted close to a bio filter. Avoid planting trees that would continuously shade the entire length of the bio filter. In addition, avoid using bark, mulch, fertilizers, and pesticides in these areas. These materials tend to run off the planted area and into the bio filter reducing its treatment effectiveness.

E. Operation and Maintenance

Systems should be inspected during regular semi-annual inspections. This inspection schedule applies to all bio filtration systems unless otherwise noted.

Grass shall be mowed to maintain an average grass height between 3 -9", depending on the site situation. Monthly mowing is needed from May through September to maintain grass vigor. Grass clippings should be removed from the swale and composted on site or disposed of properly off site.

Sediment deposited at the head of the swale shall be removed if grass growth is being inhibited for more than 10% of the bio filter length or if the sediment is blocking the even spreading or entry of water to the rest of the facility. Annual sediment removal and spot reseeding should be anticipated.

If flow channelization or erosion has occurred, the facility shall be regraded, then reseeded as necessary.

Access for mowing equipment and maintenance shall be provided. Consideration should be given to providing wheel strips in the bottom of the swale if vehicular access (other than grass mowing equipment) is needed.

BMP5.1: BIOFILTRATION SWALES**A. Description**

Bio filtration swales are storm water runoff systems which treat and then discharge storm water runoff to another system.

B. Design

- A hydraulic residence time for the storm water runoff of 9 minutes is required.
- Water velocity, as determined by Manning's "n", should not exceed 0.9 feet/second.
- The Manning's "n" for grass shall be in the range between 0.02 and 0.024.
- Swales shall be sloped as necessary to obtain the desired design velocity and residence time.
- If flow is to be introduced to the swale via curb cuts, then curb cut pavement elevation shall be no higher than 6" above swale. Curb cuts should be between 12-36" wide.
- Install a flow spreading device at the swale inlet. Appropriate devices include shallow weirs, stilling basins, and perforated pipes. Provide a sediment clean-out area. A sediment catch basin or a larger pre-settling device would control sediments at the swale inlet and allow for easy maintenance.
- Provide for energy dissipation at the inlet. Appropriate means are stilling basins and rip rap pads.
- Swale using rip rap should be sized for the expected runoff velocity.
- Swale side slopes shall be no steeper than 3:1. Swale bottom width shall be no greater than 8'. The maximum depth of flow through the biofiltration swale shall be 3.0".

C. Setbacks and Separation Distances

Perimeter slope of the swale must be a minimum of 2' from property line.

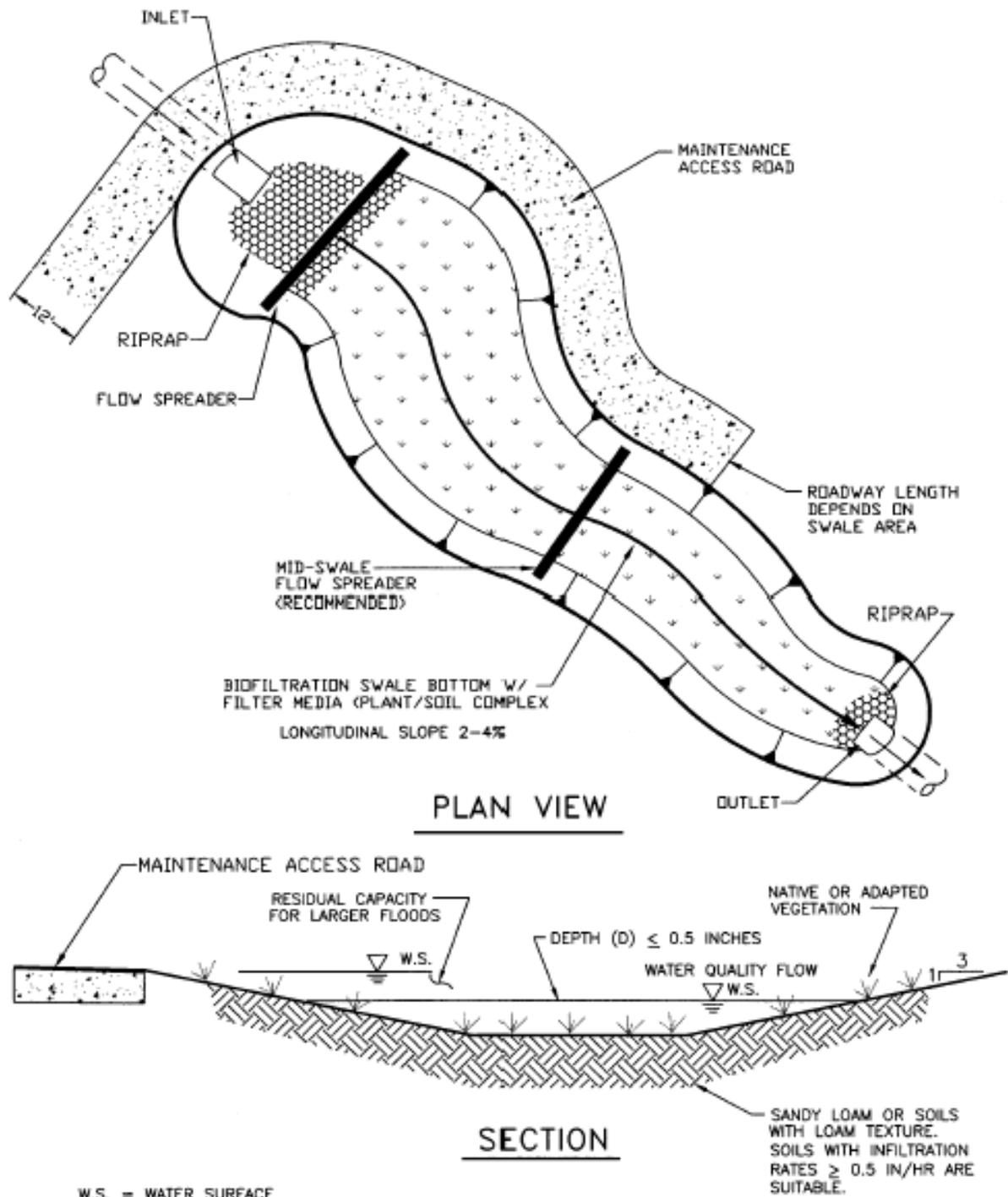


Figure 5.1. Biofiltration Swale.

BMP5.2: GRASS BUFFER STRIPS**A. Introduction**

Grass buffer strips are used as a water quality pretreatment system for smaller sites.

B. Design

- The longest flow path from the area contributing sheet flow to the filter strip shall not exceed 150 feet.
- The lateral slope of the contributing drainage (parallel to the edge of pavement) shall be 2% or less.
- A hydraulic residence time of 9 minutes is required.
- A stepped series of flow spreaders installed at the head of the strip may be used to compensate for drainage areas having lateral slopes of up to 4%.
- The longitudinal slope of the contributing drainage area (parallel to the direction of flow entering the filter strip) shall be 5% or less.
- Grass buffer strips shall not be used when the contributing drainage areas has a longitudinal slopes steeper than 5% or energy dissipation and flow spreading should be provided up slope of the upper edge of the filter strip to achieve flow characteristics equivalent to those meeting the above criteria.
- The longitudinal slope of the strip (along the direction of flow) shall be between 1 - 20%. The lateral slope of the strip (parallel to the edge of pavement, perpendicular to the direction of flow) shall be less than 2 percent.
- The ground surface at the upper edge of the filter strip (adjacent to the contributing drainage area) shall be at least 1 inch lower than the edge of the impervious area contributing flows.
- Manning's roughness coefficient (n) for flow depth calculations shall be 0.04.
- The maximum depth of flow through the filter strip for optimum water quality shall be 1.0 inch.
- The maximum allowable flow velocity for the water quality design flow (WQv) shall be 0.5 feet per second.

- Runoff entering the filter strip must not be concentrated. If the contributing drainage area is not smoothly graded to prevent concentrated flowpaths, a flow spreader shall be installed at the edge of the pavement to uniformly distribute the flow along the entire width of the filter strip. At a minimum, a gravel flow spreader (gravel-filled trench) shall be placed between the impervious area contributing flows and the filter strip. The gravel flow spreader shall be a minimum of 6" deep and shall be 18" wide for every 50' of contributing flowpath. Where the ground surface is not level, the gravel spreader must be installed so that the bottom of the gravel trench is level.
- Energy dissipaters are needed in the filter strip if sudden slope drops occur, such as locations where flows in a filter strip pass over a rockery or retaining wall aligned perpendicular to the direction of flow. Adequate energy dissipation at the base of a drop section can be provided by a rip rap pad.

C. Landscaping

Trees and shrubs should not be located within a grass filter strip.

D. Maintenance

Inspections should occur semi-annually to determine maintenance needs. Access shall be provided at the upper edge of the filter strip to enable maintenance of the inflow spreader throughout the strip width and allow access for mowing equipment.

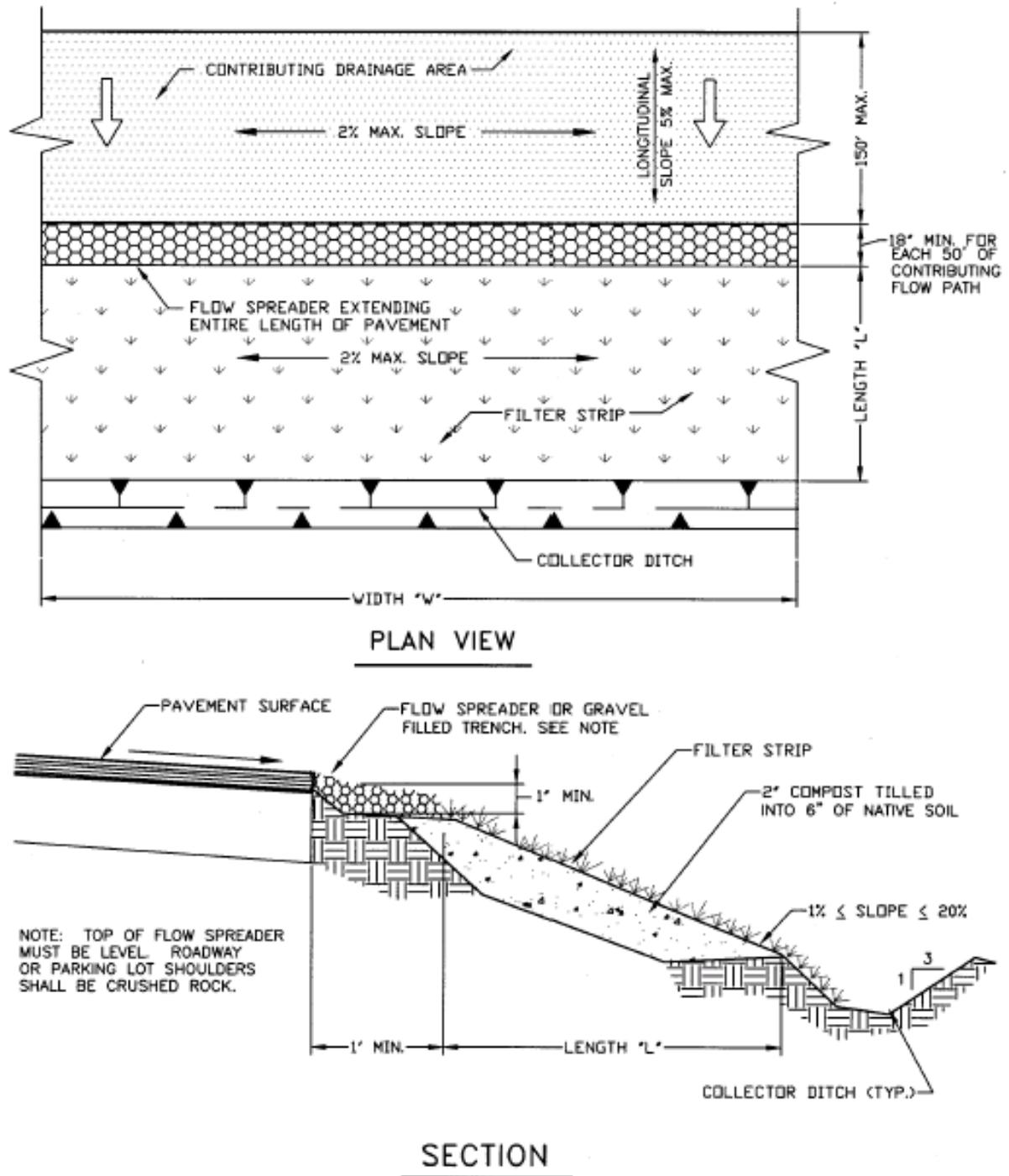


Figure 5.2. Grass Buffer Strip.

BMP6: SAND FILTERS

A. Introduction

Sand filters consist of self-contained beds of sand either underlain with underdrains or cells and baffles with inlets/outlets. Storm water runoff is filtered through the sand, and in some designs may be subject to biological uptake. The four most commonly used sand filter systems are the Austin Sand Filter, the Delaware Sand Filter, the Trench Filter, and the Pocket Sand Filter.

- Austin Sand Filter

The Austin sand filter (Figure 6.1), or surface sand filter, consists of a sedimentation chamber or pond followed by a surface sand filter with collector underdrains in a gravel bed. Filtered runoff is conveyed to a storm sewer or channel by gravity flow or pumping.

- Delaware Sand Filter

The Delaware sand filter (Figure 6.2), or perimeter system, consists 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 pumping.

- Underground Sand Filter

The underground sand filter (Figure 6.3) is placed underground but maintains essentially the same components as the Austin sand filter. The filter consists of a 3 chamber vault. A 3' deep wet sedimentation chamber is hydraulically connected by an underwater opening to provide pretreatment by trapping grit and floating organic material. The second chamber contains an 18-24" sand filter bed and an under drain system including inspection/cleanouts wells. A layer of plastic filter cloth with a gravel layer can be placed on top of the sand bed to act as a pre-planned failure plane which can be replaced when the filter surface becomes clogged. The third chamber collects the flow from the under drain system and directs flow to the downstream receiving drainage system.

- Pocket Sand Filter

The Pocket sand filter (Figure 6.4) is a simplified and low cost design suitable for smaller sites. Runoff is diverted within a catch basin. Pre-treatment is provided by a concrete flow spreader, a grass filter strip, and a plunge pool. The filter bed is a shallow basin and contains the sand filter layer. The surface of the filter bed may contain either a soil layer or grass cover crop.

B. Application and Limitations

Sand filters may be designed as trench systems to receive and treat parking lot runoff, and have been used to replace oil/water separators for pre-treatment. The storm water runoff is discharged or conveyed to another BMP for further treatment or disposal. Depending on soil types, sand filters may be designed as a stand-alone BMP to infiltrate all or a portion of treated runoff. Subsurface disposal restrictions will apply to this application.

The typical drainage area to be served by a sand filter should range from 0.5 to 10 acres. Depending on design, the contributing drainage area may be up to 50 acres.

C. Sizing

Sizing should be based on anticipated sediment accumulation and maintenance. Sand filters shall be sized using the following criteria:

- The sand filter shall be sized for water quality design storm requirements if it will be used as an off-line treatment facility.
- The maximum depth of water over the sand shall be 1'.
- Calculate the sand filter surface area using Darcy's Law or the filtration rate.
- The sand filter shall be designed to completely drain in a 24 hours or less.
- The filtration rate shall be 2" per hour.

D. Pretreatment

Sand filters should be preceded by pretreatment to allow for the settling of coarse sediment that may clog the sand filter and reduce its effectiveness. Pretreatment systems that may be used are sedimentation basins, grass buffer strips, biofiltration swales, or catch basin inserts.

E. Design

The sand bed shall include a minimum of 18" of 0.02-0.04" diameter sand or ASTM C-33 sand. If infiltration into the underlying soil is not desired, the bottom of the system shall be lined with one of the following impermeable layers:

- a minimum 12" thick layer of clay
- a concrete liner with approved sealer or epoxy coating, at least 5", reinforced with steel wire mesh (use 6 gauge or larger wire and 6" x 6" smaller mesh, or a geomembrane layer).

The bed of the filter should be composed of gravel, measuring at least 4-6"; 2" drain rock may also be used.

When sand filters are designed as off-line BMPs, they should be sized for the water quality design storm and the storm water conveyance should be fitted with flow splitters or weirs to route runoff to the sand filter. Excess runoff bypasses the sand filter and continues to another BMP for water quantity control. The inlet structure should be designed to spread the flow uniformly across the surface of the filter; use flow spreaders, weirs, or multiple orifices.

F. Design Life

Final ownership of the system may affect the design, layout and materials used in a system. The designer should specify the materials for the system and at a minimum, the system should be designed for a 50-year life.

G. Setbacks and Separation Distances

When sand filters infiltrate to the subsurface, the following requirements apply:

- Sand filters must be a minimum of 100' from public and private wells.
- There shall be a 5' vertical separation distance between the infiltration surface and bedrock.
- There shall be a 100' separation distance from surface water supplies used as drinking water and a 50' separation distance from surface water supplies not used as drinking water.
- There shall be a minimum 3' vertical separation distance from the infiltration surface and the seasonal high ground water table.

H. Maintenance

- For the first few months after construction, the sand filters should be inspected after every storm. Thereafter the sand filters should be inspected semi-annually to determine maintenance needs.
- The sand filters should be raked periodically to remove surface sediment, trash, and debris.
- Sediments shall be disposed of in accordance with local, state, and federal regulations.
- The top layer of sand should be replaced annually, or more frequently when drawdown does not occur within 36 hours after the pre-settling basin has emptied.
- The water level in the filter chamber should be monitored on a quarterly basis and after large storms during the first year.
- The sedimentation chamber should be pumped out or extracted when the sediment depth reaches 12".
- Oil on the surface should be removed separately and recycled. The remaining material may be removed by a vacuum pump and disposed of according to local, state, and federal regulations.

I. Maintenance Access

- Unobstructed access shall be provided over the entire sand filter by either doors or removable panels.
- Access to the sand filter should be provided for maintenance, including inlet pipe and outlet structure.
- Ladder access is required when vault height exceeds 4'. Access openings should have round solid locking lids with ½" diameter allen head screw locks.

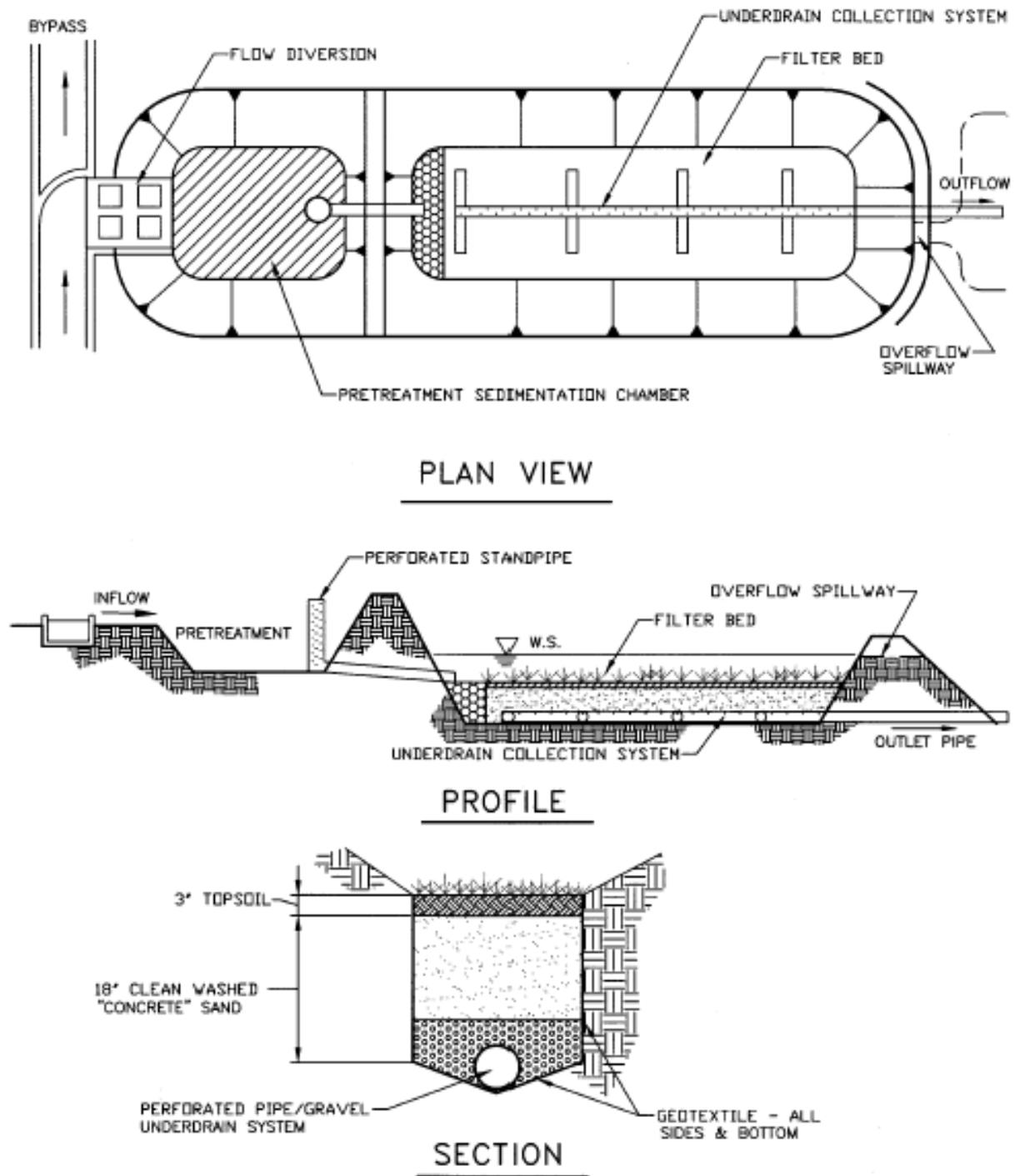


Figure 6.1. Austin Sand Filter.

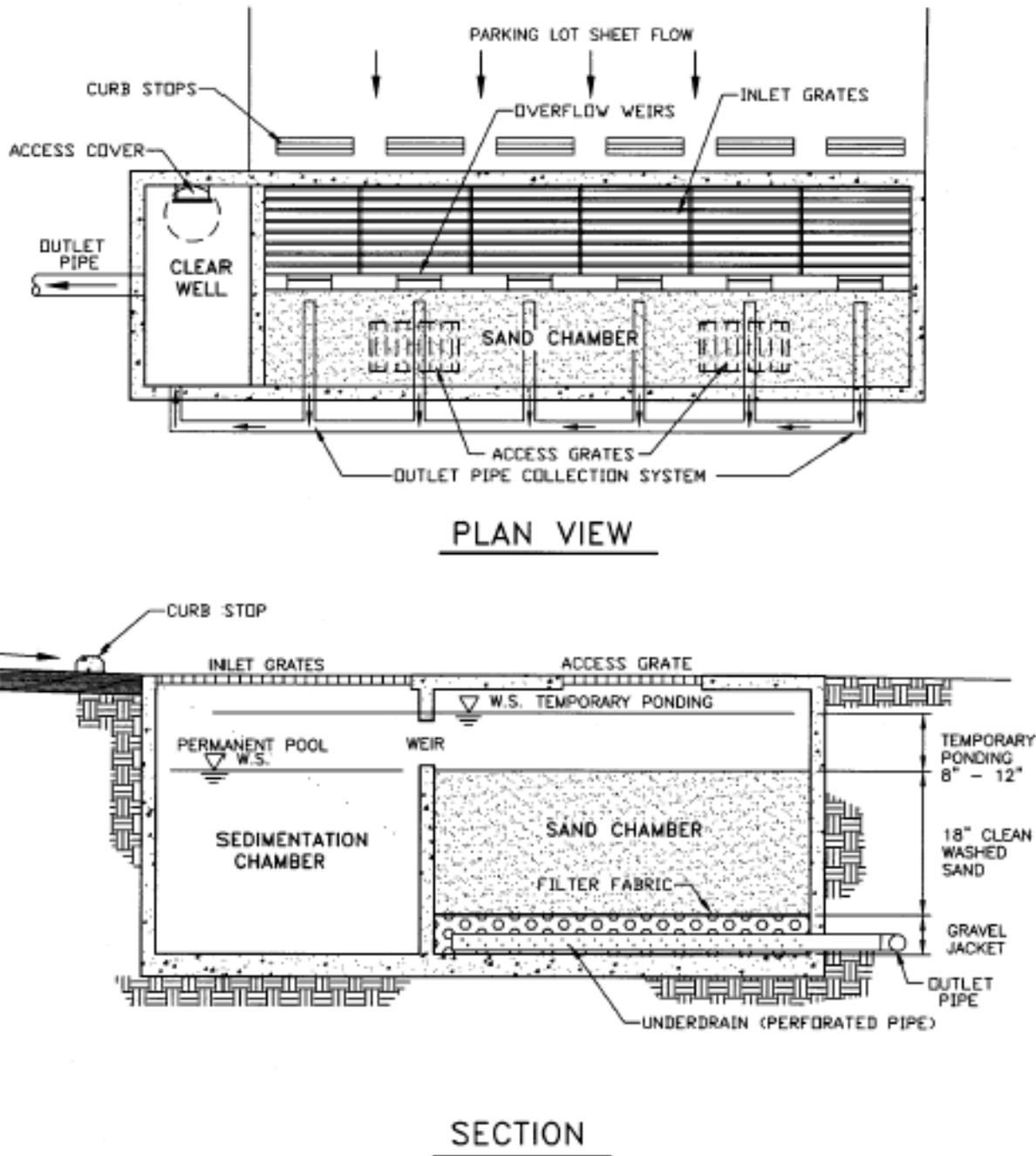


Figure 6.2. Delaware Sand Filter.

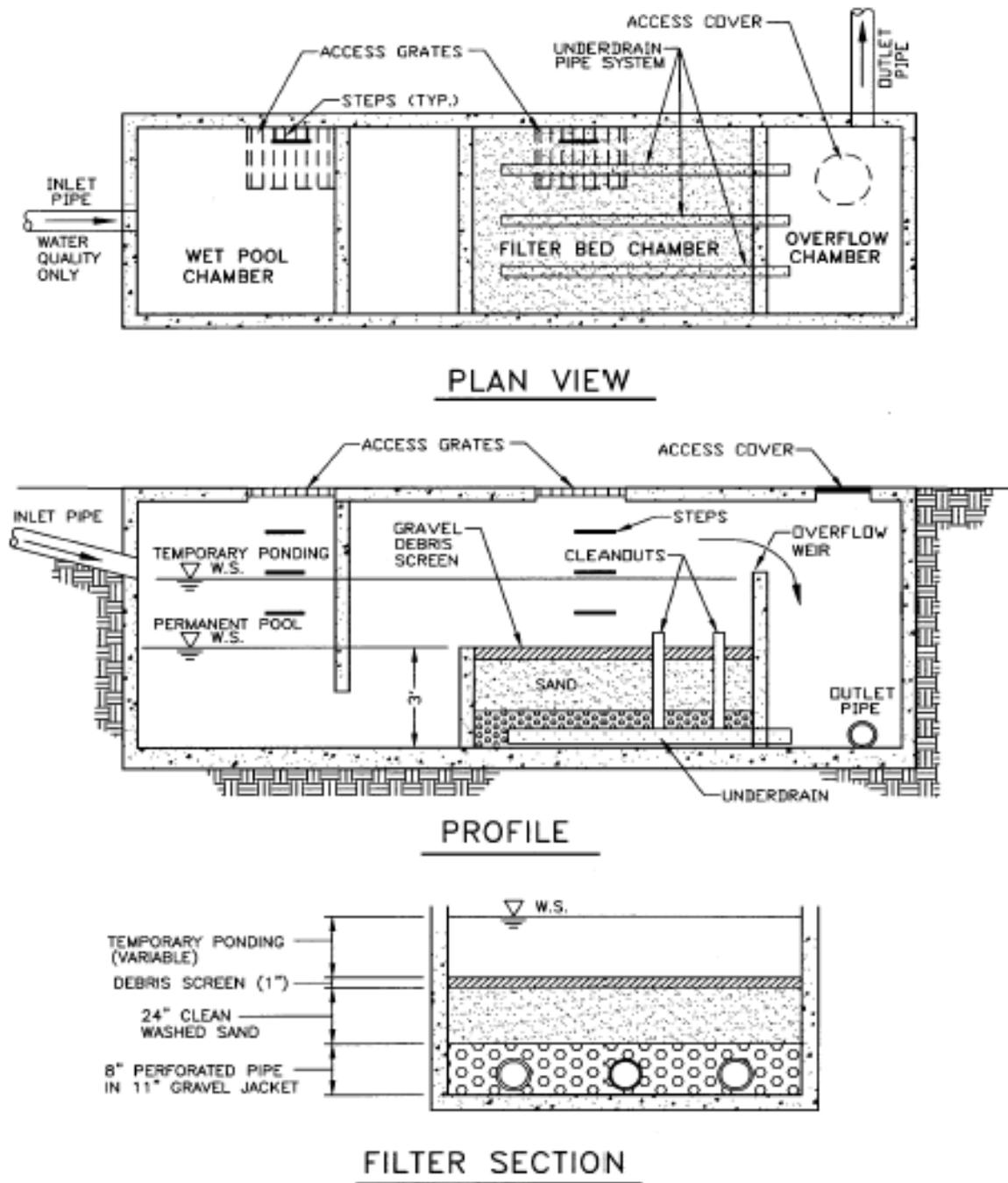


Figure 6.3. Underground Sand Filter.

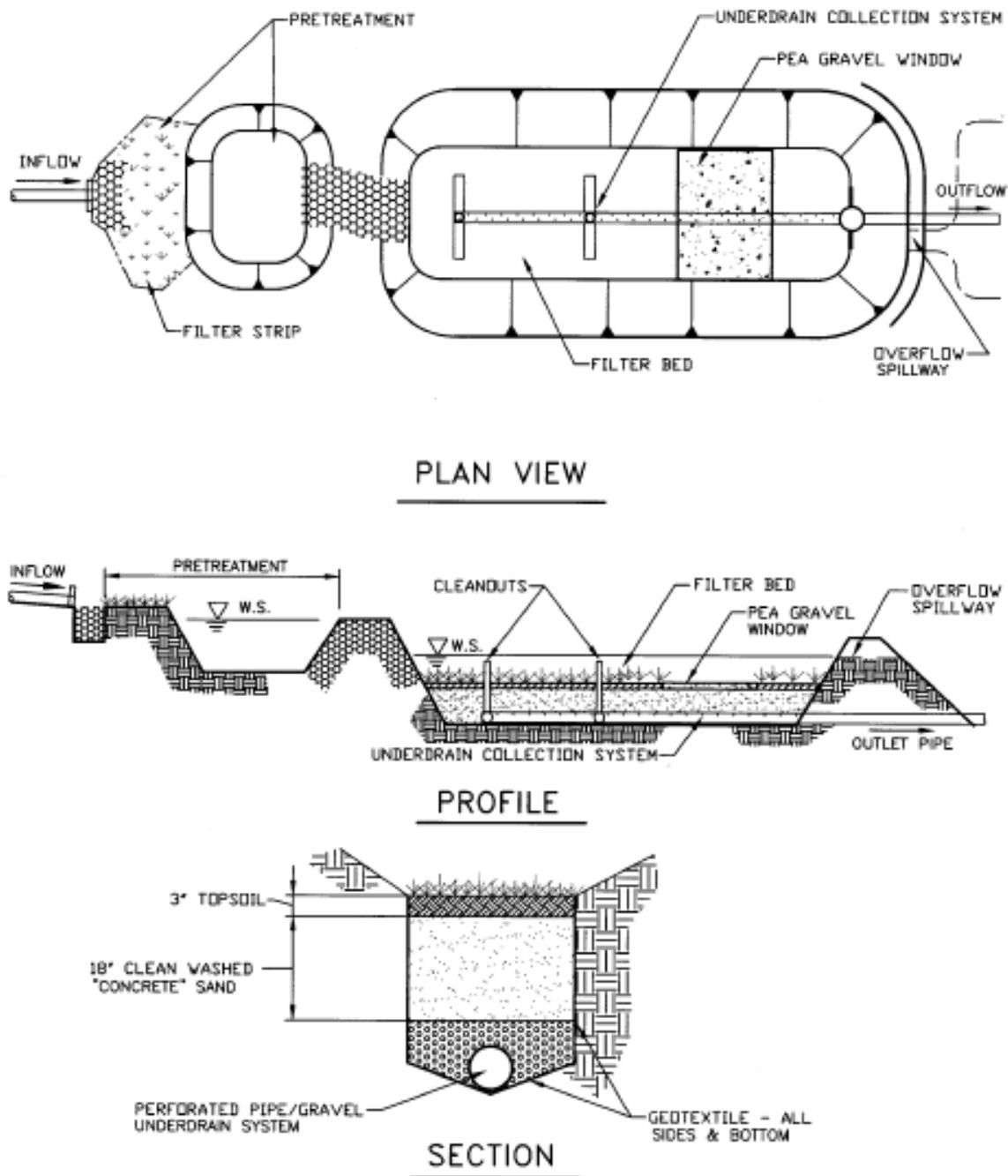


Figure 6.4. Pocket Sand Filter.

CALCULATING PEAK DISCHARGE AND VOLUME

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This appendix describes methods for calculating pre- and post- development runoff volumes and peak discharge rates. These calculations should be performed in order to help select, size, and design stormwater BMPs to meet the peak flow rate, water quality, and groundwater recharge criteria described in Section 3.B.(6) of Appendix A. This Appendix provides steps for performing these calculations using the rational method, which is only applicable for sites 200 acres or less in size. For larger sites, areas with significant flood storage effects/features, highly complicated sites, or for BMP designs that require complete design hydrographs, calculations should be performed using the NRCS TR-55 method. A description of this method is not provided in this appendix; however, detailed TR-55 documentation and a free Windows-based download of the TR-55 program can be obtained on-line at:

<http://www.wcc.nrcs.usda.gov/water/quality/hydro/>

Hydrologic methods for determining runoff rate and volume other than the rational method or TR-55 may be acceptable, but the applicant must obtain prior approval from Summit County before beginning hydrologic studies and calculations using alternative methods.

Calculating Peak Runoff

Use the rational formula:

$$Q_p = CiA$$

- Q_p = peak discharge (cfs)
- C = dimensionless runoff coefficient
- I = rainfall intensity (in./hr) for a duration equal to the time of concentration and for the recurrence interval chosen for design
- A = site area (acres)

- 1) **Calculate site area (A).** This can be determined from USGS topographic maps, site surveys, and other available information.
- 2) **Determine the runoff coefficient (C).** This value is obtained from the tables below, and is based on land use type (s) for developed areas, and soil hydrologic group/ slope characteristics for undeveloped areas. For areas with mixed land uses, the area should be divided into subareas with similar characteristics (A₁, A₂, etc.), and a weighted coefficient should be determined using the following formula:

$$C = [(A_1 * C_1) + (A_2 * C_2) \dots + (C_n * A_n)] / A$$

where C₁, C₂, etc. are the runoff coefficients for each individual subarea. Information on slope and land use can be obtained from USGS topographic maps, site surveys, air

photos, and other available data. Summit County soil maps and hydrologic group information can be obtained from local Soil Conservation Districts, or on-line at:

<http://soildatamart.nrcs.usda.gov/>

Soil hydrologic group information can be obtained by selecting the “generate reports - water features” function at this website. The different soil hydrologic groups are defined as follows (definitions taken from USDA Technical Release-55 “Urban Hydrology for Small Watersheds, 1986):

- Group A: These soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).
- Group B: These soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).
- Group C: These soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).
- Group D: These soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

Table F1. Recommended Rational Method “C” Coefficients for Developed Areas.

Land Use Category	Runoff Coefficient “C”
Business	
Central business areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential	
Single-Family	0.35-0.45
Multi-family, detached	0.40-0.60
Multi-family, attached	0.60-0.75
Low Density - 0.5 acre lots or larger	0.25-0.40
Industrial and Commercial	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad yard areas	0.20-0.40
Roofs	0.90-0.95
Streets, Drives, Walks (asphalt or concrete)	0.90-0.95
Streets, Drives, Walks (brick, gravel, or disconnected pavers)	0.70-0.85

Table F2. Recommended Rational Method “C” Coefficients for Undeveloped/Pervious Areas.

Slope	Runoff Coefficient “C” ^a			
	<u>A soils</u>	<u>B soils</u>	<u>C soils</u>	<u>D soils</u>
Flat (0-2%)	0.04-0.09	0.07-0.12	0.11-0.16	0.15-0.20
Average (2-6%)	0.09-0.14	0.12-0.17	0.16-0.21	0.20-0.25
Steep (>6%)	0.13-0.18	0.18-0.24	0.23-0.31	0.28-0.38

^avalues should be selected from the high or low end of the given ranges based on the condition of ground cover/vegetation.

- 3) **Calculate the time of concentration (T)** to use in determining the appropriate rainfall duration and intensity to use in the rational formula. T is the time required for water to travel the longest watercourse within the drainage area (i.e., the time for water to travel from the hydrologically most remote point of the basin to the location being analyzed). T can be determined graphically using Figure F1 or calculated using the FAA formula below. For small and/or highly impervious areas with very short times of concentration, the default minimum T value to be used for design purposes is 10 minutes.

$$T = 1.8 * (1.1 - C) D^{0.5} / S^{1/3}$$

T = time of concentration (minutes)

C = dimensionless runoff coefficient (same as used in rational formula)

D = length (in feet) of longest watercourse

S = % slope of longest watercourse

The variables D and S can be determined from USGS topographic maps, site surveys, and other available information. Care should be taken to field-verify flow path information to ensure that any existing graded swales, ditches, gutters, or other constructed drainage systems that intercept the natural contours are accounted for when determining slope and flow length for the purposes of these calculations.

For small and/or highly impervious areas with very short times of concentration, the default minimum T value to be used for design purposes is 10 minutes.

Additional information and an automated T calculator can be found on-line at:

<http://www.lmnoeng.com/Hydrology/TimeConc.htm>

- 4) **Determine the average rainfall intensity (I).** This value should be obtained for the recurrence interval of interest and a duration equal to the time of concentration T calculated in (3) above using the NOAA Atlas 14 intensity-duration-frequency (IDF) curve for an appropriate nearby climate station. Table F3 and Figure F2 provide IDF data for the Park City climate station; additional IDF curves and tables can be obtained online at:

http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html

Table F3. NOAA Atlas 14 Precipitation Intensity Estimates for Station “Park City Radio, Utah” (Station #42-6648). Values are in inches per hour.

duration	Frequency								
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr	1000-yr
5 min	1.90	2.62	3.26	4.36	5.36	6.56	8.00	10.31	12.44
10 min	1.45	1.99	2.48	3.32	4.09	5.00	6.09	7.84	9.47
15 min	1.19	1.64	2.05	2.74	3.38	4.13	5.03	6.48	7.83
30 min	0.80	1.11	1.38	1.85	2.27	2.78	3.39	4.36	5.27
60 min	0.50	0.69	0.85	1.14	1.41	1.72	2.10	2.70	3.26
120 min	0.31	0.41	0.50	0.65	0.78	0.95	1.15	1.46	1.75
3 hr	0.24	0.30	0.36	0.45	0.54	0.64	0.77	0.98	1.18
6 hr	0.16	0.19	0.22	0.27	0.31	0.36	0.41	0.50	0.60
12 hr	0.10	0.12	0.14	0.17	0.19	0.21	0.24	0.28	0.31
24hr	0.07	0.08	0.09	0.10	0.11	0.13	0.14	0.15	0.17
48 hr	0.04	0.05	0.05	0.06	0.07	0.08	0.08	0.09	0.10
4 day	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06
7 day	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04
10 day	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
20 day	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
30 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
45 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
60 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

5) **Calculate the peak discharge (Q_p).** For storm events with recurrence intervals more frequent than 25 years, use the following formula:

$$Q_p = \text{©} * (I) * (A)$$

For storm events with recurrence intervals of 25 years or greater, the runoff coefficient should be adjusted by the factor C_f because infiltration and other abstractions have a proportionally smaller effect on runoff. Values for C_f are provided in Table F4. Once the C_f is determined, peak discharge is calculated using the following formula:

$$Q_p = \text{©} * (C_f) * (I) * (A)$$

Q_p should be calculated for both pre- and post-development land use conditions. In order to meet the peak flow rate criteria outlined in Appendix A, Section 3B(6), non-structural and structural BMPs should be designed to control the post-development rate Q_p to the pre-development rate. Non-structural methods that reduce the post-development runoff coefficient and lengthen the time of concentration (e.g., preservation of natural areas with type A or B soils, minimizing impervious areas, using vegetated swales instead of storm sewers, etc.) will be the most effective techniques to meet the peak flow rate criteria.

Table F4. Runoff Coefficient Adjustment Factors for Rational Method.

<u>Recurrence Interval (years)</u>	<u>Adjustment Factor C_f</u>
25	1.1
50	1.2
100	1.25

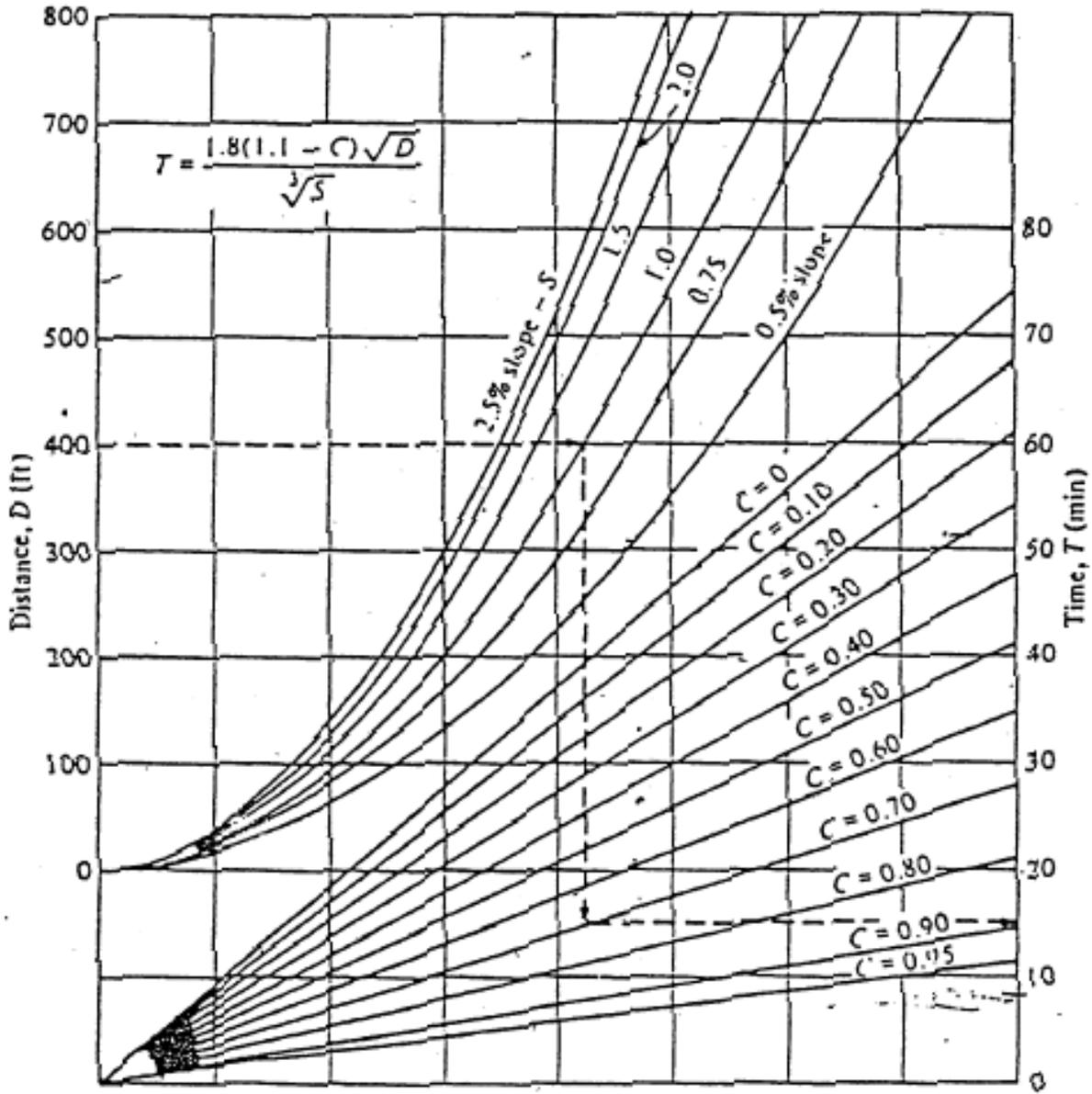


Figure F1. Time of concentration curves based on the FAA (1965) method.

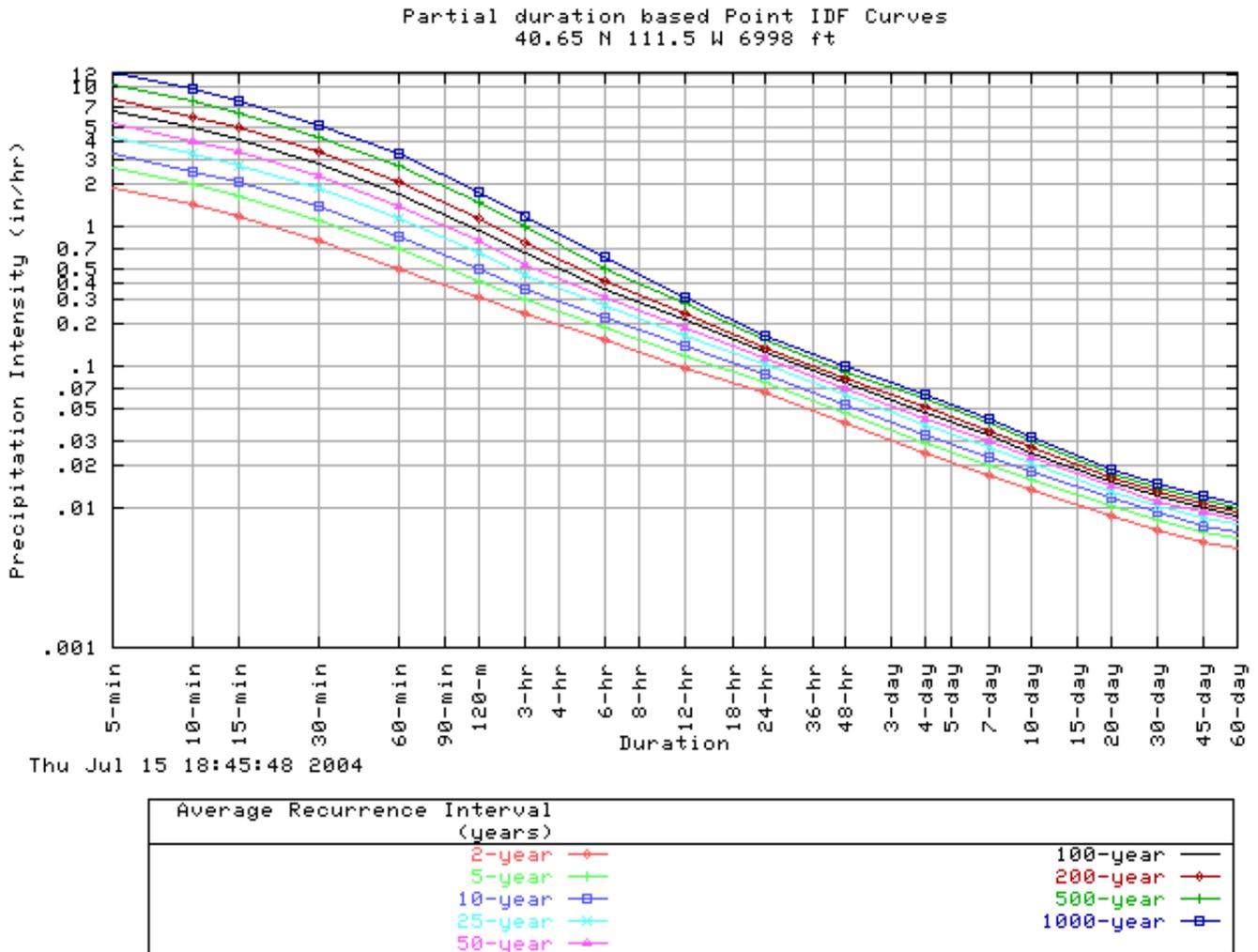


Figure F2. NOAA Atlas 14 precipitation intensity-duration-frequency curves for station “Park City Radio, Utah” (Station #42-6648).

Calculating Water Quality Volume

To meet the water quality and groundwater recharge criteria outlined in Appendix A, Section 3B(6), the runoff volume associated with a storm event of 0.5" in 1 hour must be calculated for pre- and post-development conditions.

Use the rational formula:

$$WQ_v = CItA$$

WQ_v	=	water quality volume (ft ³)
C	=	dimensionless runoff coefficient
I	=	rainfall intensity = 0.5"/hr = 0.042 ft/hr
t	=	storm duration = 1 hour
A	=	site area (ft ²)

$$WQ_v = C * (0.042 \text{ ft/hr}) * (1 \text{ hr}) * A = (0.042 \text{ ft}) * C * A$$

Runoff coefficient (C) values for the water quality volume calculation should be selected using the same tables and guidelines described above in the section on calculating peak runoff.

Calculating Groundwater Recharge Volume

The criteria in Appendix A, Section 3B(6) require that the increase in surface runoff volume from the water quality storm (0.5" in 1 hour) is recharged into the ground rather than discharged off-site as surface runoff. This required groundwater recharge volume (GW_v) is calculated as:

$$GW_v = WQ_v \text{ (post-development)} - WQ_v \text{ (pre-development)}$$

where WQ_v is calculated as described above in the section on calculating water quality volume.

Calculating TSS Removal Rate

Rather than requiring a calculation of the actual real-world TSS load for a site, the application of this standard has been simplified to estimate a site's annual TSS load as 1.0 (i.e., 100%) as it enters the first BMP in the system. Therefore, in addition to performing the calculations below to demonstrate that adequate BMP performance efficiency has been provided, the permittee must also demonstrate compliance by showing that:

- The treatment BMPs have been designed/sized to treat the post-development water quality volume (WQ_v), calculated as described above; and,
- The BMPs are inspected regularly and maintained as needed to perform efficiently.

Information on maintenance needs for individual BMPs is included in Appendix E, and sample inspection forms are provided in Appendix G.

Steps to calculate the TSS removal rate:

- 1) From Table 1 in Appendix E, determine the required final TSS removal rate (®) based on the percent of overall site area that is impervious. Use the definition for “impervious surface” provided in Appendix A Section 2. For sites where newly-developed impervious areas lie within 50 feet of a live water body (perennial or intermittent stream, lake, pond, spring, or reservoir), the Table 1 sliding scale does not apply and the default 80% TSS removal standard must be met.
- 2) If appropriate, divide the site into individual drainage areas. It is essential that the final TSS removal rate be calculated separately for each subarea. Isolated impervious areas (e.g., disconnected rooftops) that are serviced solely by their own BMPs, such as swales or seepage beds, should be considered as separate drainage areas. Each individual drainage area must meet the TSS removal rate for the entire site, as determined in step (1).
- 3) For each individual drainage area, list the storm water BMPs and their order in the engineered system, beginning with the first BMP collecting storm water from the site. For example, pretreatment and conveyance BMPs will typically precede the removal BMPs. Using the values from Appendix E Table 2, list the estimated TSS removal rate for each BMP in the treatment system.
- 4) Calculate the final TSS removal rate (®) according to the following formula:

$$R = (L_1 * R_1) + (L_2 * R_2) + (L_3 * R_3) \dots + (L_n * R_n)$$

L_1 = initial TSS load = 1.0 (i.e. 100%)

R_1 = fractional TSS removal rate for the first BMP in the system (e.g., if the removal rate listed in Appendix E Table 2 for BMP1 is 60%, the fractional rate R_1 is 0.60)

L_2 = remaining TSS load after preceding BMP = $L_1 - (L_1 * R_1)$

R_2 = fractional TSS removal rate for the second BMP in the system

L_3 = remaining TSS load after preceding BMP = $L_2 - (L_2 * R_2)$

R_3 = fractional TSS removal rate for the third BMP in the system

L_n = remaining TSS load after preceding BMP = $L_{(-1)} - (L_{(-1)} * R_{(-1)})$

R_n = fractional TSS removal rate of final (n^{th}) BMP in the system

As evident in the above formula, the TSS removal rates are not additive from one BMP to the next; instead, the estimated removal rates are applied consecutively as the TSS load passes through each BMP technology.

- 5) Check that the final removal rate R for each drainage area is greater than or equal to 0.80 (80%) or the applicable sliding scale standard from Appendix E Table 1. If R is less than the standard for any of the drainage areas, the system should be redesigned in order to meet the standards.

APPENDIX G: SAMPLE INSPECTION FORMS

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- Facility in Noncompliance
- Facility in Compliance

Signature(s)

INSPECTION AND MAINTENANCE CHECKLIST FOR STRUCTURAL POST- CONSTRUCTION BMPs

Summit County BMP3.1: Seepage Beds (Infiltration Trench)

Date: _____ Time: _____ Type of inspection (circle one):
 Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Seepage Bed	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Drain rock			
Filter fabric			
Surface Inlet (if present)			
Observation well (ponding should not be present)			
Surface (ponding should not be present)			
Surface vegetation			
Trash, sediment, debris			
Pre-treatment system (use additional checklist if appropriate, e.g. oil/water separator)			
Pollution			
Vegetated buffer strip (if present)			

**INSPECTION AND MAINTENANCE CHECKLIST FOR STRUCTURAL POST- CONSTRUCTION
BMPs**

Summit County BMP4: Ponds

Date: _____ Time: _____ Type of inspection (circle one):
Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Embankment and Spillways	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Vegetation and ground cover			
Erosion at inlets/ outlets/ side slopes			
Animal/rodent burrows			
Seeps or leaks in embankment or spillway			
Cracking, bulging, or sliding of dam			
Spillways clear of obstructions and debris			
Riser			
Pipe/ concrete/ masonry condition			
Trash rack(s) free of debris (low flow & weir)			
Orifice unobstructed by sediment/ debris			
Condition of access structures (e.g., ladders)			
Excessive sediment accumulation inside riser			
Outflow			
Evidence of slope or bank erosion			
Riprap condition			
Pipe & endwall/headwall condition			

Pond (General)			
Sedimentation level in sediment forebay			
Undesirable vegetative growth			
Sedimentation level in pond			
Evidence of pollution (oil, grease, etc.)			
Trash/ yard waste			
Graffiti			
Public safety hazards			
Noxious odors			
Noxious insects			

Appendix C Summit County LID Design Specifications & Long-Term Stormwater Management Template

Rain Garden



Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	Yes

Rain gardens are shallow bioretention areas with engineered or native soils. A variety of plants are used to increase infiltration and nutrient uptake including trees, shrubs, grasses, and other plants suitable for the climate. Rain gardens may be designed with various layers of soil, sand, and aggregate. They may also be designed with the existing soils at the site if the soils are expected to adequately infiltrate, support vegetation, and remove pollutants. They can be topped with a wood or rock mulch, any organic material, or other landscaping features. Performance is increased with high carbon soils. Sand and aggregate layers below the soil layers may provide filtration and storage. Rain gardens are usually well-received by the public for their aesthetic qualities.

Slopes leading to the garden bottom are gentle or steep based on site constraints, such as within urban areas. Ponding depths are typically between 1 to 18 inches. Underdrains and impermeable liners are necessary when subsurface concerns exist such as proximity to a structure, poorly infiltrating soils beneath the cross-section of the garden, or groundwater concerns. When a rain garden must be lined, its volume retention function is eliminated, pollutant removal effectiveness is diminished, and it functions primarily as a detention device; however, it still provides treatment through biofiltration. A bypass mechanism either within the rain garden or upstream of the rain garden should be considered for flood events.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Depth to Historical High Groundwater	2 ft	No Maximum	-
Side Slopes	No Minimum	3H:1V	-
Ponding Depth	No Minimum	18 in.	-
Drawdown Time	12 hrs	72 hrs	24 to 48 hours preferred. Drawdown time may also depend on local mosquito abatement regulations. (should we add our regs?)
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design. Infiltration rate should be low enough to allow biofiltration process to occur. During design, infiltration rate, drawdown time, and the soil matrix depth will be directly related
Freeboard	No Minimum	No Maximum	Freeboard per jurisdiction standards (ours?) . For public safety, consider requiring freeboard and a minimum 6 inch embankment when ponding depth is greater than 6 inches.

Rain Garden Effectiveness

Effective rain gardens provide an aesthetically pleasing method for retaining and treating storm water. Visiting rain gardens during rain events will reveal if the garden is draining properly. Rain gardens are performing properly if they are retaining their design volume and treating runoff. Creating and following through on maintenance guidelines are critical to ensuring that a rain garden remains functional.

There are many possible indications that a rain garden has failed or is near failure, such as: ponding beyond the design ponding depth during small storm events, drawdown time exceeds design drawdown time, larger than expected sediment buildup within or upstream of the rain garden, irregular settling of the rain garden bottom creating standing water, sloughing of side slopes, excessive and unmaintained vegetation, lack of vegetation, and no maintenance or no record of maintenance. Although this is not an all-inclusive list, being aware of these items will assist in determining what steps need to be taken to remediate a failing rain garden.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is there available right-of-way, property, or easement?	<input type="checkbox"/>	<input type="checkbox"/>
Is the design infiltration rate within acceptable rates?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present?	<input type="checkbox"/>	<input type="checkbox"/>
Is the drainage area to the rain garden less than 5 acres? (If no, consider an infiltration basin or subdividing to create smaller drainage areas.)	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the rain garden technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical conditions exist that would compromise the stability of the rain garden or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Does the rain garden provide storage for 100% of the water quality volume? (If no, it may still be appropriate to construct the rain garden if it is technically infeasible to capture 100% of the water quality volume.)	<input type="checkbox"/>	<input type="checkbox"/>
Does an overflow outlet structure or bypass mechanism exist?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Excavation

Rain gardens, like other BMPs whose functionality is dependent on infiltration, will fail if proper care is not taken during excavation and construction. Excavators and heavy machinery should not be used within the rain garden area if infiltration is expected to occur through the rain garden bottom. Additional excavation beyond the rain garden's footprint may be required depending on site conditions to provide soil stability or to be able to tie-in to the surrounding grade.

Activities During Construction

Avoid using heavy machinery within the rain garden footprint during construction as doing so will compact the soils and diminish their infiltrating capabilities. Light machinery and even walking within the rain garden's footprint will also compromise infiltration. Compaction of native soils or backfill below the rain garden subsoils is acceptable if doing so does not prevent infiltration from occurring.

Flows During Construction

Flows during construction should be diverted away from the rain garden to prevent construction site sediment from clogging soils. Scheduling installation of the rain garden shortly after excavation will minimize the impact of unnecessary storm water flows from entering the excavated area. The introduction of unwanted sediment can be prevented by placing fiber rolls or silt fences around the rain garden perimeter during construction.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.
- Follow landscaping guidance to ensure that vegetation establishes after installation.

Installation Costs

The following cost items are typically associated with rain garden construction

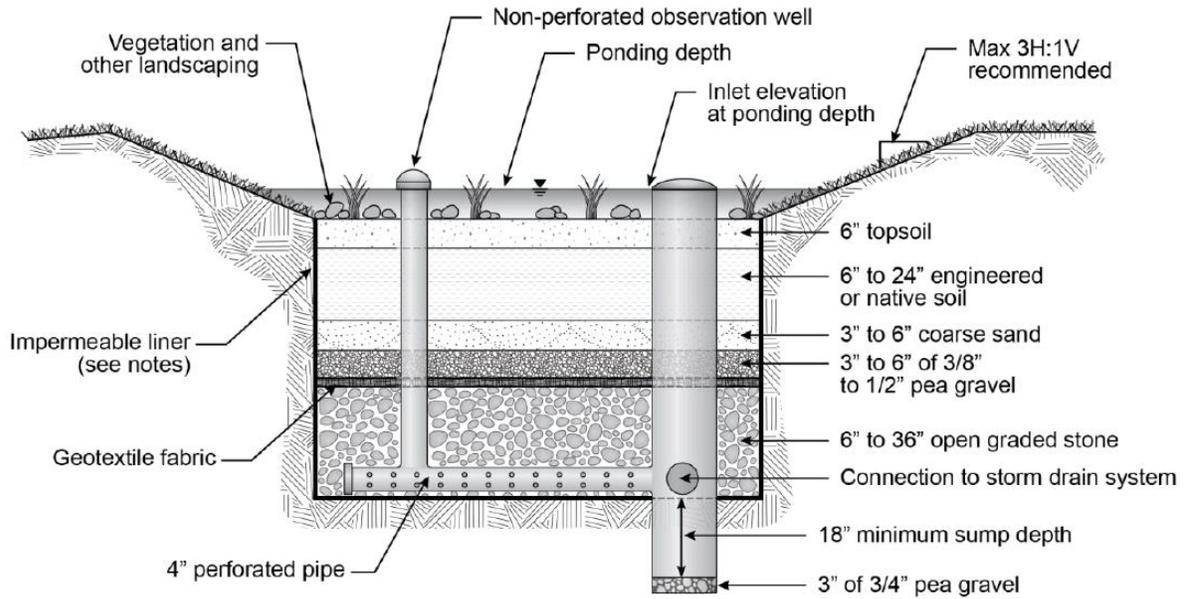
- Excavation
- Grading
- Fine grading
- Granular borrow fill
- Landscaping and vegetation
- Top layer
- Engineered soil
- Coarse sand
- Crushed gravel
- Open graded stone
- Geotextile fabric
- Outlet structure or upstream bypass structure (for larger storm events)
- Observation wells
- Curb and gutter
- Impermeable liner (if needed)
- Underdrain system (if needed)
- Irrigation system (if needed)

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of bioretention BMPs.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for adequate vegetation coverage, and impaired or failing vegetation	Semiannual (Spring, Fall)	Reseed/replant barren spots, Notify the engineer if failing vegetation persists	Low
Inspect side slopes for erosion, rilling, and sloughing	Semiannual (Spring, Fall)	Regrade side slopes if soughing does not impact slope stability. Notify the engineer if sides slope stability has been compromised and is affecting the functionality of the basin	Low
Inspect for trash and debris within basin and at inlet and outlet structures	Semiannual (Spring, Fall) or as needed	Remove and dispose of trash and debris.	Low
Inspect for large deposits of sediment on basin bottom indicating soil clogging	Semiannual (Spring, Fall) or as needed	Remove and dispose of built up sediment when buildup causes reduction in size of basin or if buildup results in standing water. Notify the engineer in the case of standing water as it may indicate clogging within the basin's soil layers	Low
Inspect for standing water within rain garden or within observation well	Semiannual (Spring, Fall) or as needed	Notify the engineer for further inspection	Medium
Inspect for failure of additional feature such as underdrains or irrigation systems	Semiannual (Spring, Fall) or as needed	Repair as needed	Medium

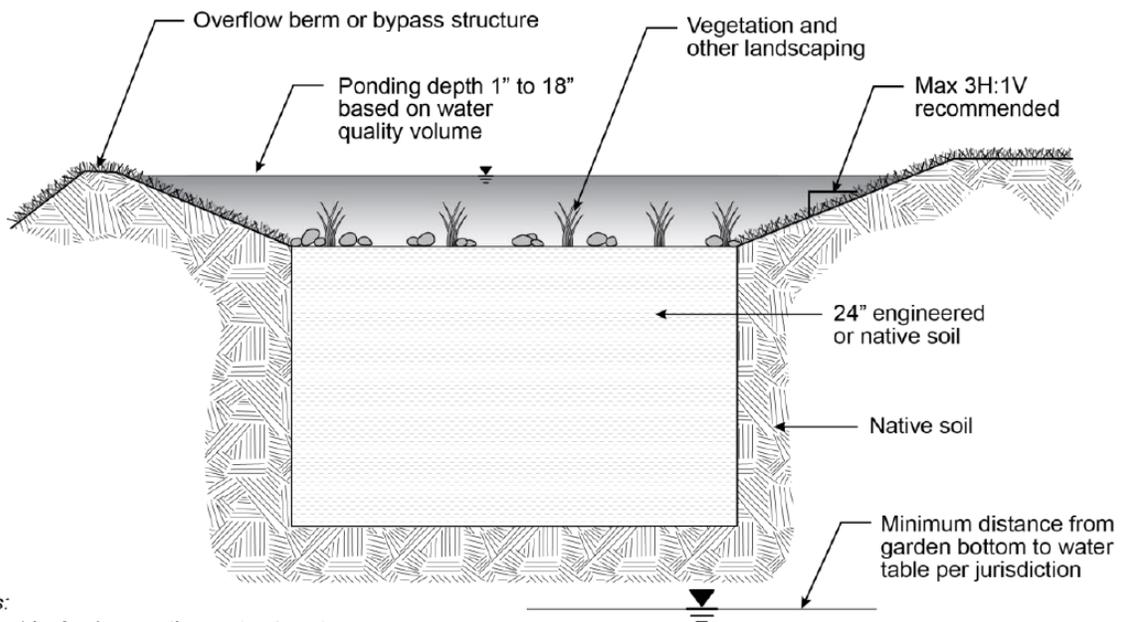


Notes:

- Impermeable liner around all sides and bottom of rain garden if groundwater concerns exist
- Dimensions shown may vary based on site conditions
- Consider forebay or other pretreatment

Rain Garden with Underdrain System

Not to scale



Notes:

- Consider forebay or other pretreatment
- Consider upstream bypass for large storm events

Rain Garden in Native or Engineered Soils

Not to scale

More information can be found at <https://documents.deq.utah.gov/water-quality/stormwater/updes/DWQ-2019-000161.pdf>

Bioretention Cell



Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	Yes

Bioretention cells are shallow bioretention areas with engineered soil. They typically differ from rain gardens by having a delineation such as a curb, wall, or other distinct boundary. Similar to a rain garden, a variety of plants are used to increase infiltration and nutrient uptake including trees, shrubs, grasses, and other plants suitable for the climate. They may be designed with native soils or various layers of soil, sand, and aggregate. They can be topped with a wood or rock mulch, any organic material, or other landscaping features. Performance is increased with high carbon soils. Sand and aggregate layers below the soil layers provide filtration and storage.

Ponding depths are usually between 1 to 18 inches. In areas with high foot traffic, it may be necessary to provide a safety bench of soil within the cell and a minimum side slope leading to the cell bottom. Underdrains and impermeable liners are necessary when subsurface concerns exist such as proximity to a structure, poorly infiltrating soils, or groundwater concerns. When a bioretention cell must be lined, its volume retention function is eliminated, its pollutant removal effectiveness is diminished, and it functions primarily as a detention device; however, it still provides treatment through biofiltration. A bypass mechanism either within the bioretention cell or upstream of the cell should be considered for flood events.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Depth to Historical High Groundwater	2 ft	No Maximum	-
Ponding Depth	No Minimum	18 in.	-
Drawdown Time	12 hrs	72 hrs	24 to 48 hours preferred. Drawdown time may also depend on local mosquito abatement regulations. (should we add our regs?)
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design. Infiltration rate should be low enough to allow biofiltration process to occur. During design, infiltration rate, drawdown time, and the soil matrix depth will be directly related
Freeboard	No Minimum	No Maximum	Freeboard per jurisdiction standards (ours?) . For public safety, consider requiring freeboard and a minimum 6 inch embankment when ponding depth is greater than 6 inches.

Bioretention Cell Effectiveness

Effective bioretention cells provide an aesthetically pleasing method for retaining and treating storm water. Inspecting bioretention cells during rain events will reveal if the cell is draining properly. Bioretention cells are performing properly if they are retaining their design volume and treating runoff. Creating and following through on maintenance guidelines are critical to ensuring that a bioretention cell remains functional.

There are many possible indications that a bioretention cell has failed or is near failure, such as: ponding beyond the design ponding depth during small storm events, drawdown time exceeds design drawdown time, larger than expected sediment buildup within or upstream of the cell, excessive and unmaintained vegetation, lack of vegetation, obstructions at the inlet and outlet locations, and no maintenance or no record of maintenance. Although this is not an all-inclusive list, being aware of these items will assist in determining what steps need to be taken to remediate a failing bioretention cell.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is there available right-of-way, property, or easement?	<input type="checkbox"/>	<input type="checkbox"/>
Is the design infiltration rate within acceptable rates?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present?	<input type="checkbox"/>	<input type="checkbox"/>
Is the drainage area to the bioretention cell less than 5 acres? (If no, consider an infiltration basin or subdividing to create smaller drainage areas.)	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the bioretention cell technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical conditions exist that would compromise the stability of the bioretention cell or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Does the bioretention cell provide storage for 100% of the water quality volume? (If no, it may still be appropriate to construct the rain garden if it is technically infeasible to capture 100% of the water quality volume.)	<input type="checkbox"/>	<input type="checkbox"/>
Does an overflow outlet structure or bypass mechanism exist?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Excavation

Bioretention cells, like other BMPs whose functionality is dependent on infiltration, will fail if proper care is not taken during excavation and construction. Excavators and heavy machinery should not be used within the excavated area if infiltration is expected to occur through the bioretention cell bottom. Additional excavation beyond the footprint may be required depending on site conditions to provide soil stability or to be able to tie-in to the surrounding grade.

Activities During Construction

Avoid using heavy machinery within the bioretention cell footprint during construction as doing so will further compact the soils and diminish their infiltrating capabilities. Light machinery and even walking within the bioretention cell's footprint will also compromise infiltration.

Compaction of native soils or backfill below the bioretention cell subsoils is acceptable if doing so does not prevent infiltration from occurring.

Flows During Construction

Flows during construction should be diverted away from the bioretention cell to prevent construction site sediment from clogging soils. Scheduling installation of the bioretention cell shortly after excavation will minimize the impact of unnecessary storm water flows from entering the excavated area. The introduction of unwanted sediment can be prevented by placing fiber rolls or silt fences around the bioretention cell perimeter during construction.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.
- Follow landscaping guidance to ensure that vegetation establishes after installation.

Installation Costs

The following cost items are typically associated with bioretention cell construction.

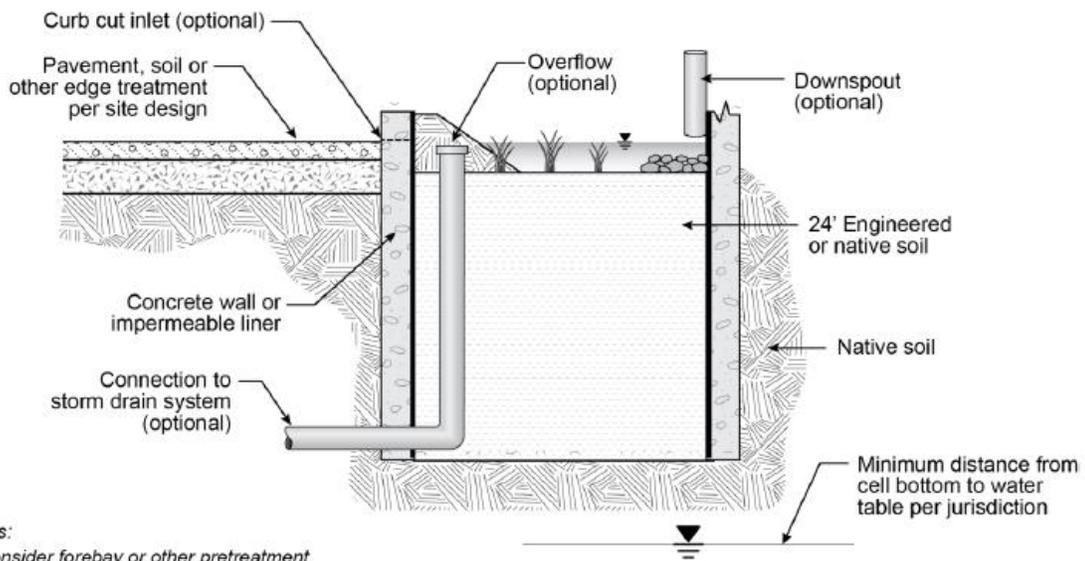
- Excavation
- Landscaping and vegetation
- Top layer
- Engineered soil
- Coarse sand
- Crushed gravel
- Open graded stone
- Geotextile fabric
- Outlet structure or upstream bypass structure (for larger storm events)
- Observation wells
- Curb and gutter
- Impermeable liner (if needed)
- Underdrain system (if needed)
- Irrigation system (if needed)

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of bioretention BMPs.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for adequate vegetation coverage, and impaired or failing vegetation	Semiannual (Spring, Fall)	Reseed/replant barren spots, Notify the engineer if failing vegetation persists	Low
Inspect for trash and debris within basin and at inlet and outlet structures	Semiannual (Spring, Fall) or as needed	Remove and dispose of trash and debris.	Low
Inspect for standing water within bioretention cell or within observation well	Semiannual (Spring, Fall) or as needed	Notify the engineer for further inspection	Medium
Inspect for failure of additional feature such as underdrains or irrigation systems	Semiannual (Spring, Fall) or as needed	Repair as needed	Medium



- Notes:
- Consider forebay or other pretreatment
 - Consider upstream bypass for large storm events

Bioretention Cell in Native or Engineered Soils

Not to scale

Bioswale



Bioswales are vegetated open channels designed to convey and treat storm water runoff. They are appropriate when it is desirable to convey flows away from structures or as an alternate conveyance method to pipes,

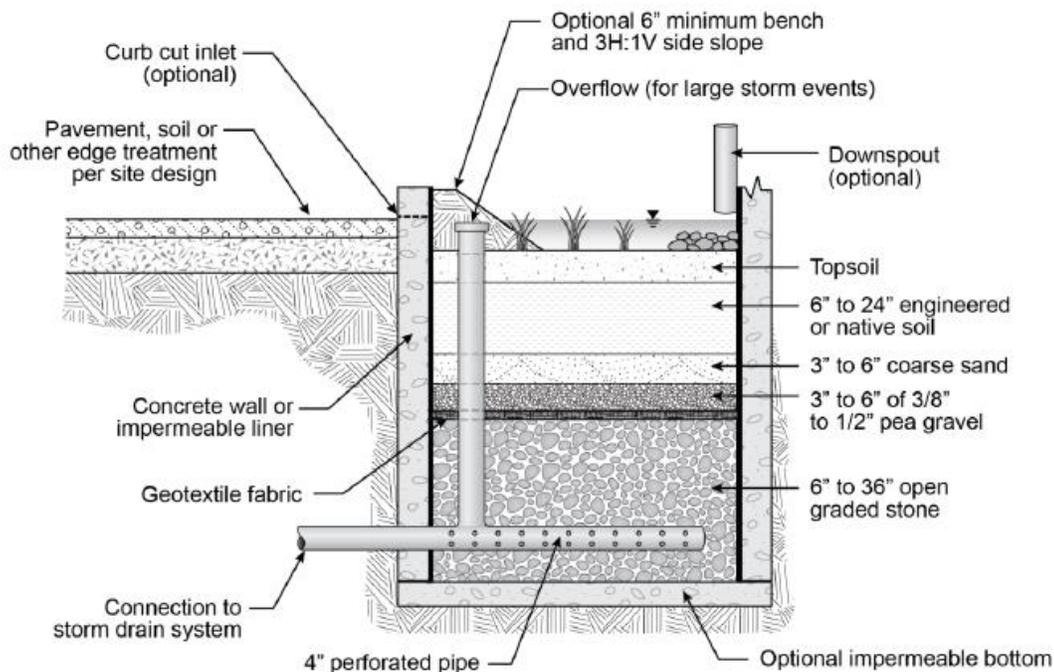
Pollutant Removal Effectiveness

Pollutant	Effectiveness ¹
Sediment	Medium
Nutrients	Medium
Metals	Medium
Bacteria	Medium
Oil/Grease	High

¹ Removal effectiveness is increased for all pollutants as retention increases

Primary Functions

Bioretention	Yes
Volume Retention	Some
Biofiltration	Yes



Notes:

- Overflow elevation must be below elevation of inlet (curb cut, downspout, or other per site design)
- Dimensions shown may vary based on site conditions
- Consider forebay or other pretreatment

Bioretention Cell with Underdrain System

Not to scale

concrete channels, or curbed gutters. Bioswales reduce peak flow rates, reduce flow velocities, filter storm water pollutants, and can also reduce runoff volume through infiltration.

The primary functions of bioswales are bioretention and treatment through biofiltration. Conveying runoff through bioswales allows the runoff to be filtered through two processes: bioretention through a native or engineered soil matrix and biofiltration through the above ground vegetation.

Although volume retention may be accomplished within the native soil or a subsoil matrix of engineered soil and gravel layers, retention is not its primary function. However, retention volumes may be determined by designing ponding areas within the swale or creating check dams. There is research to support the quantification of infiltration when runoff is simply conveyed through the swale (no ponding) but design parameters vary widely. Monitoring bioswales for volume reduction is the most reliable source for future estimates of expected reduction.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Length	Based on hydraulic residence time	No Maximum	-
Longitudinal Slope	0.50%	5%	Underdrain recommended below minimum slope
Bottom Width	No minimum	No maximum	-
Side Slope	No minimum	3H:1V	Per jurisdiction requirements
Flow Velocity	No minimum	1.0 ft/s	Maximum permissible shear stress may also dictate maximum flow velocity
Flow Depth	No minimum	2/3 vegetation height	Flow depths greater than vegetation height will bypass the biofiltration processes
Freeboard	No minimum	No maximum	Per jurisdiction requirements (?)
Vegetation Coverage	≥ 65%		Biofiltration is significantly reduced when vegetation coverage is less than 65%
Hydraulic Residence Time	5 min	No maximum	-

Bioswale Effectiveness

Bioswales are effective when they can accomplish their design goals of conveying flows to a downstream receiving structure, BMP, or other receiving area. Flows through the swale should be relatively steady and uniform during a rain event unless retention areas and check dams are part of the swale design. Established vegetation with adequate coverage is an indication of a healthy bioswale along with minimal sediment and lack of invasive vegetation.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
If longitudinal slope is less than minimum, can an underdrain be installed?	<input type="checkbox"/>	<input type="checkbox"/>
If an underdrain is needed, is sufficient hydraulic head available for proper drainage?	<input type="checkbox"/>	<input type="checkbox"/>
Do flows result in a shear stress greater than the maximum permissible for selected vegetation?	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make instillation of the bioswale technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Will bioswale provide conveyance for larger storm events? (If yes, the geometry of the bioswale will need to accommodate the larger events)	<input type="checkbox"/>	<input type="checkbox"/>
Is the bioswale providing pretreatment for a downstream BMP?	<input type="checkbox"/>	<input type="checkbox"/>
Is the bioswale connecting directly to the storm drain network? (If yes, the outlet structure elevation will need to be determined)	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Excavation

Bioswale construction is a relatively straightforward process of excavating the swale's subsurface trench prior to backfilling with any underdrain system, open graded stone, engineered soil, and geotextile fabric. Additional excavation beyond the swale's footprint may be required depending on site conditions to provide soil stability or to be able to tie-in to the surrounding grade.

Activities During Construction

Crews should avoid stepping within the trench except when necessary as doing so will compact the native soil that is expected to infiltrate runoff.

Flows During Construction

Flows during construction should be diverted away from the bioswale to prevent construction site sediment from clogging soils and to prevent erosion of the swale bed. Scheduling installation of the bioswale shortly after excavation will minimize the impact of unnecessary storm water flows from entering the excavated area. The introduction of unwanted sediment can be prevented by placing fiber rolls or silt fences around the bioswale perimeter during construction. Creating the upstream inlet or connection should be the last construction activity before flows are permitted to be conveyed as designed through the bioswale.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.
- Follow landscaping guidance to ensure that vegetation establishes after installation.

Installation Costs

The following cost items are typically associated with bioswale construction.

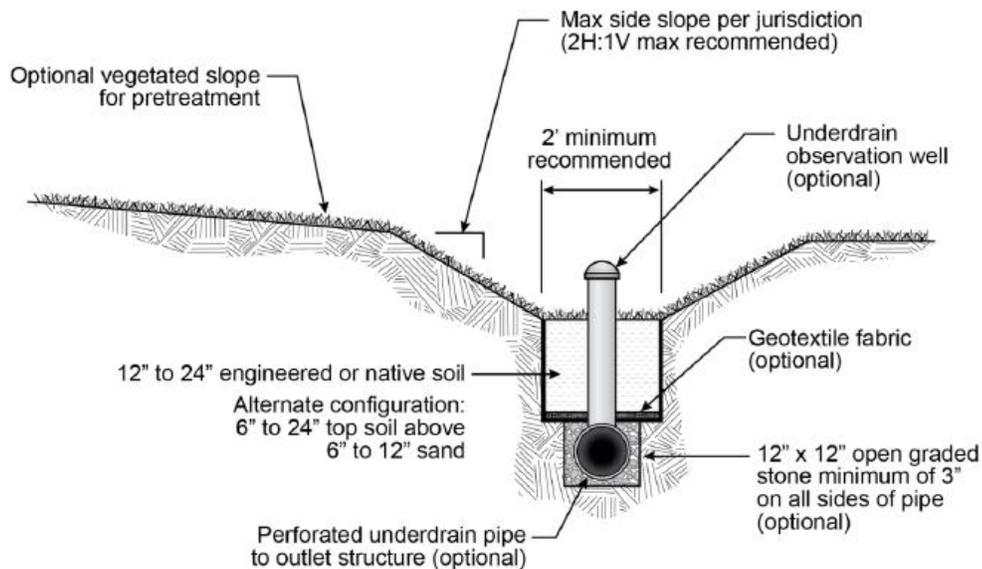
- Excavation
- Grading
- Fine grading
- Granular borrow fill
- Landscaping and vegetation
- Top layer
- Engineered soil
- Open graded stone
- Geotextile fabric
- Impermeable liner
- Outlet structure or upstream bypass structure (for larger storm events)
- Observation wells
- Underdrain system (if needed)
- Outlet protection such as riprap or other (if needed)

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of bioretention BMPs.

<https://www.epa.gov/water-research/water-research-webinar-series> **Maintenance Activities**

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for adequate vegetation coverage, and impaired or failing vegetation	Semiannual (Spring, Fall)	Reseed/replant barren spots, Notify the engineer if failing vegetation persists	Low
Inspect side slopes for erosion, rilling and sloughing	Semiannual (Spring and Fall)	Regrade side slope if stability is not affected by sloughing. Notify engineer if stability is affecting basin functionality	Low
Inspect for trash and debris within basin and at inlet and outlet structures	Prior to mowing, at least semiannually	Remove and dispose of trash and debris.	Low
Inspect for standing water within bioswale or within observation well	Semiannual (Spring, Fall)	Notify the engineer for further inspection	Medium
Inspect vegetation height	As needed	Mow swale as needed	Low



Notes:

- Engineered soil may improve filtration
- Underdrain recommended for longitudinal slopes < 1%
- Optional items shown for use of underdrain
- Dimensions shown may vary based on site conditions

Bioswales

Not to scale

Vegetated Strip



Pollutant Removal Effectiveness

Pollutant	Effectiveness¹
Sediment	High
Nutrients	Medium
Metals	Medium
Bacteria	High
Oil/Grease	High

¹ Removal effectiveness is increased for all pollutants as retention increases

Primary Functions

Bioretention	Yes
Volume Retention	Some
Biofiltration	Yes

Vegetated strips are designed to receive and treat sheet flow from adjacent surfaces. This is accomplished by slowing runoff velocity to allow for pollutants and sediments to settle and by filtering out pollutants in the vegetation before entering the storm sewer system. Vegetated strips are best utilized for storm water treatment from roads, parking lots, and other impervious surfaces.

The primary functions of vegetated strips are bioretention and biofiltration. Volume Retention Some Bioretention within a vegetated strip occurs as runoff enters the soil and

pollutants are removed through physical, chemical, and biological processes. Biofiltration Yes Similar biofiltration processes occur to provide treatment when runoff passes

through the strip's vegetation. Biofiltration is significantly reduced when vegetation coverage is less than 65%. In arid locations a gravel strip may be used as a substitute for the vegetated strip. The lack of vegetation will cause biofiltration and bioretention to be greatly reduced; however, the runoff velocity will still be decreased and allow for pollutants and sediments to settle out. Volume retention through infiltration will also occur as runoff enters the gravel's void spaces.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Length (direction of flow travel)	15ft	No Maximum	-
Longitudinal Slope	No minimum	4H:1V	Per jurisdiction requirements (?)
Flow Velocity	No minimum	1.0 ft/s	Maximum permissible shear stress may also dictate maximum flow velocity
Flow Depth	No minimum	2/3 vegetation height	Flow depths greater than vegetation height will bypass the biofiltration processes
Freeboard	No minimum	No maximum	Per jurisdiction requirements (?)
Vegetation Coverage	≥ 65%		Biofiltration is significantly reduced when vegetation coverage is less than 65%

Vegetated Strip Effectiveness

Vegetated strips are effective when they can accomplish their design goals of conveying sheet flow to the receiving area. Flows through the vegetated strip should be relatively steady and uniform during a rain event and should not create rilling or other visible signs of erosion. Established vegetation with adequate coverage is an indication of a healthy vegetated strip along with minimal sediment and lack of invasive vegetation.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Is the vegetated strip length greater than or equal to the minimum required length?	<input type="checkbox"/>	<input type="checkbox"/>
Do flows result in a shear stress greater than the maximum permissible for selected vegetation?	<input type="checkbox"/>	<input type="checkbox"/>
Is the vegetated strip providing pretreatment for a downstream BMP?	<input type="checkbox"/>	<input type="checkbox"/>
Is the slope in the direction of flow less than or equal to the jurisdiction's standards?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Vegetated strips can be installed as part of normal construction activities. An appropriate grass such as turf sod should be installed per specifications. If additional vegetation such as shrubs or bushes will be used within the strip, follow landscaping guidance to ensure that vegetation establishes after installation. To maximize infiltration performance, minimize use of heavy machinery.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.

Installation Costs

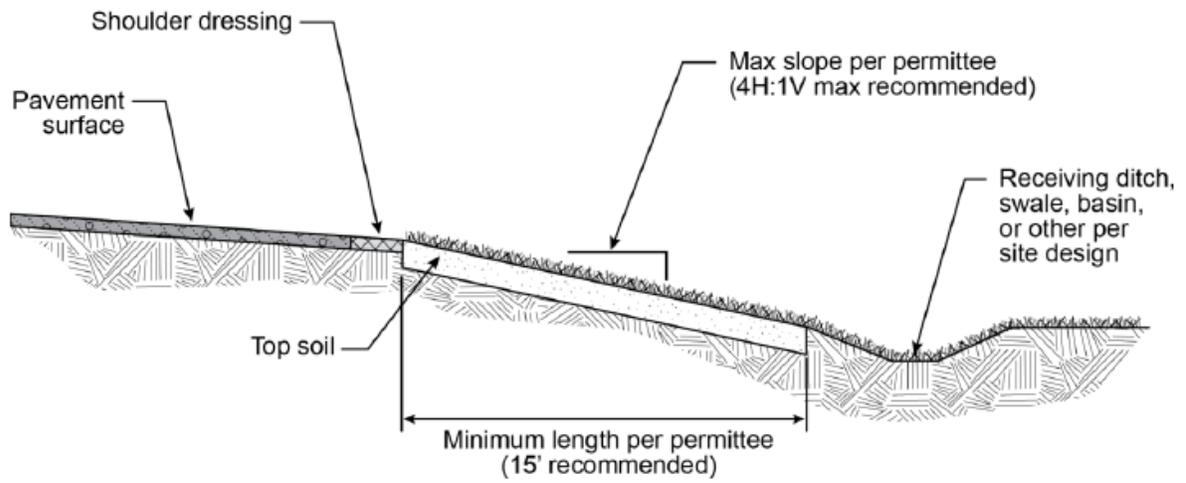
The following cost items are typically associated with bioswale construction

- Grading
- Landscaping and vegetation
- Topsoil
- Engineered soil
- Shoulder dressing upstream of vegetated strip

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of bioretention BMPs.

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect upstream end of vegetated strip for sediment buildup that may be impeding sheet flow	Semiannual (Spring, Fall) or as needed	Remove and dispose of sediment buildup	Low
Inspect grass length	As needed	Mow strip as needed	Low
Inspect side slopes for erosion, rilling and sloughing	Semiannual (Spring and Fall)	Regrade side slope if stability is not affected by sloughing. Notify engineer if stability is affecting basin functionality	Low
Inspect for adequate vegetative coverage, and impaired or failing vegetation	Semiannual (Spring, Fall) or as needed	Reseed/replant barren areas. Notify engineer if issue persists	Low



Notes:

- *Dimensions shown may vary based on site conditions*

Vegetated Strips

Not to scale

Tree Box Filter



Source: Montgomery County, Maryland Department of Environmental Protection

Tree box filters are bioretention systems that are appropriate in urban drainage areas where space is limited. An underground concrete vault contains the soil matrix that provides bioretention and has a grated top where vegetation grows. Tree box filters are typically designed as flow-through devices, meaning that they do not retain storm water but rather allow flows to pass through them. However, a bottomless concrete vault will function as a bioretention system that provides infiltration Primary Functions into the native soils. Manufacturers have developed proprietary designs for tree box filters, but they may also be designed.

The primary functions of tree box filters are bioretention and treatment. Runoff from the contributing drainage area enters the tree box through an inlet where bioretention occurs. Storm water is treated by the physical, chemical, and biological processes that occur within the mulch, soil matrix, and plant roots.

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters. Tree box filters may be proprietary devices; follow manufacturer specifications to determine design criteria on a case-by-case basis.

Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	Medium
Metals	Medium
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Varies ¹
Biofiltration	Yes

¹ Volume retention may be achieved with a bottomless vault

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Depth to historical high groundwater	2 ft	No Maximum	May be less than 2 feet if tree box filter has impermeable bottom
Ponding Depth	No minimum	12 in	-
Drawdown Times	12 hours	72 hours	24 to 48 hours preferred. Drawdown time may also depend on local mosquito abatement regulations (ours?)
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design. Infiltration rate should be low enough to allow biofiltration processes to occur. During design, infiltration rate, drawdown time, and the soil matrix depth will be directly related

Tree Box Filter Effectiveness

Tree box filters are effective when they maintain their bioretention and biofiltration capabilities. Proper inspection and maintenance of tree box filters will ensure that the chemical and biological processes that treat runoff perform optimally. Qualified inspection crews are necessary to determine if soils and vegetation are healthy.

The tree box must be able to function hydraulically. Flows must be able to pass through the filter without backing up or maintenance will be required.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Is there adequate space for a tree box filter?	<input type="checkbox"/>	<input type="checkbox"/>
Is there sufficient hydraulic head for tree box filter to connect to storm drain network?	<input type="checkbox"/>	<input type="checkbox"/>
If retention is desired, will the design infiltration rate permit a reasonable drawdown time?	<input type="checkbox"/>	<input type="checkbox"/>
If retention is desired, is depth to the historical high groundwater from the filter bottom greater than the jurisdiction's minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

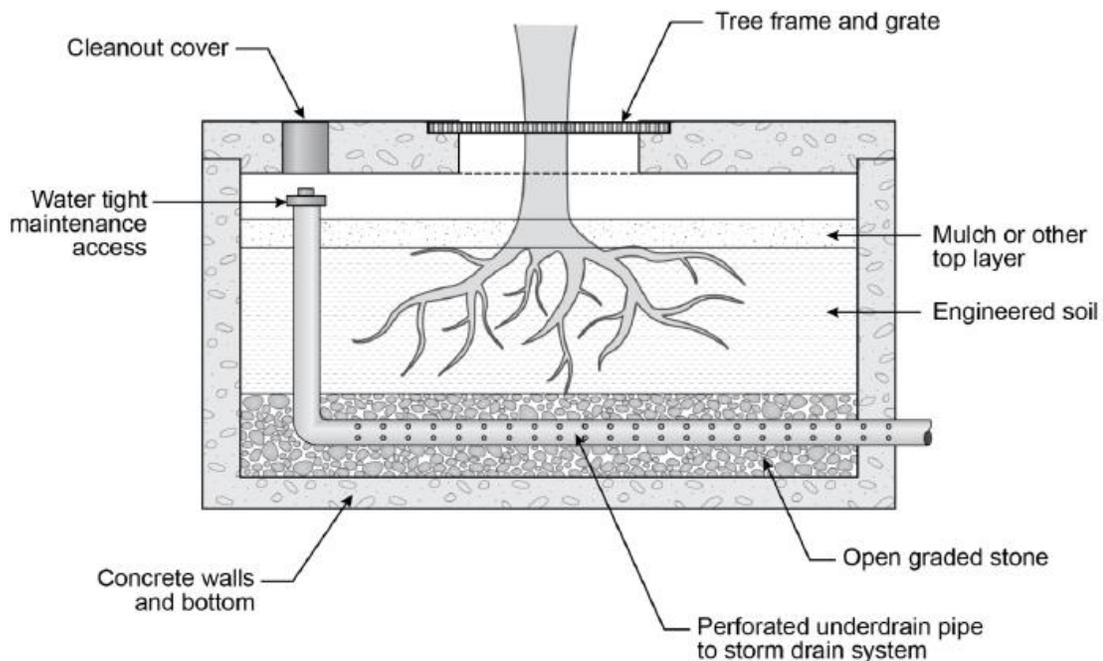
Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of bioretention BMPs.

Maintenance Activities

Proper maintenance of tree box filters will be per the manufacturer’s specifications, but it typically includes the following:

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for trash and debris within tree box filter and at inlet and outlet structures	Semiannual (Spring, Fall) or as needed	Remove trash, debris and sediment	Low
Inspect performance	Semiannual (Spring and Fall)	Replenish media filter layer with new mulch	Medium
Inspect for invasive species	Semiannual (Spring and Fall)	Prune and weed filter box	Medium



Notes:

- Dimensions shown may vary based on site conditions

Tree Box Filters

Not to scale

Green Roof



A green roof is a vegetated system that is designed to retain and treat rooftop runoff. The primary functions of green roofs are bioretention, volume retention, and filtration. Green roofs capture storm water within the pore space of the soil and vegetation and the moisture is then released through evapotranspiration.

Green roofs can be classified as either extensive or intensive systems. Extensive systems are those in which the soil media is up to 6 inches in depth and support smaller grasses and other vegetative species that do not have deep root systems. Intensive systems are those that support root systems greater than 6 inches such as those from trees and bushes.

The design of green roofs should be done with the coordination of qualified landscaping, structural, and maintenance teams. Vegetation selection and the proper maintenance of vegetation are critical items in the overall performance and functionality of the green roof. The integrity of the roof structure must also be accounted for as large volumes of plants, soils, water, and the weight of the green roof structure will create additional loads on the building.

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters.

Pollutant Removal Effectiveness

Pollutant	Effectiveness¹
Sediment	High
Nutrients	Medium ²
Metals	High
Bacteria	High
Oil/Grease	-

¹ Removal effectiveness is increased for all pollutants as retention increases

² Use of organic matter to establish vegetation may increase nutrient leaching

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	Yes

Design Criteria

Parameter	Extensive	Intensive	Notes
Drawdown Time	12 hours	12 hours	-
Grow Media Depth	< 6 in	6 + in	-
Vegetation	Low growing, low water-use vegetation such as sedum, herbs, grasses, perennials	More complex gardens including the species listed for extensive green roofs, but also incorporating trees and shrubs	-
Load	12-54 lb/sf	72 + lb/sf	-
Roof Slope	5:1 maximum	5:1 maximum	-
Access	Required for maintenance	Required for maintenance	-
Irrigation	Simple irrigation. Only needed during droughts and plant establishment if well designed	Complex irrigation	-
Drainage	Simple drainage system	Complex drainage system	-

Green Roof Effectiveness

Green roofs provide an aesthetically pleasing method for retaining and treating storm water runoff. Healthy plants and soils are indications that the green roof is performing as expected. Excessive drainage through the soil layer may be an indication that the soils and vegetation are not retaining runoff; consequently, the evaporation and transpiration processes are not occurring. Qualified horticulturists and/or green roof contractors should be involved in determining the health and effectiveness of the green roof.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Has a landscape architect been involved in the vegetation selection?	<input type="checkbox"/>	<input type="checkbox"/>
Has a structural engineer been involved in the green roof design?	<input type="checkbox"/>	<input type="checkbox"/>
Are maintenance crews trained and aware of maintenance responsibilities?	<input type="checkbox"/>	<input type="checkbox"/>
Does the green roof provide storage for 100% of the water quality volume? (If no, it may still be appropriate to construct the green roof if it is technically infeasible to capture 100% of the water quality volume)	<input type="checkbox"/>	<input type="checkbox"/>
Will the green roof partially cover or fully cover the roof?	-	-
Will the green roof be extensive or intensive?	-	-

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Green roof installation should be done with proper oversight from qualified environmental or green roof specialists. Any requirements related to working on rooftops should be followed. During construction, vegetation and the growth media should be protected from erosion until vegetation has been established.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.

Installation Costs

The following cost items are typically associated with rain garden construction.

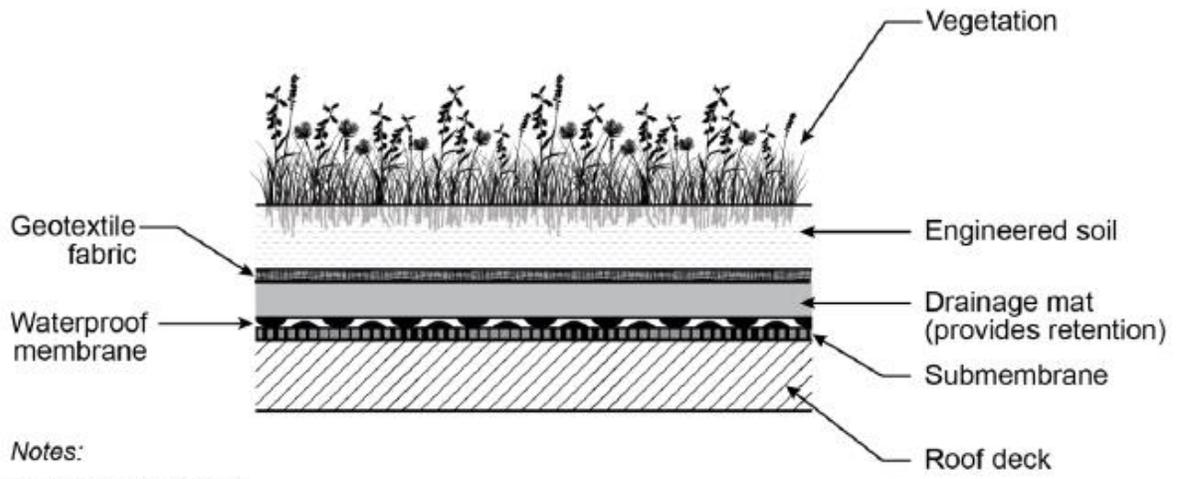
- Vegetation and landscaping expertise
- Horticulturist expertise
- Structural expertise

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of green roofs.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect weed growth	2-4 weeks during growing season	Remove weeds before they flower	High
Inspect fertilization	Annually	Apply fertilizer in accordance with manufacturer recommendations. Avoid hottest/driest parts of the year	Medium
Inspect water retention	Semiannual (Spring and Fall) or as needed	If natural precipitation is not adequate for vegetation, water plants	High



Notes:
• Dimensions shown may vary based on site conditions

Green Roof

Not to scale

Pervious Surfaces



Pervious surfaces such as permeable pavement, concrete pavers, pervious concrete, modular open pavers, and other types of pervious surfaces provide structural support for light vehicle or pedestrian traffic while also providing open space for storm water infiltration.

The primary function of pervious surfaces is volume retention, but some filtration is possible depending on the type of paver and subsurface selected. A modular open paver that, when installed, provides a certain percentage of pervious area in the form of grass, will allow for filtration processes to occur. Another source of filtration is the choker layer directly beneath the pervious surface.

The subsections beneath the pervious surface are typically a choker layer composed of small gravel and a storage layer of larger rock beneath. Underdrains may be required if existing soils do not adequately infiltrate.

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters.

Pollutant Removal Effectiveness

Pollutant	Effectiveness¹
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

¹ Removal effectiveness is increased for all pollutants as retention increases

Primary Functions

Bioretention	Yes ¹
Volume Retention	Yes
Biofiltration	Some

¹ Bioretention occurs in the subsurface and not within the pervious surface

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Drain Time	12 hours	72 hours	-
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design
Depth to Historical High Groundwater	2 ft	No maximum	-

Pervious Surface Effectiveness

Pervious surfaces are effective when runoff from the design storm depth can enter the porous spaces of the pervious surface and successfully infiltrate into the native soil or drain through an underdrain system. Visual inspection of the pervious surface can reveal reasons for failure: for example, sediment-laden sheet flows that are conveyed to the pervious surface, or a down drain might be introducing organic material. Both scenarios are likely to contribute to clogging within the porous spaces of the pervious surface or within the sublayers.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Will an underdrain system be required?	<input type="checkbox"/>	<input type="checkbox"/>
If an underdrain is needed, is there sufficient head for the underdrain system to drain?	<input type="checkbox"/>	<input style="border: 2px solid red;" type="checkbox"/>
Has the proposed pervious surface performed successfully in similar climate conditions?	<input type="checkbox"/>	<input style="border: 2px solid red;" type="checkbox"/>

Installation**Excavation**

Pervious surfaces will fail if proper care is not taken during excavation and construction. Excavators and heavy machinery should not be used if infiltration is expected to occur through the underlying soils beneath the pervious surface's subsection.

Activities During Construction

Avoid using heavy machinery on the revealed soil during construction. Crews should avoid unnecessarily walking on the underlying soils when possible. Compaction of native soils or backfill below the pervious surface subsoils is acceptable if doing so does not prevent infiltration from occurring.

Flows During Construction

Flows during construction should be diverted away from the exposed underlying soil to prevent erosion. Scheduling installation of the pervious surface within a short time span after excavation will minimize the impact of unnecessary storm water flows from entering the excavated area. The introduction of unwanted sediment and storm water flows can be prevented by placing fiber rolls or silt fences around the excavated perimeter during construction.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.

Installation Costs

The following cost items are typically associated with construction of pervious surfaces.

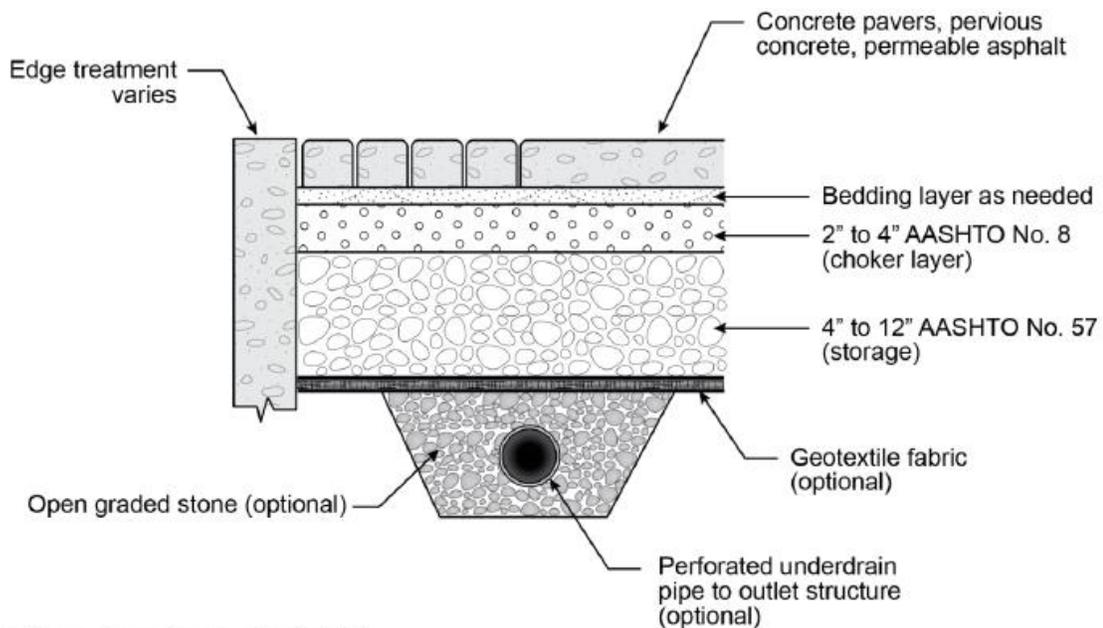
- Excavation
- Grading
- Fine grading
- Pervious surface
- Top layer
- Engineered soil
- Choker layer
- Open graded stone
- Geotextile fabric
- Impermeable liner
- Observation wells (if needed)
- Underdrain system (if needed)

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of pervious surfaces.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for sediment accumulation	Semiannual (Spring, Fall)	Use vacuum sweeper followed by pressure washing	Medium
Inspect for weed growth	Semiannual (Spring, Fall)	Remove weeds	Low
Inspect for standing water on surface or within observation well (if used)	Semiannual (Spring and Fall)	Notify engineer for further inspection	Low
Inspect surface for deterioration	Annual	Notify engineer for further inspection	Low
Inspect exfiltration and drainage performance	As needed, at least annually	Notify engineer for further inspection	Medium



- Notes:
- Optional items shown for use of underdrain
 - Dimensions shown may vary based on site conditions

Pervious Surfaces

Not to scale

Infiltration Basin



Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	Yes

Infiltration basins are shallow depressions that use existing soils to retain and provide treatment for storm water runoff. Infiltration basins function by capturing and infiltrating runoff over a specified drawdown time.

The primary functions of infiltration basins are bioretention, volume retention, and filtration. The existing soils remove pollutants through physical, chemical, and biological processes before the storm water reaches the groundwater. Filtration occurs as runoff interacts with grass and other vegetation within the basin and as runoff infiltrates through the soil.

Infiltration basins are typically designed for larger drainage areas where it may be impractical for a BMP such as a bioretention area that requires more maintenance of specialized vegetation over a larger area.

Pretreatment of runoff may take place in a forebay that will allow for particulate settling. Forebays are typically sized for a percentage of the water quality volume; typically ranging from 10% to 25%.

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Water Quality Volume	0.1 ac-ft (4356 cf)	No maximum	-
Freeboard	1 ft		-
Overflow Spillway Length	3 ft spillway length		-
Invert Slope	0% (flat basin bottom)		-
Interior Side Slope	No minimum	3H:1V	-
Drawdown Time	24 hours	72 hours	48 hours recommended
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design
Depth to Historical High Groundwater	2 ft	No maximum	-

Infiltration Basin Effectiveness

Effective infiltration basins take advantage of open spaces for retaining and treating storm water. Established vegetation with adequate coverage is an indication of a healthy infiltration basin along with minimal sediment and lack of invasive vegetation. Side slopes should be stable and show little to no signs of erosion or rilling. Slope sloughing is an indication that geotechnical remediation is needed.

During the design storm event, infiltration basins should, at most, pond up to the water quality outlet. After the rain event, runoff within the basin should infiltrate through the bottom soils within the design drawdown time.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the jurisdiction's minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is there available right-of-way, property, or easement for the infiltration basin?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present at the infiltration basin location?	<input type="checkbox"/>	<input type="checkbox"/>
Is the water quality volume above the 4,356 cf threshold	<input type="checkbox"/>	<input type="checkbox"/>
Does the infiltration basin provide storage for 100% of the water quality volume? (If no, it may still be appropriate to construct the infiltration basin if it is technically infeasible to capture 100% of the water quality volume)	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the infiltration basin technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical conditions exist that compromise the stability of the infiltration basin or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Does an overflow outlet structure or bypass mechanism exist?	<input type="checkbox"/>	<input type="checkbox"/>
Is a fence required?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Refer to Vegetation Guidance by BMP Type.

Installation

Excavation

Installation of infiltration basins is a relatively straightforward process of excavation and grading; however, the basin will fail if proper care is not taken during construction. Excavators and heavy machinery should not be used within the basin area to avoid soil compaction.

Activities During Construction

Avoid using heavy machinery within the infiltration basin footprint during construction as doing so will compact the soils and diminish their infiltrating capabilities. Installation of an outlet structure may require machinery.

Flows During Construction

Flows during construction should be diverted away from the infiltration basin to prevent construction site sediment from clogging soils. Seeding or laying turf sod should occur within a short time span after excavation to minimize the impact of unnecessary storm water flows from entering the basin area. The introduction of unwanted sediment can be prevented by placing fiber rolls or silt fences around the basin perimeter during construction.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.
- Follow landscaping guidance to ensure that vegetation establishes after installation.

Installation Costs

The following cost items are typically associated with infiltration basin construction.

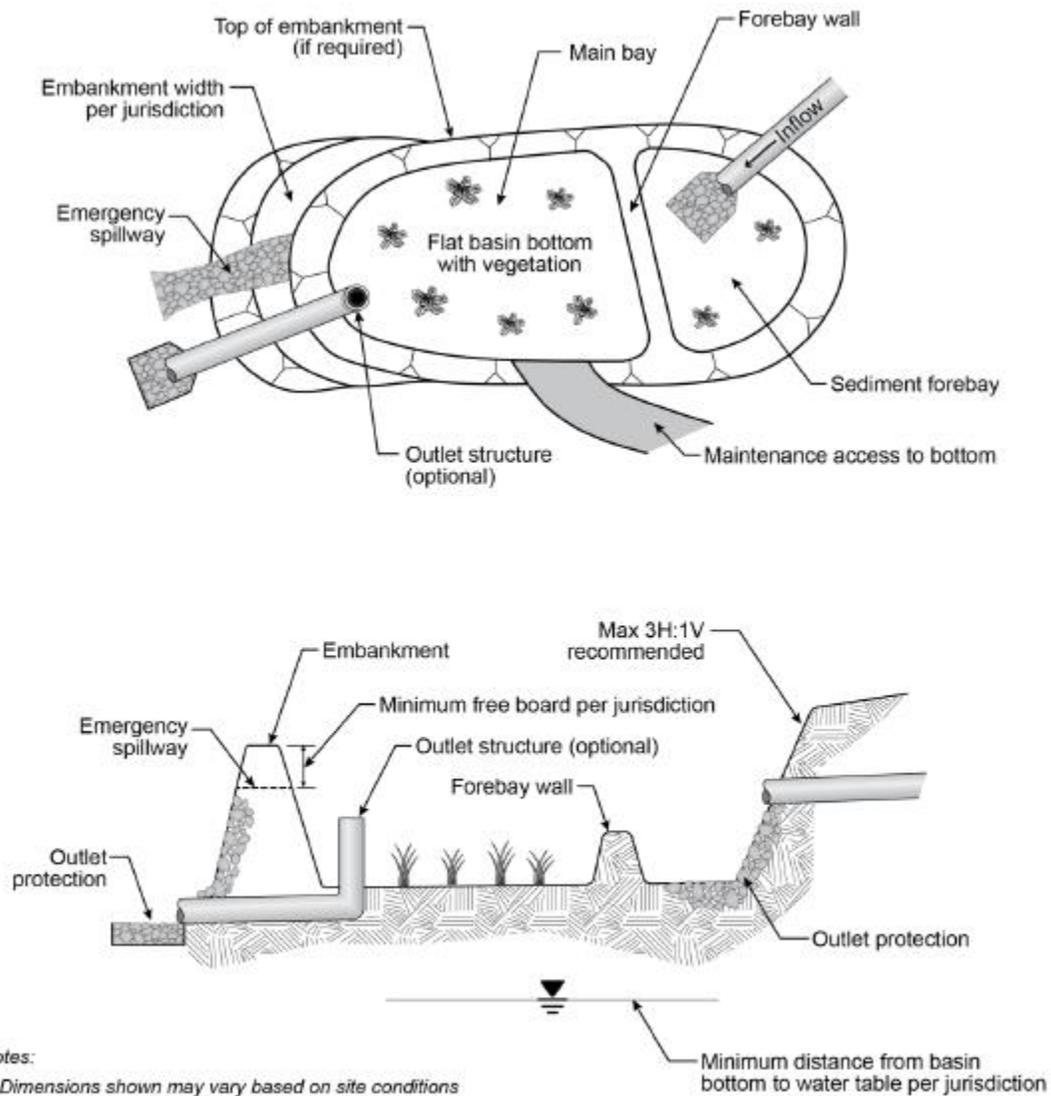
- Excavation
- Grading
- Outlet structure or upstream bypass structure (for larger storm events)
- Forebay and associated items: outlet protection, forebay wall, and connection between forebay and main bay.

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of infiltration BMPs.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for trash and debris at inlet and outlet structures	Semiannual (Spring, Fall) or as needed	Remove and dispose of trash and debris	Low
Inspect grass length	As needed	Mow basin grass	Low
Inspect pre-treatment diversion structures for sediment build-up	Semiannual (Spring and Fall)	Remove and dispose of sediment buildup	Low
Inspect topsoil for sediment build-up	Semiannual (Spring, Fall) or as needed	Notify engineer for further inspection	Low
Inspect for standing water above trench or within observation well (if used)	Semiannual (Spring, Fall)	Notify engineer for further inspection	Low



Notes:

- Dimensions shown may vary based on site conditions
- Forebay connection type to main bay will vary: outlet pipe, gabion wall, notched concrete wall, and others are acceptable
- Consider upstream bypass for large storm events

Infiltration Basin

Not to scale

Infiltration Trench



Source: NHDES Soak Up the Rain

Infiltration trenches are linear excavations that are backfilled with a combination of gravel, open graded stone, and sand layers that provide storage within the pore space of the specified layers. Although typically linear, infiltration trenches can be any shape provided that the footprint and depth are sized to retain the water quality volume.

The primary function of infiltration trenches is volume retention. The trench is designed such that the water quality volume is retained and stored within the gravel and sand layers. Depending on the design of the trench, pollutant removal occurs via filtration as runoff passes through an initial pea gravel layer and ultimately through the bottom sand layer. A geotextile fabric is also recommended along the sidewalls of the trench and under the pea gravel layer.

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Depth of Trench	2 ft	No maximum	Maximum depth determined by jurisdiction
Longitudinal Trench Slope	0%	1%	-
Width	2 ft	No maximum	-
Drawdown Time	12 hours	72 hours	-
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design
Depth to Historical High Groundwater	2 ft	No maximum	-

Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes ¹
Volume Retention	Yes
Biofiltration	Some

¹ Bioretention occurs in subsurface and not within the trench

Infiltration Trench Effectiveness

Effective infiltration trenches take advantage of limited or narrow spaces where bioretention areas or infiltration basins are impractical. Visible sediment buildup on the top layer of the trench could be an indication that clogging is present within the trench or that runoff is simply passing over the trench and not being captured. Although some vegetation intrusion or organic debris is likely not a concern, proper grooming and maintenance will contribute to a trench's extended life-span.

During the design storm event, runoff should be conveyed toward and enter the trench per the design plans. Recent new construction, regrading, or resurfacing within the contributing drainage area should be noted as it may impact flow paths or the introduction of new pollutants.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the jurisdiction's minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is the infiltration rate of the existing soils within acceptable rates?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present at the infiltration basin location?	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the infiltration basin technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical conditions exist that compromise the stability of the infiltration basin or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Does the infiltration basin provide storage for 100% of the water quality volume? (If no, it may still be appropriate to construct the infiltration basin if it is technically infeasible to capture 100% of the water quality volume)	<input type="checkbox"/>	<input type="checkbox"/>
Does an overflow outlet structure or bypass mechanism exist?	<input type="checkbox"/>	<input type="checkbox"/>

Vegetation

Vegetation is not typical for an infiltration trench.

Installation

Excavation

Excavation for infiltration trenches is typically linear but alternate geometries are possible. During excavation, light machinery should be used to avoid excessive compaction.

Activities During Construction

Avoid using heavy machinery within the infiltration trench footprint during construction as doing so will compact the soils and diminish their infiltrating capabilities.

Flows During Construction

Flows during construction should be diverted away from the infiltration trench to prevent construction site sediment from clogging soils. The introduction of unwanted sediment can be prevented by placing fiber rolls or silt fences around the trench perimeter during construction.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.

Installation Costs

The following cost items are typically associated with infiltration trench construction.

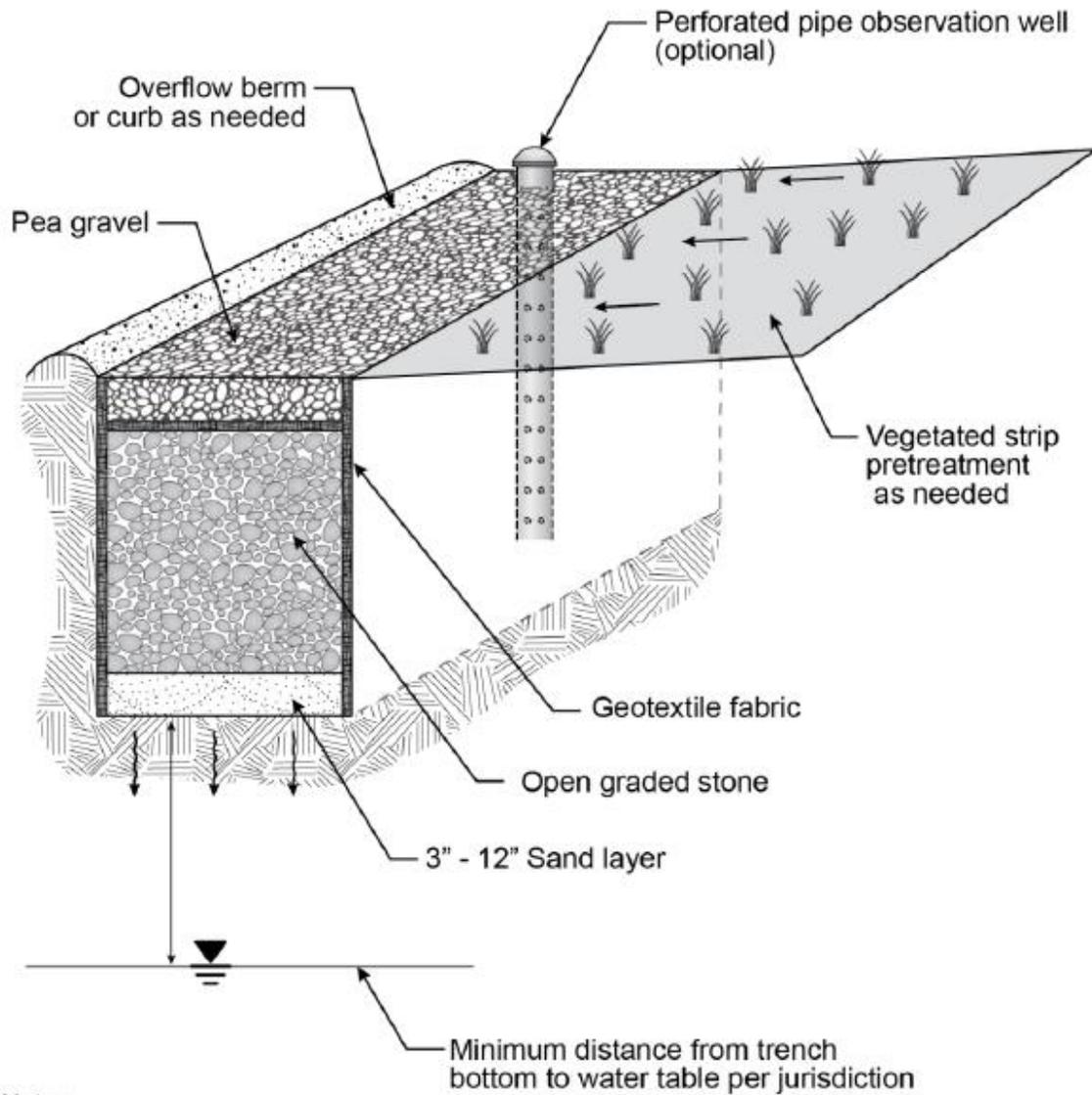
- Excavation
- Landscaping and vegetation
- Pea gravel
- Open graded stone
- Sand layer
- Geotextile separator

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of infiltration BMPs.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for trash and debris at inlet and outlet structures	Semiannual (Spring, Fall) or as needed	Remove and dispose of trash and debris	Low
Inspect grass length	As needed	Mow basin grass	Low
Inspect pre-treatment diversion structures for sediment build-up	Semiannual (Spring and Fall)	Remove and dispose of sediment buildup	Low
Inspect tree growth near trench	Semiannual (Spring, Fall)	Remove trees in vicinity of the trench	Low
Inspect for standing water above trench or within observation well (if used)	Semiannual (Spring, Fall)	Notify engineer for further inspection	Low



Notes:

- Dimensions shown may vary based on site conditions

Infiltration Trench

Not to scale

Dry Well



Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	No

Dry wells are underground storage areas that are sized to retain the water quality volume and infiltrate runoff into the existing soils.

The primary functions of dry wells are bioretention and volume retention. Bioretention does not occur within the dry well but occurs in the native soils immediately surrounding the dry well.

Dry wells contribute to aquifer recharge and as such classify as a subclass of Underground Injection Control (UIC) Class V wells. Refer to the DWQ website on storm water drainage wells (link below) for more information relating to the UIC Program.

Storm Water Drainage Wells: <https://deq.utah.gov/legacy/programs/water-quality/utah-underground-injection-control/drainage-wells/index.htm>

Design Criteria

Refer to Design Criteria in the Preface to Fact Sheets for discussion of design criteria parameters.

Design Criteria

Parameter	Min. Value	Max. Value	Notes
Depth to Historical High Groundwater	2 ft	No maximum	-
Drawdown Time	12 hours	72 hours	-
Building Setback	10 ft	No maximum	-
Design Infiltration Rate	0.25 in/hr	6 in/hr	Field testing required for final design

Dry Well Effectiveness

Effective dry wells optimize infiltrating soils within limited space to retain storm water runoff while not introducing stability concerns to nearby development or structures. The design storm volume within a functioning dry well will drawdown within the design time and leave no standing water inside of the well. Pretreatment should be provided prior to entering the dry well and the pretreatment method should be determined based on the expected pollutants. Entry to the dry well should be unobstructed and free of debris that will restrict flows from entering.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the jurisdiction's minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is the infiltration rate of the existing soils within acceptable rates?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present at the dry well location?	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the infiltration dry well technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical condition exist that compromise the stability of the infiltration dry well or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Is pretreatment provided upstream of or within the dry well	<input type="checkbox"/>	<input type="checkbox"/>

Installation

Excavation

Excavate area in which dry well will be placed.

Activities During Construction

Take proper safety measures to cover the excavated dry well area before putting the dry well in place. If the dry well is designed to infiltrate through the well bottom, place and level gravel within the excavation to provide a foundation for the well structure.

Flows During Construction

Flows during construction can enter the dry well if the grated manhole lid contains a filtering material.

Additional Guidance

- Require certificates of compliance to verify that construction items meet specification requirements.
- Obtain a permit through the UIC Program

Installation Costs

The following cost items are typically associated with dry well construction.

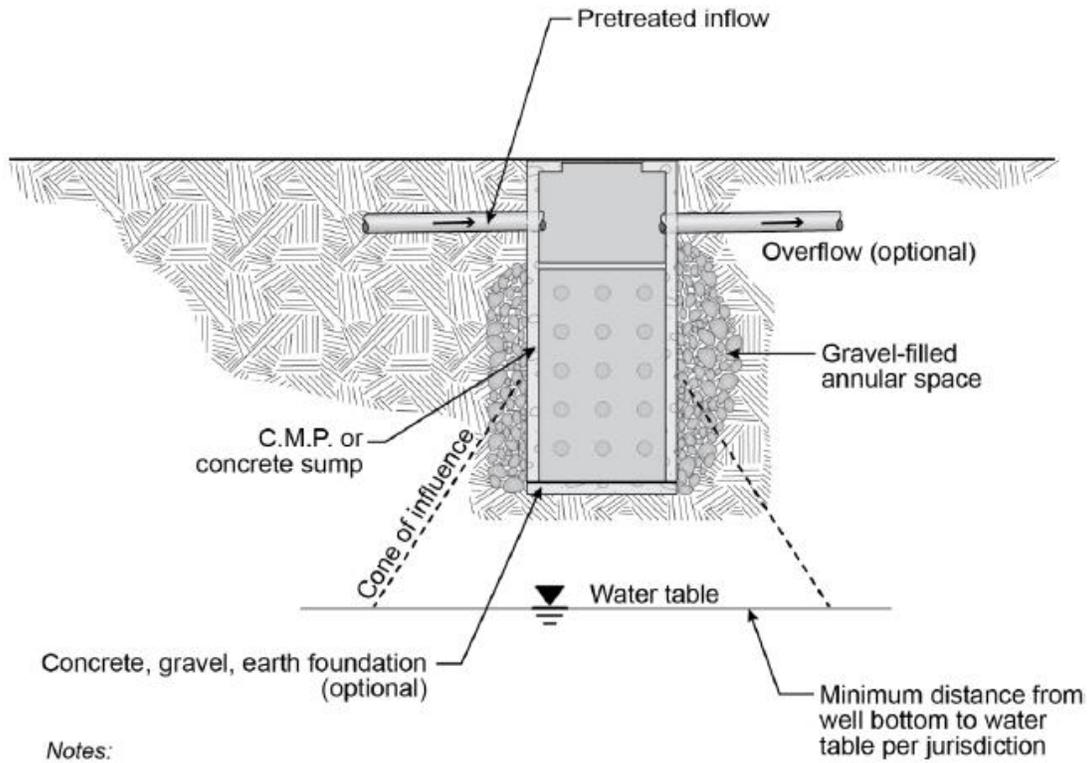
- Excavation
- Dry well
- Permit application fees for Class V Injection Wells
- Gravel-filled annular space surrounding dry well
- Pretreatment upstream of dry well
- Overflow connection to downstream system
- Gravel foundation (optional)

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of dry wells.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect water depth	Initially after every major storm, then annually	Remove and dispose of built up sediment when build up causes reduction in detention capacity. Notify the engineer.	Medium
Inspect inlet for obstructions	Semiannual (Spring and Fall) or as needed	Remove obstructions	Low
Inspect structural elements	As determined by jurisdiction	Repair or reconstruct deficient structural components	Medium



Notes:

- Dimensions shown may vary based on site conditions

Dry Well

Not to scale

Underground Infiltration Galleries



Source: StormTech

Underground storage devices are proprietary alternatives to above ground storage when space at the project site is limited. They may be sized for the 90th percentile volume similar to how they are sized for flood control volumes. When underground storage is used for water quality, its primary functions are bioretention as runoff infiltrates into the underlying soil and volume retention. They are constrained by subsurface conditions such as depth to the historical high groundwater, soil infiltration rates, and other site-specific constraints that prevent infiltration. Designing underground storage devices is Primary Functions done with the assistance of the device manufacturer.

Pretreatment for underground systems will vary. Pretreatment removes sediment that will potentially clog elements of the underground system such as geotextile fabrics or bedding layers. If the manufacturer does not include a pretreatment system as part of the device, it may be necessary to design a separate pretreatment system such as a settling basin upstream before entering the underground system.

Underground systems are typically modular and allow for configurations that range from large areas such as would be needed underneath a parking lot to linear installations like within a park strip or underneath a bioswale.

Design Criteria

Underground storage devices are proprietary devices; follow manufacturer specifications to

Pollutant Removal Effectiveness

Pollutant	Effectiveness
Sediment	High
Nutrients	High
Metals	High
Bacteria	High
Oil/Grease	High

Primary Functions

Bioretention	Yes
Volume Retention	Yes
Biofiltration	No

Underground Infiltration Effectiveness

With regular maintenance and inspection, it can be determined if the underground system is performing as expected. As part of the design process, determine how the system will be inspected. Possible inspection methods include the use of observation wells or structural vaults at tie-in locations with the site's storm drain network. Inspect for any soil displacement or movement at the perimeter of the system and any depressions above the system.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Does groundwater meet the minimum separation requirement?	<input type="checkbox"/>	<input type="checkbox"/>
Is the infiltration rate of the existing soils within acceptable rates?	<input type="checkbox"/>	<input type="checkbox"/>
Is contaminated groundwater present?	<input type="checkbox"/>	<input type="checkbox"/>
Do utility conflicts make installation of the device technically infeasible?	<input type="checkbox"/>	<input type="checkbox"/>
Do geotechnical conditions exist that would compromise the stability of the device or surrounding structures?	<input type="checkbox"/>	<input type="checkbox"/>
Is pretreatment provided upstream of or within the underground storage device?	<input type="checkbox"/>	<input type="checkbox"/>
Is the soil bearing capacity of the underlying soil sufficient for the system?	<input type="checkbox"/>	<input type="checkbox"/>
Will the underground system support the expected loads above it?	<input type="checkbox"/>	<input type="checkbox"/>

Installation

Excavation

Excavate the footprint of the underground system.

Activities During Construction

Avoid using heavy machinery within the excavated footprint during construction as doing so will compact the soils and diminish their infiltrating capabilities. Avoid using heavy machinery on top of the underground system as well. Follow all installation guidelines from the manufacturer.

Flows During Construction

Flows during construction should be diverted away from the excavated area to prevent construction site sediment from clogging soils.

Additional Guidance

- Follow all manufacturer's requirements.

Installation Costs

The following cost items are typically associated with installation of underground storage systems.

- Excavation
- Geotextile fabric
- Underground storage devices
- Aggregate (bedding, overlay, other as needed)
- Observation wells
- Pretreatment upstream of system (if not provided)

Maintenance

Underground systems are typically designed with accessible pretreatment areas such as a manhole. Refer to manufacturer's guidelines.

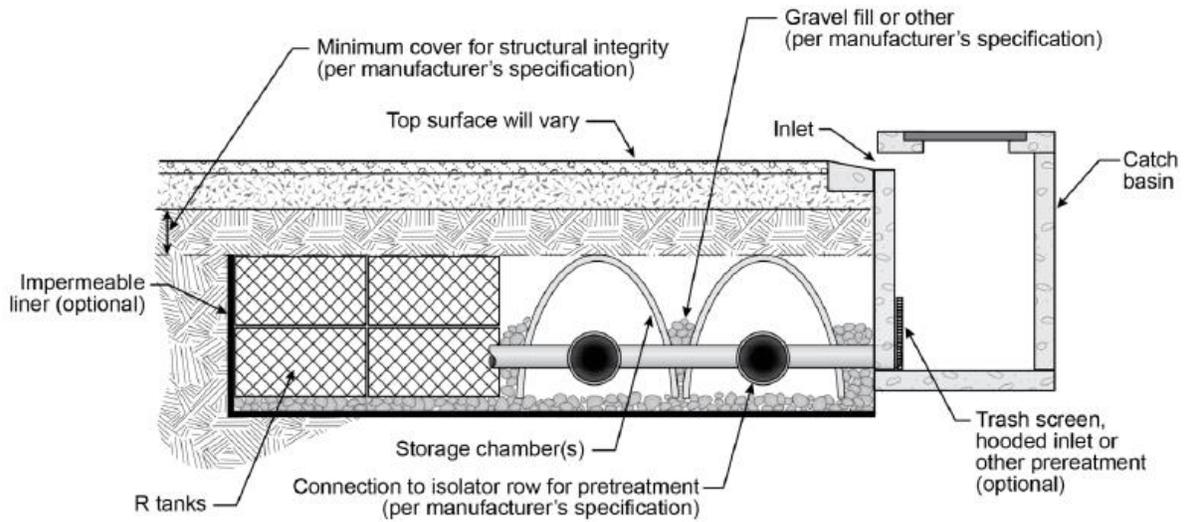
Maintenance Activities

Typical maintenance activity includes removal of sediment or debris within the pretreatment area. High pressure washing of geotextile fabrics or replacement of filter fabrics may also be needed. Refer to manufacturer's guidelines for specific activities and frequency of inspections.

Manufacturers

The following table of manufacturers is for reference only and does not constitute an endorsement.

<u>Manufacturer</u>	<u>Device Type(s)</u>	<u>URL</u>
StormTech	Chambers	http://www.stormtech.com/
ACF Environmental	Chambers R Tanks	https://www.acfenvironmental.com
ConTech	Chambers	https://www.conteches.com



- Notes:
- Configurations will vary
 - Impermeable liner around underground system if groundwater concerns exist
 - If impermeable liner is used, provide outlet to prevent standing water

Underground Infiltration Gallery

Not to scale

Harvest and Reuse

Pollutant Removal Effectiveness



Pollutant Removal Effectiveness:

Pollutant removal will vary based on the ultimate use of the harvested runoff.

Primary Functions

Bioretention	Varies
Volume Retention	Yes
Biofiltration	Varies

Harvest and reuse refers to any type of runoff collection system that captures rainfall, stores it temporarily, and reuses it for irrigation, landscaping, or other non-potable uses. Harvest and reuse systems inherently retain the volume of runoff that it captures. Depending on the subsequent use after being captured, they also provide bioretention and filtration to the released runoff.

Harvest and reuse systems may be used in lieu of directly connecting rooftop drains to storm sewer systems; where downdrains discharge to impervious surfaces and the opportunity for irrigation or landscaping exists; as part of a home owner's irrigation plan; or for any other non-potable purpose where storm water is determined to be acceptable such as vehicle or machinery washing.

As of 2010, Utah's legislative code 73-3-1.5 requires that if more than 100 gallons of rainwater (13.4 cf) are captured, it must be registered through the Utah Division of Water Rights

(<https://waterrights.utah.gov/forms/rainwater.asp>). The code also limits the total capture to 2,500 gallons (334.2 cubic feet). See the code for additional requirements.

Design Criteria

Design criteria for harvest and reuse devices or systems will vary widely. The governing principles of harvest and reuse are based on the system's function and capacity. For example, a rain barrel that provides occasional irrigation to a flower bed should be appropriately sized for the 90th percentile volume and be able to release the volume within an appropriate time that does not flood out the flower bed. A larger harvest and reuse system, such as an underground detention vault or above ground pond will be required to meet geotechnical or structural design criteria. The applications of harvest and reuse systems are endless; specific design criteria should be determined on a case-by-case basis with site-specific consideration.

Harvest and Reuse Effectiveness

The effectiveness of a harvest and reuse system is dependent on its use. Detention devices should be free of standing water to prevent stagnation and vector concerns. Systems that provide irrigation or that are part of landscaping features should be inspected regularly to ensure proper performance.

Designer Checklist

If the answer to these questions corresponds to a response box that is red, the BMP should either not be used or additional measures need to be taken to address the issue.

	Yes	No
Will stagnation of runoff be prevented by frequent release of the harvested runoff?	<input type="checkbox"/>	<input style="border: 2px solid red;" type="checkbox"/>
Does quantity of harvested runoff require registration with the Division of Water Rights?	<input type="checkbox"/>	<input type="checkbox"/>

Installation

Installation of harvest and reuse systems will vary depending on its use. Rain barrels can simply be connected to a down drain. More complicated systems require additional coordination.

Depending on the quantity of runoff being harvested, it will be necessary to register the detention device with the Division of Water Rights.

Installation Costs

The following cost items are typically associated with harvest and reuse systems.

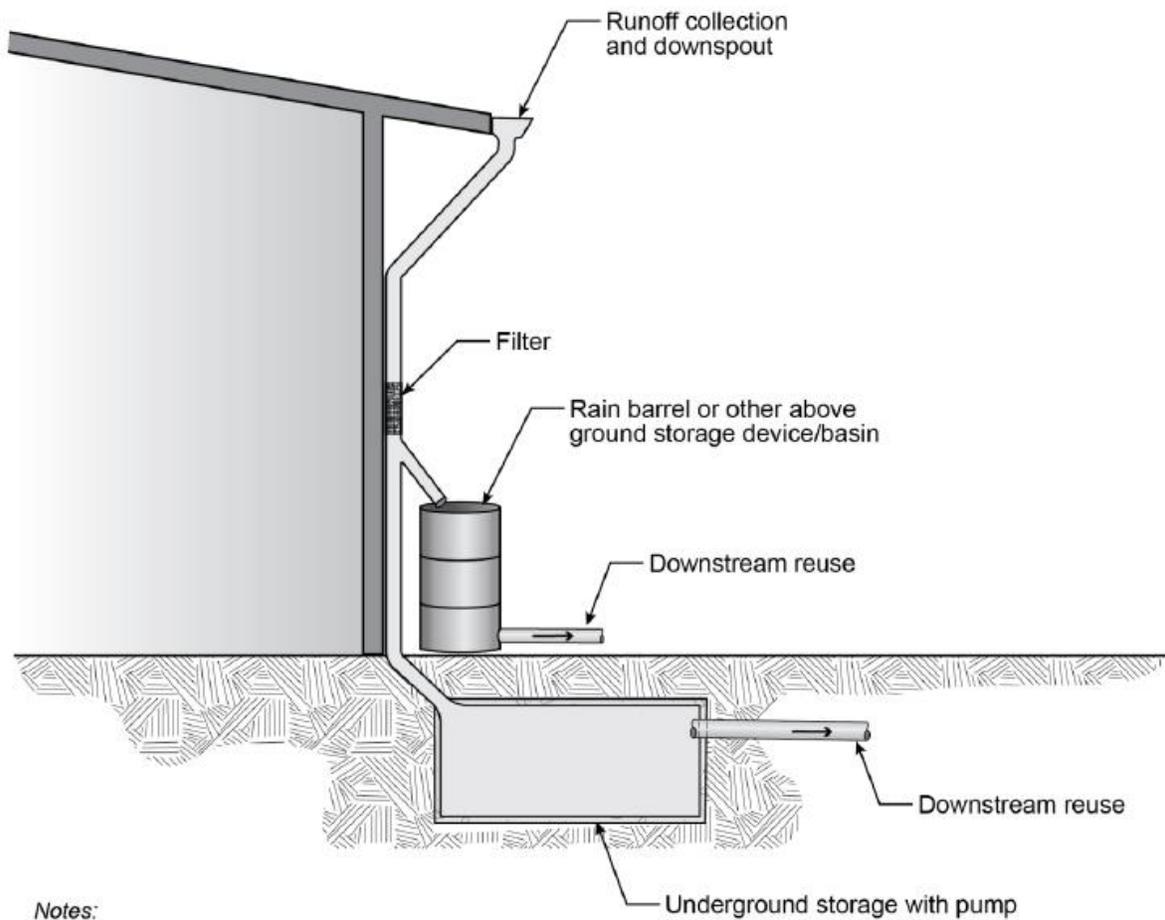
- Detention device
- Upstream connection to detention device
- Other items will be dependent on site-specific use

Maintenance

Refer to Maintenance and Maintenance Costs in the Preface to Fact Sheets for general information related to maintenance of harvest and reuse systems.

Maintenance Activities

Inspection	Inspection/Maintenance Frequency	Maintenance Activity	Effort
Inspect for mosquitos	Semiannual (Spring and Fall)	Implement larvicide or other remediation	Low
Inspect harvesting device for leaking	Semiannual (Spring and Fall)	Replace harvesting device	Low
Inspect condition of system components	Semiannual (Spring and Fall)	Replace or repair components	Medium



Notes:
 • Configurations and applications may vary

Harvest and Reuse

Not to scale

EXHIBIT A

{Include this EXHIBIT with this agreement document to be recorded. The text below that does not apply will need to be deleted along with this instruction text.}

{For properties that are not a part of a residential or commercial subdivision, provide the parcel number and a legal description for the property.}

Replace this text with the parcel #
Replace this text with the legal description

OR

{For properties that are a LOT in a commercial subdivision, provide the LOT and parcel number and refer to the newly recorded subdivision by the title it is recorded by in the Salt Lake County Recorder's Office.}

Replace this text with the parcel #
Replace this text with the LOT #
Replace this text with the plat title and the township and range as it is recorded on the plat

OR

{For properties that are a private residential subdivision, refer to the newly recorded subdivision by the title it is recorded by in the Salt Lake County Recorder's Office.}

All parcels of
Replace this text with the plat title and township and range as it is recorded on the plat.

EXHIBIT B

Long-Term Stormwater Management Plan

for:

Insert Development Name

Address

City, State, Zip Code

Company Name on legal records

Legal Company Name

Address

City, State, Zip Code

*{Long-Term Stormwater Management contact for addressing regular site operations, inspections
and annual reporting regarding this property}*

Site Manager, Company Representative, Property Agent, etc.

Phone Number:

Email:

PURPOSE AND RESPONSIBILITY

As required by the Clean Water Act and resultant local regulations, including INSERT MS4 NAME Municipal Separate Storm Sewer Systems (MS4) Permit, those who develop land are required to build and maintain systems to minimize litter and contaminants in stormwater runoff that pollute waters of the State.

This Long-Term Stormwater Management Plan (LTSWMP) describes the systems, operations and the minimum standard operating procedures (SOPs) necessary to manage pollutants originating from or generated on this property. Any activities or site operations at this property that contaminate water entering the City's stormwater system, groundwater and generate loose litter must be prohibited.

The NAME OF RIVER River is impaired. The LTSWMP is aimed at addressing these impairments in addition to all other pollutants that can be generated by this property.

CONTENTS

SECTION 1: SITE DESCRIPTION, USE AND IMPACT

SECTION 2: TRAINING

SECTION 3: RECORDKEEPING

SECTION 4 APPENDICES

SECTION 1: SITE DESCRIPTION, USE AND IMPACT

Our site infrastructure is limited at controlling and containing pollutants. If our property and operations are managed improperly we will contaminate our water resources. This LTSWMP includes standard operations procedures (SOP)s intended to compensate for the limitations of our site infrastructure and direct our maintenance operations to responsibly manage our grounds. SOPs are filed in appendix B.

Parking, Sidewalk and flatwork

[Describe the impervious infrastructure and how its presence and maintenance practices can impact surface and groundwater water quality. Acknowledge poor maintenance impact to 80th percentile infrastructure and LID if any. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique impervious infrastructure, operations and conditions]

Any sediment, leaves, debris, spilt fluids or other waste that collects on our parking areas and sidewalks will be carried by runoff to our flood and water quality control system. These solids will fill in our retention system requiring future dredging and cleaning. Also any liquids and dissolved solids can contaminate groundwater.

Landscaping

[Describe the landscape infrastructure and how its presence and maintenance practices impacts our system and water quality. Also include description of any LID if incorporated into the Landscaping system. Acknowledge poor maintenance impact to 80th percentile infrastructure. If LID included describe its benefit and the affects from poor maintenance practices. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique landscape infrastructure and conditions]

Our landscape operations can result in grass clippings, sticks, branches, dirt, mulch, fertilizers, pesticides and other pollutants to fall or be left on our paved areas. These solids will fill in our retention system requiring future dredging and cleaning. Also any liquids and dissolved solids can contaminate groundwater.

Flood and Water Quality Control System

[Describe the stormwater system including surface grading, conveyance system, runoff storage, retention storage, water quality devices and when used any LIDs. Acknowledge poor maintenance impact to 80th percentile infrastructure, groundwater and LID if any.

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique flood and water quality control infrastructure and conditions]

Our flood and water quality control system includes directing runoff into landscaping swales and open landscaping areas. Directing runoff to our landscape areas is a low impact system intended to trap and treat our urban pollutants on the surface to protect

downstream water resources. Our system includes underground detention storage, oil/sediment/trash traps and an underground infiltration system. The infiltration system is design to drain the first ½” of runoff into the ground required by Clean Water Act regulation. Infiltrating some of our runoff helps keep streams and rivers clean but if we are not careful can contaminate groundwater. Anything we put or allow to be left on our pavements will eventually be carried to our oil/sediment/trash traps and underground infiltration system filling it with sediment and debris increasing maintenance cost. Also by-passing dissolved and liquid pollutants can increase the risk for contaminating groundwater for which we are responsible. In addition, very intense storm events can scour debris and silt from our system and spill to INSERT WATER BODIES. It is important our flood control volume and water quality system is adequately maintained to function properly.

Waste Management

[Describe the waste management system infrastructure and how its presence and maintenance practices impacts our system and water quality. Provide necessary trash management SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique waste management infrastructure and operations]

Good waste management systems, if managed improperly, can become the source of the very pollution it was intended to manage. The lids of our dumpster and trash receptacles are intended to prevent light weight trash carried off by wind and precipitation exposure minimizing liquids that can leak to our pavement and from haul trucks. In addition, our dumpster pad slopes toward our pavement and any leaks can leach into runoff staining our pavement, causing smell and increasing groundwater contamination risk.

Utility System

[Describe the utility infrastructure and how its presence and maintenance practices impacts our system and water quality. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique infrastructure and conditions]

Our roof top utility system is exposed to our roof drains which drain to our pavements. This heating and air conditioner unit contains oils and other chemicals that can harm groundwater and the INSERT WATER BODIES if allowed to drain off our property.

Snow and Ice Removal Management

[Describe the snow and ice operations and how it can impact our system and water quality. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design agent are expected modify the suggested text to represent the sites unique infrastructure and conditions]

Salt is a necessary pollutant and is vital to ensuring a safe parking and pedestrian walkways. However, salt and other ice management chemicals if improperly managed will unnecessarily increase our salt impact to our own vegetation and local water

resources. Much of the runoff drains to our landscape swales. We need to minimize salt to maintain healthy root systems needed for optimum infiltration rates.

Equipment / Outside Storage

[Describe any outside storage facilities or operations and how it can impact our system and water quality. Identify the necessary SOPs and include them in Appendix B]

Add infrastructure or operations that are unique to this site

[Describe any other site infrastructure or operations unique to this property which impacts our system and water quality. Identify the necessary SOPs and include them in Appendix B]

SECTION 2: TRAINING

Ensure that all employees and maintenance contractors know and understand the SOPs specifically written to manage and maintain the property. Maintenance contractors must use the stronger of their Company and the LTSWMP SOPs. File all training records in Appendix C.

SECTION 3: RECORDKEEPING

Maintain records of operation and maintenance activities in accordance with SOPs. Mail a copy of the record to NAME OF MUNICIPALITY Stormwater Division annually.

SECTION 4: APPENDICES

- Appendix A- Site Drawings and Details
- Appendix B- SOPs
- Appendix C- Recordkeeping Documents

APPENDIX A – SITE DRAWINGS AND DETAILS

[Insert Flood and Water Quality Control Pages of Site Drawings and Details following this page. Include, any specific notes or markers to assist with inspection and maintenance requirements.]

APPENDIX B – SOPs

[Insert SOPs following the blue text]

Instruction for writing SOPs

The purpose of the SOPs is provide site managers, staff maintenance personnel and maintenance contractor's adequate instruction necessary to maintain the property in an environmentally responsible manner.

Low Impact Development and 80th percentile infrastructure is not only new to many people, it will likely need regular maintenance to adequately provide long-term benefit. In addition, many of the LID and 80th percentile systems will likely include flood control infrastructure. Sufficient flood protection will depend on adequate maintenance for success.

The following are suggested SOPs templates for typical development. However, every site's conditions and operations are usually unique in many ways. The property owner and design agent are expected to determine template applicability and modify the suggested text to the properties unique site infrastructure, its limitations and operations. Ultimately it is the property owners and design agents responsibility to ensure the SOPs are adequate for managing their urban flood and water quality impacts.

The City also encourages the use of existing company SOPs modified and geared for this sites operations. The use of the suggested SOPs and equivalent caliber company SOPs can reduce review iterations.

Pavement Sweeping

General:

These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

- a) One of the primary contaminates in the INSERT CRITICAL WATER BODIES is organic material.
- b) Any sediment, leaves, debris, spilt fluids or other waste that collects on our parking areas and sidewalks will fill in our landscaping swales, oil/sediment/trash traps and our underground infiltration system increasing our maintenance cost.

2. Regular Procedure:

- a) Remain aware of minor sediment/debris and hand sweep or remove material by other means as needed. Significant deposits will likely collect in autumn with leaf fall and early spring after winter thaw. Usually sweeping machinery is the best tool for this application.
- b) Regularly manage outside activities that spread fugitive debris on our pavements. This involves outside functions including but not limited to: Yard sales, yard storage, fund raisers, etc.
- c) Do not allow car wash fund raiser or other related activities. Detergents will damage water resources and washed pollutants will fill our storm drain system and drain into the ground which we are responsible.

4. Disposal Procedure:

- a) Dispose of hand collected material in dumpster
- b) Use licensed facilities when haul off is necessary

5. Training:

- a) Annually and at hire
- b) Inform staff and service contractors when incorrect SOP implementation is observed.

Landscape Maintenance

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

- a) One of the primary contaminates in the INSERT CRITICAL WATER BODIES is organic material.
- b) Grass clippings, sticks, branches, dirt, mulch, fertilizers, pesticides and other pollutants will fill our landscaping swales, sediment/trash traps and underground infiltration system requiring future dredging and cleaning increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system will in very expensive.

2. Maintenance Procedure:

- a) Maintain healthy vegetation root systems. Healthy root systems will help improve permeable soils maintaining more desirable infiltration rates of our landscape areas receiving runoff from our pavements.
- b) Grooming
 - Lawn Mowing – Immediately following operation sweep or blow clippings onto vegetated ground.
 - Fertilizer Operation – Prevent overspray. Sweep or blow granular fertilizer onto vegetated ground immediately following operation.
 - Herbicide Operation – Prevent overspray. Sweep or blow granular herbicide onto vegetated ground immediately following operation.
- c) Remove or contain all erodible or loose material prior forecast wind and precipitation events, before any non-stormwater will pass through the property and at end of work period. Light weight debris and landscape materials can require immediately attention when wind or rain is expected.
- d) Landscape project materials and waste can usually be contained or controlled by operational best management practices.
 - Operational; including but not limited to:
 - Strategic staging of materials eliminating exposure, such as not staging on pavement
 - Avoiding multiple day staging of landscaping backfill and spoil on pavements
 - Haul off spoil as generated and daily

➤ Scheduling work when weather forecast are clear.

e) Cleanup:

- Use dry cleanup methods, e.g. square nose shovel and broom. Conditions are usually sufficient when no more material can be swept onto the square nosed shovel.
- Power blowing tools

3. Waste Disposal:

- a) Dispose of waste according to General Waste Management SOP, unless superseded by specific SOPs for the operation.

4. Equipment:

- a) Tools sufficient for proper containment of pollutants and removal.

5. Training:

- a) Annually and at hire
- b) Inform staff and service contractors when incorrect SOP implementation is observed.
- c) Landscape Service Contractors must use equal or better SOPs.

Waste Management

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

- a) Trash can easily blow out of our dumpster and trash receptacles.
- b) Liquids can leak from our dumpster polluting waterways, subsurface soils, stain our pavement and cause smell.

2. Procedure:

- a) Remain aware of the lids and keep them closed.
- b) Remain aware of leaking and fix. Minimize allowing disposal of liquids in our receptacles and dumpster. Also liquids can leak from the waste haul trucks.
- c) Beware of dumpster capacity. Solve capacity issues. Leaving bags outside of dumpster is not acceptable.

3. Waste Disposal Restrictions for all waste Scheduled for the INSERT LOCAL LANDFILL FACILITY:

- a) Generally most waste generated at this property, and waste from spill and clean up operations can be disposed in our dumpsters under the conditions listed in this SOP. Unless specific disposal requirements are identified by the product SDS or otherwise specified in other SOPs.
- b) Know the facility disposal requirements and restrictions. It should not be assumed that all waste disposed in collection devices will be disposed at the INSERT LOCAL LANDFILL FACILITY.
- c) Review INSERT LOCAL LANDFILL FACILITY regulations for additional restrictions and understand what waste is prohibited in the INSERT LOCAL LANDFILL FACILITY. Ensure the SDS and INSERT LOCAL LANDFILL FACILITY regulations are not contradictory.

Generally the waste prohibited by the INSERT LOCAL LANDFILL FACILITY is: *[it is suggested to provide local landfill requirements to assist private development applicants]*

➤ List local prohibitions: ...

-
-
-
-

-
-
-

(provide local landfill facility contacts).

4. Training:

- Annually and at hire
- Inform staff and service contractors when incorrect SOP implementation is observed.

Flood and Water Quality System

General:

These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

- a) Our storm drain system will collect anything we leave in the way of runoff which will fill our oil/sediment/trash traps and underground infiltration system increasing maintenance cost.
- b) Any liquids or dissolved pollutants can increase the risk for contaminating groundwater for which we are responsible.
- c) During very intense storm events pollutants in excess runoff can by-pass our system increasing risk of contaminating groundwater and the INSERT CRITICAL WATER BODIES.

2. Inspections:

- a) Inspect oil/sediment/trash trap. Remove any floating trash at each inspection interval with rake or other means. Remove sediments accumulations when 2” and more. Removed oil accumulations with the heavy sediment unless oil amounts are excessive. Oil can also be removed with absorbent materials but sediments will require vacuum operated machinery.
- b) Inspect oil/sediment/trash trap for mosquito larvae. Contact the INSERT LOCAL MOSQUITO ABATMENT DISTRICT when necessary.
- c) Inspect underground infiltration system for water. Water should not remain for more than 48 hours. Contact an engineer or equal industry with adequate knowledge when water is not draining.
- d) Inspect underground infiltration system for sediment accumulations. Remove sediment and debris accumulation when volume capacities drop below 90%. Removal will require hydro-vacuum machinery.
- e) Inspect for sediment accumulations in above ground detention and retention infrastructure. Remove sediment and debris accumulation when volume capacities drop below 90%.
- f) Inspect low impact flood control swale and landscape area infrastructure for sediment accumulation. Remove sediment accumulation when volume capacities drop below 90%.
- g) Inspect low impact flood control swale and landscape area for adequate drainage and vegetation coverage. Poor drainage can be improved by maintaining healthy plant root systems.

- h) Regularly remove trash and debris from above ground detention/retention and low impact flood control swale and landscape infrastructure. Remove accumulations with regular grooming operations.

2. Disposal Procedure:

- a) Remove and dispose sediment and debris at licensed facilities. Also dry waste can be disposed in your dumpster as permitted by the INSERT LOCAL LANDFILL FACILITY.
- b) Disposal of hazardous waste
 - 1. Dispose of hazardous waste at regulated disposal facilities. Follow SDS Sheets. Also see Waste Management and Spill Control SOP

3. Training:

- a) Annually and at hire
- b) Inform staff and service contractors when incorrect SOP implementation is observed.

Pavement Washing

General:

These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

- a) Pavement washing involving detergents can potentially contaminate groundwater with phosphates and with whatever we are washing.
- b) Pavement washing can fill our low impact flood control swale and landscape area, oil/sediment/trash traps and infiltration system with detergents, including sediment and debris increasing our maintenance cost.

2. Procedure:

- a) Prevent waste fluids and any detergents if used from entering storm drain system. The following methods are acceptable for this operation.
 - Dam the inlet using a boom material that seals itself to the pavement and pick up the wastewater with shop-vacuum or absorbent materials.
 - Collect wastewater with shop-vacuum simultaneous with the washing operation.
 - Collect wastewater with vacuum truck or trailer simultaneous with the washing operation.
- b) This procedure must not used to clean the initial spills. First apply the Spill Containment and cleanup SOP following by pavement washing when desired or necessary.

3. Disposal Procedure:

- a) Small volumes of diluted washing waste can usually be drained to the local sanitary sewer. Contact the INSERT NAME OF LOCAL SEWER DISTRICT.
- b) Large volumes must be disposed at regulated facilities.

4. Pavement Cleaning Frequency:

- a) There is no regular pavement washing regimen. Pavement washing is determined by conditions that warrant it, including but not limited to: prevention of slick or other hazardous conditions or restore acceptable appearance of pavements.

5. Training:

- a) Annually and at hire

- b) Inform staff and service contractors when incorrect SOP implementation is observed.

Snow and Ice Removal Management

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

- a) Salt and other ice management chemicals if improperly managed will unnecessarily increase our salt impact to our own vegetation and local water resources.
- b) We need to maintain healthy root systems to help maintain optimum infiltration rates.

2. De-Icing Procedure:

- a) Do not store or allow salt or equivalent to be stored on outside paved surfaces.
- b) Minimize salt use by varying salt amounts relative to hazard potential.
- c) Sweep excessive piles left by the spreader.
- d) Watch forecast and adjust salt amounts when warm ups are expected the same day.

3. Training:

- a) Annually and at hire.
- b) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

General Construction Maintenance

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

- a) Any sediment, debris, or construction waste will fill in our landscaping swales, sediment/trash traps and our underground infiltration system increasing our maintenance cost.

2. Construction Procedure:

- a) Remove or contain all erodible or loose material prior forecast wind and precipitation events or before non-stormwater will pass through the project site. For light weight debris maintenance can require immediately attention for wind and runoff events. Many times daily maintenance is necessary or as needed per random, precipitation or non-stormwater events.
- b) Project materials and waste can be contained or controlled by operational or structural best management practices.
 - Operational; including but not limited to:
 - Strategic staging of materials eliminating exposure, such as not staging on pavement
 - Avoiding multiple day staging of backfill and spoil
 - Haul off spoil as generated or daily
 - Schedule work during clear forecast
 - Structural; including but not limited to:
 - Inlet protection, e.g. wattles, filter fabric, drop inlet bags, boards, planks
 - Gutter dams, e.g. wattles, sandbags, dirt dams
 - Boundary containment, e.g. wattles, silt fence
 - Dust control, e.g. water hose,
 - Waste control, e.g. construction solid or liquid waste containment, dumpster, receptacles
- c) Inspection often to insure the structural best management practices are in good operating condition and at least prior to the workday end. Promptly repair damaged best management practices achieving effective containment.
- d) Cleanup:
 - Use dry cleanup methods, e.g. square nose shovel and broom.

- Wet methods are allowed if wastewater is prevented from entering the stormwater system, e.g. wet/dry vacuum, disposal to our landscaped areas.
- e) Cleanup Standard:
 - When a broom and a square nosed shovel cannot pick any appreciable amount of material.

3. Waste Disposal:

- a) Dispose of waste according to General Waste Management SOP, unless superseded by specific SOPs for the operation.
- b) Never discharge waste material to storm drains

4. Equipment:

- a) Tools sufficient for proper containment of pollutants and cleanup.
- b) Push broom and square blade shovel should be a minimum.

5. Training:

- c) Annually and at hire.
- d) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

Spill Control

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

- a) Spilt liquids and solids will reach our low impact flood control landscaping areas, oil/sediment/trash traps and infiltration system potentially contaminating groundwater which we are responsible.
- b) It is vital we contain all spills on the surface. Spills reaching our underground flood control storage system can result in expensive spill mitigation, including potential tear out and replacement.

2. Containment Procedure:

- a) Priority is to dam and contain flowing spills.
- b) Use spill kits booms if available or any material available to stop flowing liquids; including but not limited to, nearby sand, dirt, landscaping materials, etc.
- c) Hazardous or unknown waste material spills
 1. Critical Emergency constitutes large quantities of flowing uncontained liquid that people at risk or reach storm drain systems. Generally burst or tipped tanks and containment is still critical. Call HAZMAT, DWQ, INSERT LOCAL HEALTH DEPARTMENT, City.
Also report spills to DWQ of quantities of 25 gallons and more and when the spill of lesser quantity causes a sheen on downstream water bodies
 2. Minor Emergency constitutes a spill that is no longer flowing but has reached a storm drain and adequate cleanup is still critical. Call SLVHD, City
 3. Spills that are contained on the surface, typically do not meet the criteria for Critical and Minor Emergencies and may be managed by the responsible implementation of this SOP.
 4. Contact Numbers:
HAZMAT - 911
DWQ – 801-231-1769, 801-536-4123, 801-536-4300
INSERT LOCAL HEALTH DEPARTMENT AND # – XXX-XXX-XXXX
City – INSERT CITY #

3. Cleanup Procedure:

- a) NEVER WASH SPILLS TO THE STORM DRAIN SYSTEMS.

- b) Clean per SDS requirements but generally most spills can be cleaned up according to the following:
- Absorb liquid spills with spill kit absorbent material, sand or dirt until liquid is sufficiently converted to solid material.
 - Remove immediately using dry cleanup methods, e.g. broom and shovel, or vacuum operations.
 - Cleanup with water and detergents may also be necessary depending on the spilled material. However, the waste from this operation must be vacuumed or effectively picked up by dry methods or vacuum machinery. See Pavement Washing SOP.
 - Repeat process when residue material remains.

4. DISPOSAL:

- a) Follow SDS requirements but usually most spills can be disposed per the following b. & c.
- b) Generally most spills absorbed into solid forms can be disposed to the dumpster and receptacles. Follow Waste Management SOP.
- c) Generally liquid waste from surface cleansing processes may be disposed to the sanitary sewer system after the following conditions have been met:
- Dry cleanup methods have been used to remove the bulk of the spill and disposed per the Waste Management SOP.
 - The liquid waste amounts are small and diluted with water. This is intended for spill cleanup waste only and never for the disposal of unused or spent liquids.

5. Documentation:

- a) Document all spills in Appendix C.

6. SDS sheets:

- a) SDS Manual is filed in break room.

7. Materials:

- a) Generally sand or dirt will work for most cleanup operations and for containment. However, it is the responsibility of the owner to select the absorbent materials and cleanup methods required by the SDS Manuals for chemicals used by the company.

8. Training:

- a) Annually and at hire.
- b) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

APPENDIX C – PLAN RECORDKEEPING DOCUMENTS

[Insert PLAN Recordkeeping forms following this page]

MAINTENANCE LOG

Date	Maintenance Performed/Spill Events. Perform Maintenance per SOPs	Observation Notes, including but not limited to; Inspection results, Observations, System Performance (effectiveness/inefficiencies), SOP Usefulness, Concerns, Necessary Changes...	Initials

Annual Summary of LTSWMP effectiveness, inefficiencies, problems, necessary changes etc.

*You may create your own form that provides this same information or request a word copy of this document.

Appendix D Ordinance 381

ORDINANCE NO. 381-A

AN ORDINANCE CONCERNING STORM WATER POLLUTION PREVENTION AND EROSION CONTROL FOR DEVELOPMENT AND RESIDENTIAL CONSTRUCTION PROJECTS.

WHEREAS, Summit County has adopted the Snyderville Basin Development Code, the Eastern Summit County Development Code, Ordinance 181-D, and Ordinance 315-B all of which address excavation, placement of fill, grading and or removal of vegetation; and,

WHEREAS, Summit County Storm Water Management Plan requires that more stringent Storm Water Pollution Prevention measures are to be adopted during the implementation period of the Plan; and,

WHEREAS, Storm water pollution prevention and erosion control are only generally addressed in Summit County's Codes or Ordinances; and,

WHEREAS, The United States Environmental Protection Agency and The State of Utah Division of Water Quality have rules, regulations and laws which only address Storm Water Pollution and Erosion Control for construction sites having disturbed areas of (1) acre or more; and

WHEREAS, The State of Utah Division of Water Quality is concerned about various waterways and lakes which have been determined to be impaired; and,

WHEREAS, The State of Utah Division of Water Quality has limited staff to review, inspect or enforce Storm Water Discharge Permits issued by the Division; and,

WHEREAS, The Summit County Engineering Division has been charged with the review, inspection and enforcement of construction activities of projects which require a permit under the Codes and Ordinances adopted by the County;

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF SUMMIT COUNTY, STATE OF UTAH, AS FOLLOWS:

Section 1. Requirements for Storm Water Pollution Prevention Permit and Erosion Control Permit. (SWP3 and ECP)

- 1) It shall be unlawful and punishable as a Class C Misdemeanor provided for any person, firm, public utility, public agency, or corporation, to make, enlarge or change any excavation, re-grade existing contours, place fill or strip vegetation without complying with the provisions of this ordinance and obtaining a Storm Water Pollution Prevention Plan (SWP3) and Erosion Control Plan (ECP) Permit as provided for herein. It shall also be unlawful for any person hiring or directing

another person, firm, or corporation to perform the work without obtaining a SWP3 and ECP Permit.

- 2) It shall be unlawful and punishable as provided to change or expand the excavation, regrading of existing contours, placement of fill or stripping of vegetation without first requesting a modification of the SWP3 and ECP Permit issued for the work.
- 3) A SWP3 and ECP Permit shall be required for any project which requires a permit under any other Ordinance, Development Code or Building Permit issued by Summit County.
- 4) A SWP3 and ECP Permit shall be required for Commercial and Industrial uses occupying a site of 1 acre or more, and which are found to be discharging sediment off site, into a waterway, or tracking onto a road or street.

Section 2. Emergency Conditions

Emergency excavations, grading, or placement of fill may be made without a permit if the reason for the excavation or grading or placement fill is to prevent loss of life or damage to property which appears to be imminent if the action is delayed by waiting to secure said permits. In such emergency situations, those making the excavation, grading or placement of fill **MUST** contact the County Engineer's Office at the earliest possible time, but in no case later than the first working day following the emergency work in order to secure a formal permit. None of the provisions of this ordinance are waived for emergency situations except for the prior permit requirement.

Section 3. Applications

Applications shall be made by the owner of the property on which the work is being done. In the case of work within a public right-of-way, by the firm, public utility, public agency or corporation actually doing the work, or in the case of work within a private road or private road right-of-way, by the owner of the road or association responsible for the maintenance of the road. Applications for all permits shall be made to the County Engineer's Office as provided, and state the purpose therefor, the person, firm, public utility, or corporation doing the actual work and the name of the person, firm, public utility, or corporation for whom or by which the work is being done and shall contain an agreement that the applicant will comply with all ordinance and laws of Summit County, the State of Utah, and the Federal Government relating to the work to be done. The application shall also provide for an agreement that the applicant shall indemnify the County for any loss, liability, or damage that may result from or because of the making, placement, existence, or manner of guarding or constructing any such excavation. The application shall be accompanied by a Storm Water Pollution Prevention and Erosion Control Plan (SWP3 and ECP). Said plan shall have a drawing of the location of the intended excavation, grading, filling or stripping of vegetation, the pertinent dimensions thereof. The SWP3 and ECP plan shall employ Best Management Practice (BMP's) and shall contain the layout, typical sections and details of the erosion control and sediment control measures to be used in the plan.

Section 4. Permits

1) All permits issued pursuant to this ordinance shall be valid for a period not to exceed the Development Permit, “Grading” Permit or “Excavation” Permit issued in conjunction with the SWP3 and ECP Permit. A copy of the permit issued shall be available on site at all times when work is under way.

2) Excavations, grading, or filling of sites which are one (1) acre or more, are required by State and Federal regulations to file a “Notice of Intent” with the Utah Division of Water Quality, Storm Water Permits Section (<http://waterquality.utah.gov/updes/stormwater.htm>). A copy of the Notice of Intent shall be submitted with the Application as provided herein.

Section 5. Exemptions

The following activities are exempt from the requirements of this ordinance:

- (1) Actions by a public agency or utility, the County or other governmental agency to remove or alleviate an emergency condition, restore utility service, or reopen a public thoroughfare to traffic; or
- (2) Actions by any person when the County determines, and documents in writing, that the actions are necessary to remove or alleviate an emergency condition, restore utility service, or reopen a public thoroughfare to traffic;
- (3) Landscape maintenance activities on fully developed property.
- (4) Bona fide agricultural and farming operations which constitute the principle use of any parcel or tract of ground located in the County and which meet the requirements of the zoning for that portion of the County in which the operation is located.

Section 6. Fees

A review fee and inspection fee, in the current amount as set by resolution of the Board of County Commissioners, shall accompany each application for a permit. Fees must accompany the application.

Section 7. Completion Bond

Applicants shall file a completion bond with the County Engineer in the amount as set by resolution of the Board of County Commissioners at the time the permit is approved. This may be cash, a letter of credit from an FDIC Insured Financial Institution, or a corporate surety bond. The bond shall be valid until one year after all work shown in the permit is completed to guarantee that the conditions of the permit together with any restorative works is completed properly. The bond will be released only upon recommendation of the County Engineer.

Section 8. Supervision and Inspection

1) The County Engineer shall from time to time inspect or cause to be inspected, all work done pursuant to permits to insure the enforcement of the provisions of this title. Notification shall be given to the County Engineer at least 24 hours prior to the commencement of any work and within 24 hours after implementing the SWP3 and ECP. The Completion Bond shall not be released without an inspection made to determine satisfaction of all applicable provisions of this ordinance.

2) For construction sites whose area of disturbance is one (1) acre or more, the applicant shall retain qualified personnel to inspect the sediment control measures, a) at least once each two and after a storm event which precipitated 0.5 inches of water or more within 24 hours. The inspector shall prepare written reports of each inspection and make recommendations for correcting any sediment control measure (BMP) found not performing as intended. A copy of each inspection shall be kept on site until such time as the disturbed area has been permanently stabilized. A copy of the report shall also be submitted the office of the County Engineer.

The applicant shall implement all recommendations of the inspector, or the County Engineer to correct any sediment control measure (BMP) found not performing as intended.

Section 9. Appeals

An applicant for a SWP3 and ECP whose application has been denied or approved with conditions, may appeal the denied or imposed conditions to the Board of Adjustment. A notice of appeal must be filled with the office of the County Engineer within 10 days of the denial or imposition of conditions of the permit. The notice of appeal shall contain the following information:

- (1) An application containing the applicants name, address and daytime telephone number,
- (2) A statement describing the basis for the appeal; and
- (3) The relief sought by the applicant.

The appeal shall be scheduled on the next available Board of Adjustment meeting.

Section 10. Failure to Comply

In the event of failure on the part of any person, firm, public utility, or corporation to comply fully with the provisions of this ordinance, law enforcement authorities of Summit County are authorized to:

- (1) Initiate criminal action by citation or information under Section 10 of this ordinance and/or proceed to forfeit bond, or

(2) Proceed to forfeit bond; or

(3) Install or repair such erosion control and sediment control measures as required to restore the SWP3 and ECP; or

(4) Give written notice to such person, firm, public utility, or corporation to restore such BMP's as required to restore or implement the SWP3 and ECP. Such notice may be served either by personal service or by mailing the notice to the person, firm, public utility, or corporation by certified mail and posting a copy thereof on such installation for a period for 10 days. If the SWP3 and ECP is not implemented or restored within 10 days after the notice is complete, said authorities may implement the SWP3 and ECP the same at the expense of the person, firm, or corporation and recover costs and expenses, and also the sum of \$100.00 for each day the SWP3 and ECP were not in effective operation after notice was complete, in an action for that purpose; or,

(5) If such person, firm, public utility, or corporation refuses to implement a SWP3 and ECP, said authorities may bring an action to abate the same as a nuisance, and if judgement is recovered by said authorities, there shall also be recovered, in addition to having the same abated, the cost of action and the sum of \$100.00 for every day such nuisance remained after notice was given for its implementation in the manner provided in Subsection (2) of this Section. (UCA 27-12-135).

Section 11. Penalty

Any person who violates the provisions of this ordinance is guilty of a Class "C" Misdemeanor, punishable by a fine not to exceed seven hundred and fifty dollars (\$750.00), or a jail term of up to ninety (90) days, or by both such fine and jail term.

Violators of this ordinance are also subject to any penalties that may be imposed by the State of Utah, or the Federal Government, under the Clean Water Act.

In addition to any criminal fines and/or penalties which may be assessed for a violation of this ordinance, Summit County shall have the right to issue a Stop Work Order on the entire construction site, and/or install or maintain appropriate erosion control and sediment control measures on any site which is required to have such measures in the event that construction activity is commenced or continued without such measures having been installed or required by this ordinance. Summit County shall have the right to have such measures installed and maintained by County Personnel or to have hire a private contractor to perform such work at the expense of the permittee, property owner, developer or contractor responsible for such measures. The County may assess said expenses against the bond posted by the permittee.

It is unlawful for any person, firm, public utility, public agency, or corporation to continue any further work on the construction site after a Stop Work Order has been issued. A violation of a Stop Work Order is punishable as a Class C Misdemeanor.

Summit County may also pursue civil remedies for a violation of this ordinance.

Section 12. Specific Requirements

Specific standards and requirements for the enforcement of this ordinance are attached as Appendix "A" which are made a part of this ordinance by reference.

Section 13. Repeal of Ordinance No. 381

Summit County Ordinance 381 are hereby repealed.

Section 14. Severability

Should any section, paragraph, sentence, clause, or phase of this ordinance be declared unconstitutional or invalid for any reason, the remainder of said ordinance shall not be affected thereby.

Section 15. Effective Date

This ordinance shall become effective after publication of such in accordance with applicable State Law.

PASSED AND ADOPTED by the Board of County Commissioners of Summit County, Utah, this ____ day of _____, 2004.

SUMMIT COUNTY BOARD COMMISSIONERS

KEN WOOLSTENHULME, CHAIR

BOB RICHER

SHAUNA KERR

ATTEST:

SUE FOLLETT
Summit County Clerk

APPROVED AS TO FORM:

Deputy Summit County Attorney

COMMISSIONER VOTED:

WOOLSTENHULME _____
(AYE OR NAY)

RICHER _____
(AYE OR NAY)

KERR _____
(AYE OR NAY)

LIST OF APPENDICES

- Appendix A: Storm Water Pollution Prevention Plan and Erosion Control Plan (SWP3 and ECP)**
- Appendix B: Perimeter Control Exemptions**
- Appendix C1: Erosion and Sediment Controls**
- Appendix C2: Typical Residential Storm Water Pollution Prevention Plan**
- Appendix D: Selected Nonstructural Post-Construction BMPs**
- Appendix E: Selected Structural Post-Construction BMPs**
- Appendix F: Calculating Peak Discharge and Volume**
- Appendix G: Sample Inspection Forms**

**APPENDIX A: STORM WATER POLLUTION
PREVENTION PLAN AND EROSION
CONTROL PLAN (SWP3 AND ECP)**

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Section 1. General

The purpose of this ordinance is to prevent the discharge of sediment and other construction related pollution from construction sites by storm water runoff. Construction sites are a major source of pollution to waterways and storm drain systems located within Summit County and the surrounding area. Storm Water runoff carries sediment from construction sites in to nearby water ways, lakes, canals, irrigation systems and storm drain systems. The sediment clogs storm drain systems, pollutes the water in the streams and lakes and damages wildlife habitat and water quality. The same potential for polluting waterways, lakes, canals, irrigation systems, and storm drain systems can occur from commercial or industrial operations. Existing and future commercial and industrial operations which are allowing sediments to be discharged from the operation site, or allowing sediments to be tracked onto public or private roads and streets must also comply with the provisions of this ordinance.

A second purpose of this ordinance is to minimize long-term changes in storm water runoff quantity and quality associated with development. Land development projects and associated increases in impervious cover alter the hydrologic response of local watersheds and can increase stormwater runoff rates and volumes, flooding, stream channel erosion, and sediment transport and deposition. Other potential hydrologic alterations include reduced infiltration rates and lower in-stream base flow levels. These hydrologic changes adversely affect local fishery resources and aquatic habitat, and are often accompanied by increased pollutant loadings. This ordinance is intended to minimize these adverse effects by requiring

developments to incorporate permanent, post-construction Best Management Practices (BMPs) that treat storm water runoff quantity and quality and maximize on-site infiltration of runoff to promote groundwater recharge.

This Appendix shall establish guidelines for the preparation of the SWP3/ECP, which will include both temporary and permanent BMPs to control erosion and prevent polluted runoff both during and after construction.

Section 2. Definitions

For the purpose of this ordinance and appendix, the definitions listed hereunder shall be construed as specified in this section.

APPLICANT- Any person or entity which files or is required to file an application for a SWP3 and ECP.

APPLICATION- The form and supporting information filed with Summit County for review and approval of a SWP3 and ECP.

APPROVAL- The proposed plan conforms to this ordinance and appendix in the opinion of the County Engineer.

BEST MANAGEMENT PRACTICES (BMPs)- Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

COMMENCEMENT OF CONSTRUCTION- The initial disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

CONTROL MEASURE- Any Best Management Practice or other method used to prevent or reduce the discharge of pollutants.

CIVIL ENGINEER- A professional engineer registered in the State of Utah to practice in the field of civil works.

CWA- Clear Water Act or the Federal Water Pollution Control Act.

DEVELOPMENT OR DEVELOPMENT ACTIVITY- Any of the following activities requiring a permit pursuant to the Codes and Ordinances of Summit County.

- A. Construction, clearing, filling, excavating, grading, paving, dredging, mining, drilling or otherwise significantly disturbing the soil of a site.

B. Building, installing, enlarging, replacing or substantially restoring a structure, impervious surface, and the long-term stockpiling of materials.

C. Construction, elimination or alteration of a driveway onto a public road.

DISCHARGE OF STORM WATER ASSOCIATED WITH CONSTRUCTION

ACTIVITY- Storm Water “point source” discharges from areas where soil disturbing activities (e.g. clearing, grading, or excavating, etc.), construction material or equipment activities(e.g. fill piles, concrete truck washout, fueling, etc.), or other industrial storm water directly related to the construction process (e.g. concrete or asphalt batch plants, etc.) are located.

DISTURBANCE- To alter the physical location, natural appearance, existing vegetation of the land by clearing, grubbing, grading, excavating, filling, building or other construction activity.

EPA- The United State Environmental Protection Agency.

EROSION- is the wearing away of the ground surface as a result of the movement of wind, water or ice.

EXCAVATION- Is the mechanical removal of earth material.

EXISTING GRADE- Is the grade prior to grading.

FILL- Is a deposit of earth material placed by artificial means.

FINAL STABILIZATION- All soil disturbing activities at the site have been completed, and that a uniform (e.g. evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of rip rap, gabions, or geotextiles) have been employed. In some parts of the County, background native vegetation will cover less than 100% of the ground (e.g. arid areas). Establishing at least 70% of the natural cover of native vegetation meets the vegetative cover criteria for final stabilization. For example, if the native vegetation covers 50% of the ground, 70% of 50% would require 35% cover for final stabilization.

FINISHED GRADE- The final grade of size which conforms to the approved plan.

GAS STATION- A permanent commercial or private facility that involves transferring fuel into mobile vehicles or equipment.

GEOTECHNICAL ENGINEER- See “soils engineer.”

GRADE- The vertical location of the ground surface.

GRADING- Any excavating or filling or combination thereof.

IMPERVIOUS SURFACE - Any surface which prevents or retards the penetration of water into the ground, including, but not limited to, paved streets, graveled or paved areas such as driveways, parking areas, packed earth material, oiled macadam or other treated surfaces, sidewalks, walkways, roof surfaces, patios and formal planters.

MAXIMUM EXTENT PRACTICABLE- A level of effort to be undertaken where technical feasibility and financial cost to be incurred are appropriate for the probable negative impacts to water quality to be minimized. Implementation of a storm water management practice is considered practicable unless one or both of the following apply:

- A. The practice is not technically feasible for the proposed use and physical characteristics of the site; or

B. The cost of implementing the practice would outweigh the benefits of maintaining water quality. Costs are considered to outweigh benefits only if they exceed \$0.50 per square foot of the lot or land on which the development takes place.

NATURAL LANDSCAPE- The cover and topography of land before any man-made change, or, in areas where there have been man-made modifications, that state of the area and topography of land as of the date of adoption of this Article.

PERMIT- A Summit County Storm Water Pollution Prevention Permit and Erosion Control Permit.

PERMITTEE- The recipient of a Summit County Storm Water Pollution Prevention Permit and Erosion Control Permit.

PERSON- Any individual, corporation, partnership, association, company or body politic, including any agency of the State of Utah and the United States Government.

PLAN- A Storm Water Pollution Prevention Plan and Erosion Control Plan.

POINT SOURCE- Any discernable, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, collection system, from which pollutants are or may be discharged. This

term does not include return flows from irrigated agriculture or agricultural storm water runoff.

PROFESSIONAL INSPECTION- The inspection required by this ordinance to be performed by the civil engineer, soils engineer, hydrologist, or engineering geologist. Such inspections include that performed by persons supervised by such engineers, hydrologists or geologists and shall be sufficient to form an opinion relating to the conduct of the work.

ROUGH GRADE- The stage at which the grade approximately conforms to the approved plan.

RUNOFF COEFFICIENT- The fraction of total rainfall that will appear at a conveyance as runoff.

SITE- Any lot or parcel of land or contiguous combination thereof, under the same ownership, where grading is performed or permitted.

SLOPE- An inclined ground surface the inclination of which is expressed as a ration of horizontal distance to vertical distance.

SOIL- Naturally occurring superficial deposits overlying bedrock.

SOILS ENGINEER (GEOTECHNICAL ENGINEER)- An engineer experienced and knowledgeable in the practice of soils engineering (geotechnical) engineering.

SOILS ENGINEERING (GEOTECHNICAL ENGINEERING)- The application of the principles of soils mechanics in the investigation, evaluation and design of civil works involving the use of earth materials and the inspection or testing of the construction thereof.

STORM WATER- Storm water runoff, snow melt runoff, and surface runoff and drainage.

STORM WATER DISCHARGE ASSOCIATED WITH INDUSTRIAL ACTIVITY-

Existing Commercial or Industrial operations whose operation may allow sediment, mud or debris to flow from the site or is tracked onto adjacent public or private roads by vehicles leaving the site.

SWP3- Storm water pollution prevention plan, referring to the plan required in the permit.

UNSTABILIZED- Areas of land which are disrupted or whose natural landscape has been changed due to excavation, grading grubbing and clearing, or other construction activity and which has not been finally stabilized.

Section 3. Storm Water Pollution Prevention Plan and Erosion Control Plan (SWP3 and ECP)

A. The Storm Water Pollution Prevention Plan and Erosion Control Plan shall contain the following:

(1) General Information including:

- a brief narrative description of the project
- legal description of site
- copies of relevant permits, easements, rights-of-way, and discharge permission agreements
- copies of maintenance easement(s) and covenant(s)
- total area of parcel/site
- area of expected disturbance by clearing, grading, excavation, filling, or other activities
- contact information for the applicant/permittee

(2) A Site Plan Map or maps that show:

- existing topography and proposed grades (2' contour interval or greater if needed for readability)
- existing drainage courses and impoundments (wet or dry)
- existing wetlands on or adjacent to the site
- existing soil and vegetation cover types

- environmentally sensitive features
- boundary of the 100-year flood plain (if applicable)
- receiving water body(ies) or , if far offsite, distance to and name(s) of receiving water body (ies)
- boundaries of individual drainage areas within the site and discharge point locations (per-and post-development, if different)
- location of construction activities
- extent/limits of clearing and grading
- existing and proposed utility locations
- location and finished elevations of proposed permanent structures including buildings, roads, and parking areas
- location of existing on-site or adjacent storm drain systems and canals
- landscaping plan, including any proposed irrigation system
- location of temporary and permanent stormwater runoff and erosion control BMPs

(3) Technical Information including:

- results of any soil or geologic tests/borings
- construction sequence and schedule for implementation of temporary erosion and sediment control measures
- area of new impervious surfaces and total post-development impervious area

- grades of all impervious surfaces
- hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in this ordinance (see Appendix F for additional details)
- design drawings (plan and profile), construction details, grades, elevations, and supporting engineering calculations (as applicable) for individual permanent stormwater BMPs and proposed drainage systems (see Appendix E for details)
- a description of how the SWP3 and ECP use non-structural controls to the maximum extent practicable for long-term treatment of stormwater runoff, and justification for any use of large-scale structural surface runoff controls (use form provided in Appendix D).

B. The proposed measures and controls described in the SWP3 and ECP shall be designed to meet the following goals and criteria.

(1) The proposed measure and controls shall be designed to prevent or minimize, to the maximum extent practical, the discharge of sediment, debris and other construction- related pollutants from the construction site by storm water runoff.

(2) The proposed measures and controls shall be designed to prevent or minimize, to the maximum extent practicable, the deposit, discharge, tracking by

construction vehicles or other vehicles leaving the construction site, or dropping of mud, sediment, debris or other potential pollutants onto public or private roads and streets. Any such discharge shall be cleaned up and removed prior to the end of the work shift in which the deposit occurred, or prior to sunset whichever comes first.

(3) The proposed measures and controls shall consist of the Best Management Practices (BMPs) available at the time that the plan is submitted. BMPs may include, but shall not be limited to, temporary silt or sediment fences, sediment traps and detention ponds, gravel construction (drain rock) entrances and wash down pads to reduce or eliminate off site tracking, straw bale sediment carriers, establishment of temporary and permanent vegetative cover, use straw mulch as a temporary ground cover, erosion control blankets, temporary interceptor dikes and swales, storm drain inlet protection, check dams, surface drains, pipe slope drains, level riprap pads for culvert outlet protection, reinforced soil retaining systems and gabions.

(4) Existing vegetation should be preserved wherever possible and disturbed portions of the site shall be stabilized. Stabilization practices may include, but not be limited to temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of nature vegetation, and other appropriate measures. Use of impervious surfaces

for stabilization shall be avoided. Except as provided below, stabilization measures shall be initiated as soon as possible in disturbed portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 10 working days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a) Where the initiation of stabilization measures by the 10th day after construction activity temporarily or permanently ceases is precluded by deep snow or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

(b) Where construction activity on a portion of the site is temporarily ceased, and earth disturbing will resume within 15 working days, temporary stabilization measures need not be initiated on that portion of the site.

(5) Measures shall be employed to minimize the risk of discharge of construction-related pollutants (such as paint, thinners, solvents, fuels and oils) from the construction site. Such measures may include implementation of storage practices to minimize exposure of the material to storm water as well as spill prevention and response.

(6) The SWP3 and ECP shall include long-term, post-construction runoff control measures that meet the following performance criteria:

(a) Peak Flow Rate Criteria. The flow rate of runoff from the proposed land development shall not exceed the pre-development runoff rate. Pre- and post- development rates shall be checked for the 10 and 100-year storm events. Structural controls such as detention or extended detention ponds shall include spillways that are adequate to transport the entire peak runoff of the 100-year storm event. The 10-year storm event shall be used for sizing underground storm water conveyance systems, i.e., pipe sections between catch basins and storm drainage manholes. Surface conveyance systems such as canals, drainage channels/ditches/swales, curb and gutters, and culverts shall be designed to safely pass the 100-year storm event. Design storms and runoff values shall be calculated using the methods described in Appendix F.

(b) Flood Control Criteria. Development activities that result in new releases of surface water from the development that inundate, erode, deposit sediment or otherwise damage downstream property, real or personal, shall not be allowed. Releases of runoff to downstream property that, prior to the proposed development, would not have received any runoff, will require that the downstream property owner provides an

easement and consent that shall be written in the land record, and that Summit County grants approval. When releases of runoff are directed into an irrigation canal or ditch, written permission will be required from the canal company president for acceptance of storm water into a canal unless otherwise covered by a flood control agreement. The canal company may also stipulate how the storm drain will enter the canal and any erosion protection needed. Entrance into the smaller private ditches will require the approval of the relevant water right holder and owner of the property upon which the ditch is located. If there is a question as to whether or not the ditch can carry the additional storm water, a capacity evaluation shall be submitted for the ditch in question.

©) Water Quality Criteria. Surface and subsurface (i.e. infiltration) storm water BMPs shall be implemented and maintained such that they provide water quality treatment for (i.e., infiltrate or capture and treat) the runoff volume (WQ_v) associated with a storm event of **0.5 inch in 1 hour** under post-development site conditions. Storm water BMPs shall be designed to remove a proportion of the average annual load of Total Suspended Solids (TSS), according to the sliding scale shown in Appendix E. The required removal rate is based on the percentage of impervious cover under post-development site conditions, and BMPs must be applied to all impervious areas in such a manner that the overall weighted average TSS removal rate

(from one or more BMPs) equals or exceeds the required removal efficiency level. BMPs will also be implemented to remove floatables from storm water runoff prior to discharge of the water from the development site.

(d) Groundwater Recharge Criteria. Annual groundwater recharge rates shall be maintained by promoting infiltration through the use of non-structural and structural methods. At a minimum, annual recharge from the post development site shall mimic the annual recharge from pre-development site conditions. Specifically, BMPs shall be implemented to ensure that the increase in surface runoff volume from the 1-hour, 0.5" storm event relative to pre-development conditions (i.e., the post-development WQv minus the pre-development WQv) is recharged into the groundwater rather than discharged off-site as surface runoff. Infiltration facilities must be situated in areas with suitable soils and adequate depths to groundwater (see Appendix E for detailed suitability information). Adequate pretreatment must be provided for runoff from pollution "hot spots" prior to recharging such runoff into the ground. Pollution "hot spots" include:

- road salt storage facilities
- parking lots that receive road salt applications

- vehicle salvage yards and recycling facilities
- vehicle service and maintenance facilities
- vehicle and equipment cleaning facilities, including carwashes
- fleet storage areas
- industrial sites
- marinas (service and maintenance)
- outdoor liquid container storage
- outdoor loading/unloading facilities
- public works storage areas
- facilities that generate or store hazardous materials
- commercial container nurseries
- permanent, temporary, and mobile fueling operations

(e) Water Quality Criteria for Gas Stations. Because the paved portions of gas stations are sources of harmful pollutants such as oil, gas, grease, metals, and other organic compounds, new gas station developments shall be required to install oil/water separators approved by the County Engineer to treat runoff from all impervious surfaces. Examples of appropriate oil/water separator devices are provided in Appendix E. Oil/water separators shall be installed off-line, upstream of any additional water quality BMPs and detention basins, and as close to the source of oil-generating activity as possible. Separators shall be sized to the water

quality design storm (WQv; 1-hour 0.5" storm) and shall be inspected monthly and maintained as needed. During larger storm events, excess flows should be safely directed away from the separator to another BMP. In addition to installing oil/water separators, gas stations must also install controls to meet all other treatment criteria listed above. Oil-water separators should not be used alone to treat storm water runoff, but rather as pretreatment to another storm water BMP or series of BMPs.

Section 4. Temporary and Permanent Erosion and Sediment Control/Stormwater Treatment Methods

Refer to Appendix B, C, D, and E for examples of temporary and permanent erosion and sediment control/stormwater treatment measures. The permittee may use those controls which may apply to his/her site, or may use other BMPs, and erosion and sediment control measures provided they are approved by the County Engineer. However, when selecting long-term (post-construction) stormwater treatment methods, the applicant must demonstrate that they have employed non-structural controls (e.g., reduction in paved area, disconnection of rooftop runoff, source control/pollution prevention, etc.) to the maximum extent practicable rather than relying solely on structural controls such as detention ponds. A more detailed list of non-structural control measures is provided in Appendix D. Non-structural controls are the preferred treatment method because they limit the increase in volume and rate of runoff associated with development, help preserve groundwater recharge, and limit pollutants at their source. Large-

scale structural surface runoff controls (e.g., large detention ponds) will only be permitted when the applicant demonstrates to the satisfaction of Summit County that it is not feasible to meet the storm water quantity and quality requirements through the use of non-structural and subsurface techniques alone. The worksheet included in Appendix D should be filled out by the applicant to demonstrate the use of non-structural techniques. If BMPs other than those shown in Appendix B, D or E are used, the permittee must demonstrate to the satisfaction of the County Engineer that the alternative controls will successfully meet the requirements listed in Section 3 above. Summit County may require more than the minimum control requirements specified if hydrologic, geologic, or topographic conditions warrant or if unique flooding, stream channel erosion, or water quality problems exist downstream from a proposed project.

Section 5. Proper Operation and Maintenance

A. The permittee shall install the erosion and sediment control measures required by the approved SWP3 and ECP before commencing any construction activities on the site to which the plans apply, or at such time as indicated on the plan. The permittee shall contact County Engineer's Office to schedule an inspection of the installed measures prior to commencing other construction activities.

B. The permittee shall maintain such measures on the site in good condition until the disturbed areas have been finally stabilized and the measures are no longer necessary to prevent or minimize, to the maximum extent practicable, the discharge of sediment,

debris and other pollutants from the site by storm water runoff or vehicular tracking. The erosion control measures shall be properly installed and maintained in accordance with the manufacturers specifications and good engineering practices. Once the temporary erosion control measures have been deemed no longer necessary, or once the site is finally stabilized, the controls shall be removed from the site in a timely manner.

C. Maintenance Covenants

(1) Establishment of Covenant. Maintenance of all long-term stormwater management facilities, including non-structural practices such as natural area conservation and buffer establishment, shall be ensured through the creation of a formal maintenance covenant that must be approved by Summit County and recorded into the land record prior to final plan approval. As part of the covenant, the location of each permanent structure will be added to the county's storm water map and a schedule shall be developed for when and how often maintenance will occur to ensure proper function of the stormwater management facility. The covenant shall also include plans for periodic inspections to ensure proper performance of the facility between scheduled cleanouts. The property owner listed on the land record is responsible for performing these periodic inspections and keeping written records of the inspections and any maintenance activities performed. Sample inspection forms are provided in Appendix G. These written records shall be retained for a minimum of three years from the date of the

inspection or maintenance activity. A copy of these written records shall be sent to Summit County within one week of the inspection.

(2) Maintenance and Inspection Plan Requirements. All permanent stormwater management facilities must undergo, at the minimum, semi-annual inspections in the fall and in the spring to document maintenance and repair needs and ensure compliance with the requirements of this ordinance and accomplishment of its purposes. These needs may include; removal of silt, litter, and other debris from all catch basins, inlets and drainage pipes, grass cutting and vegetation removal, necessary replacement of landscape vegetation, and removal and replacement of contaminated filter media. Specific maintenance needs for individual long-term BMPs are provided in Appendix E and sample inspection forms are provided in Appendix G. Following each inspection, a copy of the completed inspection form shall be sent to Summit County within one week of the inspection. Any maintenance needs found must be addressed in a timely manner.

(3) Failure to Maintain Practices. If a responsible party fails or refuses to meet the requirements of the maintenance covenant, Summit County, after reasonable notice, may correct a violation of the design standards or maintenance needs by performing all necessary work to place the facility in proper working condition. In the event that the stormwater management facility becomes a danger to public safety or public health, Summit County shall notify the party responsible for

maintenance of the stormwater management facility in writing. Upon receipt of that notice, the responsible person shall have 30 days to implement maintenance and repair of the facility in an approved manner. After proper notice, Summit County may assess the owner(s) of the facility for the cost of repair work; and the cost of the work shall be a lien on the property.

Section 6. Inspection and Entry

A. The permittee shall allow authorized employees and representatives of Summit County, State of Utah Division of Water Quality, and the Environmental Protection Agency (EPA), to enter the site to which the permit applies at any time during or after construction and to inspect the erosion and sediment control and permanent stormwater treatment measures installed and maintained by the permittee. The permittee shall allow inspection of any other construction activity pertaining to the conditions of the permit. This right of entry shall be formalized in a Maintenance and Inspection Easement that must be approved by Summit County and recorded into the land record such that the easement remains binding on all subsequent land owners.

B. Inspections During Construction

(1) For construction sites greater than 1 acre, qualified personnel (provided by the permittee) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to

precipitation, areas with structural control measures, and locations where vehicles enter or exit the site at least once every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater. Where sites have been temporarily stabilized, such inspection shall be conducted at least once every month.

(2) Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

(3) Based on the results of the inspection, the pollution prevention, erosion and sediment control, and stormwater runoff control measures identified in the SWP3 and ECP shall be revised as appropriate as soon as practical after such inspection. Such modifications shall provide for timely implementation of any changes to the plan within seven (7) calendar days following the inspection. Such modifications may include maintenance of existing controls, adjustments in the locations of

controls, or addition of new controls to ensure that the ECP/SWP3 is meeting its goals and criteria.

(4) An inspection report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with Section 6B(3) above, shall be made and retained as part of the SWP3/ECP Plan for at least three years from the date that the site is finally stabilized (see Appendix G for sample inspection forms). During construction, the reports shall be maintained onsite along with a copy of the SWP3/ECP Plan. The construction inspection reports shall identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed by the permittee or their duly authorized representative and the inspector.

Section 7. Revocation or Suspension of SWP3 and ECP

A. A SWP3 and ECP may be revoked or suspended by the County Engineer or designee upon the occurrence of any of the following:

(1) Failure of the permittee to comply with the plan or any portion thereof, or any condition of the permit; or

(2) Failure of the permittee to comply with any provision of this ordinance, or any other applicable law, ordinance, rule or regulation; or

(3) A determination by the County Engineer that the erosion and sediment control measures implemented by the permittee pursuant to the plan are inadequate to prevent or minimize, to the maximum extent practicable, the discharge of sediment, debris or other pollutants from the construction site by storm water runoff or vehicular tracking.

B. Summit County shall mail permittee written notice of non compliance or personally serve notice to the person responsible for maintaining the erosion control and sediment control measures, before revoking or suspending a permit. The notice shall state the nature and location of the non compliance and shall specify what action is required for the permittee to avoid revocation or suspension of the permit, which in the absence of

exceptional circumstances shall not be less than 5 working days or more than 10 working days. The notice shall be sent by certified mail to the address listed for the permittee on the application.

C. For the purposes of this ordinance, exceptional circumstances include, but are not limited to, situations which involves risk of injury to persons, damage to storm drain facilities, or damage to other property. Summit County may take any action deemed necessary to alleviate any such exceptional circumstances defined above and may bill the permittee, property owner, developer or contractor responsible for creating the exceptional circumstances for the cost of alleviating said circumstance.

D. A stop work order on all construction activity on the site may be issued upon the revocation or suspension of a permit. No construction activity may be commenced or continued on any site for which a permit has been revoked or suspended and a stop work order issued until the permit has been reinstated or reissued.

E. A SWP3 and ECP may be reinstated or reissued upon review and approval of a written description of the permittee's proposed actions to bring the erosion control and sediment control measures into compliance with all provisions of this ordinance, or submission, review and approval of a revised SWP3 and ECP.

Section 8. Compliance with Federal and State Law

Nothing contained in this ordinance is intended to relieve any person or entity from any obligation to comply with applicable federal and/or state laws and any other regulations pertaining to clean water and/or storm water runoff and erosion control.

APPENDIX B: PERIMETER CONTROL EXEMPTIONS

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PURPOSE 1

APPLICATION 1

DEFINITION: Certain construction sites may be exempt from installing silt fence or other temporary perimeter controls if the site meets certain criteria.

PURPOSE: Exemptions for silt fence or other perimeter controls are for construction sites where such controls may be ineffectual, excessive, and/or detrimental to nearby water resources and other natural resources.

APPLICATION: All exemptions must be approved by the Summit County Engineer and must meet the following criteria:

1. Total disturbance is less than 1 acre.
2. A 50 foot wide vegetated buffer exists down gradient from the disturbed portion(s) of the site.
3. A 100 foot wide vegetated buffer exists down gradient between the disturbed portions(s) of the site and any live stream or existing drainage way.
4. The site and vegetated buffer have less than 5% slope (slope must be documented).
5. The vegetated buffer has at least 70% ground cover.

APPENDIX C1: EROSION AND SEDIMENT CONTROLS

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Appendix C2: Typical Residential Stormwater Pollution Prevention Plan C2-1

List of Temporary and Permanent Erosion/Sediment Controls contained in Appendix B.

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

UDOT Standard Drawings Temporary Erosion Control Drawings Number 1010- 1014

This list is not to be construed to be the limit of available BMPs, only as a partial list, and as examples which may be employed.

REVEGETATION

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

PURPOSE:

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

APPLICATION :

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

LIMITATIONS:

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

INSTALLATION:

Temporary Seeding

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

Permanent Seeding

- Grade and shape the area to be seeded so that it will drain properly and accommodate seeding equipment. If slopes are steeper than 3:1, the use of hydraulic seeding equipment is encouraged.
- Loosen compacted soil by racking, or discing where hydraulic seeding will not be used, to provide for seed retention and germination.
- Spread at least 3 inches of topsoil, if required, before seeding. If topsoil is required, the subsoil should be serrated or disced to provide an interface.

- Apply seed and fertilization suitable for the area and season. The seed species and fertilization requirements must be developed by a professional or the local Soil Conservation Service Office.

MAINTENANCE:

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

MULCHING

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

PURPOSE:

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

APPLICATION :

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

LIMITATIONS:

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

INSTALLATION:

- Rough area to receive mulch to create depressions that mulch material can settle into.
- Apply mulch to required thickness and anchor as necessary.

- Recommended Application Rates:
 - Straw: 2-3 bales/1000 square feet (90-120 bales/acre)
 - Wood Fiber: 25-30 pounds/1000 square feet (1000-1500 pounds/acre)
- Ensure material used is weed free and does not contain any constituent that will inhibit plant growth.

MAINTENANCE:

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

Recommended Application Rates for Mulching.

Material	Application	Depth	Comments
<u>Gravel:</u> Washed 3/4" to 1 1/2"	9 cu yd/1000 sq ft	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 sq ft	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 sq ft	1 inch (Min.)	For critical areas, double application rate; Limit to slopes <3% and < 150 feet

GEOTEXTILES

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

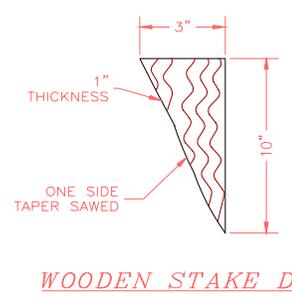
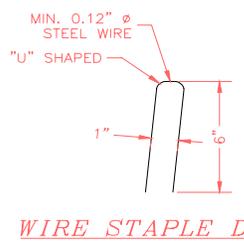
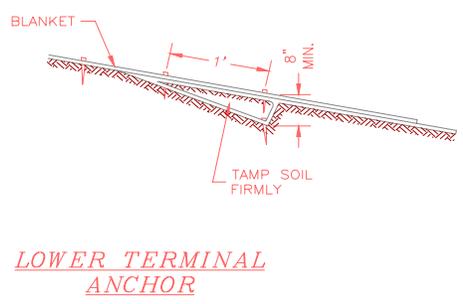
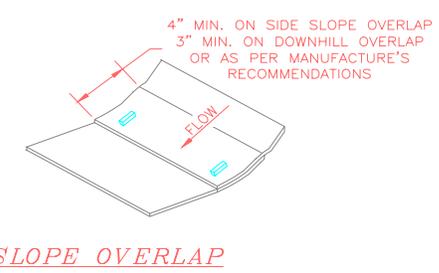
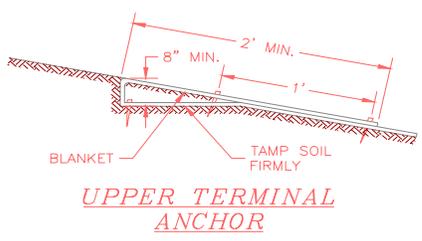
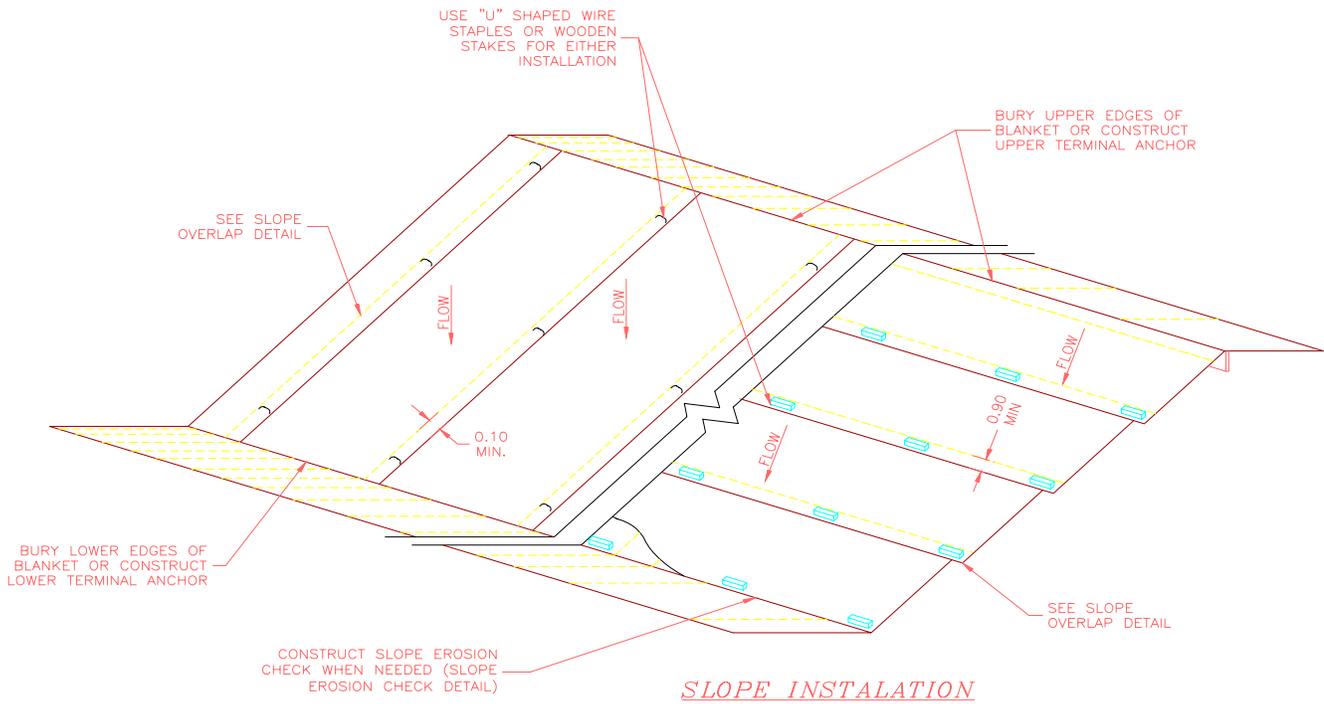
- Allow for an overlap of 4 inches on both sides of each roll and 36 inches at the ends of the roll.
- The fabric must extend beyond the edge of the exposed area at least 12 inches at the sides and 36 inches at the top and bottom.
- At the top of the area, bury the end of each roll in a trench at least 8 inches deep. The trench should then be backfilled and tamped.
- Staples should be driven perpendicularly into the slope face. Staples must be of 3/16" diameter (or heavier) steel wire. Allow for spacing of approximately 5 feet apart along the sides and center of each roll and not more than 12 inches apart along upper end of a roll or at the overlap of two rolls.
- The soil must be reasonably smooth. Fill and compact any rills and gullies. Remove any protruding rocks and other obstructions.
- Apply the individual rolls up and down the slope, from top to bottom--never along the contour.

- Make sure that the fabric makes uniform contact with the slope face underneath. No bridging of rills or gullies should be allowed.

MAINTENANCE:

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

GEOTEXTILES— TYPICAL DESIGN / LAYOUT



SURFACE ROUGHENING

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

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

APPLICATION:

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

LIMITATIONS :

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

CONSTRUCTION:

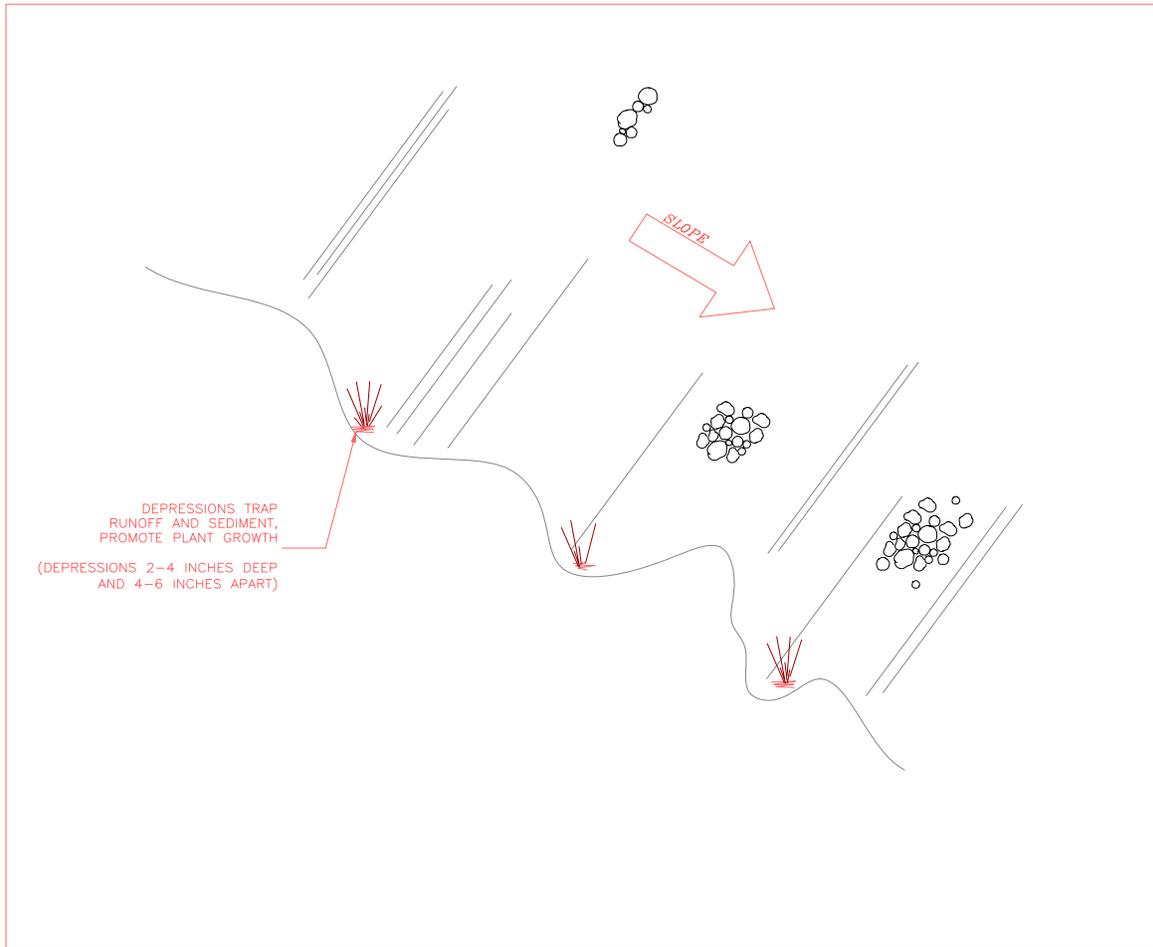
- Surface should be left in rough condition during initial earthwork activity.
- Surfaces that have become smoothed or compacted due to equipment traffic should be roughened by use of disks, spring harrows, teeth on front end loader, or similar, operating along the contour of the slope. Tracking (by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

MAINTENANCE:

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

SURFACE ROUGHENING

*TYPICAL
DESIGN LAYOUT*



SILT FENCE

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

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

APPLICATION:

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

LIMITATIONS:

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

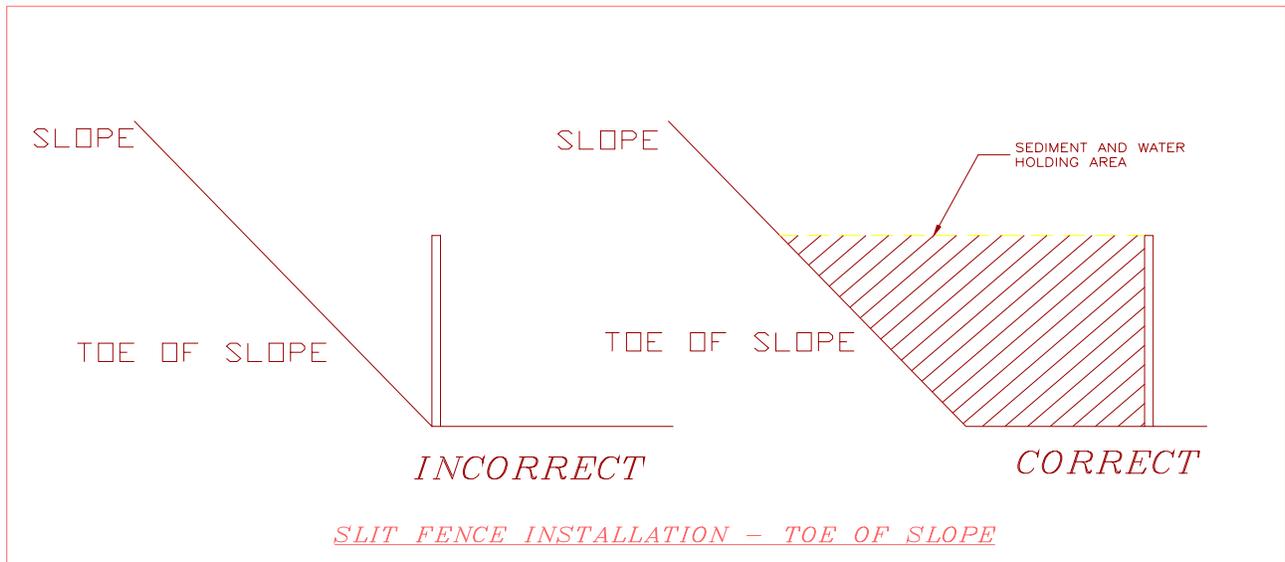
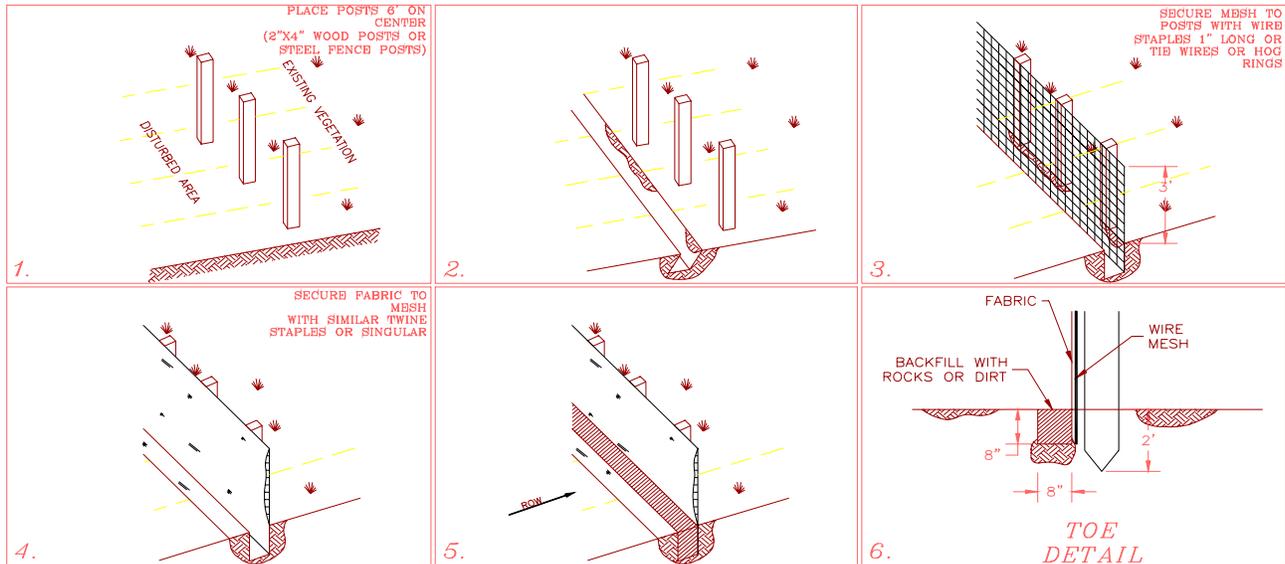
INSTALLATION:

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

MAINTENANCE :

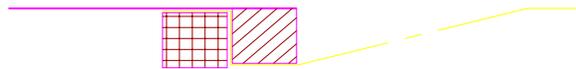
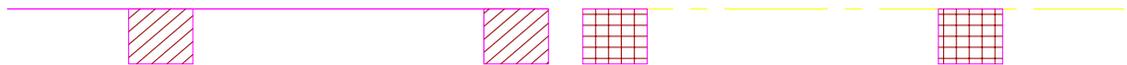
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Look for runoff bypassing ends of barriers or undercutting fence (repair immediately).
- Repair or replace damaged areas of the fence and remove accumulated sediment.
- Re-anchor fence as necessary to prevent shortcutting.
- Remove accumulated sediment when it reaches ½ the height of the fence.

SILT FENCE TYPICAL DESIGN LAYOUT

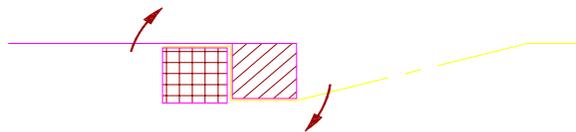


*SILT FENCE
TYPICAL
DESIGN LAYOUT*

ATTACHING TWO SILT FENCES

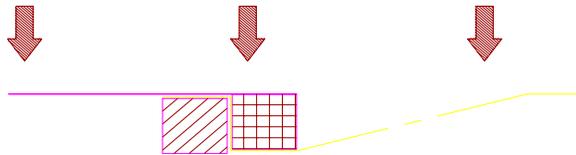


PLACE THE END POST OF THE SECOND FENCE INSIDE THE END POST OF THE FIRST FENCE



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

DIRECTION OF RUNOFF WATERS



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

STRAW BALE BARRIER

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

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

APPLICATION:

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

LIMITATIONS:

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

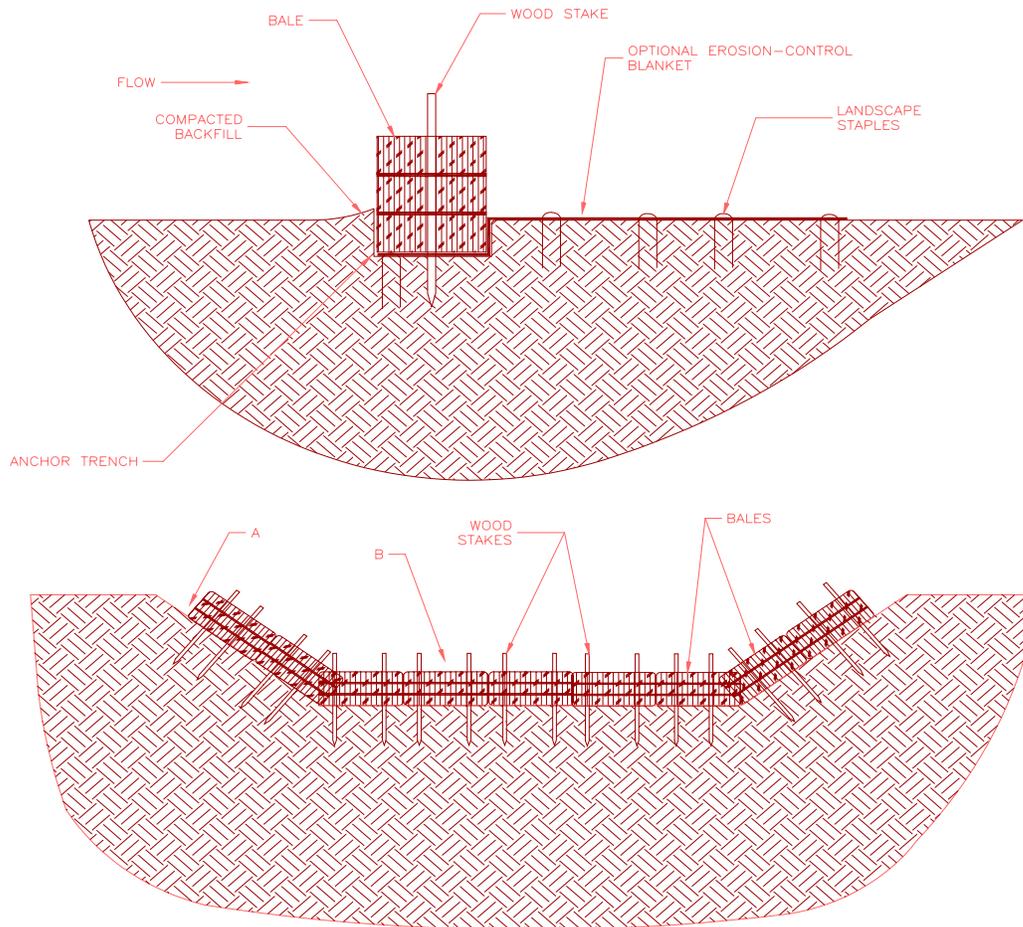
INSTALLATION:

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

MAINTENANCE:

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

*STRAW BALE CHECK DAM
TYPICAL DESIGN
LAYOUT*



CHECK DAM SPACING

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

<i>DITCH (%)</i>	<i>CHECK DAM SPACING (FEET)</i>
1.0	200
2.0	100
3.0	66
4.0	50
5.0	40
6.0	33

STABILIZED CONSTRUCTION ENTRANCE

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

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

APPLICATION:

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

LIMITATIONS: Not listed.

INSTALLATION:

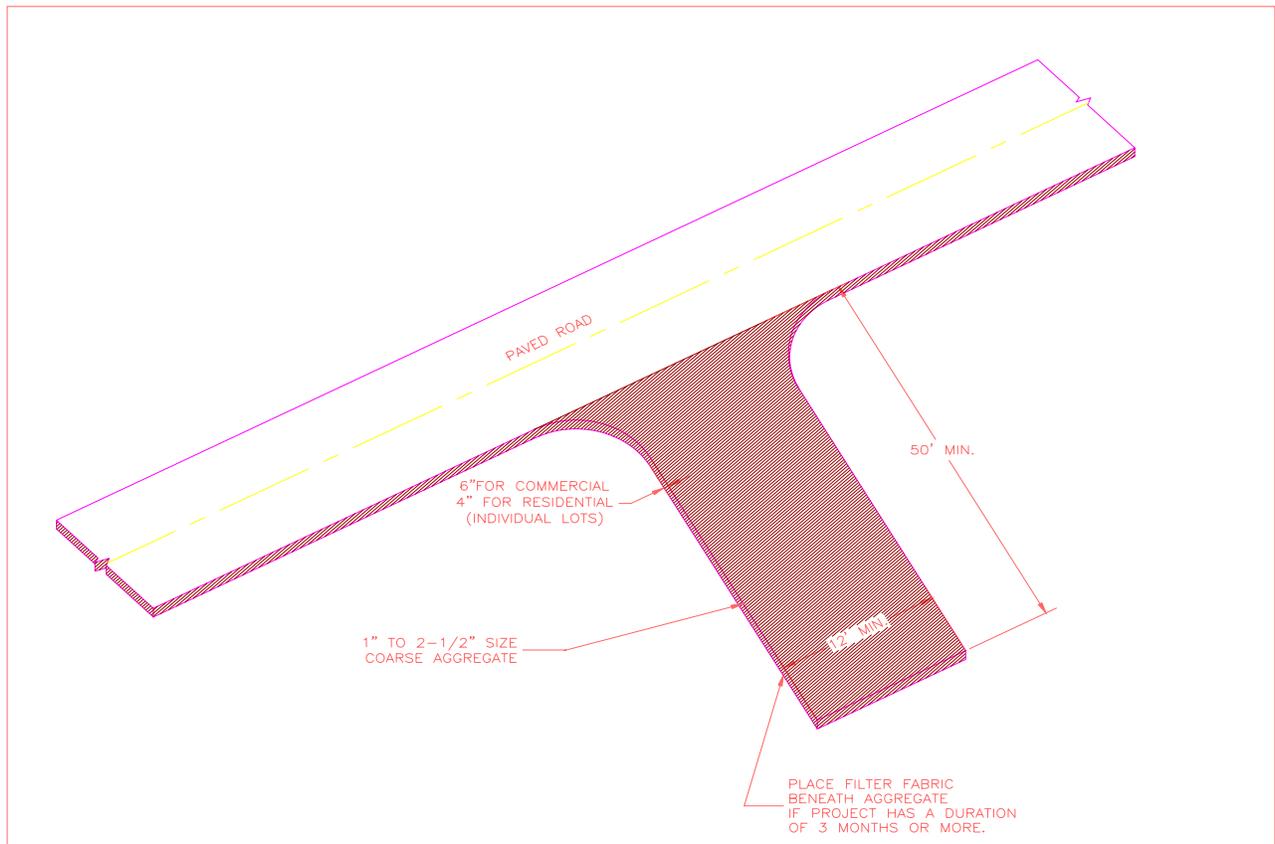
- Clear and grub area and grade to provide slope shown for driveway, or access/intersection. If adjacent to waterway, use a maximum slope of 2%.
- Compact subgrade and place filter fabric if required.
- Place coarse aggregate, 1 to 2 ½ inches size, to a minimum depth of 6 inches for commercial projects,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

MAINTENANCE:

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

STABILIZED CONSTRUCTION ENTRANCE

*TYPICAL DESIGN
LAYOUT*



DIVERSION DITCH/DIKE

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

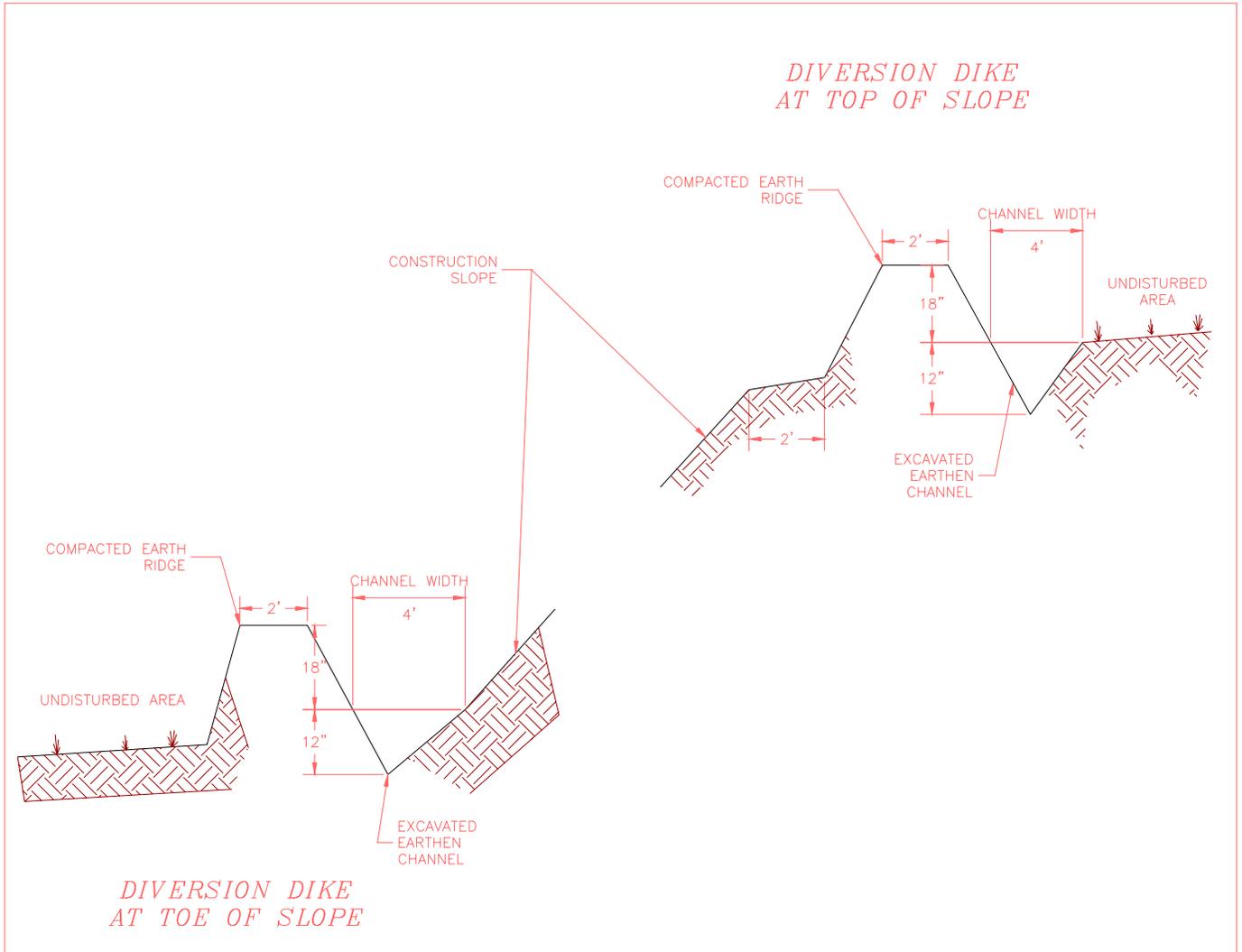
- Clear and grub area for ditch/dike construction.
- Excavate channel and place soil on down gradient side.
- Shape and machine compact excavated soil to form ditch/ridge.
- Place erosion protection (Riprap, mulch, appropriate geotextiles) at outlet.
- Stabilize channel and ridge as required with mulch,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

MAINTENANCE:

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

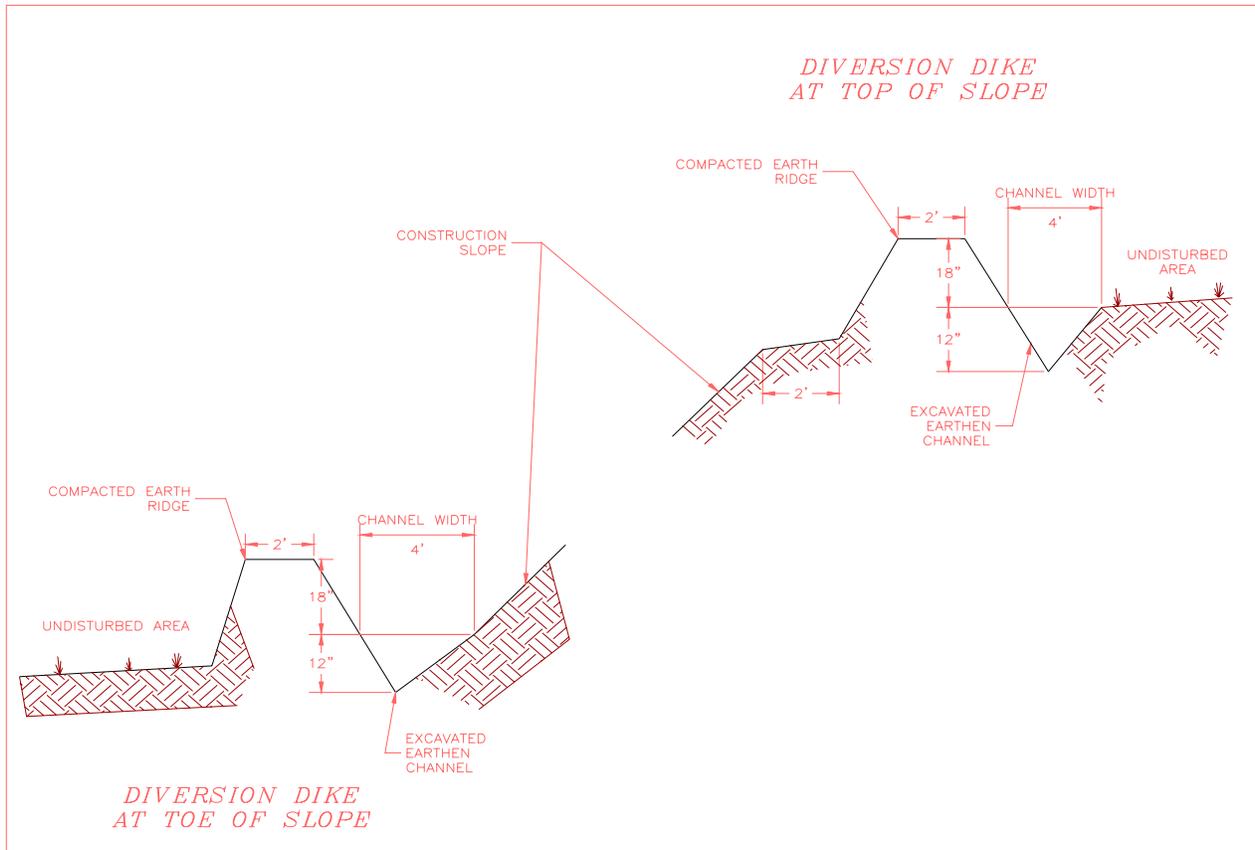
DIVERSION DIKE

TYPICAL DESIGN LAYOUT



DIVERSION DIKE

TYPICAL DESIGN LAYOUT



WATER BAR

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

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

APPLICATION:

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

LIMITATIONS:

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

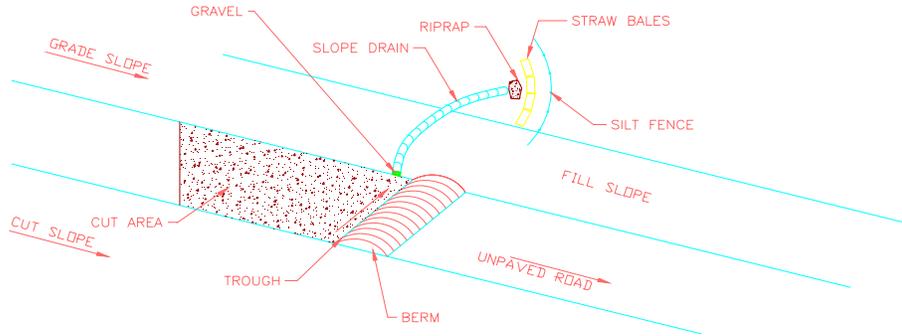
INSTALLATION:

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

MAINTENANCE:

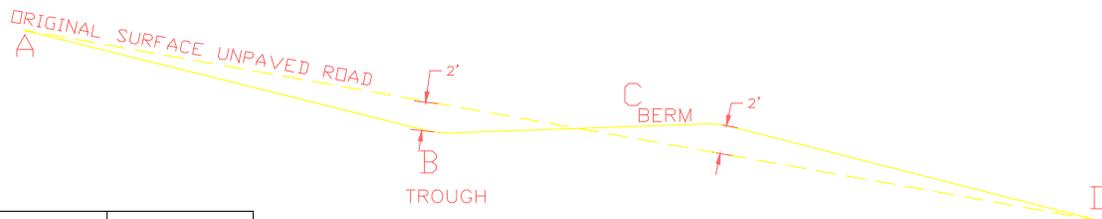
- Inspect immediately after any rainfall and at least daily during prolonged rainfall.
- Remove sediment as necessary .
- Inspect for runoff breaching water bar or eroding at/or below the discharge point.
- Repair vehicle ruts on the top of the berm and stabilize as necessary.

WATER BAR — PLAN VIEW



#1 WATER BAR — CROSS SECTION

BERM METHOD

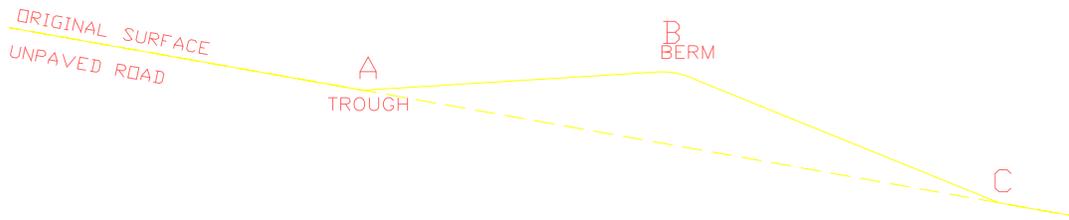


SEGMENT	SLOPE DISTANCE
A-B	25'
B-C	15'
C-D	15'

CUT AND FILL METHOD

#2 WATER BAR — CROSS SECTION

BERM METHOD



SEGMENT	SLOPE DISTANCE
A-B	8'
B-C	16'

BERM METHOD

STORM DRAIN INLET PROTECTION

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

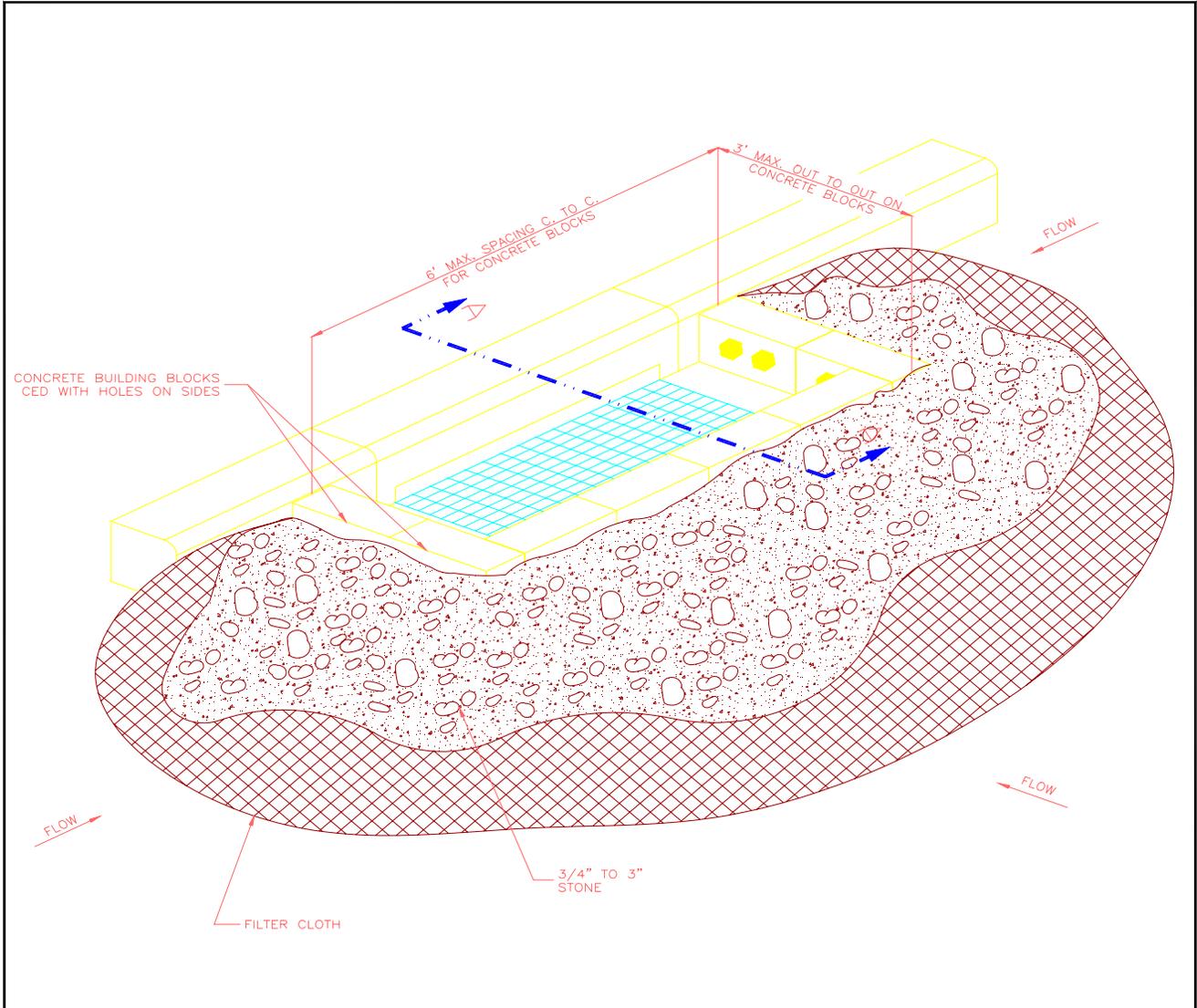
- Place wire (with ½ inch openings) over the inlet extending 12-inches past inlet opening. Place filter fabric over mesh.
- Place concrete blocks around the inlet with openings facing outward. Stack blocks to minimum height of 12-inches and a maximum height of 24-inches.
- Place wire mesh around outside of blocks.
- Place gravel (¾ inch to 3 inches) around blocks.

MAINTENANCE:

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

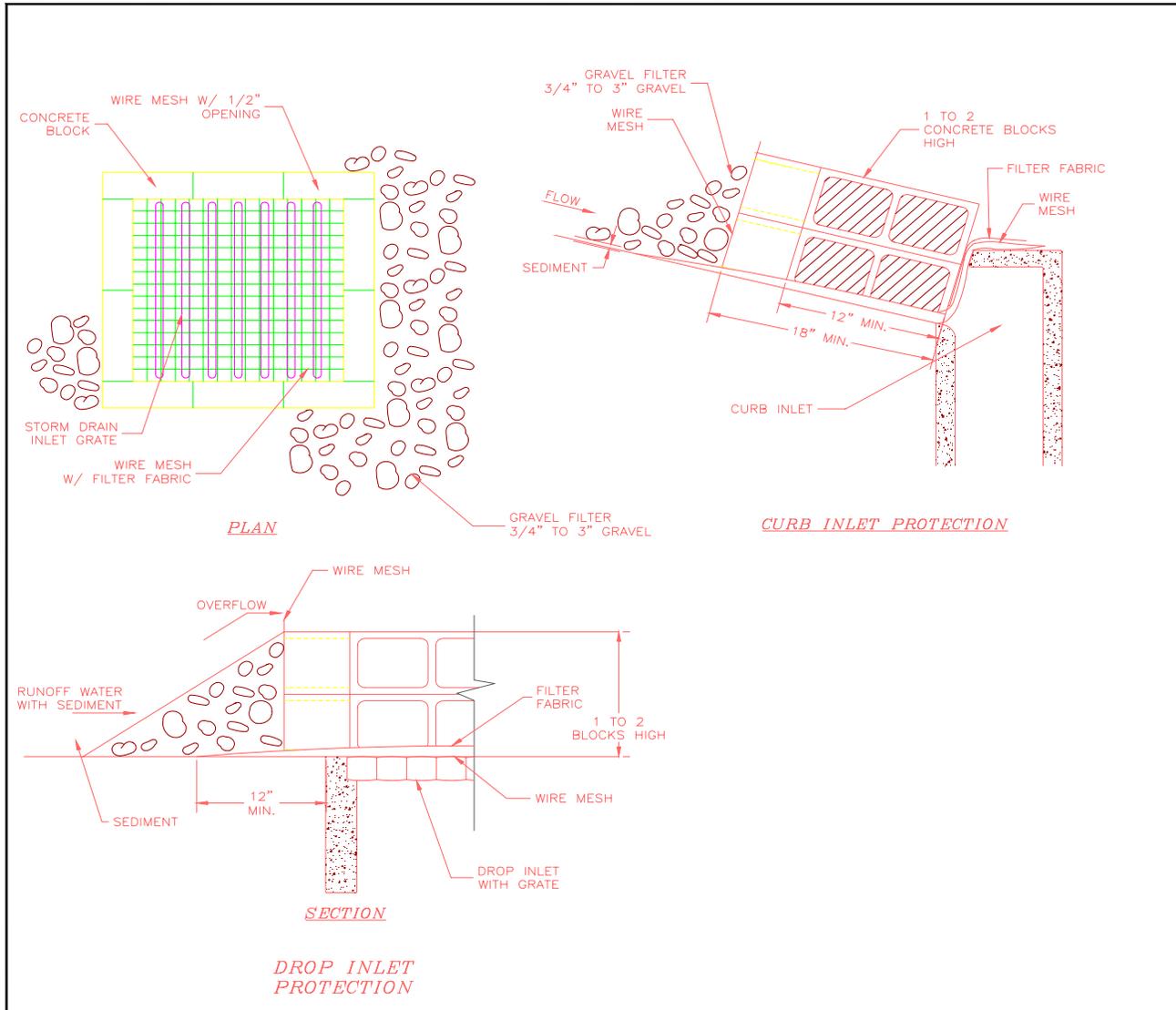
INLET PROTECTION

TYPICAL DESIGN LAYOUT



INLET PROTECTION

TYPICAL DESIGN LAYOUT



STRAW BALE DROP-INLET BARRIER

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

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

APPLICATION:

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

LIMITATIONS:

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

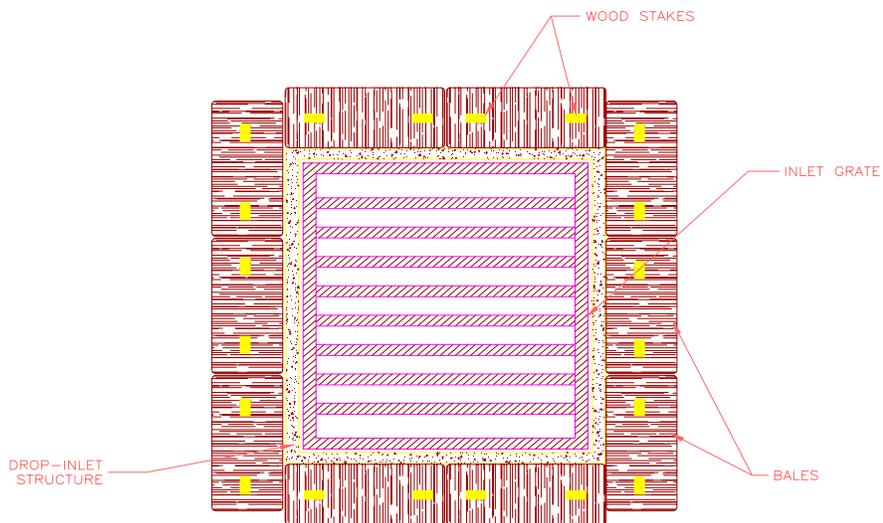
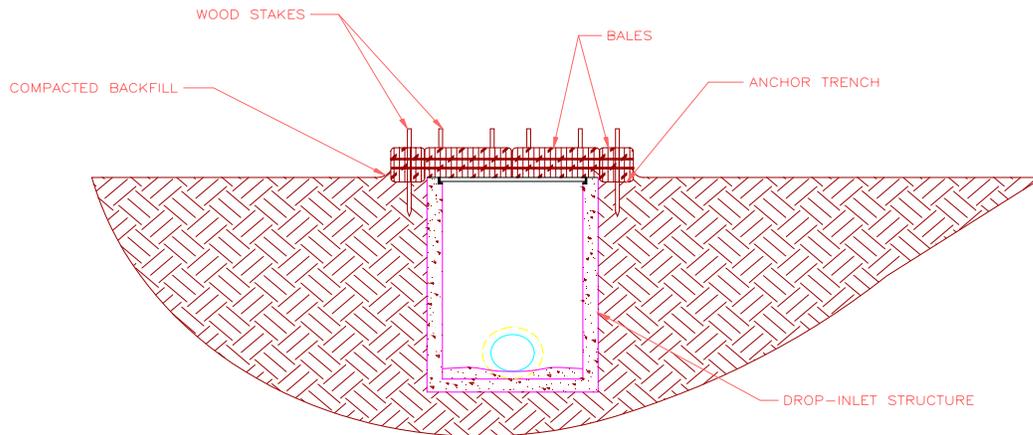
INSTALLATION:

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

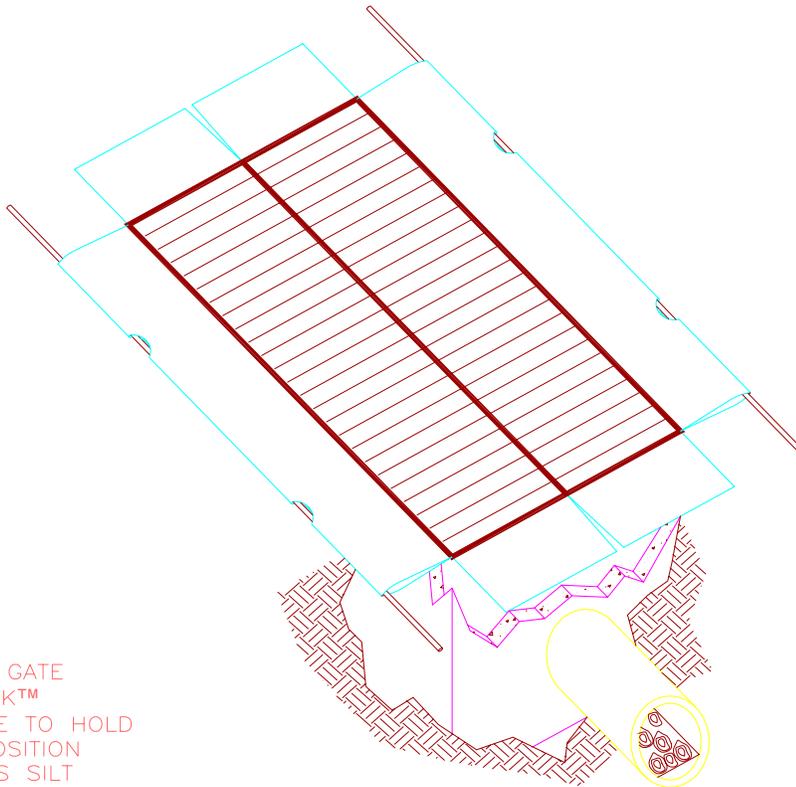
MAINTENANCE:

- Inspect inlet protection after every large storm event and at a minimum of once weekly.
- Remove sediment accumulated when it reaches half the height of the bale.
- Replace bales which become damaged.
- Replace filter sack (if used) if clogging is apparent.

STRAW BALE DROP-INLET BARRIER INSTALLATION



SILTSACK™



REMOVE DRAIN GATE
INSERT SILTSACK™
REPLACE GRATE TO HOLD
SILTSACK IN POSITION
SILTSACK TRAPS SILT
REMOVE FILLED SILTSACK
(WITH FRONT-LOADER OR OTHER EQUIPMENT)
LIFT DUMP STRAPS
CLEAN AND REUSE OR
DISCARD AND REPLACE
SIZED TO FIT ANY SIZE OR SHAPE CATCH BASIN
ALL SEAMS DOUBLE STICHED
PERMEABILITY- REGULAR FLOW SILTSACK -40 GAL./MIN./FT²
HIGH FLOW SILTSACK-200GAL./MIN./FT²
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ATLANTIC CONSTRUCITON FABRICS, INC.
1801-A WILLIS ROAD
RICHMOND, VA 23237

BRUSH BARRIER

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

PURPOSE: To trap sediment and filter construction runoff.

APPLICATION:

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

LIMITATIONS :

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

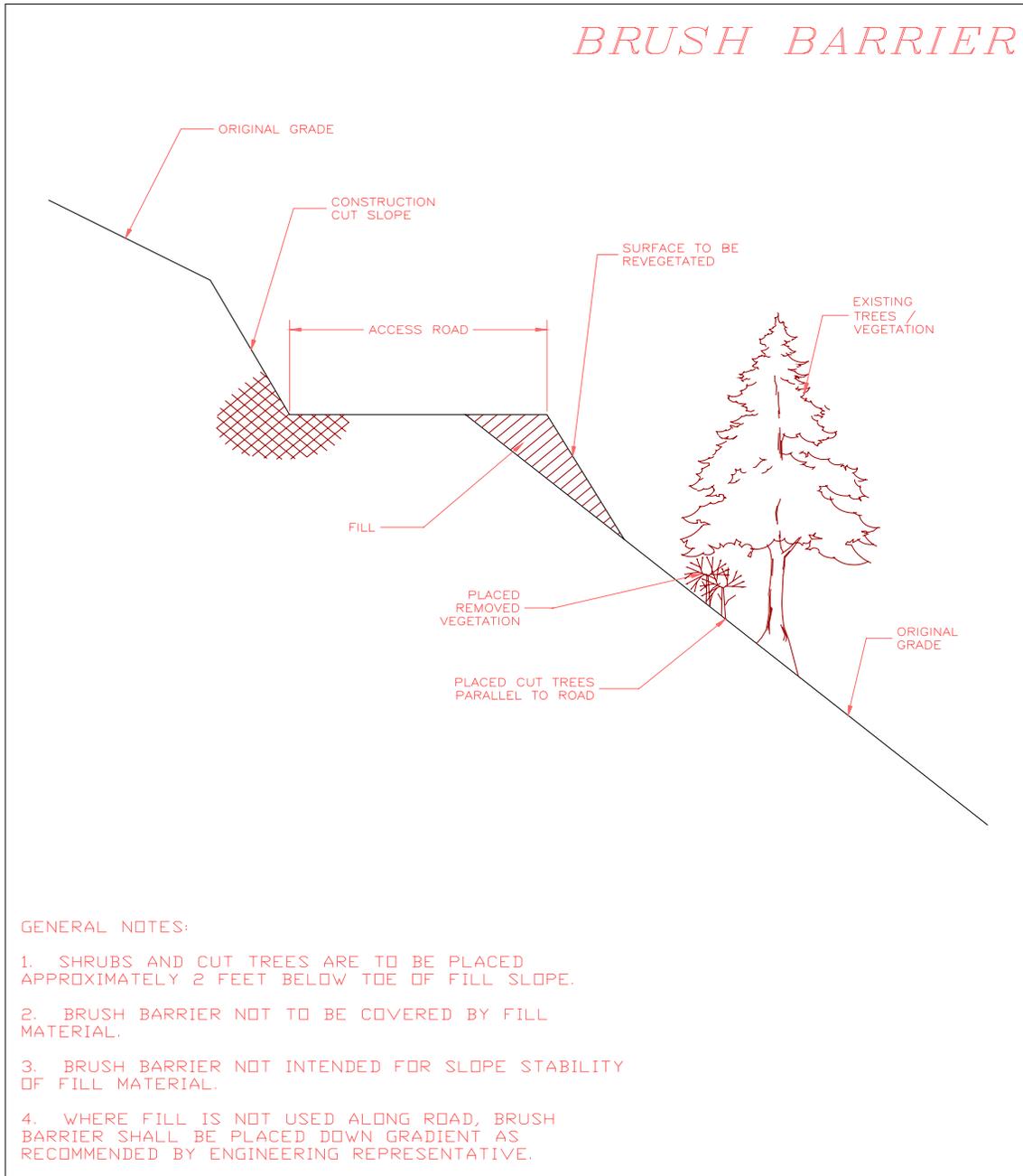
INSTALLATION:

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

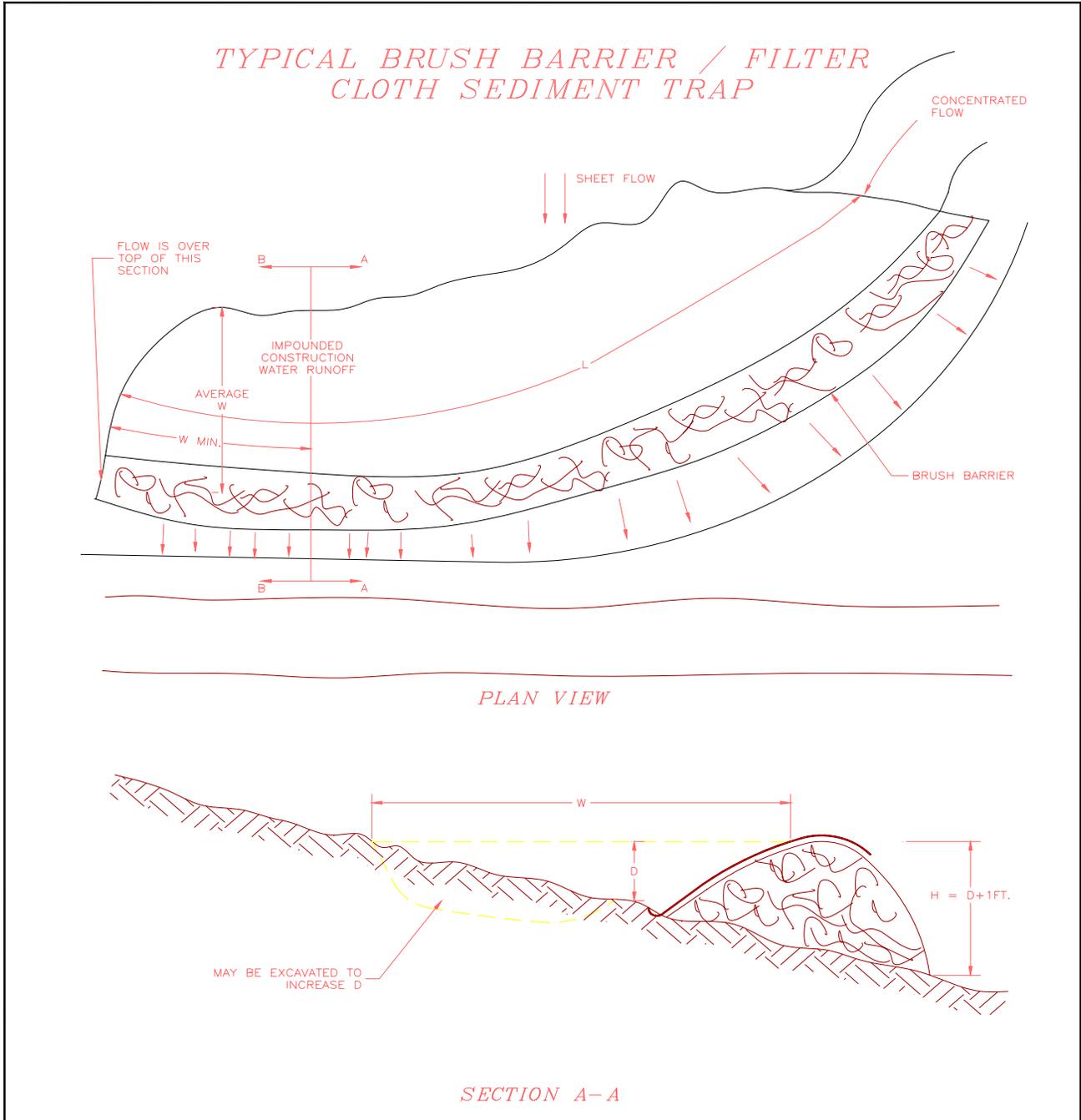
MAINTENANCE:

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

BRUSH BARRIER



*BRUSH BARRIER
TYPICAL DESIGN
LAYOUT*



GRAVEL CHECK DAMS

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

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

APPLICATION:

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

LIMITATIONS:

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

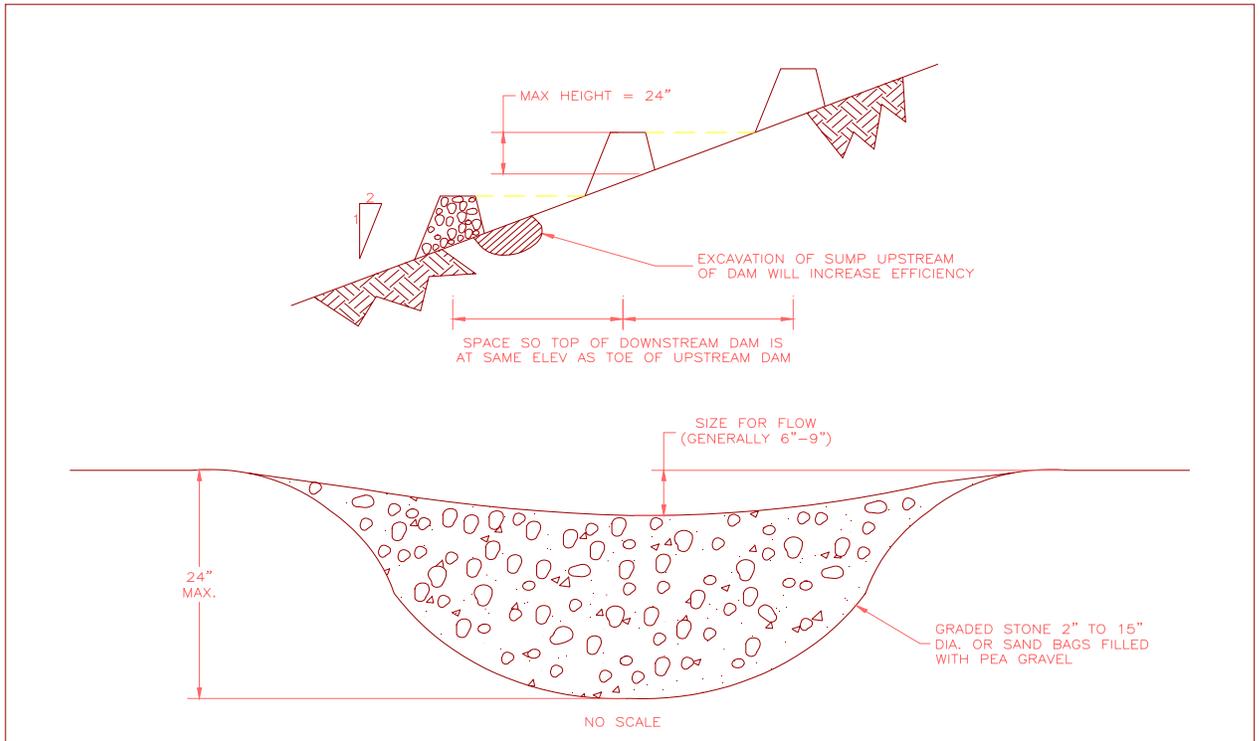
INSTALLATION:

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

MAINTENANCE:

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

GRAVEL CHECK DAMS
TYPICAL DESIGN LAYOUT



<i>DITCH GRADE (%)</i>	<i>CHECK DAM SPACING (FEET)</i>
5.0	60
6.0	50
7.0	43
8.0	36
9.0	33
10.0	30

STRAW BALE CHECK DAMS

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

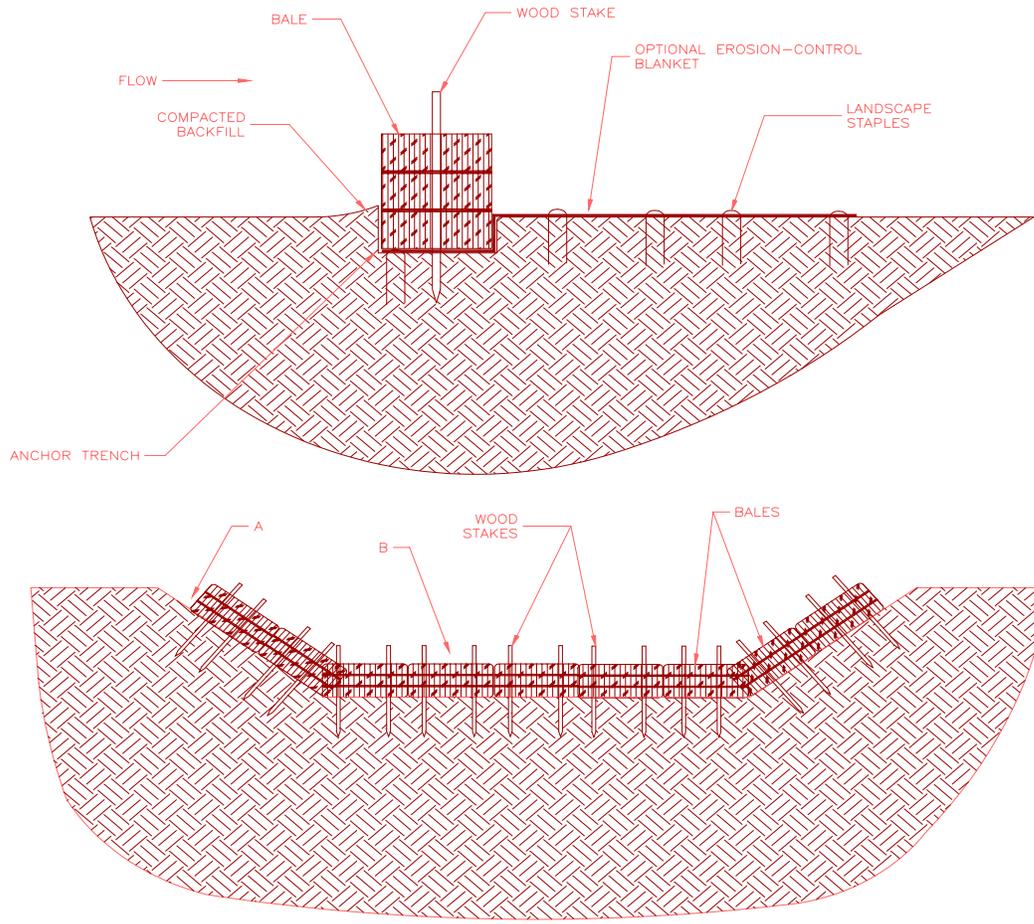
- Prepare location of dam by removing any debris and rough grading any irregularities in channel bottom.
- Bales must be free of weeds declared noxious by the State of Utah, Department of Agriculture.
- Excavate a vertical trench perpendicular to the ditch flow line the length of the straw bale dam that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

MAINTENANCE:

- Inspect dams daily during prolonged rainfall, after each major rain event and at a minimum of once monthly.
- Remove any large debris and repair any damage to dam, channel, or side slopes.

- Remove accumulated sediment when it reaches one half the height of the dam.

*STRAW BALE CHECK DAM
TYPICAL DESIGN
LAYOUT*



CHECK DAM SPACING

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

<i>DITCH (%)</i>	<i>CHECK DAM SPACING (FEET)</i>
1.0	200
2.0	100
3.0	66
4.0	50
5.0	40
6.0	33

SLOPE DRAIN

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

PURPOSE:

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

APPLICATION:

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

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

INSTALLATION:

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

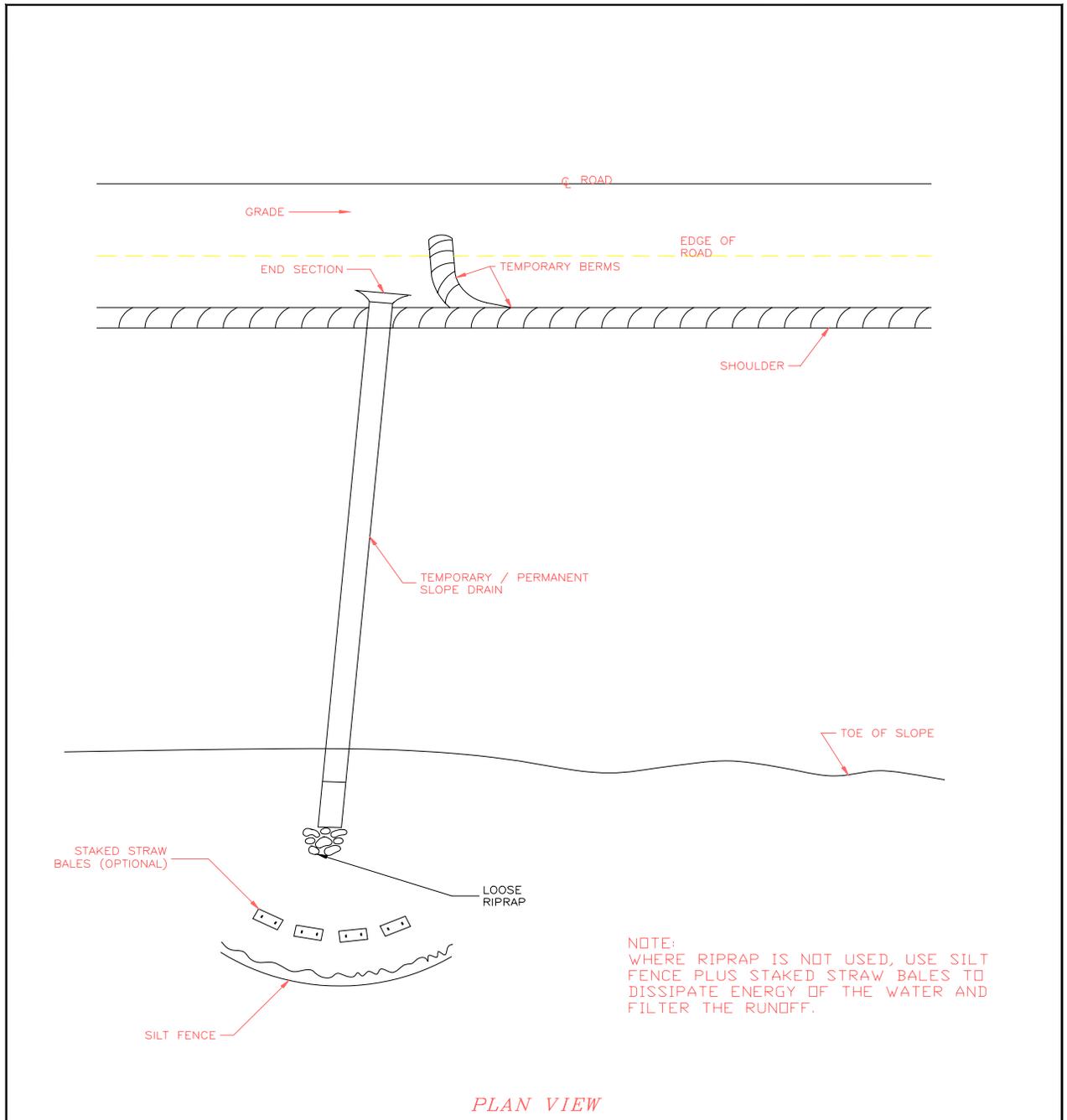
Maximum Drainage Area (Acres)	Pipe Diameter (inches)
0.50	12
0.75	15
1.00	18

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

MAINTENANCE:

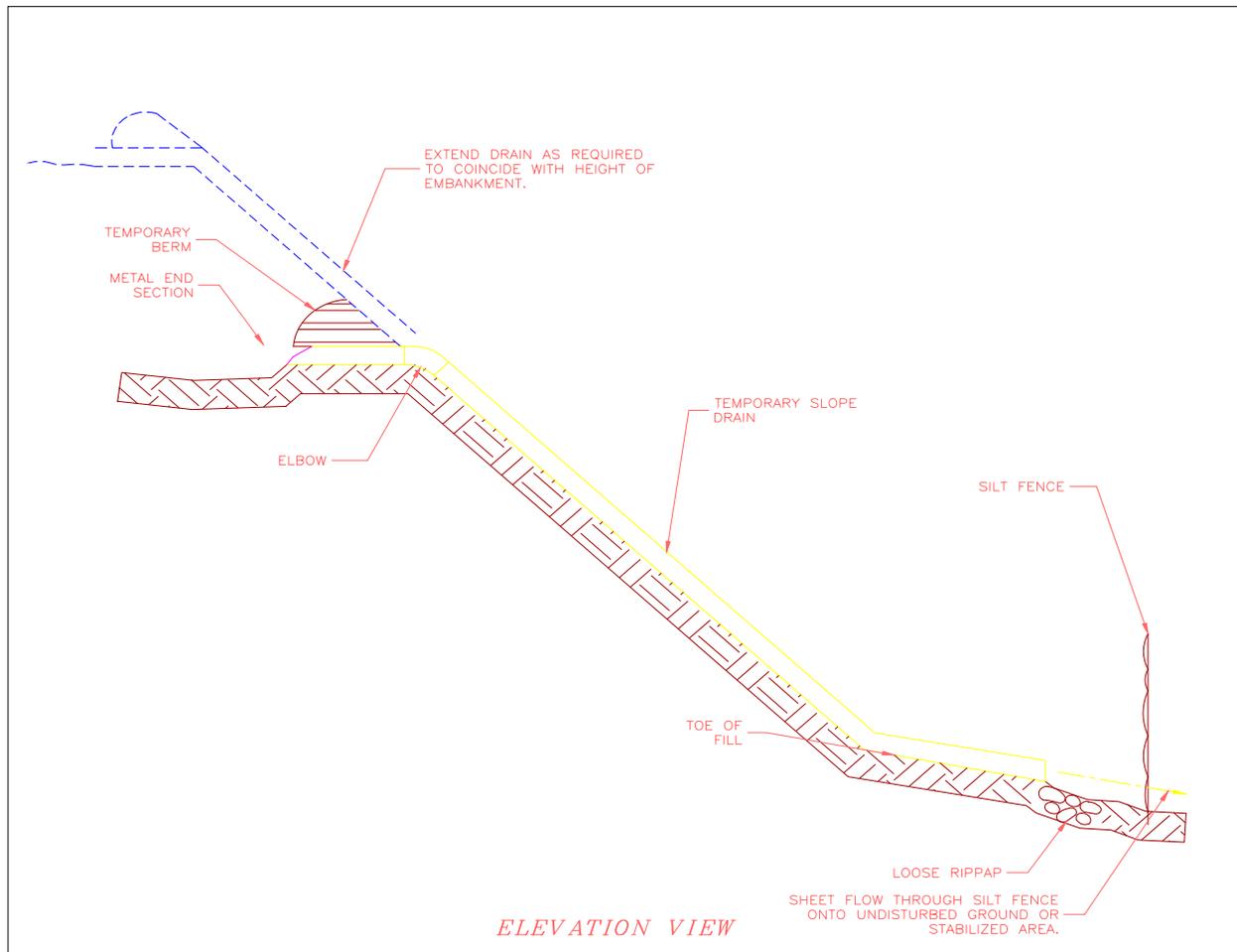
- Inspect the slope drain regularly and after every storm. Check to see if water is bypassing the inlet or undercutting the inlet or pipe. If necessary , install head walls or sandbags to prevent bypass flow.
- Check for erosion at the outlet point and check the pipe for breaks or clogs.

*SLOPE DRAIN
TYPICAL DESIGN
LAYOUT*



NOTE:
WHERE RIPRAP IS NOT USED, USE SILT FENCE PLUS STAKED STRAW BALES TO DISSIPATE ENERGY OF THE WATER AND FILTER THE RUNOFF.

SLOPE DRAIN
TYPICAL DESIGN LAYOUT



OPEN CHUTE DRAIN

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

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

APPLICATION:

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

LIMITATIONS:

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

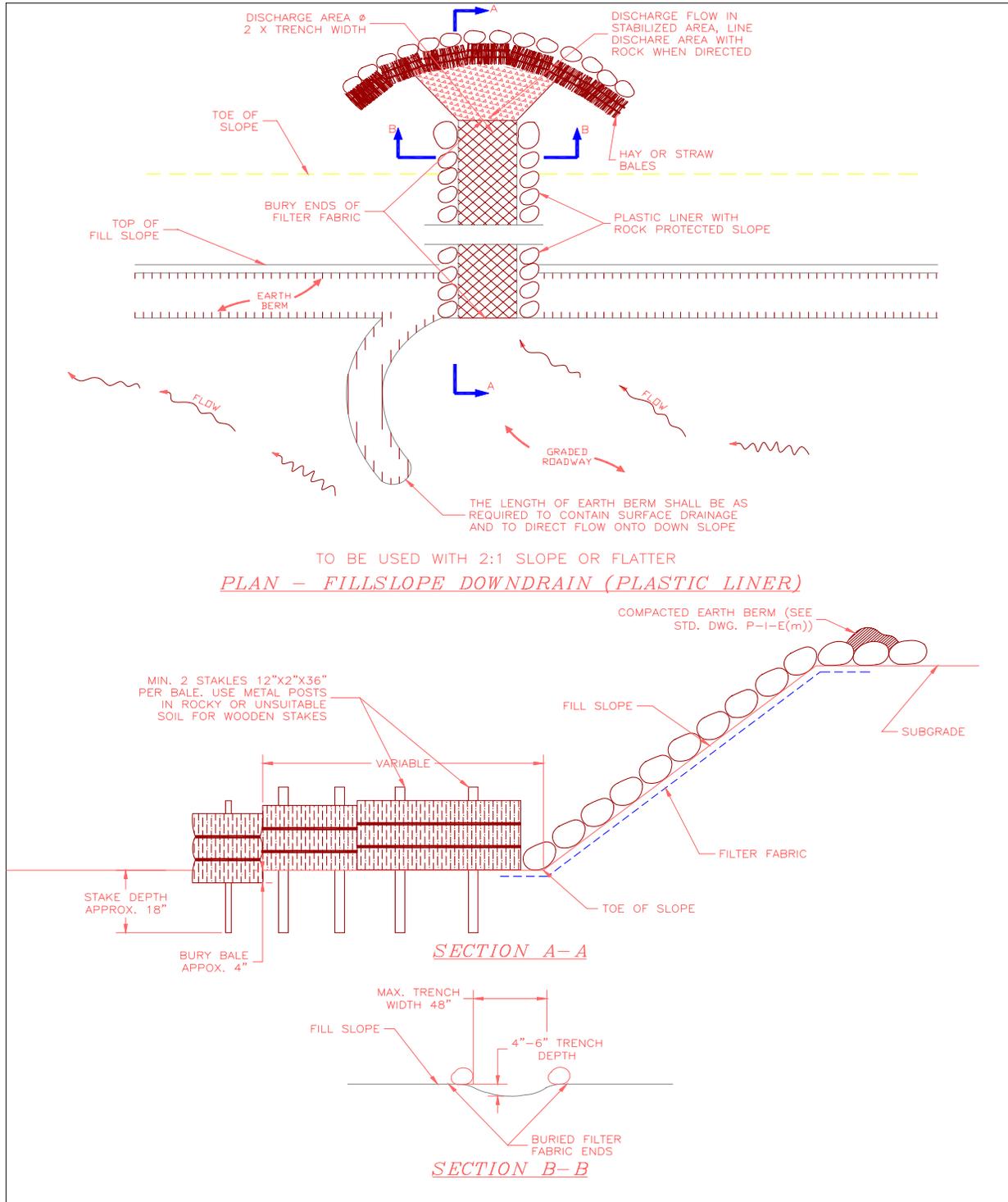
INSTALLATION:

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

MAINTENANCE:

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

OPEN CHUTE DRAIN TYPICAL DESIGN LAYOUT



ROCK-LINED (RIP RAP) DITCHES

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

MAINTENANCE:

- Inspect after major storms. Look for undermining failures.
- Repair any damage promptly .

GRASSED/MATTED SWALES

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

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

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

MAINTENANCE:

- Inspect after major storms. Look for undermining failures.
- Repair any damage promptly .

TEMPORARY EXCAVATED SEDIMENT TRAP

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

PURPOSE:

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

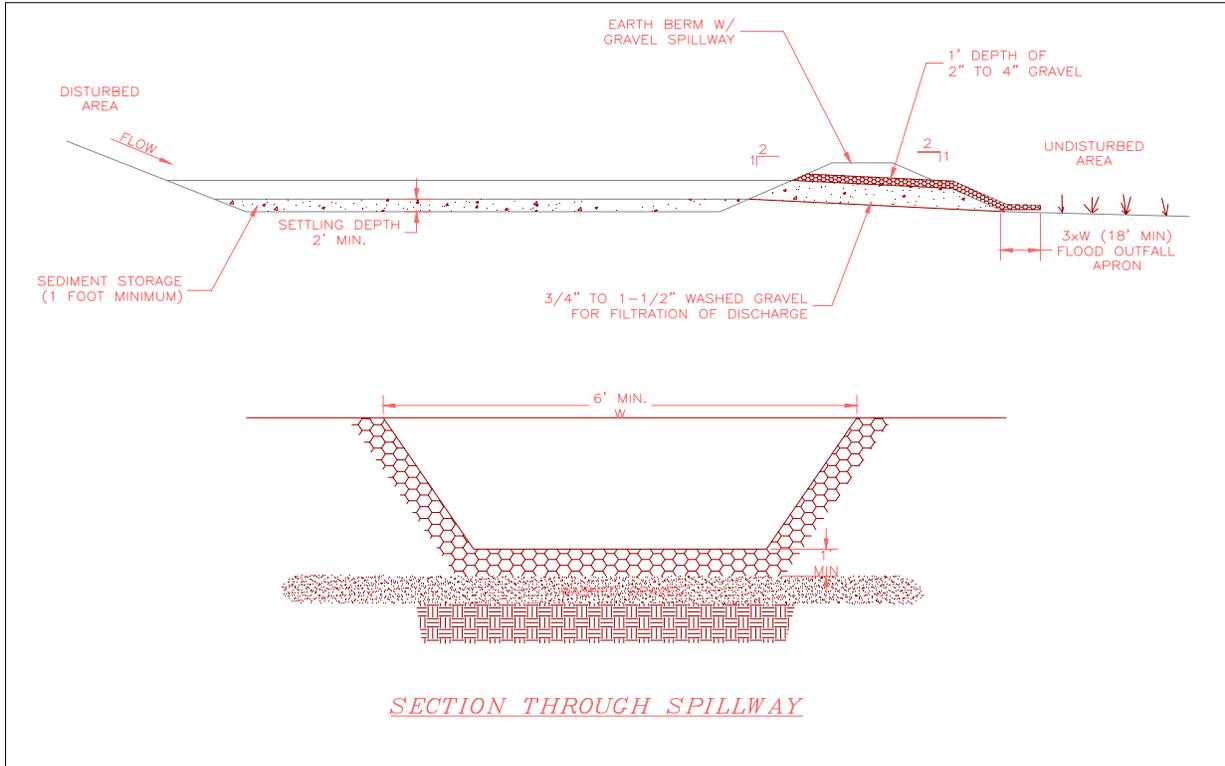
- Design basin for site specific location.
- Excavate basin or construct compacted berm containment.
- Construct outfall spillway with gravel (Rip Rap) apron.
- Provide downstream silt fence if necessary.
- Use straw bales in trap to reduce gullyng.

MAINTENANCE:

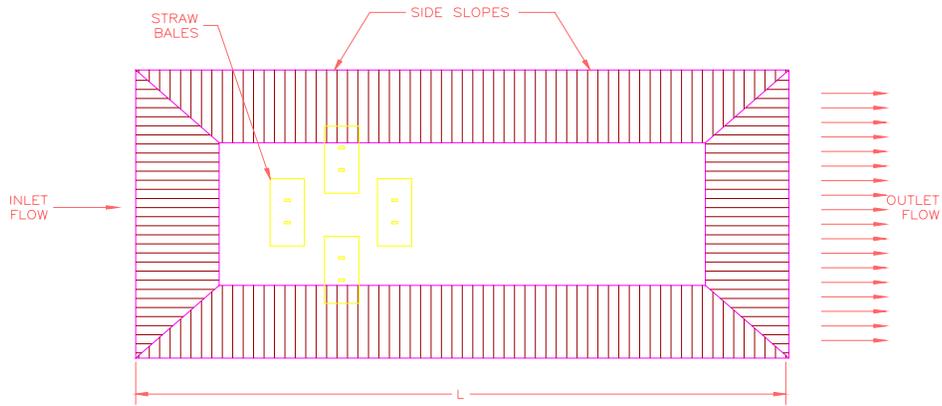
- Inspect after each rainfall event and at a minimum of monthly.
- Repair any damage to berm, spillway or sidewalls.
- Remove accumulated sediment as it reaches 50% height of available storage.
- Check outlet for sediment/erosion of down-gradient area and remediate as necessary. Install silt fence if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

TEMPORARY EXCAVATED SEIMENT TRAP

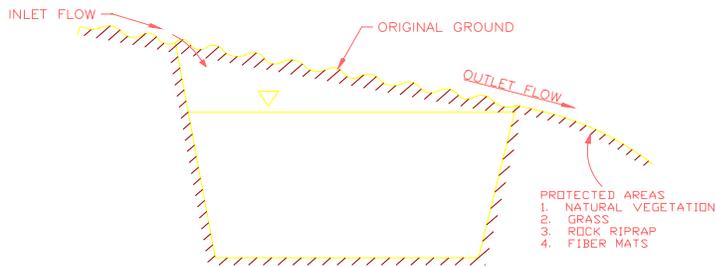
TYPICAL DESING LAYOUT



*TEMPORARY EXCAVATED
SIDEWENT TRAP
TYPICAL DESIGN LAYOUT*



PLAN VIEW



SECTION A-A

EQUIPMENT AND VEHICLE WASH DOWN AREA

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

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

APPLICATION:

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

LIMITATIONS:

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

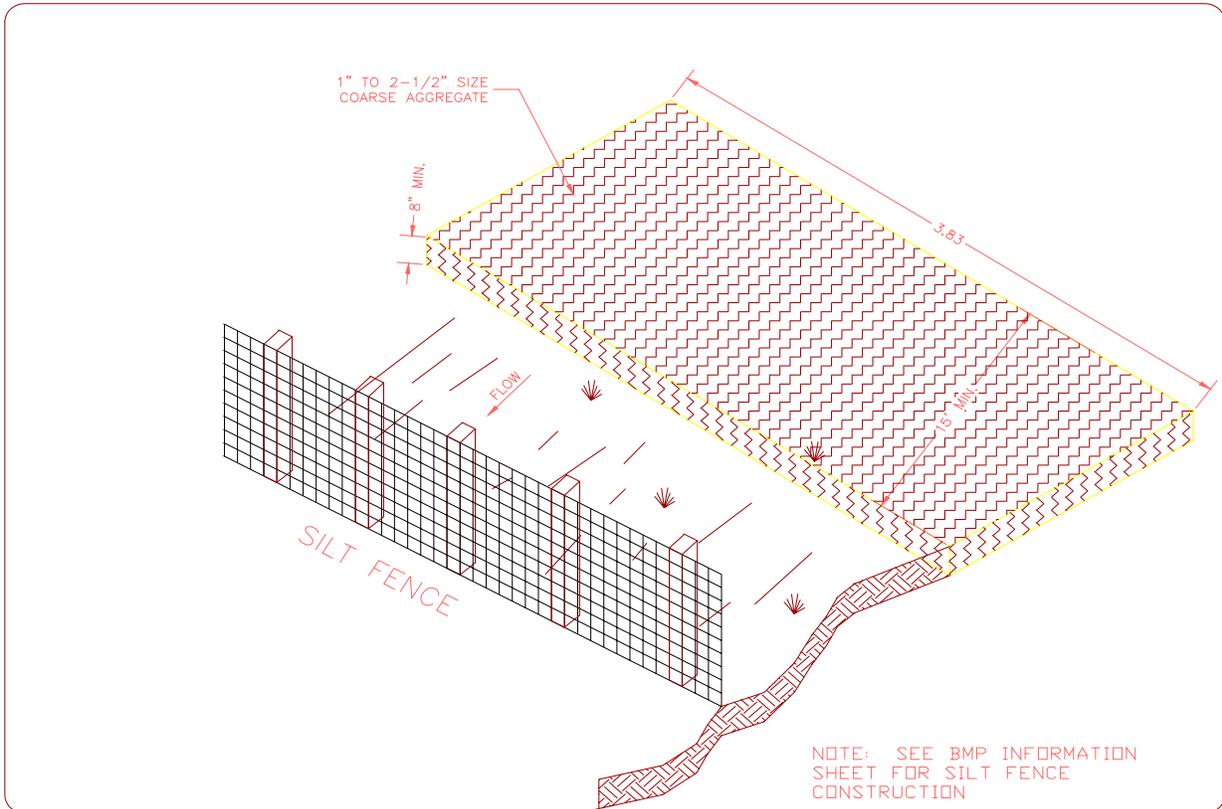
INSTALLATION:

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

MAINTENANCE:

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

*EQUIPMENT AND VEHICLE
WASH DOWN AREA
TYPICAL DESIGN LAYOUT*



MATERIAL STORAGE

DEFINITION: Controlled storage of on-site materials.

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

APPLICATION:

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

LIMITATIONS:

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

INSTALLATION:

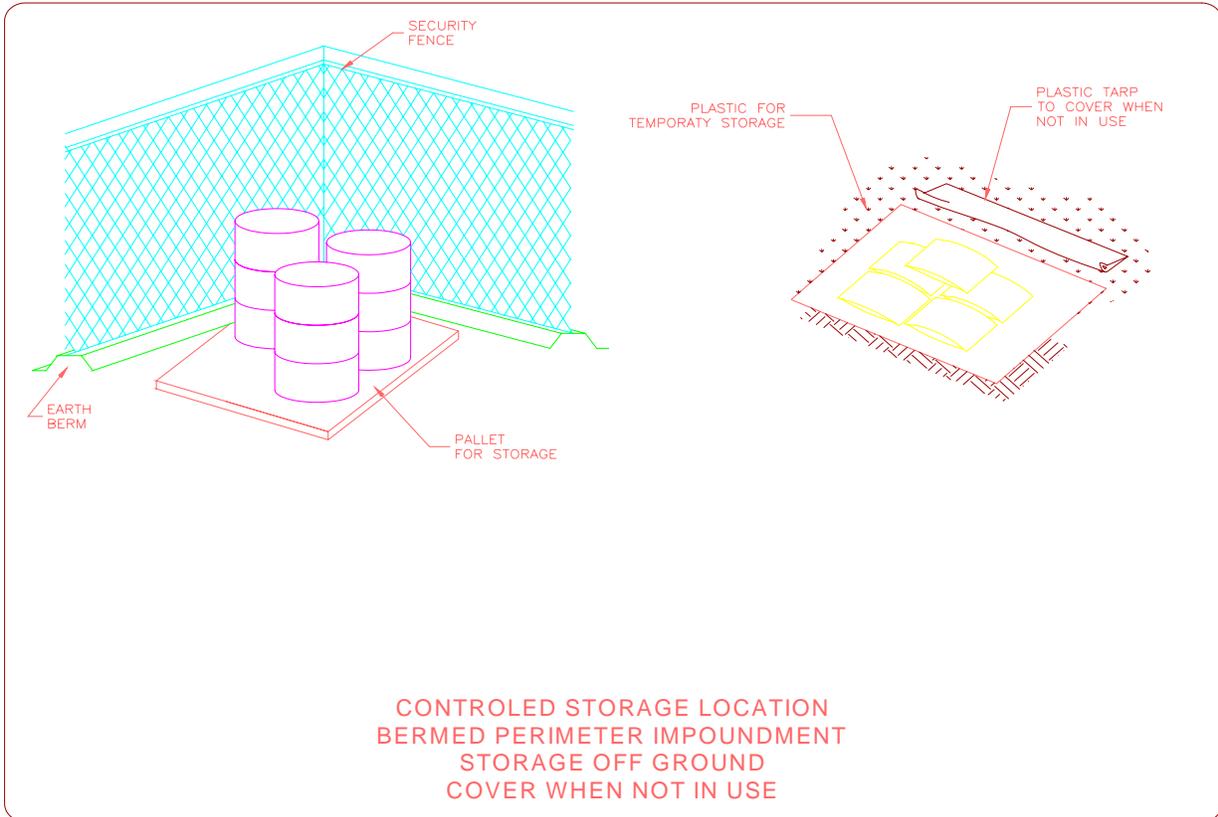
- Designate a secured area with limited access as the storage location. Ensure no waterways or drainage paths are nearby.
- Construct compacted earthen berm or similar perimeter containment around storage location for impoundment in the case of spills.
- Ensure all on-site personnel utilize designated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

MAINTENANCE:

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

MATERIAL STORAGE

TYPICAL DESIGN LAYOUT



WASTE DISPOSAL

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

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

APPLICATION: All construction sites.

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

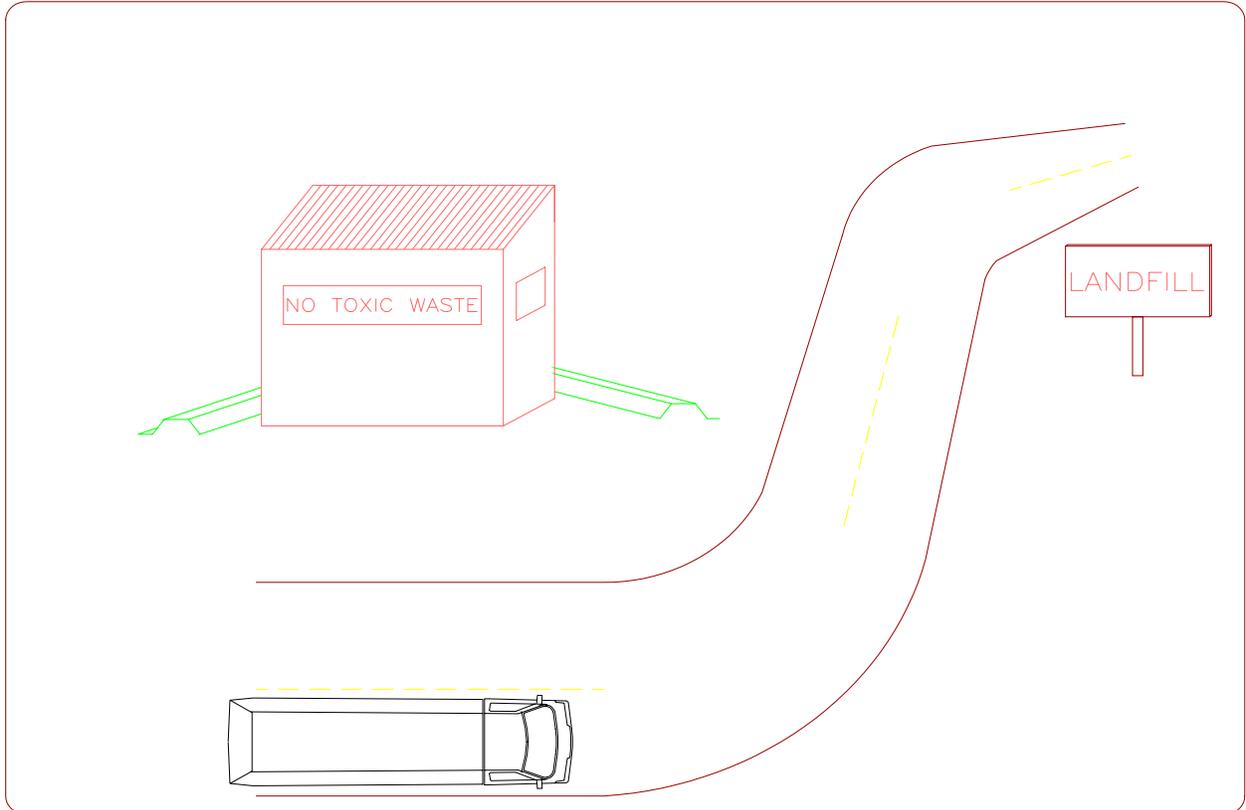
INSTALLATION:

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

MAINTENANCE:

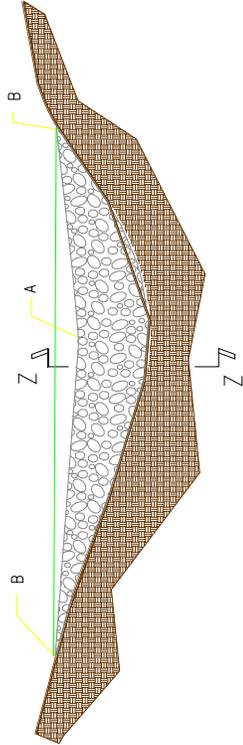
- Discuss waste management procedures at progress meetings.
- Collect site trash daily and deposit in covered containers at designated collection area.
- Check containers for leakage or inadequate covers and replace as needed.
- Randomly check disposed materials for any unauthorized waste (e.g., toxic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

*WASTE DISPOSAL
TYPICAL DESIGN LAYOUT*



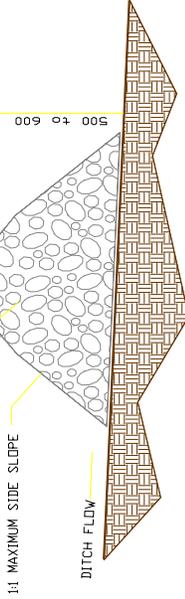
CHECK DAMS

CONSTRUCT THE CHECK DAM SO THAT POINT "A" IS APPROXIMATELY 100 mm LOWER THAN POINT "B".



STONE CHECK DAM

STONE, WELL-GRADED, RANGING FROM 13 mm TO 38 mm.



SECTION Z - Z

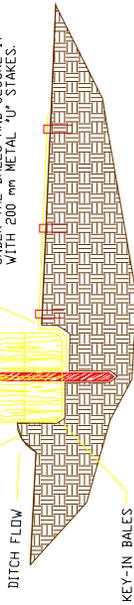
GENERAL NOTES:

1. PLACE CHECK DAMS PERPENDICULAR TO THE FLOWLINE OF THE DITCH.
2. DO NOT PLACE CHECK DAMS ACROSS NATURAL STREAM BEDS.
3. CONSTRUCT CHECK DAMS TO ENSURE WATER DOES NOT FLOW AROUND THE ENDS OF THE DAM.

STRAW OR HAY BALE
50 mm SQUARE BY 1.2 m MINIMUM HARDWOOD STAKE. PROVIDE 2 STAKES PER BALE.

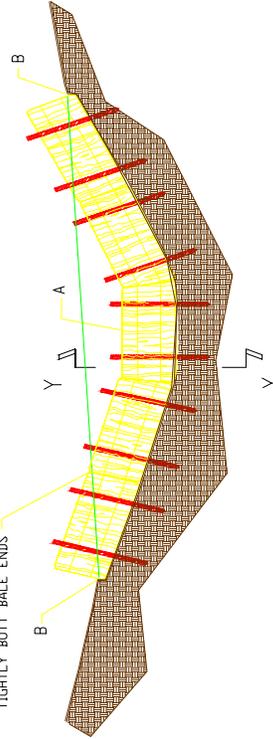
PLACE 75 mm OF EXCAVATED MATERIAL ON THE RECEIVING END OF THE BALE AND COMPACT.

INSTALL 1.8 m WIDE EROSION CONTROL BLANKET AS A SCOUR APRON ALONG THE DOWNSTREAM SIDE OF THE DAM. ANCHOR 250 mm OF THE BLANKET EDGE UNDER THE BALES AND SECURE IT WITH 200 mm METAL "U" STAKES.



SECTION Y - Y

CONSTRUCT THE CHECK DAM SO THAT POINT "A" IS A MINIMUM OF 100 mm LOWER THAN POINT "B".



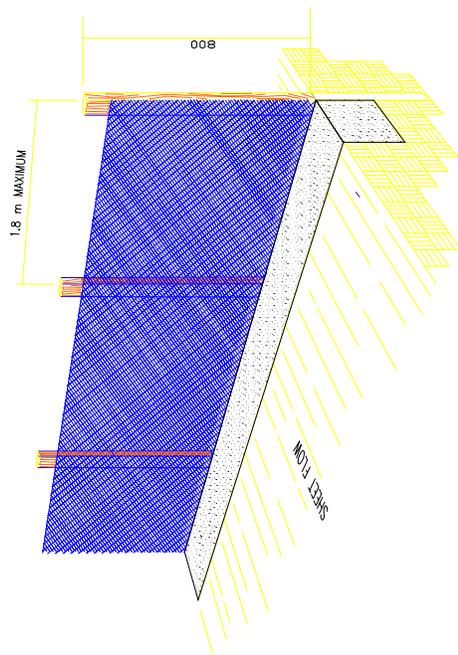
STRAW OR HAY BALE CHECK DAM

NO.	DATE	APPR.	REVISIONS
1	02/25/94	T.J.	TOTALLY REVISED DRAWINGS

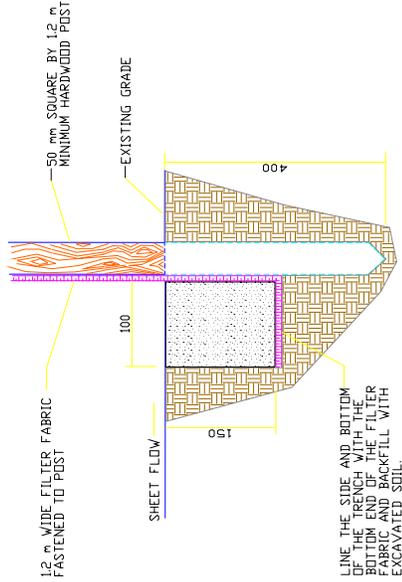
DATE	APPROVED	RECOMMENDED FOR APPROVAL
APR 13, 1999	CHAIRMAN STANDARDS COMMITTEE	UTAH DEPARTMENT OF TRANSPORTATION SALT LAKE CITY, UTAH
APR 13, 1999	APPROVED	DEPUTY DIRECTOR

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION
(CHECK DAMS)
TEMPORARY EROSION CONTROL
(METRIC)
STANDARD DRAWING TITLE
STD. DWG. NO. 1010
ALL DIMENSIONS ARE EXPRESSED IN MILLIMETERS UNLESS OTHERWISE NOTED.

SILT FENCE



PERSPECTIVE VIEW



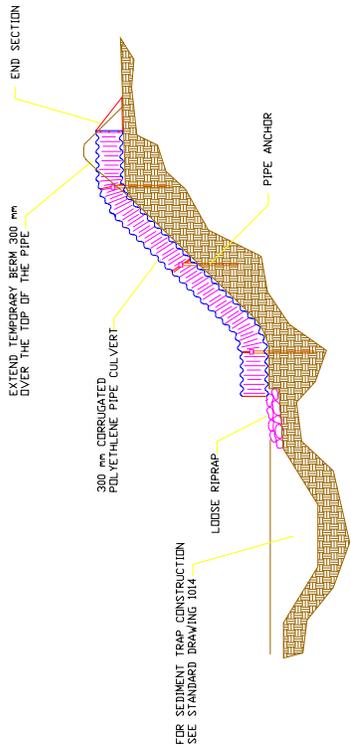
SECTION

GENERAL NOTES:

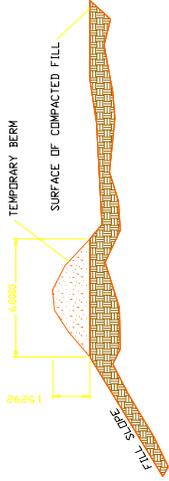
1. WHERE POSSIBLE, LAYOUT THE SILT FENCE 1.5 m TO 30 m BEYOND THE TOE OF SLOPE.
2. ALIGN THE FENCE ALONG THE CONTOUR AS CLOSE AS POSSIBLE.
3. WHEN EXCAVATING THE TRENCH, USE MACHINERY THAT WILL PRODUCE NO MORE THAN THE DESIRED DIMENSIONS.
4. EXTEND THE BOTTOM 400 mm OF FILTER FABRIC TO LINE ALL THREE SIDES OF THE TRENCH.
5. TO AVOID EXCESSIVE PONDING OF WATER AT LOW POINTS ALONG THE FENCE, PROVIDE AN OPENING IN THE SILT FENCE AND INSTALL A CHECK DAM.
6. AVOID USING JOINTS ALONG THE FENCE AS MUCH AS POSSIBLE. IF A JOINT IS NECESSARY, SPlice THE FILTER FABRIC AT POSTS WITH A 150 mm OVERLAP AND SECURELY FASTEN BOTH ENDS TO THE POST.
7. MAINTAIN A PROPERLY FUNCTIONING SILT FENCE THROUGHOUT THE DURATION OF THE PROJECT OR UNTIL DISTURBED AREAS HAVE BEEN VEGETATED.
8. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

UTAH DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION SALT LAKE CITY, UTAH		RECOMMENDED FOR APPROVAL APR 13, 1999 DATE	
CHAIRMAN STANDARDS COMMITTEE APR 13, 1999 DATE		DEPUTY DIRECTOR	
STANDARD DRAWING TITLE (SILT FENCE) TEMPORARY EROSION CONTROL < METRIC >			
REVISIONS		STANDARD DRAWING NO. 1011	
NO.	DATE	APPROVED	REMARKS
1	02/09/94	TJ	TOTALLY REVISED DRAWINGS

SLOPE DRAIN AND TEMPORARY BERM

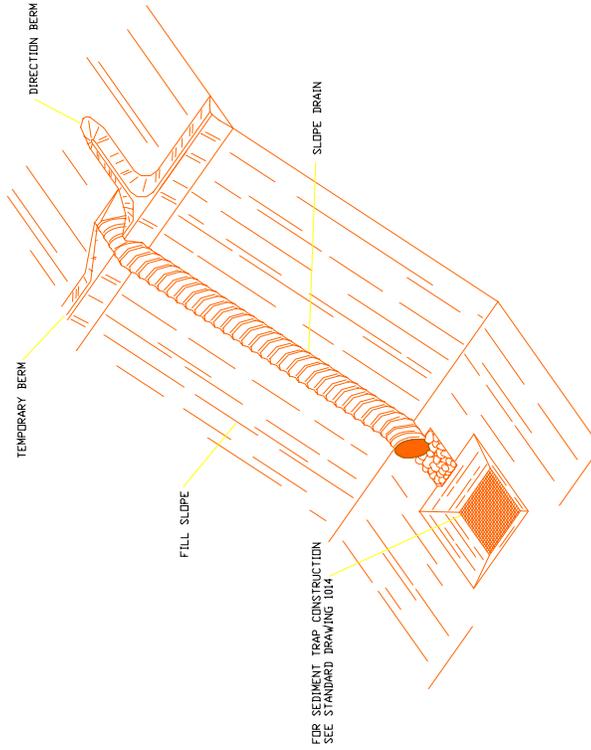


SLOPE DRAIN SECTION



TEMPORARY BERM

- GENERAL NOTES FOR TEMPORARY BERM:
1. COMPACT THE RIDGE OF EXISTING SOIL TO PROVIDE A NON-ERODIBLE BERM THAT RESISTS ROUNDOFF FROM TRAFFIC. FULLY CONSTRUCTED SLOPES: REPAIR ANY EROSION OF THE BERM IMMEDIATELY.
 2. TEMPORARY BERMS ARE TYPICALLY USED IN CONJUNCTION WITH SLOPE DRAINS.



SLOPE DRAIN ISOMETRIC

- GENERAL NOTES FOR SLOPE DRAIN:
1. COMPACT THE SOIL SURFACE AND BERMS AROUND THE ENTRANCE TO THE PIPE END SECTION TO PREVENT WATER FROM UNDERMINING THE PIPE AND ERODING THE SLOPE. REPAIR ANY EROSION AROUND THE INLET, OUTLET OR SLOPE IMMEDIATELY.
 2. ANCHOR THE PIPE TO THE GROUND EVERY 3 m TO PREVENT PIPE MOVEMENT AND SUBSEQUENT FAILURES DURING STORM EVENTS.
 3. USE WATER-TIGHT FITTINGS AT ALL SLOPE DRAIN CONNECTIONS.
 4. EXTEND THE DRAIN A MINIMUM OF 1 m BEYOND THE TOE OF THE SLOPE AND PROVIDE OUTLET PROTECTION.
 5. EXTEND THE SLOPE DRAIN AS REQUIRED TO COINCIDE WITH THE HEIGHT OF THE EMBANKMENT.
 6. MAINTAIN PROPERLY FUNCTIONING SLOPE DRAINS UNTIL SLOPES HAVE BEEN PERMANENTLY STABILIZED.
 7. 50 PERCENT OF THE RIPRAP TO BE BETWEEN 150 mm AND 200 mm WITH A MAXIMUM SIZE OF 300 mm AND A MINIMUM SIZE OF 100 mm.

UTAH DEPARTMENT OF TRANSPORTATION SALT LAKE CITY, UTAH		RECOMMENDED FOR APPROVAL	APPROVED BY	DEPUTY DIRECTOR
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION		DATE	APR13/1999	DATE
APR13/1999		DATE	APR13/1999	DATE
NO.		DATE	APPROV.	REMARKS
1	02/26/99	T.J.	TOTALY	REVISED DRAWINGS

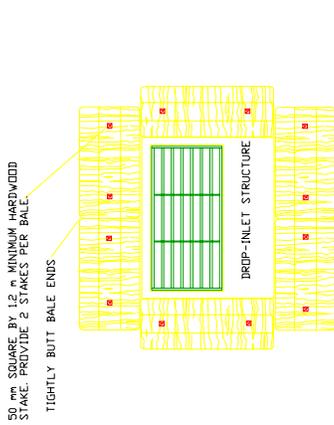
STANDARD DRAWING TITLE: TEMPORARY EROSION CONTROL (SLOPE DRAIN AND TEMPORARY BERM) < METRIC >

STD. DWG. NO. 1012

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETERS UNLESS OTHERWISE NOTED.

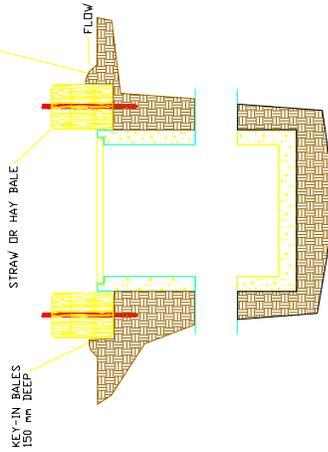
DROP-INLET BARRIERS

STRAW AND HAY BALE DROP-INLET BARRIER



PLAN VIEW

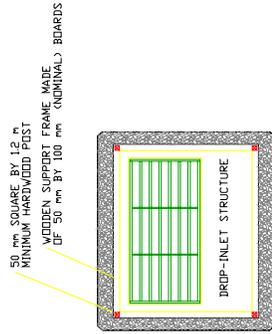
PLACE 75 mm TO 100 mm OF EXCAVATED MATERIAL ALONG THE RECEIVING SIDE OF THE BALE AND COMPACT



SECTION

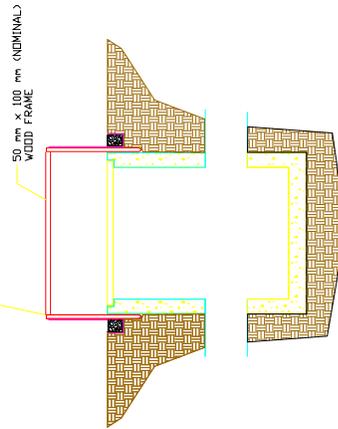
- GENERAL NOTES:
1. KEY-IN BALES IN AN EXCAVATED TRENCH AROUND THE PERIMETER OF THE INLET STRUCTURE THAT IS 150 mm DEEP BY A BALES WIDTH WIDE.
 2. OVERLAP IN CORNERS MUST BE AT LEAST HALF A BALE WIDE.
 3. MORE THAN 10 BALES PER LINE ARE REQUIRED.
 4. IN MEDIAN AREAS, CONSTRUCT SO THAT THE TOPS OF THE BALES ARE NOT HIGHER THAN THE ADJACENT ROADWAY.
 5. THROUGHOUT CONSTRUCTION OR UNTIL DISTURBED AREAS CONTRIBUTING TO THE INLET HAVE BEEN PAVED OR VEGETATED.
 6. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

SILT FENCE DROP-INLET BARRIER



PLAN VIEW

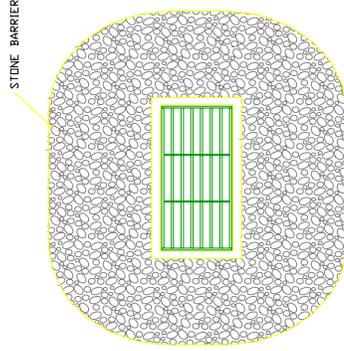
SEE STANDARD DRAWING 1011 FOR SILT FENCE DETAIL.



SECTION

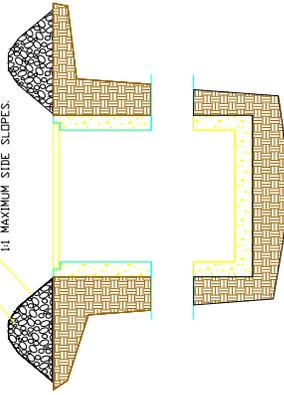
- GENERAL NOTES:
1. EXCAVATE A TRENCH AROUND THE CORNER THE PERIMETER OF THE INLET STRUCTURE.
 2. DRIVE POSTS AT EACH CORNER OF THE INLET STRUCTURE IF THE DISTANCE BETWEEN CORNER POSTS EXCEEDS 1.2 m. PLACE ANOTHER POSTS BETWEEN THEM.
 3. FRAME MADE OF 50 mm BY 100 mm BOARDS. USE WALLS OR SCREWS FOR FASTENING.
 4. IS NOT HIGHER THAN THE ADJACENT ROADWAY.
 5. MAINTAIN A PROPERLY FUNCTIONING SILT FENCE BARRIER THROUGHOUT CONSTRUCTION OR UNTIL DISTURBED AREAS CONTRIBUTING TO THE INLET HAVE BEEN PAVED OR VEGETATED.
 6. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

STONE DROP-INLET BARRIER



PLAN VIEW

STONE BARRIER: WELL GRADED, 13 mm TO 38 mm 500 mm TO 600 mm HIGH WITH 1:1 MAXIMUM SIDE SLOPES.



SECTION

- GENERAL NOTES:
1. PLACE STONE BARRIER AS SHOWN AROUND THE INLET OPENING.
 2. IN MEDIAN AREAS, CONSTRUCT SO THAT THE TOPS OF THE STONE BARRIERS ARE NOT HIGHER THAN THE ADJACENT ROADWAY.
 3. MAINTAIN A PROPERLY FUNCTIONING STONE BARRIER THROUGHOUT CONSTRUCTION OR UNTIL DISTURBED AREAS CONTRIBUTING TO THE INLET HAVE BEEN PAVED OR VEGETATED.
 4. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETERS UNLESS OTHERWISE NOTED.

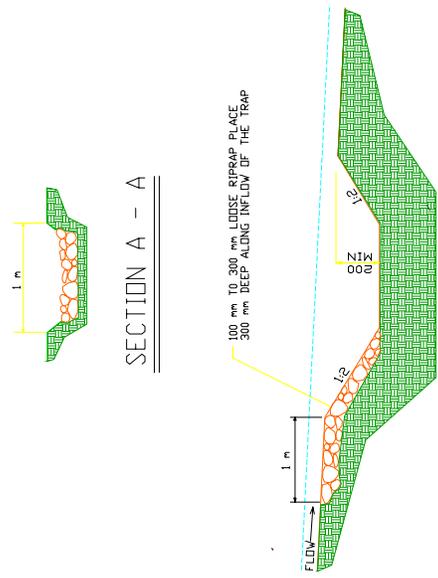
STD. DWG. NO.
1013

< METRIC >

UTAH DEPARTMENT OF TRANSPORTATION
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION
SALT LAKE CITY, UTAH
RECOMMENDED FOR APPROVAL
CHAIRMAN STANDARDS COMMITTEE
APR 13, 1999
DEPUTY DIRECTOR
APR 13, 1999

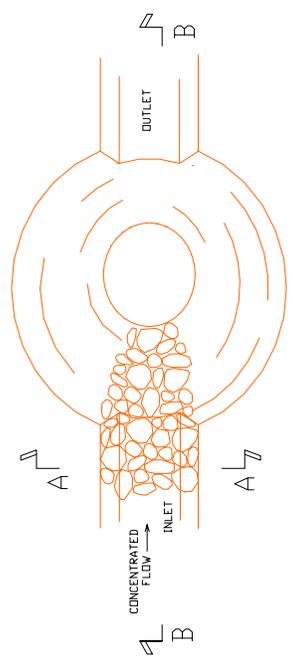
NO.	DATE	APPROV.	REVISIONS
1	02/26/99	TJ	TOTALY REVISED DRAWINGS

SEDIMENT TRAP



SECTION A - A

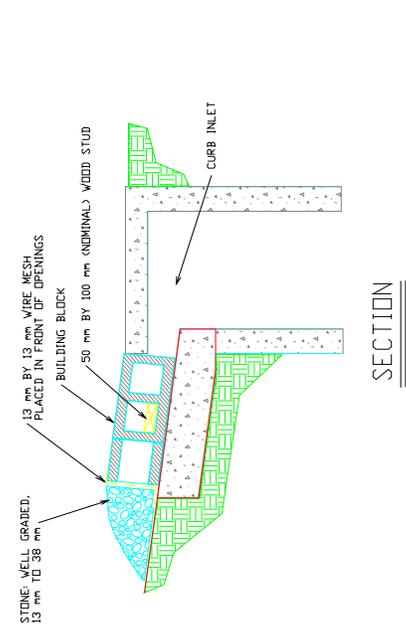
SECTION B - B



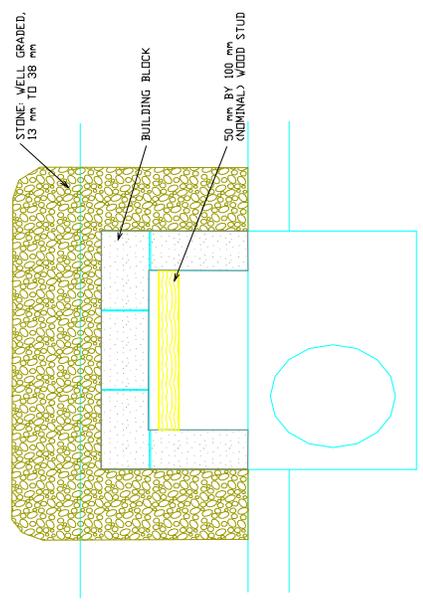
PLAN VIEW

- GENERAL NOTES:
1. PLACE SEDIMENT TRAPS AT LOCATIONS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
 2. THE STORAGE CAPACITY OF EACH SEDIMENT TRAP WILL BE LIMITED BY THE LENGTH OF THE TRAP.
 3. CONSTRUCT TRAPS AS LONG AS THE WIDTH.
 4. MAINTAIN A PROPERLY FUNCTIONING SEDIMENT TRAP THROUGHOUT CONSTRUCTION OR UNTIL DISTURBED AREAS CONTRIBUTING TO THE BASIN HAVE BEEN PAVED OR VEGETATED.
 5. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

CURB INLET BARRIER



SECTION



PLAN VIEW

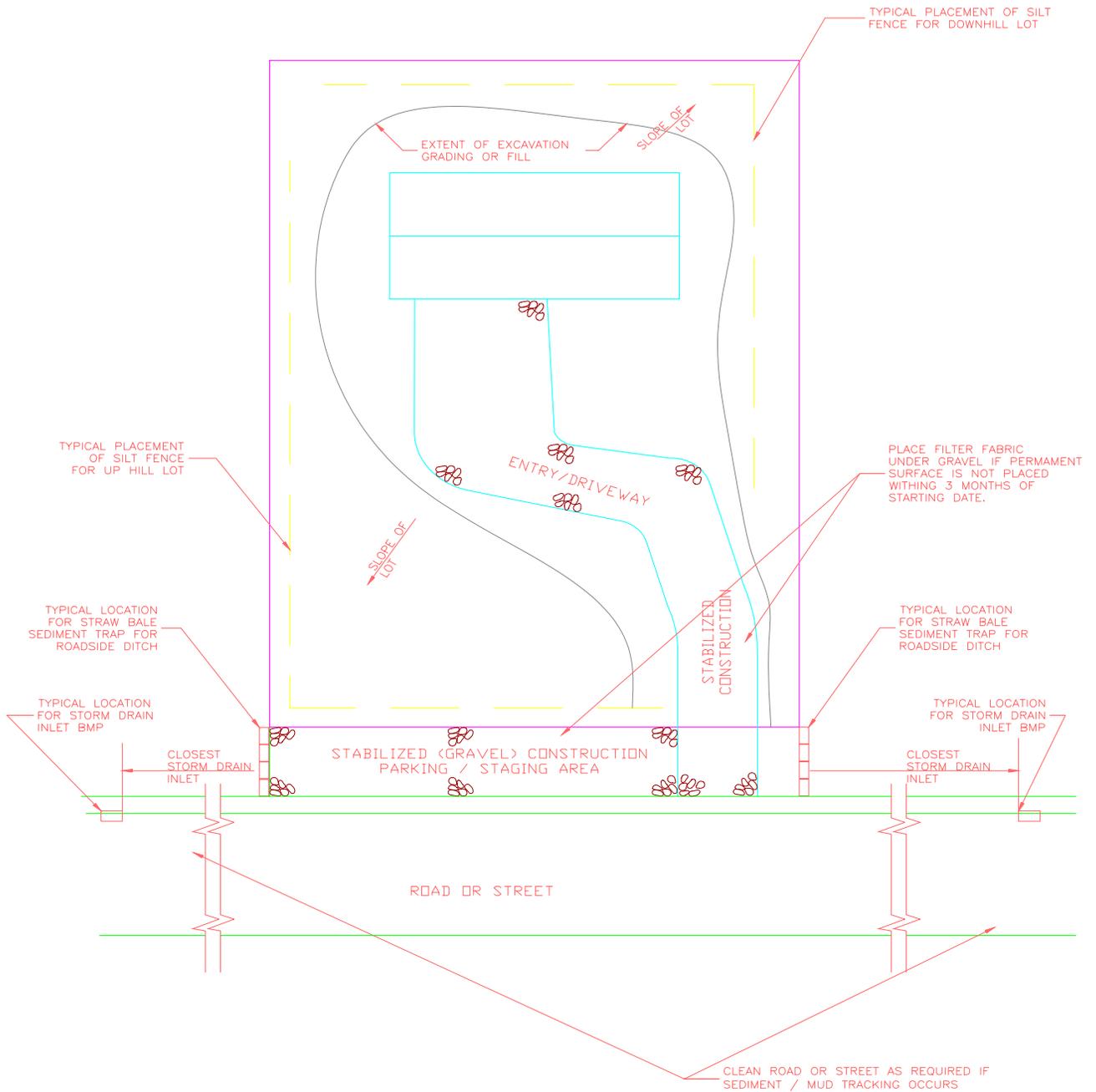
- GENERAL NOTES:
1. PLACE BUILDING BLOCKS, WIRE MESH AND STONE AS SHOWN AROUND THE CURB INLET.
 2. MAINTAIN A PROPERLY FUNCTIONING STONE BARRIER THROUGHOUT CONSTRUCTION OR UNTIL DISTURBED AREAS CONTRIBUTING TO THE INLET HAVE BEEN PAVED OR VEGETATED.
 3. REMOVE SEDIMENT AS IT ACCUMULATES AND PLACE IT IN A STABLE AREA APPROVED BY THE ENGINEER.

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETERS UNLESS OTHERWISE NOTED.

UTAH DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION SALT LAKE CITY, UTAH		APR.13.1999 DATE	APR.13.1999 DATE	REMARKS
1	03/02/94	T	TOTALY REVISED DRAWINGS	
REVISIONS				
RECOMMENDED FOR APPROVAL	CHAIRMAN STANDARDS COMMITTEE	DEPUTY DIRECTOR	APPROVED	
STANDARD DRAWING TITLE CURB INLET BARRIER < SEDIMENT TRAP AND TEMPORARY EROSION CONTROL >				
STD. DWG. NO. 1014				

APPENDIX C2: TYPICAL RESIDENTIAL STORM WATER POLLUTION PREVENTION PLAN

TYPICAL RESIDENTIAL STORMWATER POLLUTION PROTECTION PLAN



**APPENDIX D: SELECTED NONSTRUCTURAL POST-
CONSTRUCTION BMPS**

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Introduction

As described in Appendix A, Section 4, Summit County requires that proposed developments utilize nonstructural stormwater control BMPs to the maximum extent practicable in order to meet the required criteria for long-term runoff control. This appendix provides a list and description of appropriate nonstructural BMPs that a permit applicant could choose to utilize in their design. This list is not intended to be comprehensive, and alternative nonstructural controls may be selected subject to approval by Summit County. A nonstructural BMP checklist is included in this Appendix. This checklist is intended for planners, designers and/or developers to utilize during the site planning, design, and construction phases of all developments. Additional information and detailed examples of nonstructural controls and environmentally-sensitive design principles can be obtained online at :

http://www.cwp.org/better_site_design.htm

<http://www.georgiastormwater.com/vol2/1-4.pdf>

<http://www.stormwatercenter.net/>

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

BMP 1: Preservation of Undisturbed Natural Areas

This BMP involves formally designating appropriate undisturbed natural areas within the site as preservation areas. These areas must be specified in the maintenance covenant and recorded by the County in the land record to ensure they remain undeveloped in perpetuity. These areas must be clearly marked and remain undisturbed (i.e., no clearing, grubbing, or construction traffic) during construction. Areas that provide the greatest stormwater benefits through their preservation include:

- wetlands & meadows
- riparian buffers
- forested areas
- areas with high infiltration rates (e.g., hydrologic group A and B soils)
- groundwater recharge zones
- streams and natural drainageways

BMP 2: Minimization of Disturbance

This BMP involves using careful construction sequencing, well-designated limits of disturbance, and well-defined construction entrances/exits to minimize the total area of disturbance (e.g., excavation, grading, clearing, grubbing) and reduce soil compaction from construction traffic. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection. Site layouts and roadway patterns should be designed to conform with or “fit” the natural landforms and topography of a site. This helps to preserve the natural hydrology and drainageways on the site, as well as reduce the need for grading and disturbance of vegetation and soils.

BMP 3: Reduction of Impervious Cover

This BMP involves modifying the designs of permanent structures to reduce the overall area of impervious surfaces while still achieving development objectives. Specific modifications may include:

- reducing roadway lengths and widths to the minimum size needed to meet traffic and safety needs
- reducing building footprints (e.g., build up rather than out)
- reducing the parking footprint (build underground parking or multi-level parking decks; size a proportion of stalls for compact vehicles; use grass or alternative paving for overflow parking areas)
- reducing lot setbacks and frontages
- using fewer or alternative cul-de-sacs (e.g., install pervious vegetated islands in cul-de-sacs; reduce radius of cul-de-sacs; use alternatives such as T-shaped turnarounds)
- integrating porous areas such as landscaped islands, swales, filter strips, and bioretention areas into parking lot designs
- using alternative paving techniques (e.g., use loose gravel, coarse sand, wood or bark chips, or disconnected pavers for all or parts of driveways and walkways)
- using vegetated swales instead of curb and gutter to convey road runoff

BMP 4: Routing of Runoff to Pervious Areas/disconnection of Runoff

This BMP involves routing the runoff from impervious areas to pervious areas such as natural areas, buffers, lawns, landscaping, filter strips and vegetated channels. In this way, the runoff is “disconnected” from other impervious areas and paved collection/conveyance systems (e.g., curb and gutter) that do not allow for groundwater recharge or uptake of pollutants. Some of the methods for disconnecting impervious areas include:

- designing roof drains to flow to vegetated areas
- directing flow from paved areas such as driveways to stabilized vegetated areas
- breaking up flow directions from large paved surfaces and rooftops
- carefully locating and grading impervious areas and landscaped areas to achieve sheet flow runoff to the vegetated pervious areas

BMP 5: Pollution Prevention/Source Reduction

This BMP involves implementing measures to reduce or contain potential sources of contamination at a site. Specific measures include:

- controlling litter (providing adequate numbers of trash receptacles, emptying receptacles regularly, keeping dumpster lids closed, etc.)
- sweeping streets and paved areas rather than hosing them down or using pressurized washers
- reducing rainfall contact with potential pollution sources by installing roofs/canopies over gas station fueling areas, salt/sand piles, hazardous material storage areas, etc.
- providing secondary spill containment (e.g., berms) for hazardous liquid storage containers
- clearly marking storm drains “No Dumping- Drains to Live Stream”

Checklist for Nonstructural BMPs

Project name:
 Project location:
 Contractor/builder information:
 name:
 address:
 email:
 phone/fax:

Site area (total acres):
 Temporarily disturbed area (acres):
 Permanently disturbed area (acres):
 Undisturbed natural areas or preservation areas
 (acres):

Best Management Practices (BMPs)	Yes/ No	Comments (If applicable, describe actions taken or give explanation of no action)
Preservation of Undisturbed Natural Areas		
Specification of natural areas in maintenance covenant.		
Preservation is recorded in the land record.		
Clear demarcation of undisturbed areas during construction.		
Minimization of disturbance		
Construction sequence reduces the amount of land disturbed at one time.		
Well-defined construction access points.		
Limited site clearing.		
Site layout and roadway patterns conform to topography.		
Reduction of impervious cover		
Appropriate road sizing.		
Reduced building footprint.		
Reduction of impervious cover (Cont.)		
Reduced parking footprint.		

Best Management Practices (BMPs)	Yes/No	Comments (If applicable, describe actions taken or give explanation of no action)
Reduced lot setbacks and frontages.		
Alternative cul-de-sac design.		
Integration of porous or infiltration areas (islands, swales etc.).		
Alternative paving.		
Use of vegetated swales in place of curb and gutter.		
Routing of runoff to pervious areas/Disconnection of runoff		
Drains and runoff are directed to vegetated areas.		
Runoff from large impervious surfaces (including pavement and rooftops) is broken into several flow paths.		
Design so that impervious areas direct runoff to vegetated areas.		
Pollution prevention/Source reduction		
Litter/trash control.		
Dry sweep rather than washing or hosing off areas.		
Provide secondary spill containment for hazardous liquid if stored on- site.		
Stencil storm drains.		

**APPENDIX E: SELECTED STRUCTURAL POST-
CONSTRUCTION BMPS**

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GENERAL

A. Introduction

This appendix provides a list and description of appropriate structural BMPs that a permit applicant could select from to meet the stormwater treatment requirements described in Appendix A. This list is not intended to be comprehensive, and alternative structural controls may be selected subject to approval by Summit County. Additional information and detailed examples of long-term post-construction stormwater BMPs can be found online at:

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>
http://www.deq.state.id.us/water/stormwater_catalog/index.asp

All structural post-construction BMPs shall be inspected regularly (at least every six months or as otherwise noted) to determine maintenance needs.

For the purposes of meeting the water quality treatment requirements outlined in Appendix A, the sliding scale and TSS design removal rates shown in Tables 1 and 2 should be used. TSS removal rates for alternative structural controls will be determined by the applicant and approved by the County Engineer. Credible references justifying/documenting the removal rates used shall be submitted by the permit applicant.

For sites where newly-developed impervious areas lie within 50 feet of a live water body (perennial or intermittent stream, lake, pond, spring, or reservoir), the Table 1 sliding scale does not apply and the default 80% TSS removal standard must be met. The less-stringent removal efficiencies listed in Table 1 apply only to sites that refrain from creating new impervious cover near live water bodies.

B. Location of Structural BMPs

Structural BMPs should never be constructed in natural streams (perennial or intermittent) or wetlands. BMPs should be designed to only intercept and capture storm water runoff, not natural stream channel runoff.

Table 1.1 Sliding Scale for Required TSS Removal Efficiency (adapted from City of Boise).

% of parcel area that is impervious	% TSS removal efficiency required^a
# 30	40
35	47
40	53
45	59
50	62
55	66
60	68
65	70
70	72
75	74
80	75
85	77
90	78
95	79
100	80

^afor sites where newly-developed impervious cover lies within 50 feet of a live water body, the values in Table 1 do not apply and instead a removal efficiency of 80% must be met, even if the total site imperviousness % is less than 100%.

Table 2.1 TSS Removal Rates for Selected BMPs (adapted from Schueler 1997, Winer 2000, & EPA 1993).

BMP	Design Removal Rate (%)	Comments
Dry Detention Ponds	15	Quantity control pond
Wet Detention Ponds	60	Quantity control pond
Dry Extended Detention Pond	45	Sediment forebay included
Wet Extended Detention Pond	80	Sediment forebay included
Evaporation Pond	100	Designed to evaporate or retain
Bioinfiltration Swale	70	
Sand Filter	80	Pretreatment, includes Austin, underground, pocket, and Delaware designs
Organic Filter	80	Pretreatment, includes compost and peat/sand
Catch Basin Insert	25	Off-line only
Infiltration Facilities	95*	*removal rate only valid with adequate maintenance and pre-treatment
Sediment Trap	25	
Grass Buffer Strip	85	Minimum width of 10'
Oil/Water Separator	15	

BMP1: OIL/WATER SEPARATORS

A. Introduction

This section includes standards for oil/water separators to be installed to treat runoff from gas stations and parking lots. These systems can be used to intercept and remove contaminants from storm water runoff. They can also be used during redevelopment to retrofit an existing system in order to provide water quality treatment. Oil/water separators and catch basin inserts should not be used alone to treat storm water runoff but rather in combination with other BMPs to improve water quality.

B. Description

These structures are used to capture floatables, oil and grease, and sediment found in runoff. Two types of oil/water separators are discussed in this section: coalescing plate interceptor (CP) (Figure 1.1) and the conventional gravity separator, or API (Figure 1.2). The CP and API separators can function as pre-treatment systems if regularly maintained. A third system, the spill control (SC) separator should be considered for sites where there is a risk of leaks and small spills, such as gas station sand chemical storage areas. It is not considered a pre-treatment system.

C. Sizing

The contributing area to any individual oil/water separator should be limited to one acre of impervious cover. The maximum allowable velocity through the throat of the separator (0.5 fps) will also limit the size of the area served. Separators, boxes, or vaults are sized based on the contributing runoff area, sedimentation rates of particles, and maximum velocities through the throat of the separator.

Certain developments such as fuel farms or gas stations should consider properly sized facilities to capture floatables such as oil and grease. The American Petroleum Institute (API) standards related to oil rise rates and turbulence should be used to design these facilities.

D. Access

Provide access for inspection, proper maintenance, and monitoring activities, including clearance from structures to allow for equipment to clean out devices. Provide access to each compartment. If the length or width of any compartment exceeds 15', an additional access point for each 15' is required.

E. Design Life

The system shall be designed either to the manufacturer's specifications or 50 years, whichever is greater.

All metal parts should be corrosion-resistant. Acceptable materials include parts made of aluminum and stainless steel, fiberglass, or plastic. Metal parts that come in contact with storm water runoff should not be painted because the paint tends to wear off.

Vault baffles should be made of concrete, stainless steel, fiberglass reinforced plastic, or other acceptable material and should be securely fastened to the vault. Apply the HS-20 traffic loading standard when locating the API and CP systems in parking lots.

F. Maintenance

Clean accumulated oil, grease, sediments and floating debris every two years, unless inspections show that more frequent maintenance is necessary. Oil/water separators should be inspected monthly to insure proper maintenance.

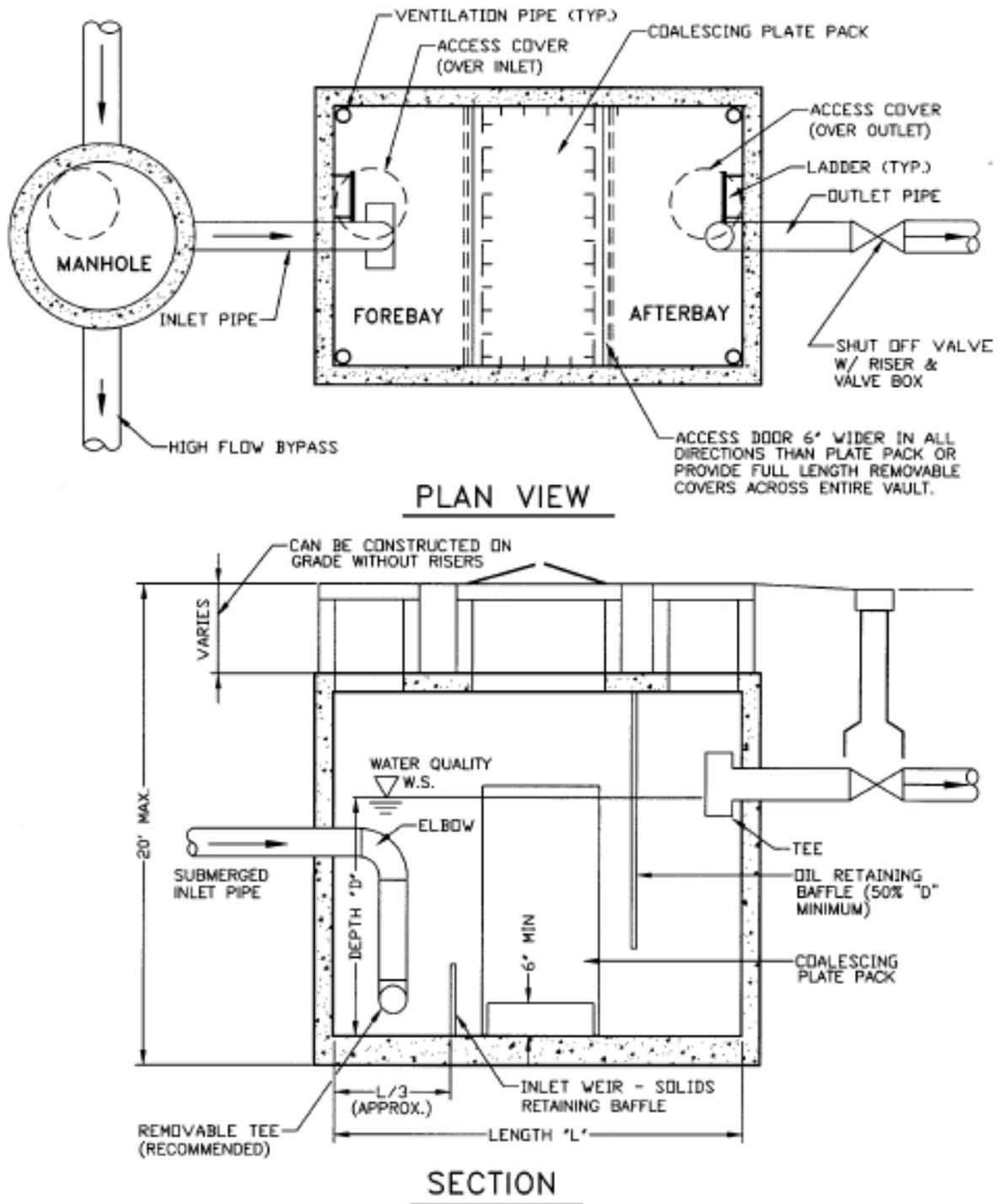
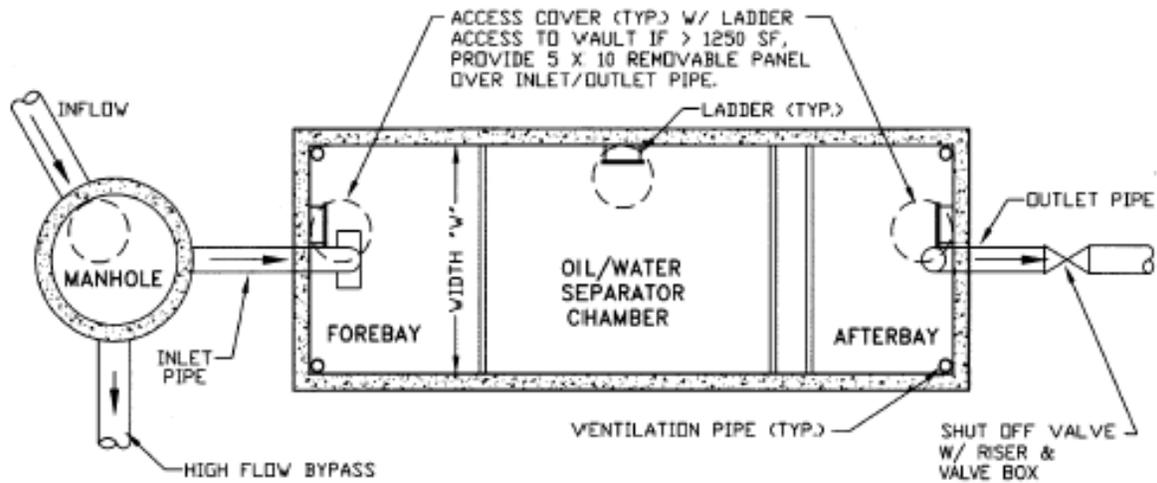
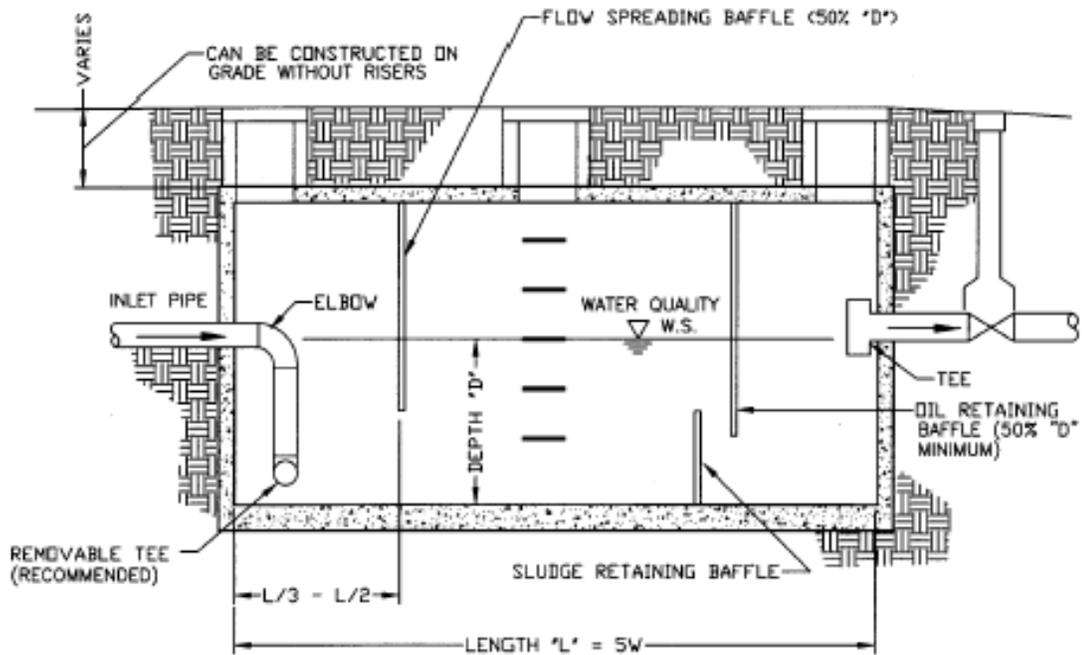


Figure 1.1. Coalescing Plate Oil/Water Separator.



PLAN VIEW



SECTION

Figure 1.2. Conventional Gravity Oil/Water Separator.

BMP2: CATCH BASIN INSERTS

A. Introduction

A catch basin insert is a device installed underneath a catch basin inlet that treats storm water through filtration, settling, absorption, adsorption, or a combination of these mechanisms.

A variety of catch basin inserts are commercially available from various different manufacturers. Summit County does not endorse any single product or manufacturer over any other; however, each selected product will be subject to review by the County and must be approved prior to installation.

Because they have limited capacity and limited sediment removal capabilities, catch basin inserts should NOT be used alone to treat storm water runoff but rather as pretreatment to another storm water management BMP or series of BMPs.

B. Installation

The insert must be fitted with oil-absorbent/adsorbent filter media. The filter must be changed monthly or when the filter media surface is covered with sediment. If the insert is installed in an existing catch basin, the insert shall be demonstrated to fit properly so that there is a positive seal around the grate to prevent low-flow bypass. If the insert is installed in a new or redevelopment project, it shall be installed according to the manufacturer's recommendations. The insert should be installed in the catch basin after the site has been paved or stabilized (for new development) or after completion of construction (for a redevelopment site that is already paved).

C. Access

The catch basin insert shall be located in an easily-accessible area for maintenance activities. It should not be placed in an area with continuous vehicle parking. Consequently, redevelopment projects may have to modify a parking stall in order to provide access to a catch basin insert.

D. Maintenance

Catch basin inserts shall be maintained at a frequency recommended by the manufacturer. Inspections should occur at least monthly during wet months and during periods of high runoff and once every 2 months during the remainder of the year. Full replacement or renewal of oil absorbent/adsorbent material shall be part of maintenance activities. In addition, the catch basin sump should be inspected for sediment accumulation. Filter media shall be disposed of in accordance with applicable regulations. In most cases, dewatered filter media may be disposed of as solid waste. To insure proper maintenance of the catch basin inserts inspections should occur monthly.

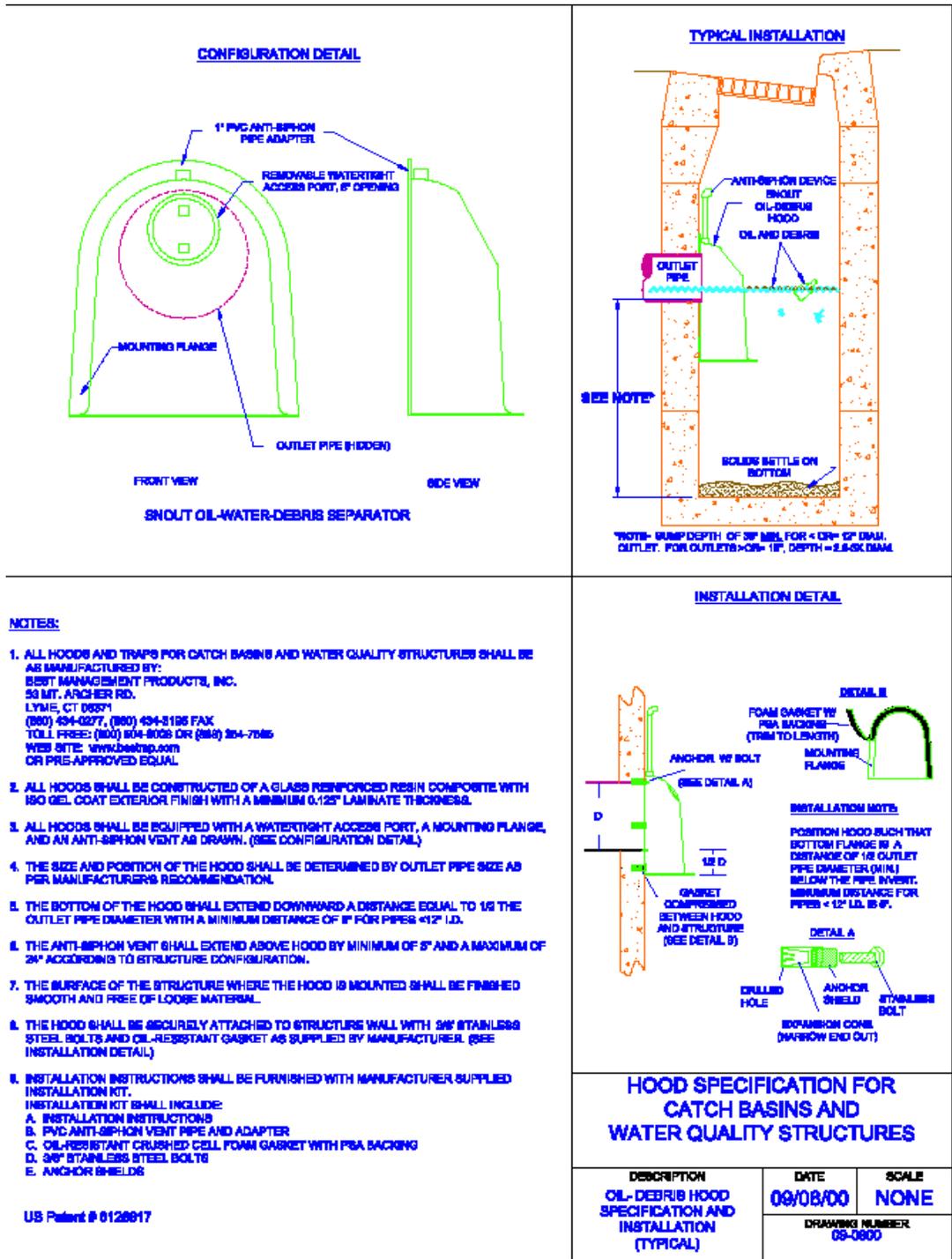


Figure 2.1. Sample Detail of One Type of Catch Basin Insert (SNOUT brand). Summit County does not endorse this brand over any other.

BMP3: INFILTRATION FACILITIES (GENERAL)

A. Introduction

This section contains requirements for facilities that manage storm water by subsurface disposal through infiltration. Requirements are included for seepage beds (infiltration trenches), infiltration basins, and infiltration swales. A seepage bed (Figure 3.1) receives runoff in a shallow excavated trench that has been backfilled with stone to form a below-grade reservoir. Seepage beds are typically located beneath landscaped or parking areas. A seepage bed can also be open to the surface and covered with landscaping rock. This type of system is referred to as an open trench. An infiltration basin (Figure 3.2) impounds water in a surface pond until it infiltrates the soil. Infiltration basins do not maintain a permanent pool between storm events and should drain within 48-72 hours after a design storm event. Infiltration swales (Figure 3.3) are vegetated channels designed to retain/detain, treat and infiltrate stormwater runoff.

B. Plan Submittal

For each infiltration facility, the applicant will be required to submit the general information listed in Section 3.A.1 of Appendix A as well as the following additional information:

- site characteristics that pertain to the proposed infiltration system (site evaluation information) soils report and geologic report with boring logs
- written opinion of site suitability by a hydrologist, geologist, soil scientist or engineer
- recommended design infiltration rate
- infiltration test data and results

C. Construction

Before the site is disturbed, the area selected for the infiltration system shall be secured to prevent heavy equipment from compacting the underlying soils. Runoff should be diverted away from the completed infiltration system during all phases of construction, until the site is completely stabilized. Excessive sediment loading during construction can severely impact the long-term performance of infiltration systems.

D. Setbacks and Separation Distances

- Infiltration facilities shall be located 100' from surface water supplies and tributaries used as drinking water and 50' from surface waters not used as drinking water, excluding drainage and irrigation water delivery systems.
- Infiltration facilities shall be located 100' from public and private drinking water wells.
- Infiltration facilities shall be located 5' from bedrock or basalt (vertical distance from bottom of facility to bedrock). Infiltration facilities must not be used on slopes >20%.

E. Infiltration Rate

The infiltration rate shall be measured at a depth equal to the proposed bottom grade of the facility. Appropriate soil types are those that have an infiltration rate of 0.5"/hour or greater, as initially determined from NRCS Soil Textural Classification and subsequently confirmed by field geotechnical tests. Maximum soil percolation rates shall generally not exceed 8" per hour.

F. Maintenance

Systems should be inspected and cleaned during regular semi-annual inspections. This inspection schedule applies to all of the infiltration facilities unless otherwise noted. The maximum depth of sediment allowed should be stated in the O&M Plan with an estimate of impact on infiltration rate. Sediments shall be removed and disposed of properly.

BMP3.1: SEEPAGE BEDS

A. Limitations

Seepage beds are prohibited in the following situations:

- where hazardous or toxic materials greater than SARA Title III “reportable quantities” are stored or handled, including loading and unloading areas
- where there is existing soil and/or ground water contamination
- in fill material, where there is the possibility of creating an unstable grade and potential for movement at the interface between the fill and in-situ soils

Vadose zone characteristics and depth to water will determine where seepage beds will be prohibited. A final determination regarding the use of seepage beds is based on evaluating the natural, unaltered characteristics of the proposed location for the system. Table 3.1 illustrates how restrictions may be applied.

Table 3.1. Restrictions for Seepage Beds.

Depth to groundwater (below ground surface)	Vadose Zone			
	Gravels, pebbly gravels, pebbles	Sands, sands interbedded with silt and or clays, silty clays	Rhyollite or Granitics	Basalts
< 15 feet ^a	seepage beds prohibited	seepage beds prohibited	seepage beds prohibited	seepage beds prohibited
15-30 feet	additional treatment required	no additional restrictions ¹	subject to further evaluation	subject to further evaluation
31-100 feet	additional treatment required	no additional restrictions ¹	subject to further evaluation	subject to further evaluation
>100 feet	additional treatment required	no additional restrictions ^b	subject to further evaluation	subject to further evaluation

^a Assumes bottom of seepage bed is 5' below ground surface.

^b Assumes the separation distance between the bottom of the seepage bed and ground water is 10'.

B. Setbacks and Separation Distances

- Seepage beds must be separated a minimum of 10' from ground water (vertical distance from bottom of facility to seasonal high ground water level). A test boring shall be drilled to a sufficient depth to verify that a 10' separation distance between the proposed bottom of the facility and seasonal high ground watertable is met. Each facility shall have one test boring, unless prior approval is obtained from Public Works.
- Seepage beds must be separated 10' from structures (foundations, septic systems, other seepage beds).
- Seepage beds must be separated 20' from basements.
- Seepage beds must be separated 10' from property boundaries.

C. Design

- Seepage beds should be designed to provide a direct method for removal of contaminants and sediments before direct discharge into the vadose zone. If the bed has a surface inlet, the system must be designed to capture sediment either through a grass buffer strip, biofiltration swale, or sediment trap. Depending on the expected site activities, a pretreatment system, such as an oil/water separator should also be considered.
- A vegetated buffer (20' minimum) is recommended for open trenches.
- A stone aggregate of clean, washed drain rock, 1.5- 2" in diameter should be used. This size of aggregate will give a void ratio of 30-40%. Aggregate between .5-2.0" may be used but the void ratio must be certified.
- The bottom of the seepage bed shall be covered with a 6-12" layer of clean, washed sand that meets either specification: ASTM C-33 or ITD Standard 703.02, "Fine Aggregate for Concrete".
- The seepage bed aggregate must be lined on the sides by an appropriate geotextile fabric. If the trench is an open trench, it should also be lined at the top and the top fabric layer should be located 1' below the surface to prevent surface sediment from passing through into the stone aggregate. Filter fabric can be placed on the bottom of the trench. Filter fabric should have a minimum weight of at least 4 oz./yd², a filtration rate of 0.08"/second, and an equivalent opening size of 30 for non-woven fabric.

- Seepage beds must have observation wells to determine how quickly the seepage bed drains after a storm. Wells shall be placed and every 2000 SF, with a minimum of 1 well/seepage bed. The observation well should be a perforated PVC pipe, 4-6" in diameter, extending to the bottom of the bed where it is connected to a foot plate. It should be capped and locked to prevent vandalism or tampering.
- If the seepage bed is located in a landscaped area, the bed should be constructed in one of the following ways: the bed should be covered with native soils and planted in grass, or if the seepage bed is an open trench, covered with stone aggregate and protected from sediment build-up with a vegetated buffer strip 20-25' wide on either side of the bed.

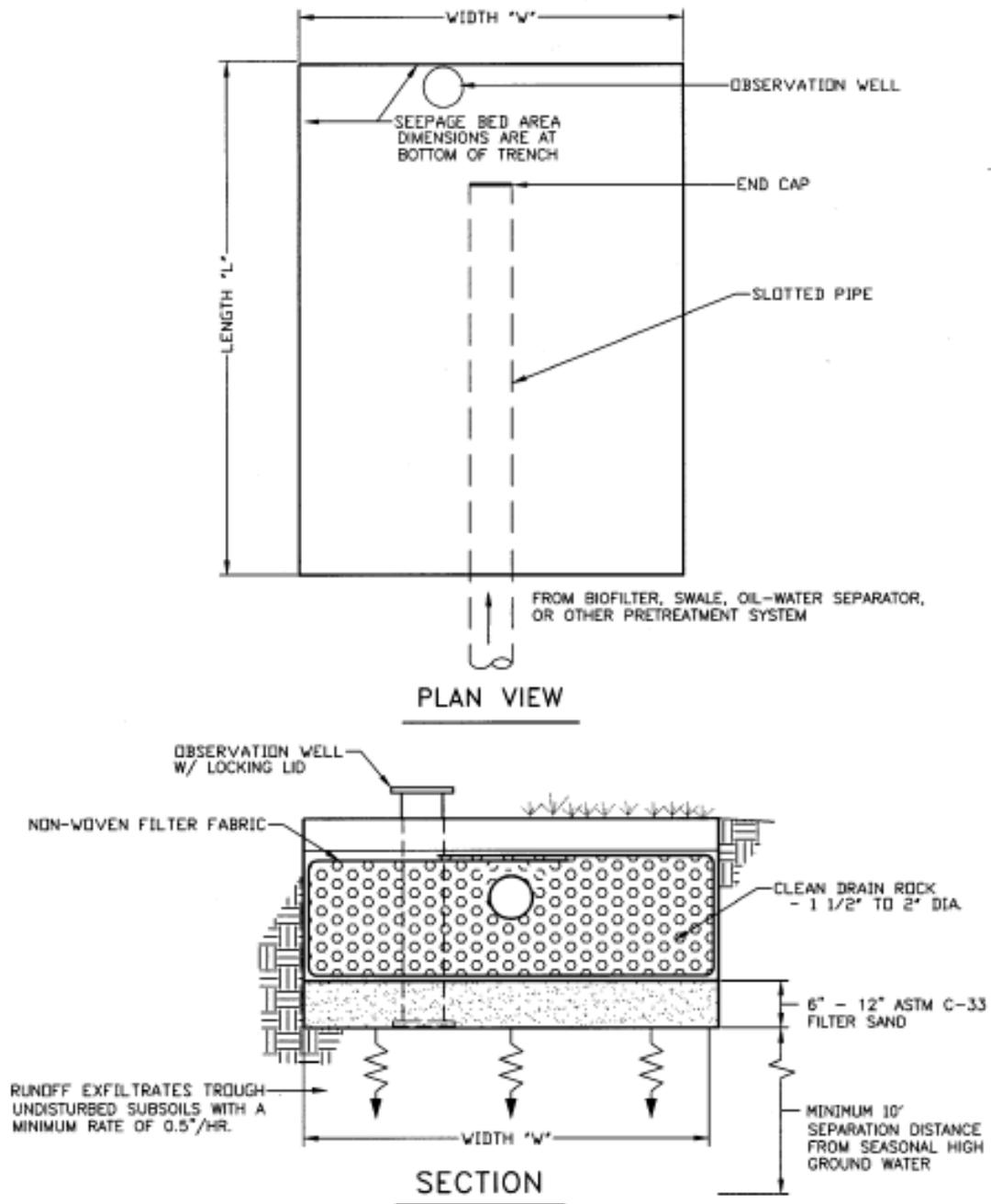
D. Operation and Maintenance

The system should be located so that it can be easily accessed by equipment necessary to maintain the pretreatment system and trench. The buffer and surface vegetation must be maintained by reseeding bare spots and mowing as frequently as needed to preserve aesthetics.

When ponding occurs at the surface or in the bed, corrective maintenance is required immediately. Ponding indicates the bed is clogged. Stripping off the top layer of soil, replacing the clogged filter fabric, and then replacing the top foot of aggregate or soil will correct the problem. Ponded water inside the trench (as visible from the observation well) after 24 hours or several days can indicate that the bottom of the trench is clogged. If this problem has occurred, then it is necessary to remove all of the layers and replace them.

E. Closure or Replacement

The owner is required to repair, replace, or reconstruct the infiltration system if it fails to operate as designed. A system fails to operate as designed when water is standing 24 hours or longer following the design storm. The maintenance and operation schedule for an infiltration system shall include such a provision. The owner is required to notify Summit County if the owner plans to close or replace the infiltration system. Additional studies may be required for all facilities depending on the land use of the site.



BMP3.2 INFILTRATION BASIN

A. Applicability

An infiltration basin is suitable in residential and commercial developments. Infiltration basins should not be placed in locations where the basin could cause flooding to downstream properties or in natural drainages such that the basin would restrict inflows to the point of causing upstream flooding.

B. Sizing

In determining the size of the basin, the critical parameters are the storage capacity and the maximum rate of runoff released from the basin. In addition the basin size should be based on expected sediment accumulation and frequency of maintenance.

C. Forebay/Sediment Trap

A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1. The forebay/sediment trap shall have a treatment volume equal to 0.75 times the runoff from the mean annual storm (0.23").

D. Construction Requirements

Infiltration basins shall be constructed in appropriate soil types. Infiltration basins should be excavated in a manner that will minimize disturbance and compaction of the basin. The basin bottom should be sloped to maximize infiltration. In addition, infiltration basins should not be constructed in highly erodible contributing areas, on slopes > 15%, or within fill soils. Inlet and outlet channels must be stabilized.

E. Separation Distance

The bottom of the infiltration basin should be separated by at least 3' vertically from the bedrock layer or seasonal high water table, as indicated by on-site geotechnical test results. Within the 3' separation distance, there must be at least a 2' layer of soil that conforms to infiltration rate requirements.

F. Pretreatment

Each infiltration basin shall have additional pretreatment. One of the following techniques can be used:

- construct grass channel
- construct grass filter strip
- install bottom sand layer
- install upper filter fabric with 6" sand layer
- use washed cobble rock as aggregate
- vegetate basin with deep-rooted turf

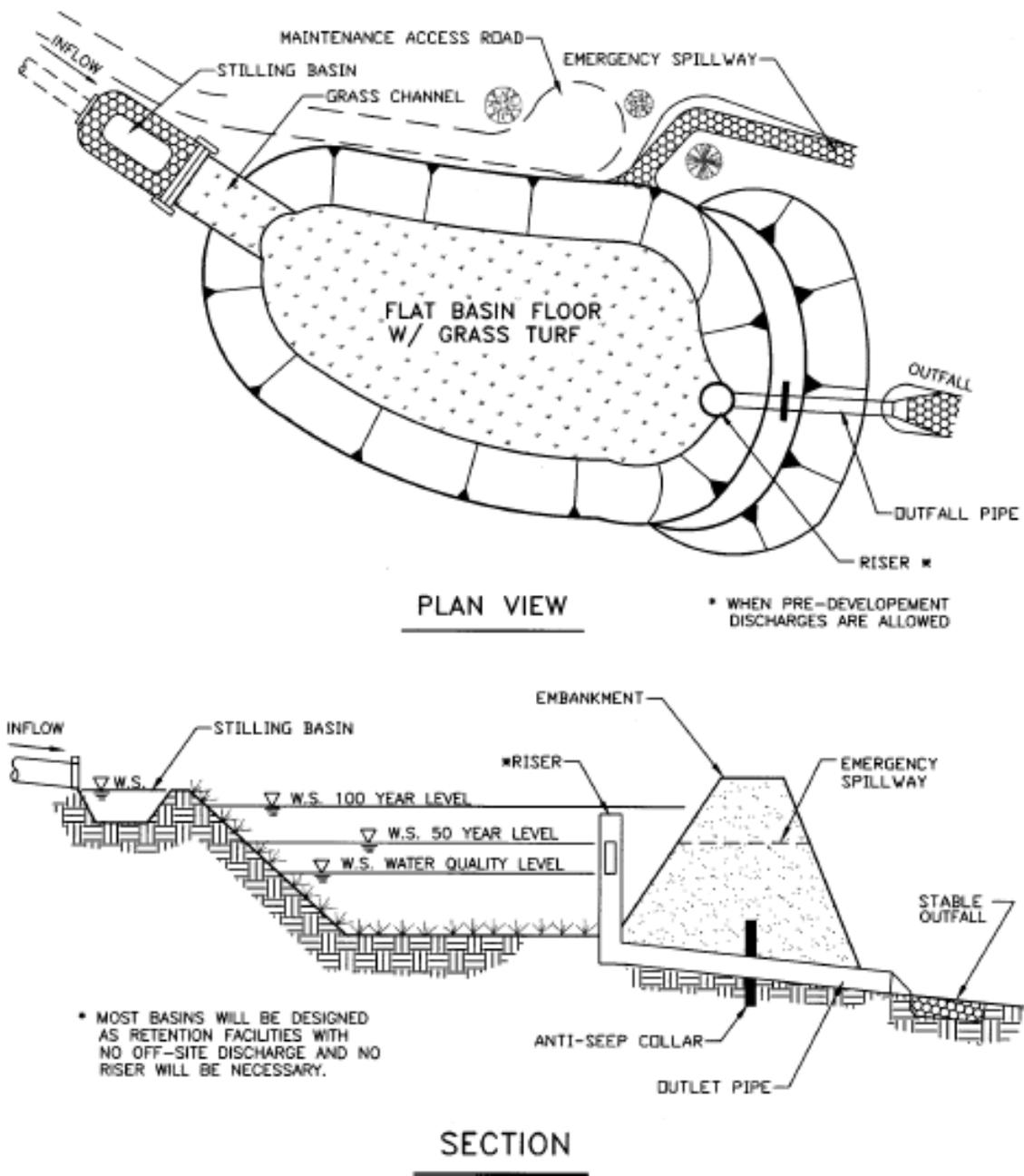


Figure 3.2. Infiltration Basin.

BMP3.3 INFILTRATION SWALE

A. Design

- Swale bottom slopes shall be between 1-4%.
- Curb cut pavement shall be installed at a maximum height of 6" above the swale if curb cuts will be used to introduce flow to the swale. Curb cuts shall be between 12-36" wide.
- A flow spreading device at the swale inlet shall be installed. Appropriate devices include shallow weirs, stilling basins, and perforated pipes. Provide a sediment clean-out area.
- Energy dissipation shall be provided at the inlet. Appropriate means are stilling basins and rip rap pads. If rip rap is used, it should be sized for the expected runoff velocity. A drainage window may be provided to direct the storm water runoff from events larger than the quantity design storm to the free draining material in the under drain. The top of the drainage window should be placed at an elevation above the water surface of the quantity design storm and should be located at the lower end of the swale.
- The swale side slopes shall be no more than 3:1.
- The swale bottom width shall be no greater than 8'.
- Swale shall be a maximum of 1.5' deep.
- The swale shall be grass-covered. Uniformly fine, close-growing, water-tolerant grasses should be used. Landscaping rock may also be used with an open trench.
- The swale under drain shall be constructed using clean 2" drain rock. The rock shall be wrapped in geotextile filter fabric, with a weight of greater than 4 ounces per square yard. The under drain will be a minimum depth of 12".
- A 6-12" layer of clean, washed sand that meets either specification: ASTM C-33 or ITD Standard 703.02, "Fine Aggregate for Concrete" shall be placed below the under drain.

B. Setbacks and Separation Distances

- Swale perimeter slope must be a minimum of 2' from the property line.
- There shall be at least 3' of separation between the bottom of the swale or under drain and the seasonal high ground water table.

C. Landscaping

Vegetate swales uniformly with fine, close-growing, water-tolerant grasses that can withstand seasonally saturated soils. Swales shall not be used until the vegetation is established. The side slopes above the swale treatment area should be vegetated to prevent erosion. Additional grass or nonaggressive ground covers are appropriate.

Barrier shrubs, such as barberry, planted around the swale should be considered when there is a possibility that the public could damage the swale or hinder its function. Other plant materials are appropriate if recommended by a landscape professional.

Trees and shrubs should be planted high on the side slopes or above the water line elevation for the design storm. Avoid using bark, mulch, fertilizers, and pesticides in swale bottoms or sides. These materials tend to run off the planted area and into the swales reducing its treatment effectiveness. When storm water control and landscaping are integrated, the following standards apply:

- Up to 15% of the total area of the swale designated for storm water infiltration may be covered with ground cover plants other than grass.
- Up to 10% of the total area of the swale designated for storm water infiltration may be elevated above the bottom of the swale to allow the planting of trees and shrubs.

The decrease in swale area resulting from this action will be compensated for by infiltration of runoff that occurs during the storm. If trees and shrubs will be used, plant them on the top perimeter of swale side slopes. Minimize shading the vegetation in the swale treatment area. A spacing of at least 20' (6 meters) is appropriate for trees planted close to a swale. Avoid planting trees that would continuously shade the entire length of the swale. In addition, avoid using bark, mulch, fertilizers, and pesticides in these areas. These materials tend to run off the planted area and into the swale reducing its treatment effectiveness.

D. Pretreatment

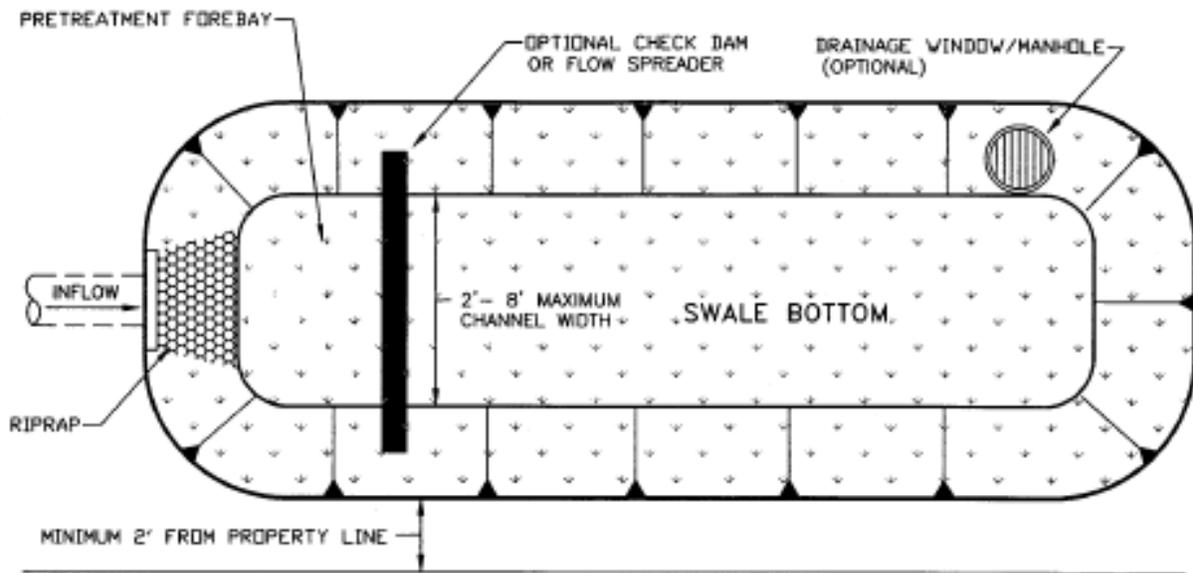
To protect ground water from possible contamination, runoff cannot be infiltrated without proper pretreatment. Pretreatment shall be provided by a grass buffer strip, sediment forebay, biofiltration swale, oil/water separator, or sediment trap.

E. Operation and Maintenance

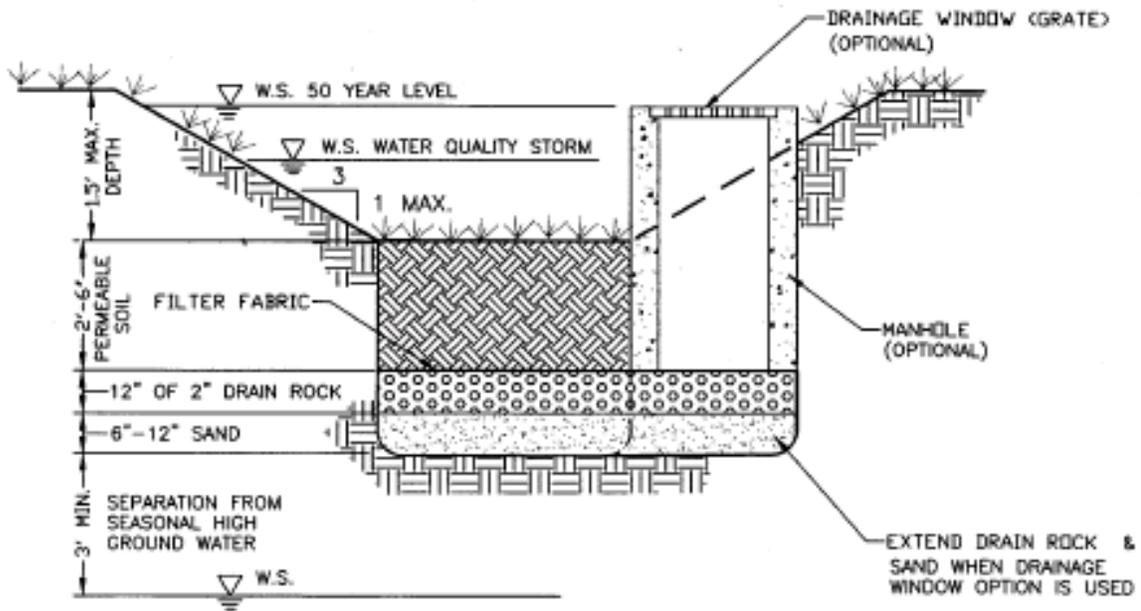
Grass should be mowed to maintain an average grass height between 3"-9", depending on site characteristics. Monthly mowing is needed from May through September to maintain grass vigor. Grass clippings should be removed from the swale and composted on site or disposed of properly off site.

Sediment deposition at the head of the swale should be removed if grass growth is being inhibited for more than 10% of the swale length or if the sediment is blocking the even spreading or entry of water to the rest of the swale. Annual sediment removal and spot reseeding should be anticipated.

The swale should be regraded to produce a flat bottom width then reseeded if flow channelization or erosion has occurred. Regrading should not be required every year.



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Figure 3.3. Infiltration Swale.

BMP4: PONDS (GENERAL)

A. Definitions

A detention pond (water quantity) (Figure 4.1) is a pond designed to collect and temporarily hold surface and storm water runoff from a site and release it at a slower rate than it is collected. The water should drain within 24 hours. Detention ponds are traditionally used to mitigate downstream impacts and alleviate flooding problems.

An extended detention pond (water quality) (Figure 4.2) is a pond designed to treat and release surface and storm water runoff from a site. Extended detention ponds are designed to provide water quality treatment and may be used to provide peak flow attenuation. The water is held for at least 48-72 hours to allow for treatment of pollutants by settlement, nutrient absorption, and filtering by plant materials.

B. Requirements for All Ponds

- Design Life

The system should be designed for at least a 50-year life.

- Location

Ponds should not be constructed in natural streams or wetlands. Ponds should be located off-channel and should only hold storm water runoff, not natural runoff.

- Site Evaluation/Site Suitability

Sites should be evaluated for soils, depth to bedrock, and depth to water table. Requirements will depend on pond type. Ponds may be used at sites where a receiving body or structure can accept pond discharges. Ponds designed to meet on-site detention requirements shall not be located in regulatory flood plains. Also, ponds should not be used in areas where storm water has the potential to contain soluble metals, toxic organics, or where high sediment loads may occur.

- Design

The design of any detention pond requires consideration of several factors. Balancing the requirements is done by developing an inflow hydrograph, a depth-storage relationship, and a depth-outflow relationship. The inflow/storage/outflow relationships should be based on a storm duration that identifies a peak detention pond volume for the storm interval

required. Refer to Appendix A, Section 3.B(6) for water quantity and quality design criteria.

The factors to be considered include:

- basin size
- minimum free board
- maximum allowable depth of temporary ponding
- recurrence interval of the storm being considered
- storm duration
- timing of the inflow
- allowable outflow rate
- the length of time water remains in the facility.

- **Maximum Outflow Rate**

The maximum outflow rate shall not be more than the pre-development rate of runoff for each storm return interval. The receiving system must be shown to be capable of accommodating the pre-development flow.

- **Outlets**

Outlet pipes shall be at least 12" in diameter. If riser pipes are used, they shall be 1 1/2 times the cross sectional area of the outfall pipe. Trash racks or anti-vortex devices shall be installed. All pipe joints are to be watertight. Anti-seep cutoff walls, 8" thick, or other seepage control methods are to be installed around outlet pipes. The channel immediately below the pond outfall shall be protected against erosion and shall transition to natural drainage conditions in the shortest distance possible.

- **Dam Safety Requirements**

If a pond is categorized as a dam by the State of Utah, the relevant sections of the Utah Code will apply. Contact the Utah Division of Water Rights for more information on dam safety requirements.

- **Vegetative Buffers**

Vegetative buffer strips shall be established around the perimeter of the pond for erosion control and additional sediment and nutrient removal. Buffer strips should include all areas between the normal pond water surface elevation to the top of the pond embankment.

- Side Slopes/Safety

Take all practical safety precautions. Side slopes should not exceed 4:1 (3:1, if the pond will normally remain dry).

- Soils

A soils investigation is required on all ponds. At a minimum, it shall include information along the centerline of the proposed dam in the emergency spillway location and the planned borrow area. It should include recommendations on cutoff trenches, compaction, and any other special design requirements.

- Freeboard and Emergency Spillway

All open surface facilities shall be designed with adequate freeboard above the maximum design water elevation. Emergency spillways are required on all ponds. The spillway shall be sized to safely pass the 100-year developed peak flow.

- Maintenance Access

Direct access to the pond bottom, inlet sedimentation area, and control structure is required. A right-of-way maintenance easement from a road to the pond (if not accessible from the public right-of-way), shall be provided.

- Inspection

Detention ponds should be inspected during regular semi-annual inspections to determine maintenance needs.

BMP4.1: DETENTION PONDS

A. Definition

Detention ponds are designed to detain a volume of water to attenuate peak flows. A wet pond has a permanent pool and provides temporary storage of storm water runoff. A dry detention pond does not maintain a permanent pool between storm events.

B. Applicability

Detention ponds are suitable in residential, commercial, and industrial sites.

C. Pond Geometry

The pond can be any shape provided that it has sufficient capacity to meet general design requirements.

D. Outlet Design

At the peak flow rate, pond volume shall be equal to the difference between pre and post-development storm volumes. The outlet structure shall be designed in accordance with the water quantity and quality requirements of Appendix A, Section 3.B(6). The outlet design shall incorporate a multi-stage riser that will allow water (above the permanent pool, in a wet pond) to be drained over 24 hours. The outlet shall be designed to mimic pre-development flow rates. The outlet structure shall be designed to prevent clogging and plugging.

E. Construction Requirements

Detention ponds shall be excavated in a manner that will minimize disturbance and compaction of the pond. Sediment measuring devices shall be installed at opposite ends of the bottom of the basin or sediment trap to measure sediment accumulation.

F. Sediment Storage

Ponds shall be designed to contain computed storage volume plus 15% of the computed storage volume to adequately accommodate sediment deposition.

G. Forebay/Sediment Trap

Each pond shall have a sediment forebay or equivalent upstream pretreatment. The forebay shall have a separate cell formed by an acceptable barrier. A fixed vertical sediment depth marker shall be installed in the forebay to measure sediment accumulation.

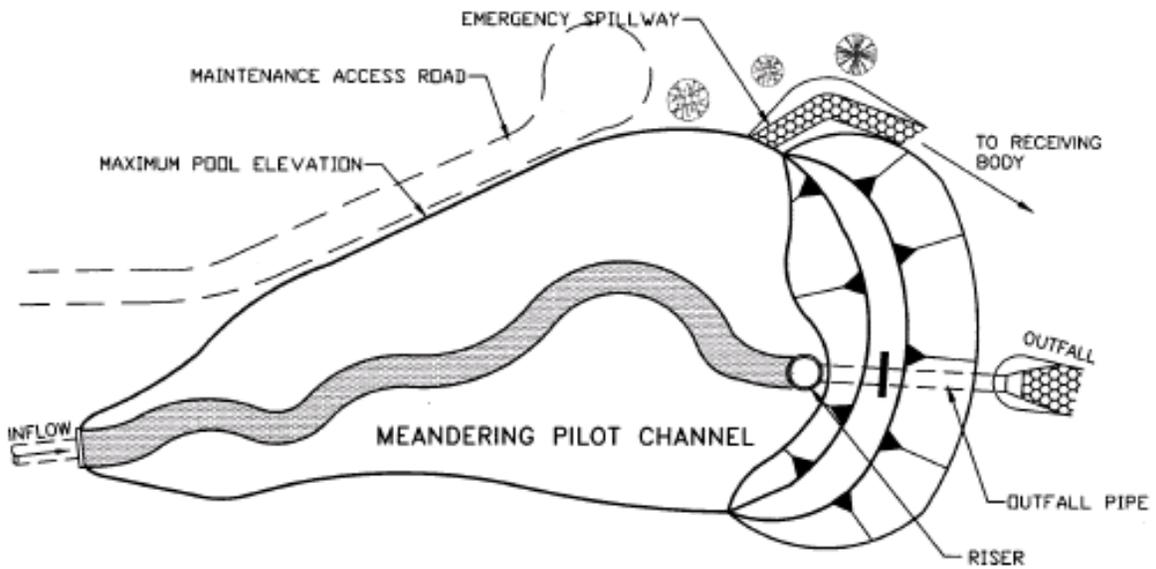
Minimum forebay size shall be equal to 15% of the water quality treatment volume. Optimal volume should be equal to 25% of the water quality treatment volume. Forebay volume shall be in addition to permanent pool volume, where applicable, and shall be separated from permanent pool, if possible. A weir flow structure or physical separation with pipes may be utilized. A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1 to provide separation from the permanent pool. A drainpipe should be included in the forebay to dewater the pool area for maintenance purposes.

H. Inlet Protection

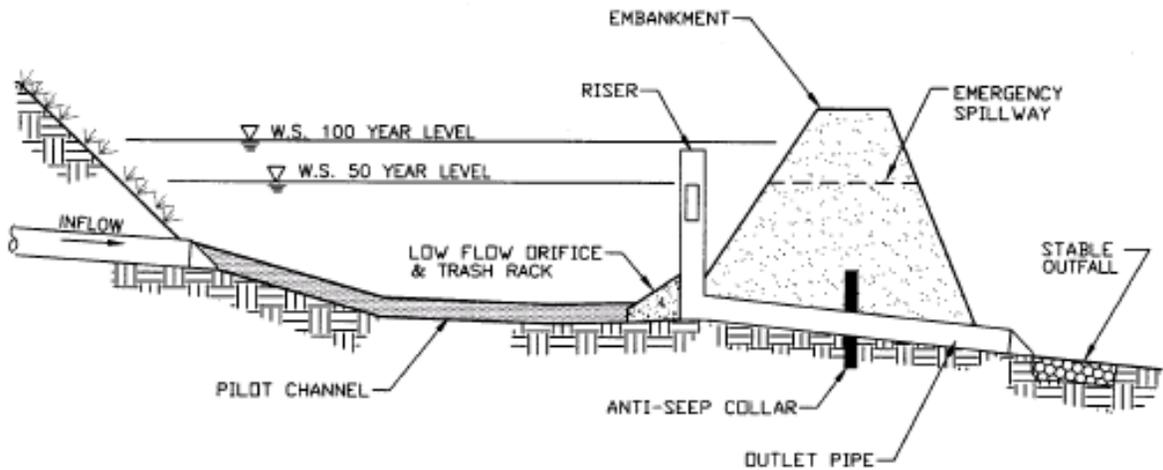
The inlet shall be protected against erosion or scour. Riprap or other material may be required at the inlet to provide for energy dissipation.

I. Stabilization

Wet detention ponds shall be stabilized with vegetation to control dust and improve pond aesthetics. A landscaping plan for a pond and surrounding area should be prepared to indicate how aquatic and terrestrial areas will be vegetatively stabilized, established, and maintained. Whenever possible, wetland plants should be used in a pond design, either along the aquatic bench or within shallow areas of the pool.



PLAN VIEW



SECTION

Figure 4.1. Detention Pond.

BMP4.2: EXTENDED DETENTION PONDS

A. Definition

An extended detention pond is a constructed pond designed to detain a volume of water for a minimum time to allow for the settling of particles and associated pollutants. This type of pond can also be utilized for flood control by including additional temporary storage for peak flows. A wet extended detention pond incorporates both a permanent pool and extended detention. Dry extended detention ponds do not maintain a permanent pool between storm events.

B. Applicability

Ponds should not be used where storm water has the potential to contain soluble metals or toxic organics. In addition, ponds placed in areas where high sediment loads may occur, require frequent maintenance but still may be the most cost-effective treatment method. A wet extended detention pond is suitable in residential, commercial, and industrial sites. It is appropriate in areas where nutrient loadings are expected to be high. Dry extended detention ponds do not maintain a permanent pool between storm events.

C. Pond Geometry

The pond shall be designed to lengthen the flow path, thereby increasing detention time and limiting peak flow rates to pre-development rates. Shallow basins with large surface areas also provide better removal efficiencies than small deep basins. The pond geometry shall meet the following criteria:

- Permanent pool depth shall not exceed 12' with an average depth between 4-6'.
- Length from inlet to outlet should be as far apart as possible.
- Length to width ratio should be approximately 3:1 and side slopes should be 4:1.

D. Sizing

Size the pool according to the design storm criteria in Appendix A, Section 3.B(6). The critical parameters in determining the size of the basin are the storage capacity and the maximum rate of runoff released from the basin. The design shall provide an average of 48-72 hours detention time. This design objective can be achieved by setting the maximum detention time for the greatest runoff volume at approximately 40 hours. The average detention time for very small storms should be at least 6 hours.

E. Forebay

Each pond shall have a sediment forebay or equivalent upstream pretreatment. The forebay shall have a separate cell formed by an acceptable barrier. A fixed vertical sediment depth marker shall be installed in the forebay to measure sediment accumulation.

Minimum forebay size shall be equal to 15% of the water quality treatment volume. Optimal volume should be equal to 25% of the water quality treatment volume. Forebay volume shall be in addition to permanent pool volume, where applicable, and shall be separated from permanent pool, if possible. A weir flow structure or physical separation with pipes may be utilized. A rock or an earthen berm shall be constructed with a minimum top width of 4' and side slopes no steeper than 3:1 to provide separation from the permanent pool. A drainpipe should be included in the forebay to dewater the pool area for maintenance purposes.

F. Outlet Design for a Wet Extended Detention Pond

The outlet shall be designed to pass a flow rate necessary for extended quantity attenuation. The outlet design shall incorporate a multi-stage riser that will allow water to be drained over a minimum of 48-72 hour period depending upon the design storm.

Ponds may be constructed with safety benches. The perimeter of all deep permanent pool areas (at least 4' deep) shall be surrounded by two safety benches with a combined minimum width of 15'. The benches should be designed as follows:

- A safety bench that extends landward from the normal water level edge to the toe of the pond side slope. The maximum slope of the safety bench shall be 12%.
- An aquatic bench that extends from the normal shoreline and has a maximum depth of 18" below the normal pool water surface elevation. Pond slope between the top of the bank and bench shall not exceed 2:1.

G. Outlet Design for a Dry Extended Detention Pond

A perforated riser can be used to slowly release the water over a prolonged period. A cutoff collar should be considered for the outlet pipe to control seepage.

H. Construction Guidelines

Wet extended detention ponds should be excavated in a manner that will minimize disturbance and compaction of the pond. Sediment measuring gauges should be installed at opposite ends of the bottom of the basin to measure sediment accumulation.

I. Stabilization

A landscaping plan for a wet extended detention pond and its buffer shall be submitted to indicate how aquatic and terrestrial areas will be vegetatively stabilized and established. Whenever possible, wetland plants should be used in a pond design, either along the aquatic bench or within shallow areas of the pool. Bottom and banks of all dry extended detention ponds shall be stabilized with gravel, rock, vegetation, or other acceptable material to control dust and prevent erosion.

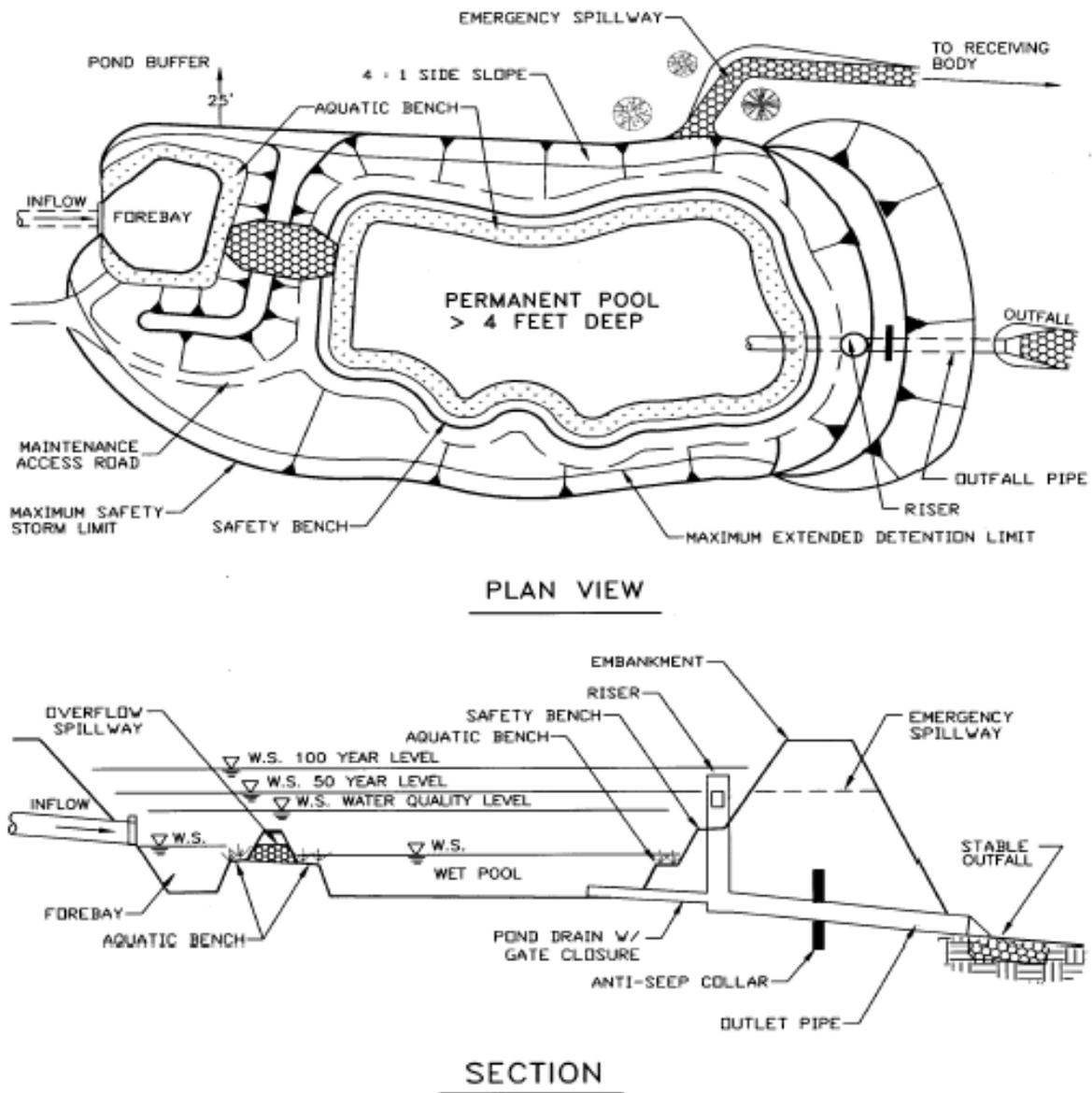


Figure 4.2. Extended Detention Pond.

BMP5: BIOFILTRATION SYSTEMS

A. Introduction and Purpose

This section includes requirements that apply to biofiltration swales (Figure 5.1) and grass buffer strips (Figure 5.2). These BMPs are pre-treatment systems that utilize plant materials for various physical and biological processes in the water quality treatment of runoff. These systems should not be used alone to treat storm water runoff. Rather, they should be used in combination with other structural and nonstructural BMPs to improve water quality.

B. Plan Submittal Requirements

The applicant will be required to provide a written report that includes the Plan Submittal Requirements and a Landscape Plan.

C. Sizing

Unless a bypass is included, the biofilter must be sized as both a treatment device and to pass the peak hydraulic flows. The depth of the storm water should not exceed the height of the grass.

D. Landscaping

Vegetate biofilters with fine, close-growing, water-tolerant grasses that can withstand seasonally saturated soils. Biofilters shall not be used to manage storm water until the vegetation is established. The side slopes of a biofilter should be vegetated to prevent erosion. Barrier shrubs, such as barberry, planted around the biofilter should be considered when there is a high potential for people to damage the biofilter or hinder the biofilter's function. Other grasses or nonaggressive ground covers are appropriate if recommended by a landscape professional.

If trees will be planted near the biofilter, then minimize shading the vegetation in the biofilter treatment area. A spacing of at least 20' (6 meters) is appropriate for trees planted close to a biofilter. Avoid planting trees that would continuously shade the entire length of the biofilter. In addition, avoid using bark, mulch, fertilizers, and pesticides in these areas. These materials tend to run off the planted area and into the biofilter reducing its treatment effectiveness.

E. Operation and Maintenance

Systems should be inspected during regular semi-annual inspections. This inspection schedule applies to all biofiltration systems unless otherwise noted.

Grass shall be mowed to maintain an average grass height between 3 -9", depending on the site situation. Monthly mowing is needed from May through September to maintain grass vigor. Grass clippings should be removed from the swale and composted on site or disposed of properly off site.

Sediment deposited at the head of the swale shall be removed if grass growth is being inhibited for more than 10% of the biofilter length or if the sediment is blocking the even spreading or entry of water to the rest of the facility. Annual sediment removal and spot reseeding should be anticipated.

If flow channelization or erosion has occurred, the facility shall be regraded, then reseeded as necessary.

Access for mowing equipment and maintenance shall be provided. Consideration should be given to providing wheel strips in the bottom of the swale if vehicular access (other than grass mowing equipment) is needed.

BMP5.1: BIOFILTRATION SWALES

A. Description

Biofiltration swales are storm water runoff systems which treat and then discharge storm water runoff to another system.

B. Design

- A hydraulic residence time for the storm water runoff of 9 minutes is required.
- Water velocity, as determined by Manning's "n", should not exceed 0.9 feet/second.
- The Manning's "n" for grass shall be in the range between 0.02 and 0.024.
- Swales shall be sloped as necessary to obtain the desired design velocity and residence time.
- If flow is to be introduced to the swale via curb cuts, then curb cut pavement elevation shall be no higher than 6" above swale. Curb cuts should be between 12-36" wide.
- Install a flow spreading device at the swale inlet. Appropriate devices include shallow weirs, stilling basins, and perforated pipes. Provide a sediment clean-out area. A sediment catch basin or a larger pre-settling device would control sediments at the swale inlet and allow for easy maintenance.
- Provide for energy dissipation at the inlet. Appropriate means are stilling basins and rip rap pads.
- Swale using rip rap should be sized for the expected runoff velocity.
- Swale side slopes shall be no steeper than 3:1. Swale bottom width shall be no greater than 8'. The maximum depth of flow through the biofiltration swale shall be 3.0".

C. Setbacks and Separation Distances

Perimeter slope of the swale must be a minimum of 2' from property line.

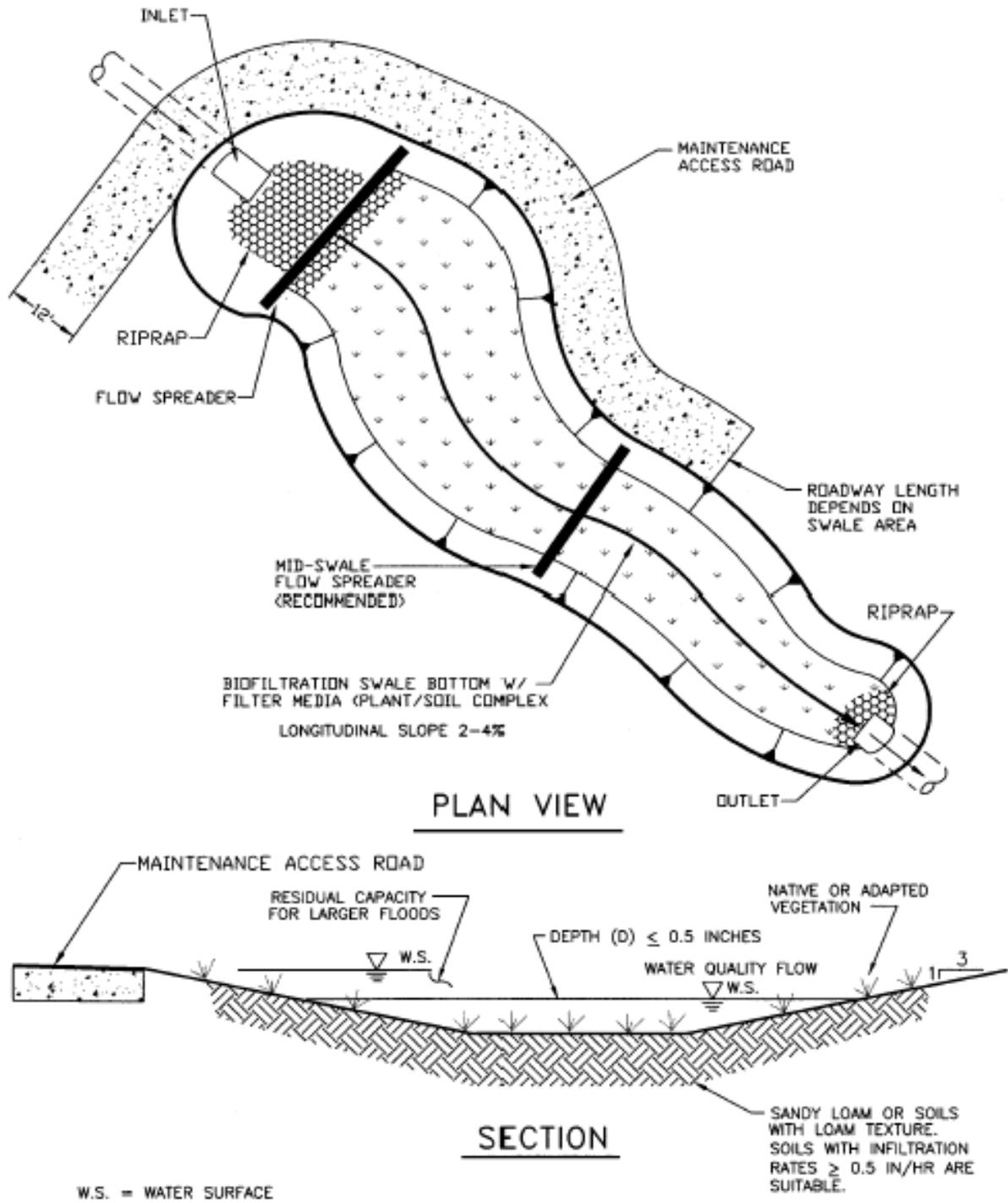


Figure 5.1. Biofiltration Swale.

BMP5.2: GRASS BUFFER STRIPS

A. Introduction

Grass buffer strips are used as a water quality pretreatment system for smaller sites.

B. Design

- The longest flow path from the area contributing sheet flow to the filter strip shall not exceed 150 feet.
- The lateral slope of the contributing drainage (parallel to the edge of pavement) shall be 2% or less.
- A hydraulic residence time of 9 minutes is required.
- A stepped series of flow spreaders installed at the head of the strip may be used to compensate for drainage areas having lateral slopes of up to 4%.
- The longitudinal slope of the contributing drainage area (parallel to the direction of flow entering the filter strip) shall be 5% or less.
- Grass buffer strips shall not be used when the contributing drainage areas has a longitudinal slopes steeper than 5% or energy dissipation and flow spreading should be provided up slope of the upper edge of the filter strip to achieve flow characteristics equivalent to those meeting the above criteria.
- The longitudinal slope of the strip (along the direction of flow) shall be between 1 - 20%. The lateral slope of the strip (parallel to the edge of pavement, perpendicular to the direction of flow) shall be less than 2 percent.
- The ground surface at the upper edge of the filter strip (adjacent to the contributing drainage area) shall be at least 1 inch lower than the edge of the impervious area contributing flows.
- Manning's roughness coefficient (n) for flow depth calculations shall be 0.04.
- The maximum depth of flow through the filter strip for optimum water quality shall be 1.0 inch.
- The maximum allowable flow velocity for the water quality design flow (WQ_v) shall be 0.5 feet per second.

- Runoff entering the filter strip must not be concentrated. If the contributing drainage area is not smoothly graded to prevent concentrated flowpaths, a flow spreader shall be installed at the edge of the pavement to uniformly distribute the flow along the entire width of the filter strip. At a minimum, a gravel flow spreader (gravel-filled trench) shall be placed between the impervious area contributing flows and the filter strip. The gravel flow spreader shall be a minimum of 6" deep and shall be 18" wide for every 50' of contributing flowpath. Where the ground surface is not level, the gravel spreader must be installed so that the bottom of the gravel trench is level.
- Energy dissipaters are needed in the filter strip if sudden slope drops occur, such as locations where flows in a filter strip pass over a rockery or retaining wall aligned perpendicular to the direction of flow. Adequate energy dissipation at the base of a drop section can be provided by a rip rap pad.

C. Landscaping

Trees and shrubs should not be located within a grass filter strip.

D. Maintenance

Inspections should occur semi-annually to determine maintenance needs. Access shall be provided at the upper edge of the filter strip to enable maintenance of the inflow spreader throughout the strip width and allow access for mowing equipment.

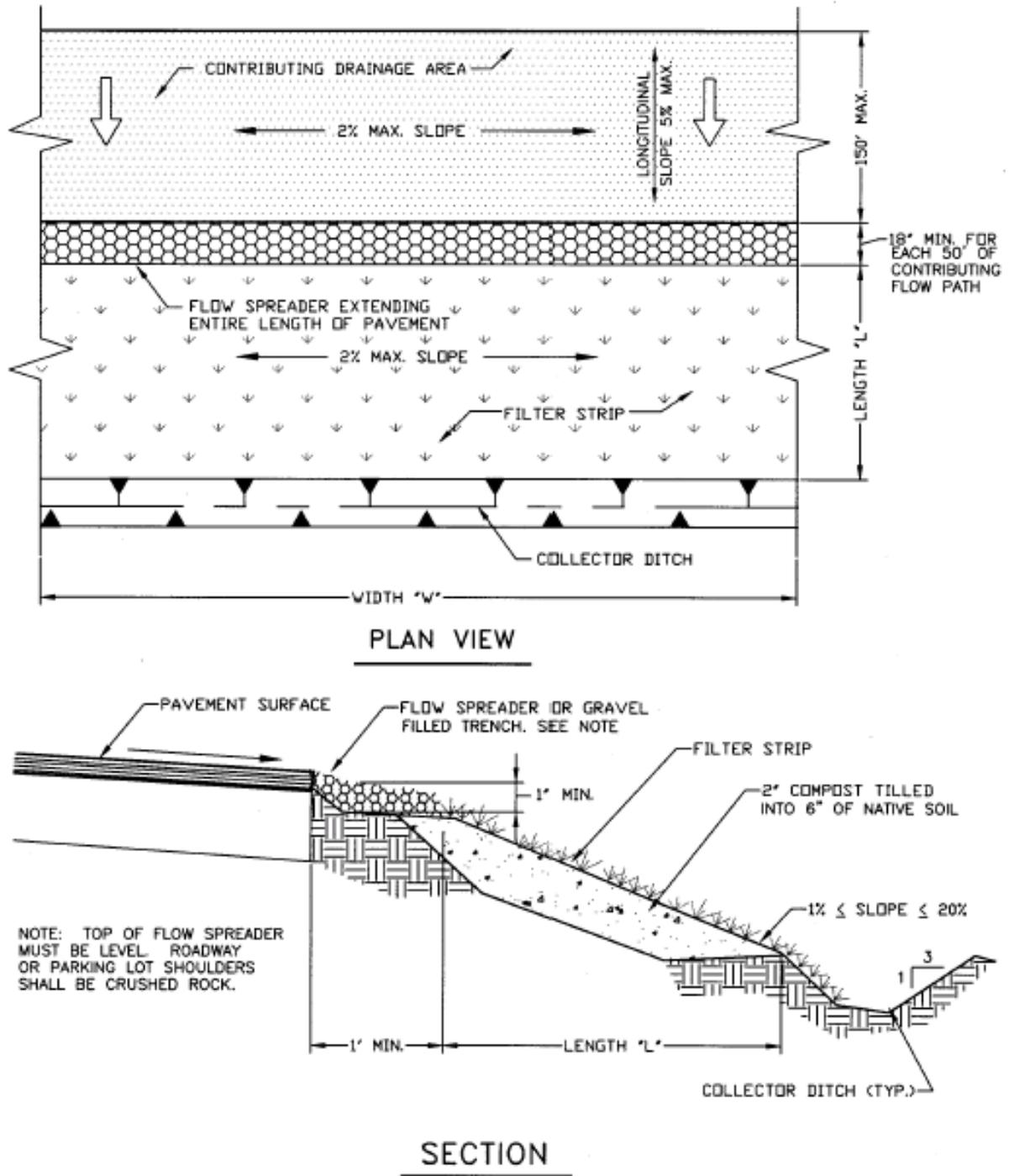


Figure 5.2. Grass Buffer Strip.

BMP6: SAND FILTERS

A. Introduction

Sand filters consist of self-contained beds of sand either underlain with underdrains or cells and baffles with inlets/outlets. Storm water runoff is filtered through the sand, and in some designs may be subject to biological uptake. The four most commonly used sand filter systems are the Austin Sand Filter, the Delaware Sand Filter, the Trench Filter, and the Pocket Sand Filter.

- Austin Sand Filter

The Austin sand filter (Figure 6.1), or surface sand filter, consists of a sedimentation chamber or pond followed by a surface sand filter with collector underdrains in a gravel bed. Filtered runoff is conveyed to a storm sewer or channel by gravity flow or pumping.

- Delaware Sand Filter

The Delaware sand filter (Figure 6.2), or perimeter system, consists 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 pumping.

- Underground Sand Filter

The underground sand filter (Figure 6.3) is placed underground but maintains essentially the same components as the Austin sand filter. The filter consists of a 3 chamber vault. A 3' deep wet sedimentation chamber is hydraulically connected by an underwater opening to provide pretreatment by trapping grit and floating organic material. The second chamber contains an 18-24" sand filter bed and an under drain system including inspection/cleanouts wells. A layer of plastic filter cloth with a gravel layer can be placed on top of the sand bed to act as a pre-planned failure plane which can be replaced when the filter surface becomes clogged. The third chamber collects the flow from the under drain system and directs flow to the downstream receiving drainage system.

- Pocket Sand Filter

The Pocket sand filter (Figure 6.4) is a simplified and low cost design suitable for smaller sites. Runoff is diverted within a catch basin. Pre-treatment is provided by a concrete flow spreader, a grass filter strip, and a plunge pool. The filter bed is a shallow basin and contains the sand filter layer. The surface of the filter bed may contain either a soil layer or grass cover crop.

B. Application and Limitations

Sand filters may be designed as trench systems to receive and treat parking lot runoff, and have been used to replace oil/water separators for pre-treatment. The storm water runoff is discharged or conveyed to another BMP for further treatment or disposal. Depending on soil types, sand filters may be designed as a stand-alone BMP to infiltrate all or a portion of treated runoff. Subsurface disposal restrictions will apply to this application.

The typical drainage area to be served by a sand filter should range from 0.5 to 10 acres. Depending on design, the contributing drainage area may be up to 50 acres.

C. Sizing

Sizing should be based on anticipated sediment accumulation and maintenance. Sand filters shall be sized using the following criteria:

- The sand filter shall be sized for water quality design storm requirements if it will be used as an off-line treatment facility.
- The maximum depth of water over the sand shall be 1'.
- Calculate the sand filter surface area using Darcy's Law or the filtration rate.
- The sand filter shall be designed to completely drain in a 24 hours or less.
- The filtration rate shall be 2" per hour.

D. Pretreatment

Sand filters should be preceded by pretreatment to allow for the settling of coarse sediment that may clog the sand filter and reduce its effectiveness. Pretreatment systems that may be used are sedimentation basins, grass buffer strips, biofiltration swales, or catch basin inserts.

E. Design

The sand bed shall include a minimum of 18" of 0.02-0.04" diameter sand or ASTM C-33 sand. If infiltration into the underlying soil is not desired, the bottom of the system shall be lined with one of the following impermeable layers:

- a minimum 12" thick layer of clay
- a concrete liner with approved sealer or epoxy coating, at least 5", reinforced with steel wire mesh (use 6 gauge or larger wire and 6" x 6" smaller mesh, or a geomembrane layer).

The bed of the filter should be composed of gravel, measuring at least 4-6"; 2" drain rock may also be used.

When sand filters are designed as off-line BMPs, they should be sized for the water quality design storm and the storm water conveyance should be fitted with flow splitters or weirs to route runoff to the sand filter. Excess runoff bypasses the sand filter and continues to another BMP for water quantity control. The inlet structure should be designed to spread the flow uniformly across the surface of the filter; use flow spreaders, weirs, or multiple orifices.

F. Design Life

Final ownership of the system may affect the design, layout and materials used in a system. The designer should specify the materials for the system and at a minimum, the system should be designed for a 50-year life.

G. Setbacks and Separation Distances

When sand filters infiltrate to the subsurface, the following requirements apply:

- Sand filters must be a minimum of 100' from public and private wells.
- There shall be a 5' vertical separation distance between the infiltration surface and bedrock.
- There shall be a 100' separation distance from surface water supplies used as drinking water and a 50' separation distance from surface water supplies not used as drinking water.
- There shall be a minimum 3' vertical separation distance from the infiltration surface and the seasonal high ground water table.

H. Maintenance

- For the first few months after construction, the sand filters should be inspected after every storm. Thereafter the sand filters should be inspected semi-annually to determine maintenance needs.
- The sand filters should be raked periodically to remove surface sediment, trash, and debris.
- Sediments shall be disposed of in accordance with local, state, and federal regulations.
- The top layer of sand should be replaced annually, or more frequently when drawdown does not occur within 36 hours after the presettling basin has emptied.
- The water level in the filter chamber should be monitored on a quarterly basis and after large storms during the first year.
- The sedimentation chamber should be pumped out or extracted when the sediment depth reaches 12".
- Oil on the surface should be removed separately and recycled. The remaining material may be removed by a vacuum pump and disposed of according to local, state, and federal regulations.

I. Maintenance Access

- Unobstructed access shall be provided over the entire sand filter by either doors or removable panels.
- Access to the sand filter should be provided for maintenance, including inlet pipe and outlet structure.
- Ladder access is required when vault height exceeds 4'. Access openings should have round solid locking lids with ½" diameter allen head screw locks.

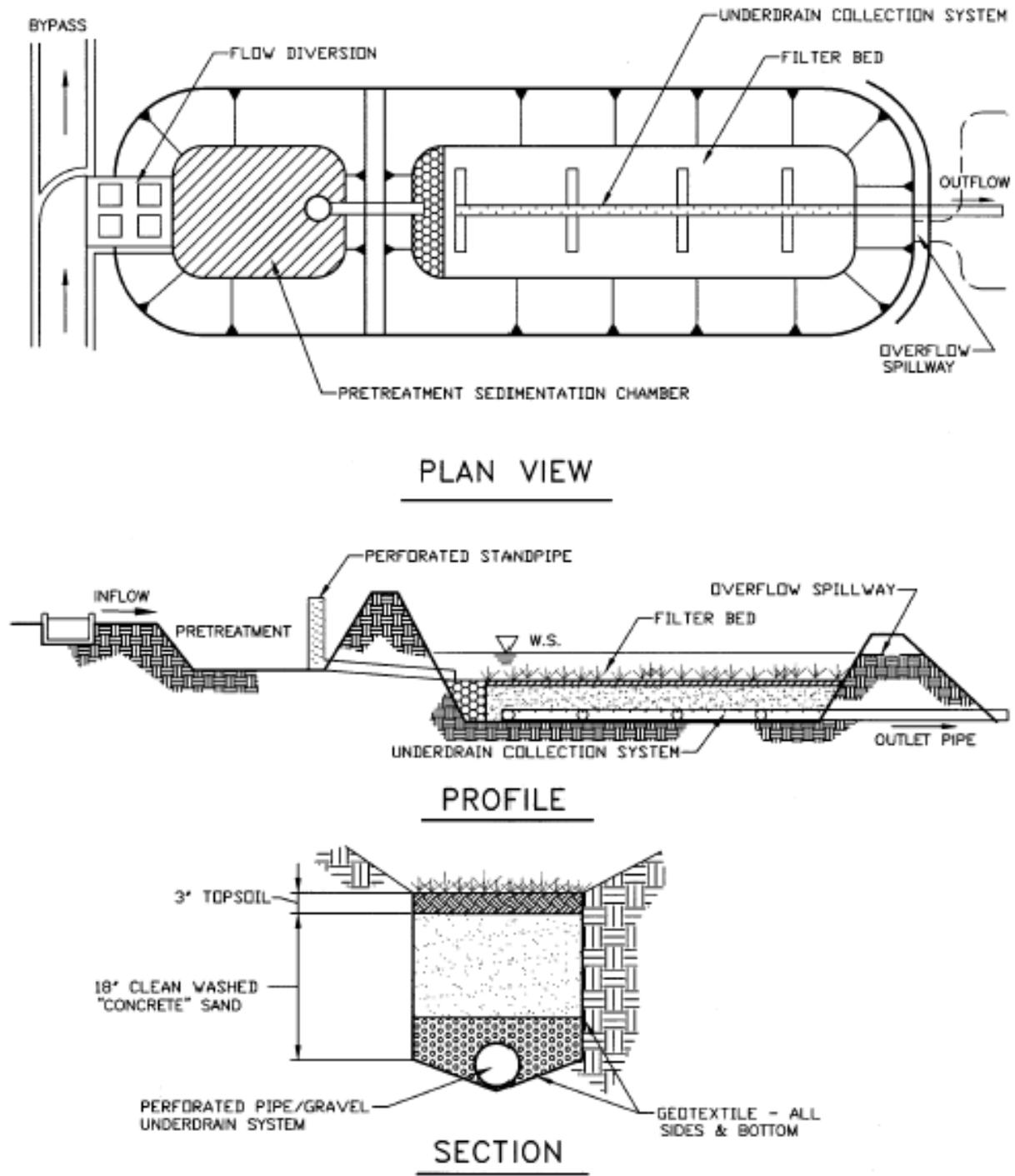


Figure 6.1. Austin Sand Filter.

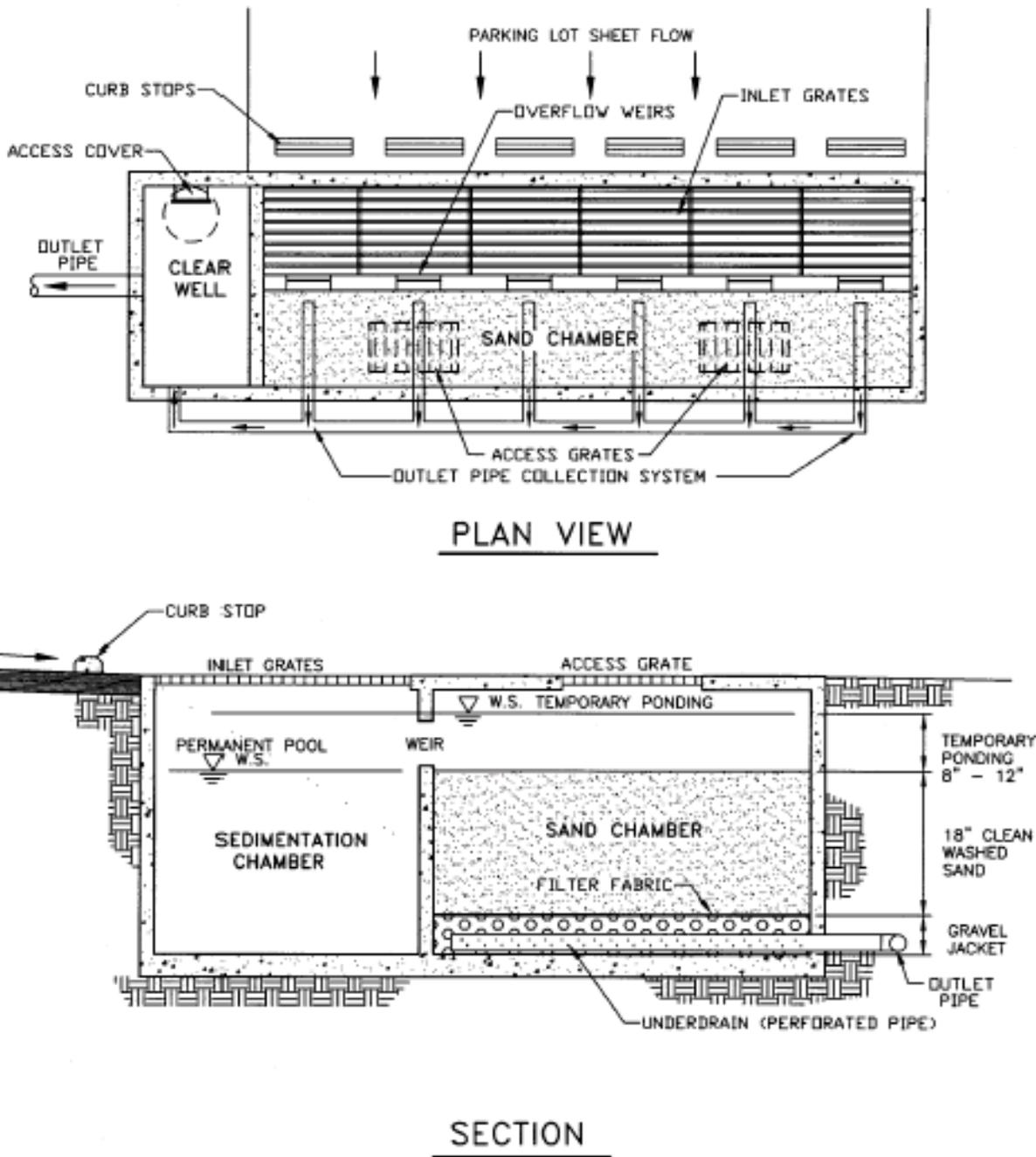


Figure 6.2. Delaware Sand Filter.

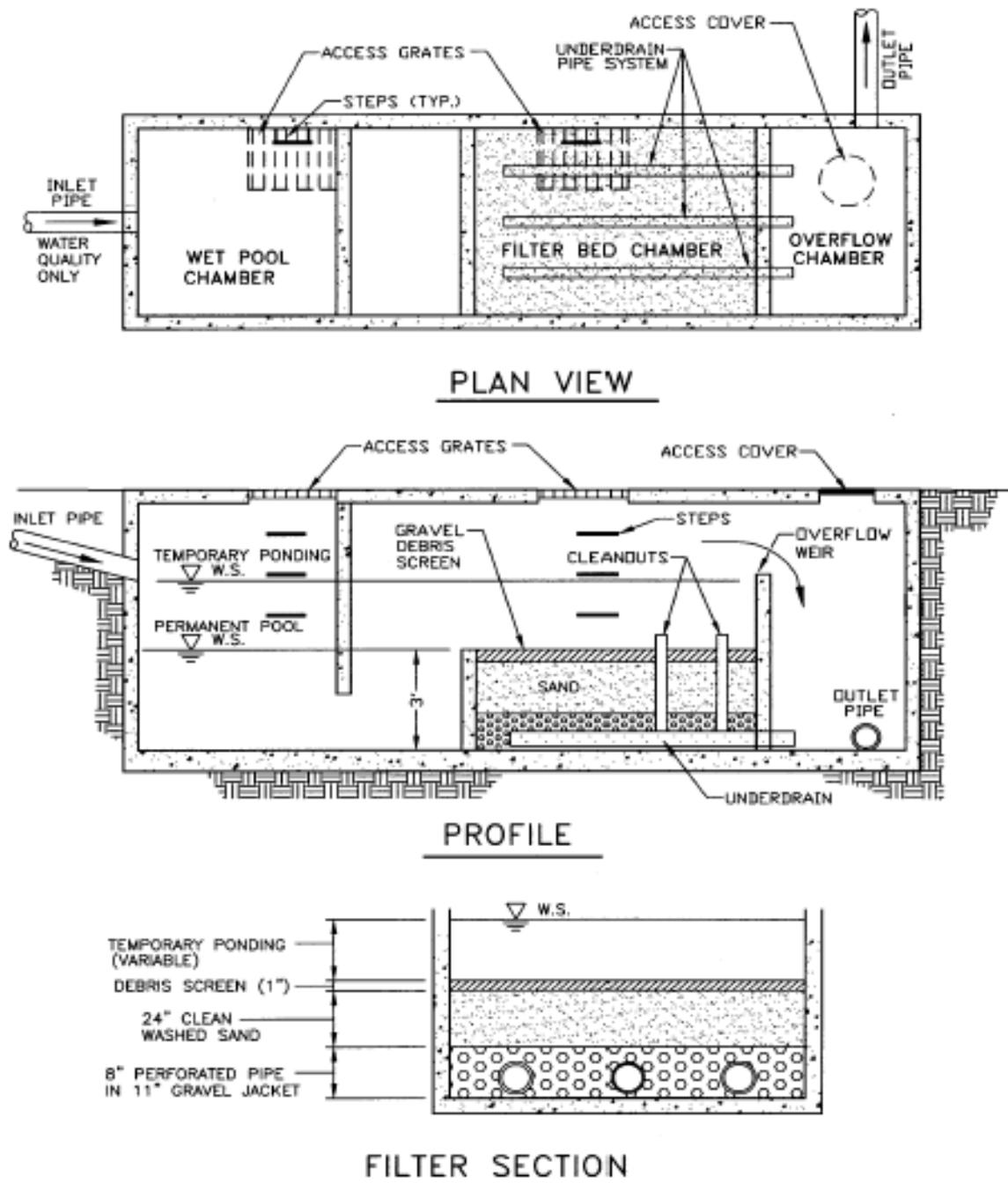


Figure 6.3. Underground Sand Filter.

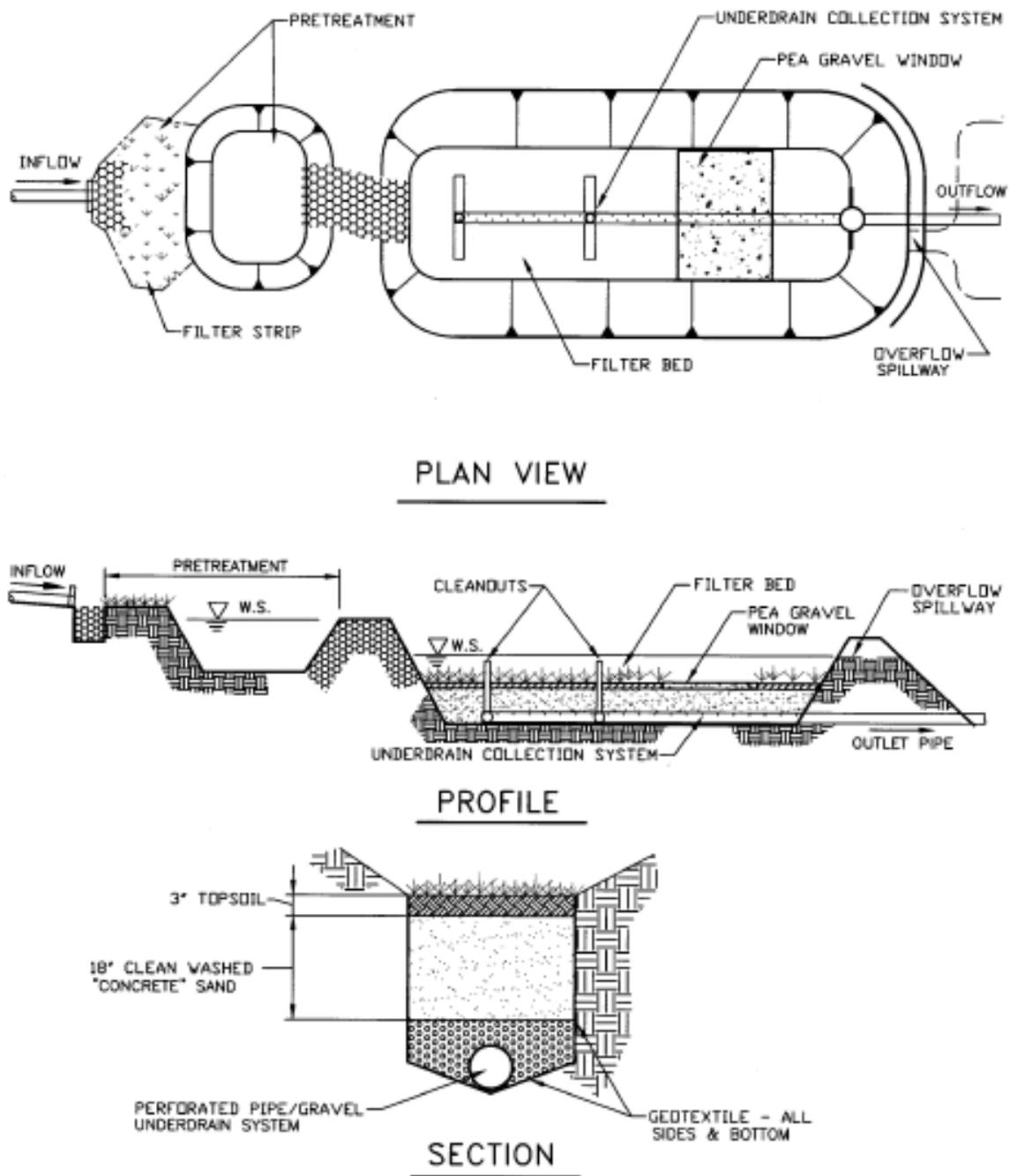


Figure 6.4. Pocket Sand Filter.

**APPENDIX F: CALCULATING PEAK DISCHARGE
AND VOLUME**

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This appendix describes methods for calculating pre- and post- development runoff volumes and peak discharge rates. These calculations should be performed in order to help select, size, and design stormwater BMPs to meet the peak flow rate, water quality, and groundwater recharge criteria described in Section 3.B.(6) of Appendix A. This Appendix provides steps for performing these calculations using the rational method, which is only applicable for sites 200 acres or less in size. For larger sites, areas with significant flood storage effects/features, highly complicated sites, or for BMP designs that require complete design hydrographs, calculations should be performed using the NRCS TR-55 method. A description of this method is not provided in this appendix; however, detailed TR-55 documentation and a free Windows-based download of the TR-55 program can be obtained on-line at:

<http://www.wcc.nrcs.usda.gov/water/quality/hydro/>

Hydrologic methods for determining runoff rate and volume other than the rational method or TR-55 may be acceptable, but the applicant must obtain prior approval from Summit County before beginning hydrologic studies and calculations using alternative methods.

Calculating Peak Runoff

Use the rational formula:

$$Q_p = CiA$$

Q_p	=	peak discharge (cfs)
C	=	dimensionless runoff coefficient
I	=	rainfall intensity (in./hr) for a duration equal to the time of concentration and for the recurrence interval chosen for design
A	=	site area (acres)

- 1) **Calculate site area (A).** This can be determined from USGS topographic maps, site surveys, and other available information.
- 2) **Determine the runoff coefficient (C).** This value is obtained from the tables below, and is based on land use type (s) for developed areas, and soil hydrologic group/ slope characteristics for undeveloped areas. For areas with mixed land uses, the area should be divided into subareas with similar characteristics (A_1 , A_2 , etc.), and a weighted coefficient should be determined using the following formula:

$$C = [(A_1 * C_1) + (A_2 * C_2) \dots + (C_n * A_n)] / A$$

where C_1, C_2 , etc. are the runoff coefficients for each individual subarea. Information on slope and land use can be obtained from USGS topographic maps, site surveys, air

photos, and other available data. Summit County soil maps and hydrologic group information can be obtained from local Soil Conservation Districts, or on-line at:

<http://soildatamart.nrcs.usda.gov/>

Soil hydrologic group information can be obtained by selecting the “generate reports - water features” function at this website. The different soil hydrologic groups are defined as follows (definitions taken from USDA Technical Release-55 “Urban Hydrology for Small Watersheds, 1986):

- Group A: These soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).
- Group B: These soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).
- Group C: These soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).
- Group D: These soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

Table F1. Recommended Rational Method “C” Coefficients for Developed Areas.

Land Use Category	Runoff Coefficient “C”
Business	
Central business areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential	
Single-Family	0.35-0.45
Multi-family, detached	0.40-0.60
Multi-family, attached	0.60-0.75
Low Density - 0.5 acre lots or larger	0.25-0.40
Industrial and Commercial	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad yard areas	0.20-0.40
Roofs	0.90-0.95
Streets, Drives, Walks (asphalt or concrete)	0.90-0.95
Streets, Drives, Walks (brick, gravel, or disconnected pavers)	0.70-0.85

Table F2. Recommended Rational Method “C” Coefficients for Undeveloped/Pervious Areas.

<u>Slope</u>	Runoff Coefficient “C” ^a			
	<u>A soils</u>	<u>B soils</u>	<u>C soils</u>	<u>D soils</u>
Flat (0-2%)	0.04-0.09	0.07-0.12	0.11-0.16	0.15-0.20
Average (2-6%)	0.09-0.14	0.12-0.17	0.16-0.21	0.20-0.25
Steep (>6%)	0.13-0.18	0.18-0.24	0.23-0.31	0.28-0.38

^avalues should be selected from the high or low end of the given ranges based on the condition of ground cover/vegetation.

- 3) **Calculate the time of concentration (T)** to use in determining the appropriate rainfall duration and intensity to use in the rational formula. T is the time required for water to travel the longest watercourse within the drainage area (i.e., the time for water to travel from the hydrologically most remote point of the basin to the location being analyzed). T can be determined graphically using Figure F1 or calculated using the FAA formula below. For small and/or highly impervious areas with very short times of concentration, the default minimum T value to be used for design purposes is 10 minutes.

$$T = 1.8 * (1.1 - C) D^{0.5} / S^{1/3}$$

T = time of concentration (minutes)

C = dimensionless runoff coefficient (same as used in rational formula)

D = length (in feet) of longest watercourse

S = % slope of longest watercourse

The variables D and S can be determined from USGS topographic maps, site surveys, and other available information. Care should be taken to field-verify flow path information to ensure that any existing graded swales, ditches, gutters, or other constructed drainage systems that intercept the natural contours are accounted for when determining slope and flow length for the purposes of these calculations.

For small and/or highly impervious areas with very short times of concentration, the default minimum T value to be used for design purposes is 10 minutes.

Additional information and an automated T calculator can be found on-line at:

<http://www.lmnoeng.com/Hydrology/TimeConc.htm>

- 4) **Determine the average rainfall intensity (I)**. This value should be obtained for the recurrence interval of interest and a duration equal to the time of concentration T calculated in (3) above using the NOAA Atlas 14 intensity-duration-frequency (IDF) curve for an appropriate nearby climate station. Table F3 and Figure F2 provide IDF data for the Park City climate station; additional IDF curves and tables can be obtained online at:

http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html

Table F3. NOAA Atlas 14 Precipitation Intensity Estimates for Station “Park City Radio, Utah” (Station #42-6648). Values are in inches per hour.

duration	Frequency								
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr	1000-yr
5 min	1.90	2.62	3.26	4.36	5.36	6.56	8.00	10.31	12.44
10 min	1.45	1.99	2.48	3.32	4.09	5.00	6.09	7.84	9.47
15 min	1.19	1.64	2.05	2.74	3.38	4.13	5.03	6.48	7.83
30 min	0.80	1.11	1.38	1.85	2.27	2.78	3.39	4.36	5.27
60 min	0.50	0.69	0.85	1.14	1.41	1.72	2.10	2.70	3.26
120 min	0.31	0.41	0.50	0.65	0.78	0.95	1.15	1.46	1.75
3 hr	0.24	0.30	0.36	0.45	0.54	0.64	0.77	0.98	1.18
6 hr	0.16	0.19	0.22	0.27	0.31	0.36	0.41	0.50	0.60
12 hr	0.10	0.12	0.14	0.17	0.19	0.21	0.24	0.28	0.31
24hr	0.07	0.08	0.09	0.10	0.11	0.13	0.14	0.15	0.17
48 hr	0.04	0.05	0.05	0.06	0.07	0.08	0.08	0.09	0.10
4 day	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06
7 day	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04
10 day	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
20 day	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
30 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
45 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
60 day	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

5) **Calculate the peak discharge (Q_p).** For storm events with recurrence intervals more frequent than 25 years, use the following formula:

$$Q_p = C \cdot I \cdot A$$

For storm events with recurrence intervals of 25 years or greater, the runoff coefficient should be adjusted by the factor C_f because infiltration and other abstractions have a proportionally smaller effect on runoff. Values for C_f are provided in Table F4. Once the C_f is determined, peak discharge is calculated using the following formula:

$$Q_p = C \cdot C_f \cdot I \cdot A$$

Q_p should be calculated for both pre- and post-development land use conditions. In order to meet the peak flow rate criteria outlined in Appendix A, Section 3B(6), non-structural and structural BMPs should be designed to control the post-development rate Q_p to the pre-development rate. Non-structural methods that reduce the post-development runoff coefficient and lengthen the time of concentration (e.g., preservation of natural areas with type A or B soils, minimizing impervious areas, using vegetated swales instead of storm sewers, etc.) will be the most effective techniques to meet the peak flow rate criteria.

Table F4. Runoff Coefficient Adjustment Factors for Rational Method.

<u>Recurrence Interval (years)</u>	<u>Adjustment Factor C_r</u>
25	1.1
50	1.2
100	1.25

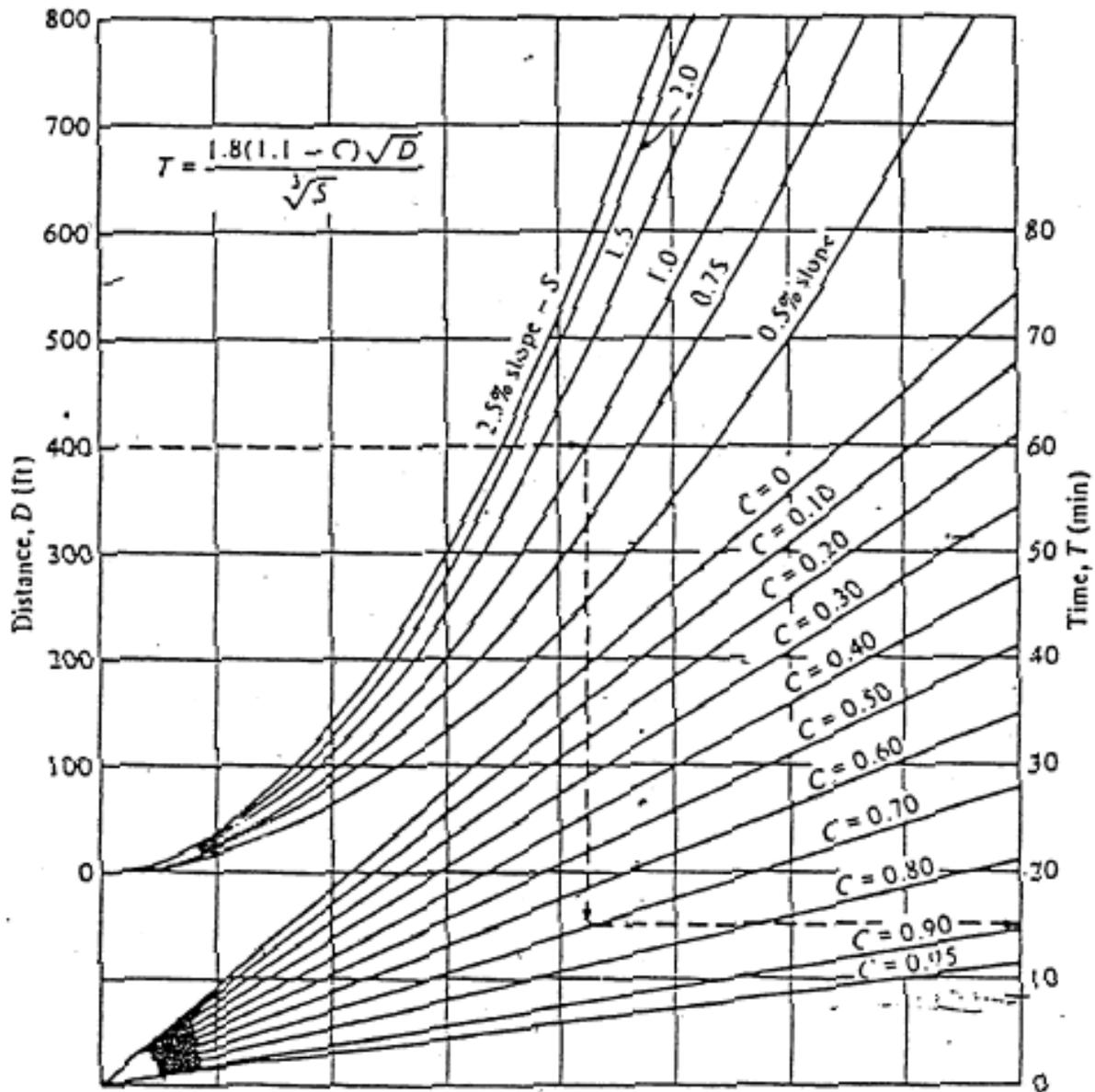
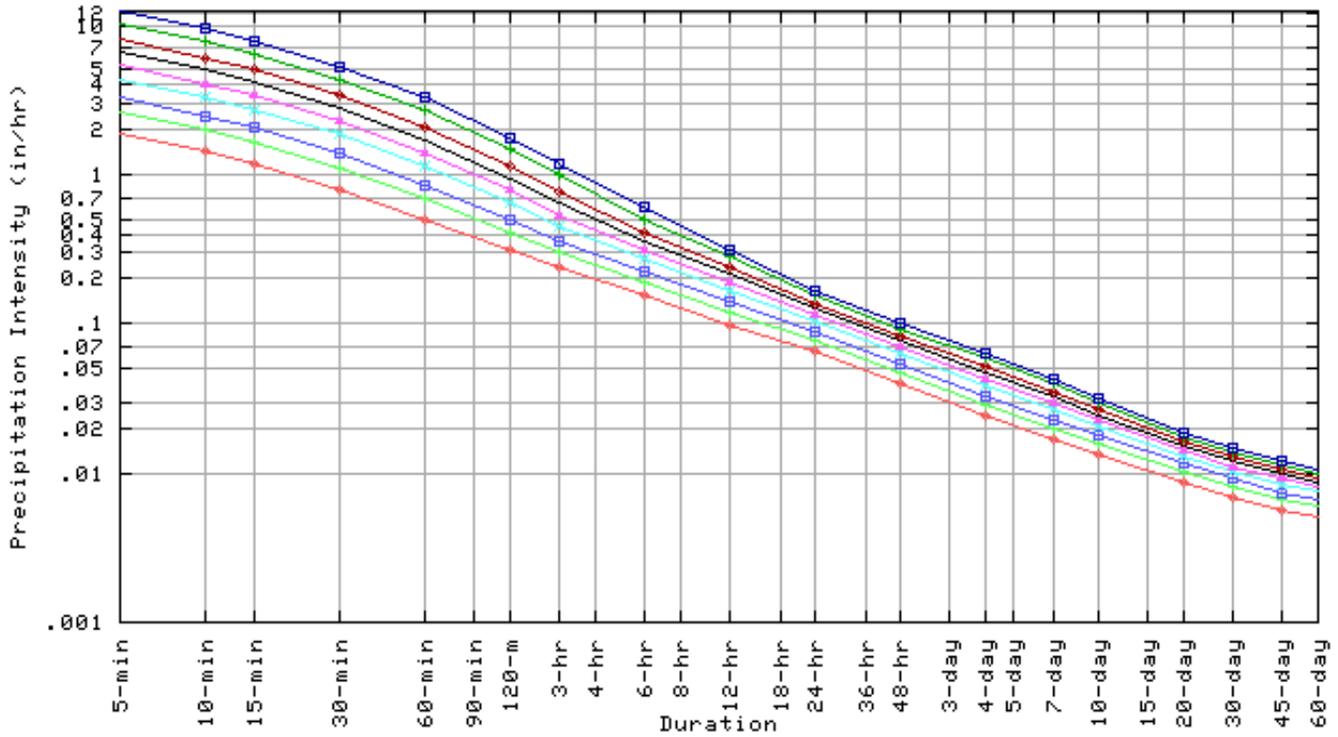


Figure F1. Time of concentration curves based on the FAA (1965) method.

Partial duration based Point IDF Curves
 40.65 N 111.5 W 6998 ft



Thu Jul 15 18:45:48 2004

Average Recurrence Interval (years)	
2-year	100-year
5-year	200-year
10-year	500-year
25-year	1000-year
50-year	

Figure F2. NOAA Atlas 14 precipitation intensity-duration-frequency curves for station "Park City Radio, Utah" (Station #42-6648).

Calculating Water Quality Volume

To meet the water quality and groundwater recharge criteria outlined in Appendix A, Section 3B(6), the runoff volume associated with a storm event of 0.5" in 1 hour must be calculated for pre- and post-development conditions.

Use the rational formula:

$$WQ_v = CItA$$

WQ_v	=	water quality volume (ft ³)
C	=	dimensionless runoff coefficient
I	=	rainfall intensity = 0.5"/hr = 0.042 ft/hr
t	=	storm duration = 1 hour
A	=	site area (ft ²)

$$WQ_v = C * (0.042 \text{ ft/hr}) * (1 \text{ hr}) * A = (0.042 \text{ ft}) * C * A$$

Runoff coefficient (C) values for the water quality volume calculation should be selected using the same tables and guidelines described above in the section on calculating peak runoff.

Calculating Groundwater Recharge Volume

The criteria in Appendix A, Section 3B(6) require that the increase in surface runoff volume from the water quality storm (0.5" in 1 hour) is recharged into the ground rather than discharged off-site as surface runoff. This required groundwater recharge volume (GW_v) is calculated as:

$$GW_v = WQ_v (\text{post-development}) - WQ_v (\text{pre-development})$$

where WQ_v is calculated as described above in the section on calculating water quality volume.

Calculating TSS Removal Rate

Rather than requiring a calculation of the actual real-world TSS load for a site, the application of this standard has been simplified to estimate a site's annual TSS load as 1.0 (i.e., 100%) as it enters the first BMP in the system. Therefore, in addition to performing the calculations below to demonstrate that adequate BMP performance efficiency has been provided, the permittee must also demonstrate compliance by showing that:

- The treatment BMPs have been designed/sized to treat the post-development water quality volume (WQ_v), calculated as described above; and,

- The BMPs are inspected regularly and maintained as needed to perform efficiently. Information on maintenance needs for individual BMPs is included in Appendix E, and sample inspection forms are provided in Appendix G.

Steps to calculate the TSS removal rate:

- 1) From Table 1 in Appendix E, determine the required final TSS removal rate $\text{\textcircled{R}}$ based on the percent of overall site area that is impervious. Use the definition for “impervious surface” provided in Appendix A Section 2. For sites where newly-developed impervious areas lie within 50 feet of a live water body (perennial or intermittent stream, lake, pond, spring, or reservoir), the Table 1 sliding scale does not apply and the default 80% TSS removal standard must be met.
- 2) If appropriate, divide the site into individual drainage areas. It is essential that the final TSS removal rate be calculated separately for each subarea. Isolated impervious areas (e.g., disconnected rooftops) that are serviced solely by their own BMPs, such as swales or seepage beds, should be considered as separate drainage areas. Each individual drainage area must meet the TSS removal rate for the entire site, as determined in step (1).
- 3) For each individual drainage area, list the storm water BMPs and their order in the engineered system, beginning with the first BMP collecting storm water from the site. For example, pretreatment and conveyance BMPs will typically precede the removal BMPs. Using the values from Appendix E Table 2, list the estimated TSS removal rate for each BMP in the treatment system.
- 4) Calculate the final TSS removal rate $\text{\textcircled{R}}$ according to the following formula:

$$R = (L_1 * R_1) + (L_2 * R_2) + (L_3 * R_3) \dots + (L_n * R_n)$$

L_1 = initial TSS load = 1.0 (i.e. 100%)

R_1 = fractional TSS removal rate for the first BMP in the system (e.g., if the removal rate listed in Appendix E Table 2 for BMP1 is 60%, the fractional rate R_1 is 0.60)

L_2 = remaining TSS load after preceding BMP = $L_1 - (L_1 * R_1)$

R_2 = fractional TSS removal rate for the second BMP in the system

L_3 = remaining TSS load after preceding BMP = $L_2 - (L_2 * R_2)$

R_3 = fractional TSS removal rate for the third BMP in the system

L_n = remaining TSS load after preceding BMP = $L_{(-1)} - (L_{(-1)} * R_{(-1)})$

R_n = fractional TSS removal rate of final (n^{th}) BMP in the system

As evident in the above formula, the TSS removal rates are not additive from one BMP to the next; instead, the estimated removal rates are applied consecutively as the TSS load passes through each BMP technology.

- 5) Check that the final removal rate R for each drainage area is greater than or equal to 0.80 (80%) or the applicable sliding scale standard from Appendix E Table 1. If R is less than the standard for any of the drainage areas, the system should be redesigned in order to meet the standards.

APPENDIX G: SAMPLE INSPECTION FORMS

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**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP1: Oil/Water Separators

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Separator Components (General)	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Discharge Quality			
Inlet Pipe			
Outlet Pipe			
Trash and Debris			
Sediment			
Bypass Valve			
Oil Absorbent Pads			
Item Inspected: Vault Structure			
Ladder			
Concrete (inspect when vault cleaned)			
Maintenance hole			
Inlet grates			
Baffles			
Item Inspected: Coalescing Plates			
Sediment			
Plates			
Item Inspected: Spill Control Separators			
Tee Section			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP2: Catch Basin Inserts

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Catch Basin Insert Components	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Filter Insert			
Grate Seal			
Sump			
Trash, debris, sediment, vegetation			
Pollution			
Access			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP3.1: Seepage Beds (Infiltration Trench)

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Seepage Bed	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Drain rock			
Filter fabric			
Surface Inlet (if present)			
Observation well (ponding should not be present)			
Surface (ponding should not be present)			
Surface vegetation			
Trash, sediment, debris			
Pre-treatment system (use additional checklist if appropriate, e.g. oil/water separator)			
Pollution			
Vegetated buffer strip (if present)			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP3.2: Infiltration Basin

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After
major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Infiltration Basin	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Inlet channel			
Inflow			
Outlet channel			
Outfall			
Forebay/sediment trap			
Pretreatment system (use additional checklist if appropriate)			
Trash, debris, sediment			
Surface vegetation			
Emergency spillway (if present)			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP3.3: Infiltration Swale

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Infiltration Swale	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Inflow			
Inflow energy dissipation (stilling basin, rip rap pad)			
Flow spreading device			
Sediment clean-out area			
Vegetation			
Trash, debris, sediment			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP4: Ponds

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Embankment and Spillways	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Vegetation and ground cover			
Erosion at inlets/ outlets/ side slopes			
Animal/rodent burrows			
Seeps or leaks in embankment or spillway			
Cracking, bulging, or sliding of dam			
Spillways clear of obstructions and debris			
Riser			
Pipe/ concrete/ masonry condition			
Trash rack(s) free of debris (low flow & weir)			
Orifice unobstructed by sediment/ debris			
Condition of access structures (e.g., ladders)			
Excessive sediment accumulation inside riser			
Outflow			
Evidence of slope or bank erosion			
Riprap condition			
Pipe & endwall/headwall condition			

Pond (General)			
Sedimentation level in sediment forebay			
Undesirable vegetative growth			
Sedimentation level in pond			
Evidence of pollution (oil, grease, etc.)			
Trash/ yard waste			
Graffiti			
Public safety hazards			
Noxious odors			
Noxious insects			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**
Summit County BMP5: Biofiltration Systems

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Biofiltration system components: Biofiltration swales and grass buffer strips	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Discharge Quality			
Vegetation height			
Sediment			
Flow channelization/erosion			
Vegetation type			
Bare spots/need for reseeding			
Flow spreading device			
Maintenance access			
Noxious weeds			
Pollution			
Ponding			
Trash/litter			

**INSPECTION AND MAINTENANCE CHECKLIST
FOR STRUCTURAL POST- CONSTRUCTION BMPs**

Summit County BMP6: Sand Filters

Date: _____ Time: _____ Type of inspection (circle one): Semi-Annual Monthly After major storm

Site Name/Location: _____

Inspector: _____

Item Inspected: Sand Filter Components (General)	Satisfactory yes/no	Type of Maintenance Needed if Unsatisfactory	Comments
Discharge Quality			
Inlet Pipe			
Outlet Pipe			
Trash and Debris			
Sediment depth			
Bypass Valve			
Filter Bed			
Sedimentation Chamber/Pond (use additional checklist if appropriate)			
Infiltration rate/ponding after 36 hours			
Oil or other pollutants			
Vegetation			

Appendix E Summit County Water Body Impairments

OBJECTID	ASSESS_ID	AU_Type	AU_NAME	AU_DESCRIP	BEN_CLASS	MGMT_UNIT	ASSESSMENT	IMPAIRMENT	TMDL_REQRD	TMDL_APPRV	HAB_IMPAIR
1	UT-L-14040106-001_00	Reservoir/Lake	Hoop Lake	Hoop Lake	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
2	UT-L-14040106-002_00	Reservoir/Lake	Spirit Lake	Spirit Lake	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
3	UT-L-14040106-031_00	Reservoir/Lake	Beaver Meadow Reservoir	Beaver Meadow Reservoir	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
4	UT-L-14040107-001_00	Reservoir/Lake	Meeks Cabin Reservoir	Meeks Cabin Reservoir	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
5	UT-L-14040107-003_00	Reservoir/Lake	Marsh Lake	Marsh Lake	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
6	UT-L-14040107-004_00	Reservoir/Lake	Bridger Lake	Bridger Lake	2B, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Dissolved Oxygen, pH	Dissolved Oxygen, pH	none	none
7	UT-L-14040107-005_00	Reservoir/Lake	Lyman Lake	Lyman Lake	2A, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Dissolved Oxygen	Dissolved Oxygen	none	none
8	UT-L-14040107-006_00	Reservoir/Lake	China Lake	China Lake	2B, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Dissolved Oxygen, Temperature	Dissolved Oxygen, Temperature	none	none
9	UT-L-14040107-007_00	Reservoir/Lake	Stateline Reservoir	Stateline Reservoir	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
10	UT-L-16010101-030_00	Reservoir/Lake	Whitney Reservoir	Whitney Reservoir	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none
11	UT-L-16020101-001_00	Reservoir/Lake	Echo Reservoir	Echo Reservoir	1C, 2A, 3A, 4	Weber River	4A: Approved TMDL. Impaired	Use Class 3A (Cold Water Fishery/Aquatic Life): Phosphorus	none	Phosphorus	none
12	UT-L-16020101-002_00	Reservoir/Lake	Rockport Reservoir	Rockport Reservoir	1C, 2A, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 1C (Domestic/Drinking Water Source): E. coli; Use Class 2A (Frequent Primary Contact Recreation): E. coli; Use Class 3A (Cold Water Fishery/Aquatic Life): pH	E. coli, pH	none	none
13	UT-L-16020101-005_00	Reservoir/Lake	Smith and Morehouse Reservoir	Smith and Morehouse Reservoir	1C, 2B, 3A, 4	Weber River	2: Supports all assessed uses	none	none	none	none
14	UT-L-16020203-002_00	Reservoir/Lake	Trial Lake	Trial Lake	1C, 2B, 3A, 4	Upper Provo River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): pH	pH	none	none
15	UT-L-16020203-005_00	Reservoir/Lake	Washington Lake	Washington Lake	2B, 3A, 4	Upper Provo River	2: Supports all assessed uses	none	none	none	none
16	UT-L-16020203-006_00	Reservoir/Lake	Wall Lake	Wall Lake	2B, 3A, 4	Upper Provo River	3: Insufficient Data. Need more information	none documented	none	none	none
17	UT14040106-001_00	River/Stream	Dahlgreen Creek	Dahlgreen Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
18	UT14040106-002_00	River/Stream	Henrys Fork River	Henrys Fork River and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
19	UT14040106-003_00	River/Stream	West Fork Beaver Creek	West Fork Beaver Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	1: Supports all designated uses	none	none	none	none
20	UT14040106-004_00	River/Stream	Middle Fork Beaver Creek	Middle Fork Beaver Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	1: Supports all designated uses	none	none	none	none
21	UT14040106-005_00	River/Stream	Burnt Fork Creek	Burnt Fork Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
22	UT14040106-006_00	River/Stream	Birch Creek-tribs	Birch Creek tributaries Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	3: Insufficient Data. Need more information	none documented	none	none	none
23	UT14040106-007_00	River/Stream	Sheep Creek	Sheep Creek and tributaries from Flaming Gorge Reservoir to headwaters	2B, 3A, 4	Uinta Basin	1: Supports all designated uses	none	none	none	none

24	UT14040107-001_00	River/Stream	Blacks Fork	Blacks Fork River and tributaries from Utah-Wyoming state line at Meeks Cabin Reservoir to headwaters	2B, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Aluminum	Aluminum	none	none
25	UT14040107-002_00	River/Stream	Archie Creek	Archie Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
26	UT14040107-003_00	River/Stream	West Fork Smiths Fork	West Fork Smiths Fork and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
27	UT14040107-004_00	River/Stream	Gilbert Creek	Gilbert Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	2: Supports all assessed uses	none	none	none	none
28	UT14040107-005_00	River/Stream	East Fork Smiths Fork	East Fork Smiths Fork and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Aluminum, Zinc	Aluminum, Zinc	none	none
29	UT14040108-001_00	River/Stream	West Muddy Creek	West Muddy Creek and tributaries from Utah-Wyoming state line to headwaters	2B, 3A, 4	Uinta Basin	3: Insufficient Data. Need more information	none documented	none	none	none
30	UT14060003-024_00	River/Stream	Uinta River-4	Uinta River and tributaries from USFS boundary to headwaters	2B, 3A, 4	Uinta Basin	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Zinc	Zinc	none	none
31	UT16010101-018_00	River/Stream	Sutton Creek	Sutton Creek and tributaries from Utah-Wyoming border to headwaters	2B, 3A, 4	Bear River	3: Insufficient Data. Need more information	none documented	none	none	none
32	UT16010101-019_01	River/Stream	Yellow Creek Tributaries-1	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none
33	UT16010101-019_02	River/Stream	Yellow Creek Tributaries-2	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none
34	UT16010101-021_00	River/Stream	Bear River-6	Bear River and tributaries from Utah-Wyoming border to Hayden Fork - Stillwater Fork confluence	2B, 3A, 4	Bear River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Aluminum	Aluminum	none	none
35	UT16010101-022_00	River/Stream	Mill Creek	Mill Creek and tributaries from Utah-Wyoming border to headwaters	2B, 3A, 4	Bear River	1: Supports all designated uses	none	none	none	none
36	UT16010101-023_00	River/Stream	West Fork Bear River	West Fork Bear River and tributaries from confluence with Bear River to headwaters	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none
37	UT16010101-024_00	River/Stream	Hayden Fork	Hayden Fork and tributaries from confluence with Stillwater Creek to headwaters	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none

38	UT16010101-025_00	River/Stream	Stillwater Fork	Stillwater Fork and tributaries from confluence with Hayden Fork to headwaters	2B, 3A, 4	Bear River	5: TMDL Required (Impaired 303d list)	Use Class 2B (Infrequent Primary Contact Recreation): pH; Use Class 3A (Cold Water Fishery/Aquatic Life): pH; Use Class 4 (Agriculture - crop irrigation, stock watering): pH	pH	none	none
39	UT16010101-026_00	River/Stream	East Fork Bear River	East Fork Bear River and tributaries from confluence with Hayden Fork to headwaters	2B, 3A, 4	Bear River	2: Supports all assessed uses	none	none	none	none
40	UT16010101-028_00	River/Stream	Yellow Creek	Yellow Creek and tributaries from Utah-Wyoming border to headwaters	2B, 3A, 4	Bear River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Benthic Invertebrate Assessment	Benthic Invertebrate Assessment	none	none
41	UT16020101-001_00	River/Stream	Lost Creek1-Croydon	Lost Creek and tributaries from confluence with Weber River to Lost Creek Reservoir	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
42	UT16020101-004_00	River/Stream	Weber River-7	Weber River segment between confluence of Lost Creek and Echo Reservoir	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Phosphorus; Use Class 3A (Cold Water Aquatic Life): Benthic Invertebrate Assessment	Benthic Invertebrate Assessment, Phosphorus	none	none
43	UT16020101-005_00	River/Stream	Main Canyon	Main Canyon Creek and other tributaries to Weber River	1C, 2B, 3A, 4	Weber River	2: Supports all assessed uses	none	none	none	none
44	UT16020101-006_00	River/Stream	Weber Upper Tributaries-1	Weber River east side tributaries from Lost Creek confluence to Echo Creek	1C, 2B, 3A, 4	Weber River	3: Insufficient Data. Need more information	none documented	none	none	none
45	UT16020101-007_00	River/Stream	Echo Creek	Echo Creek and tributaries from confluence with Weber River to headwaters, excluding Sawmill Creek	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 3A (Cold Water Fishery/Aquatic Life): Sediment; Use Class 4 (Agriculture - crop irrigation, stock watering): Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS)	Sediment	none
46	UT16020101-008_00	River/Stream	Carruth Creek	Carruth and Lewis Canyon Creeks and tributaries from confluence with Echo Reservoir to headwaters	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 1C (Domestic/Drinking Water Source): E. coli; Use Class 2B (Infrequent Primary Contact Recreation): E. coli	E. coli	none	none
47	UT16020101-009_00	River/Stream	Grass Creek	Grass Creek and tributaries from confluence with Echo Reservoir to headwaters	1C, 2B, 3A, 4	Weber River	3: Insufficient Data. Need more information	none documented	none	none	none
48	UT16020101-010_00	River/Stream	Chalk Creek1-Coalville	Chalk Creek and tributaries from confluence with Weber River to South Fork confluence	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
49	UT16020101-011_00	River/Stream	South Fork Chalk Creek	South Fork Chalk Creek and tributaries from confluence with Chalk Creek to headwaters	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 1C (Domestic/Drinking Water Source): E. coli; Use Class 2B (Infrequent Primary Contact Recreation): E. coli; Use Class 3A (Cold Water Fishery/Aquatic Life): Sediment, Phosphorus	E. coli	Sediment, Phosphorus	none

50	UT16020101-012_00	River/Stream	Chalk Creek-2	Chalk Creek and tributaries from South Fork confluence to Huff Creek confluence	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 1C (Domestic/Drinking Water Source): E. coli; Use Class 2B (Infrequent Primary Contact Recreation): E. coli	E. coli	none	none
51	UT16020101-013_00	River/Stream	Huff Creek	Huff Creek and tributaries from confluence with Chalk Creek to headwaters	1C, 2B, 3A, 4	Weber River	4A: Approved TMDL. Impaired	Use Class 3A (Cold Water Fishery/Aquatic Life): Sediment, Phosphorus	none	Sediment, Phosphorus	none
52	UT16020101-014_00	River/Stream	Chalk Creek3-Coalville	Chalk Creek and tributaries from Huff Creek confluence to East Fork confluence	1C, 2B, 3A, 4	Weber River	4A: Approved TMDL. Impaired / 4C: Habitat Impaired	Use Class 3A (Cold Water Fishery/Aquatic Life): Habitat Alterations, Phosphorus, Sediment	none	Phosphorus, Sediment	Habitat Alterations
53	UT16020101-015_00	River/Stream	East Fork Chalk Creek	East Fork Chalk Creek and tributaries from confluence with Chalk Creek to headwaters	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
54	UT16020101-016_00	River/Stream	Chalk Creek-4	Chalk Creek and tributaries from East Fork Chalk Creek confluence to headwaters	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 3A (Cold Water Fishery/Aquatic Life): Dissolved Oxygen, Sediment, Phosphorus	Dissolved Oxygen	Sediment, Phosphorus	none
55	UT16020101-017_00	River/Stream	Weber River-8	Weber River from Echo Reservoir to Rockport Reservoir	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
56	UT16020101-018_00	River/Stream	Weber Upper Tributaries-2	Weber River west side tributaries between Echo Reservoir and Silver Creek confluence	1C, 2B, 3A, 4	Weber River	3: Insufficient Data. Need more information	none documented	none	none	none
57	UT16020101-019_00	River/Stream	Weber Upper Tributaries-3	Weber River east side tributaries between Echo Reservoir and Fort Creek confluence	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
58	UT16020101-020_01	River/Stream	Silver Creek-1	Silver Creek and tributaries, from the confluence with Weber River to below the confluence with Tollgate Creek	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 1C (Domestic/Drinking Water Source): E. coli, Cadmium, Arsenic, Nitrate, Nitrite + Nitrate as N; Use Class 2B (Infrequent Primary Contact Recreation): E. coli; Use Class 3A (Cold Water Fishery/Aquatic Life): Cadmium, Zinc, Benthic Invertebrate Assessment; Use Class 4 (Agriculture - crop irrigation, stock watering): Cadmium, Total Dissolved Solids (TDS)	Arsenic, E. coli, Total Dissolved Solids (TDS), NITRATE, Benthic Invertebrate Assessment, NITRATE/NITRITE (NITRITE + NITRATE AS N)	Cadmium, Zinc	none
59	UT16020101-020_02	River/Stream	Silver Creek-2	Silver Creek and tributaries, from confluence with Tollgate Creek to headwaters	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 1C (Domestic/Drinking Water Source): E. coli, Cadmium, Arsenic, Nitrate, Nitrite + Nitrate as N; Use Class 2B (Infrequent Primary Contact Recreation): E. coli; Use Class 3A (Cold Water Fishery/Aquatic Life): Cadmium, Zinc, Benthic Invertebrate Assessment; Use Class 4 (Agriculture - crop irrigation, stock watering): Cadmium, Total Dissolved Solids (TDS)	Benthic Invertebrate Assessment, NITRATE, Arsenic, Total Dissolved Solids (TDS), NITRATE/NITRITE (NITRITE + NITRATE AS N), E. coli	Cadmium, Zinc	none
60	UT16020101-021_00	River/Stream	Weber Upper Tributaries-4	Weber River west side tributaries between Silver Creek confluence and Beaver Creek confluence	1C, 2B, 3A, 4	Weber River	2: Supports all assessed uses	none	none	none	none

61	UT16020101-022_00	River/Stream	Fort Creek	Fort Creek and tributaries from confluence with Weber River to headwaters	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
62	UT16020101-023_00	River/Stream	Weber River-9	Weber River from Rockport Reservoir to Weber-Provo Canal	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
63	UT16020101-024_00	River/Stream	Weber River-10	Weber River and tributaries from Provo Canal Diversion to Smith-Morehouse confluence	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
64	UT16020101-025_00	River/Stream	Weber River-11	Weber River and tributaries from Smith Morehouse confluence to Holiday Park	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
65	UT16020101-026_00	River/Stream	Smith Morehouse River-1	Smith Morehouse River from confluence with Weber River to Smith Morehouse Reservoir	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
66	UT16020101-027_00	River/Stream	Smith Morehouse River-2	Smith Morehouse River and tributaries from Smith Morehouse Reservoir to headwaters	1C, 2B, 3A, 4	Weber River	3: Insufficient Data. Need more information	none documented	none	none	none
67	UT16020101-028_00	River/Stream	Weber River-12	Weber River and tributaries from Holiday Park to headwaters	1C, 2B, 3A, 4	Weber River	2: Supports all assessed uses	none	none	none	none
68	UT16020101-029_00	River/Stream	Beaver Creek-1	Beaver Creek and tributaries from confluence with Weber River to Kamas	1C, 2B, 3A, 4	Weber River	3: Insufficient Data. Need more information	none documented	none	none	none
69	UT16020101-030_00	River/Stream	Beaver Creek2-Kamas	Beaver Creek and tributaries from Kamas to headwaters	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Aluminum	Aluminum	none	none
70	UT16020101-031_00	River/Stream	Sawmill Creek	Sawmill Creek and tributaries from confluence with Echo Creek to headwaters	1C, 2B, 3A, 4	Weber River	1: Supports all designated uses	none	none	none	none
71	UT16020102-026_01	River/Stream	East Canyon Creek-2	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters, except Murnin Creek and Toll Canyon	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 3A (Cold Water Fishery/Aquatic Life): Phosphorus, Temperature; Use Class 4 (Agriculture - crop irrigation, stock watering): Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS), Temperature	Phosphorus	none
72	UT16020102-026_02	River/Stream	Murnin Creek	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters, Murnin Creek portion	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 3A (Cold Water Fishery/Aquatic Life): Phosphorus, Temperature; Use Class 4 (Agriculture - crop irrigation, stock watering): Total Dissolved Solids (TDS)	Temperature, Total Dissolved Solids (TDS)	Phosphorus	none
73	UT16020102-026_03	River/Stream	Toll Canyon	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters, Toll Canyon portion	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list) and 4A: TMDL Approved (Impaired)	Use Class 3A (Cold Water Fishery/Aquatic Life): Phosphorus, Temperature; Use Class 4 (Agriculture - crop irrigation, stock watering): Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS), Temperature	Phosphorus	none
74	UT16020102-027_00	River/Stream	Kimball Creek	Kimball Creek and tributaries from East Canyon Creek confluence to headwaters, including McLeod Creek	1C, 2B, 3A, 4	Weber River	5: TMDL Required (Impaired 303d list)	Use Class 1C (Domestic/Drinking Water Source): Arsenic	Arsenic	none	none

75	UT16020203-005_00	River/Stream	Provo River-5	Provo River from Jordanelle Reservoir to Woodland	1C, 2B, 3A, 4	Upper Provo River	Upper Provo River	Upper Provo River	Upper Provo River	Upper Provo River	Upper Provo River
76	UT16020203-006_01	River/Stream	Provo River-6-1	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	1C, 2B, 3A, 4	Upper Provo River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Aluminum	Aluminum	none	none
77	UT16020203-006_02	River/Stream	Provo River-6-2	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	1C, 2B, 3A, 4	Upper Provo River	5: TMDL Required (Impaired 303d list)	Use Class 3A (Cold Water Fishery/Aquatic Life): Zinc, Aluminum	Zinc, Aluminum	none	none
78	UT16020203-006_03	River/Stream	Provo River-6-3	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	1C, 2B, 3A, 4	Upper Provo River	5: TMDL Required (Impaired 303d list)	Use Class 1C (Domestic/Drinking Water Source): pH; Use Class 2B (Infrequent Primary Contact Recreation): pH; Use Class 3A (Cold Water Fishery/Aquatic Life): pH, Aluminum, Copper; Use Class 4 (Agriculture - crop irrigation, stock watering): pH	Aluminum, Copper, pH	none	none

Appendix F Summit County Area Prioritization Plan and Procedures



SUMMIT COUNTY OUTFALL MAPPING PLAN, AREA PRIORITIZATION PLAN, PROCEDURES & HIGH PRIORITY AREA MAP

UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)
DIVISION OF WATER QUALITY (DWQ)
SUMMIT COUNTY'S UTAH POLLUTION DISCHARGE ELIMINATION SYSTEM (UPDES)
PERMIT NO. UTR090074 FOR SMALL MS4S
PERMIT REQUIREMENT 4.2.3.1

4.2.3.1 Maintain a current storm sewer system map of the MS4, showing the location of all municipal storm sewer outfalls with the names and location of all State waters that receive discharges from those outfalls, storm drain pipes, and other storm water conveyance structures within the MS4.

This plan has been prepared as required under the DWQ's Audit Report (DWQ-2021-035601) dated March 1, 2022. The report states:

The Permittee had not completed mapping of their system including location of all outfalls, location/names of all receiving water, all storm drains pipes, or all other stormwater conveyance structures. The County must submit a plan to prioritize mapping that takes into consideration land-use and population. The focus should be on areas that discharge to impaired waters and areas with greatest potential for storm water related discharges (e.g. areas not primarily agriculture or forest). The County must also detail how new infrastructure and outfalls are mapped.

Proposed actions:

1. County-Wide Mapping and System Information Updates
 - a. Outfall identification will occur one day a week by a Summit County Stormwater Inspector (typically Tuesday's) starting April 12, 2022 and continue until completion.
 - i. If time restraints allow the inspection frequency will be increased to two days a week, but never decreased given unavoidable restrictions (i.e. weather conditions, illness, etc..)
 - b. Outfall inspection will occur one day a week by a Summit County Stormwater Inspector in conjunction with identification (typically Tuesday's) starting April 12, 2022 and continue until completion.

- i. If time restraints allow the inspection frequency will be increased to two days a week, but never decreased given unavoidable restrictions (i.e. weather conditions, illness, etc..)
 - c. Outfall updated mapping will occur one day a week either same day or day after identification and inspection.
- 2. Estimated Time Frame
 - a. The time frame for completion is unknown, but Summit County estimates that it will take about 7-12 months.
- 3. Prioritization Areas
 - a. Outfall mapping will begin in the areas with the following criteria:
 - i. Areas with older infrastructure with increased potential for illicit connections
 - ii. Industrial, commercial or mixed-use areas
 - iii. Areas with a history of illegal dumping
 - iv. Areas with onsite sewage disposal systems
 - v. Areas with older sewer lines or a history of sewer overflows or cross connections
 - vi. Areas upstream of sensitive waterbodies
 - vii. Other areas Summit County determines to have increased potential for illicit discharges
- 4. New Infrastructure Mapping
 - a. New infrastructure will be reviewed and identified at the pre-construction meeting and included on the pre-construction checklist
 - b. At the Notice of Termination inspection the new infrastructure will be inspected and updated in the ArcGIS mapping database

Summit County's Prioritized Outfall Map

Below is a link to the Summit County Zoning Map.

<https://summitcounty.maps.arcgis.com/apps/webappviewer/index.html?id=8fa54cade4d64da8b8a6869ba9b38f82>

Please reference the Layers List within the ArcGIS system as it correlates to the ranking areas below:

Ranking Area Prioritized for Mapping Outfalls:

1. **Ridgelines**
2. **Snyderville Basin Planning District**
 - a. **Mountain Remote**
 - b. **Hillside Stewardship**
 - c. **Community Commercial**
 - d. **Resort Center**
 - e. **Town Center**
 - f. **Service Commercial**
 - g. **Neighborhood Commercial**
 - h. **Rural Residential**
3. **Lower Silver Creek Soils Overlay Zone**
4. **Agriculture Protection Parcels**
5. **Eastern Summit County Planning District**
 - a. **Commercial**
 - b. **Industrial**
 - c. **Light Industrial**
 - d. **AG/Grazing – 40**
 - e. **AG/Grazing – 5**
 - f. **AG/Grazing – 10**
 - g. **AG/Grazing – 20**
 - h. **AG/Grazing – 80**

Note: Rankings 1 - 5 and sub-rankings a – h were based on the following criteria; areas with older infrastructure with increased potential for illicit connections, industrial, commercial or mixed- use areas, areas with a history of illegal dumping, areas with onsite sewage disposal systems, areas with older sewer lines or a history of sewer overflows or cross connections, areas upstream of

sensitive waterbodies, and other areas Summit County determines to have increased potential for illicit discharges

Procedures to Identify High Priority Areas

Steps for Identifying High Priority Areas

Requirements:

Step 1. Identify areas with frequent illicit discharges or sewer overflows, maintained on ArcGIS map

Step 2. Identify areas with frequent complaints maintained on complaint log

Step 3. Identify areas with increasing construction activities

- a. look at size and number of permits,
- b. this is a general characterization, and may change with areas being built out

Step 4. Identify areas that have a higher population density

Step 5. Identify areas that have older infrastructure

Step 6. Areas near and directly discharging to East Canyon Creek Corridor (sensitive water body)

Areas with frequent IDDE's will automatically be considered high priority

Areas with 2 or more other requirements will be considered high priority

Areas with 1 requirement will be considered medium priority

All other areas will be considered low priority

List and Map will be reviewed and updated annually in conjunction with review of the SWMP

List and Justification of High Priority Areas in Summit County

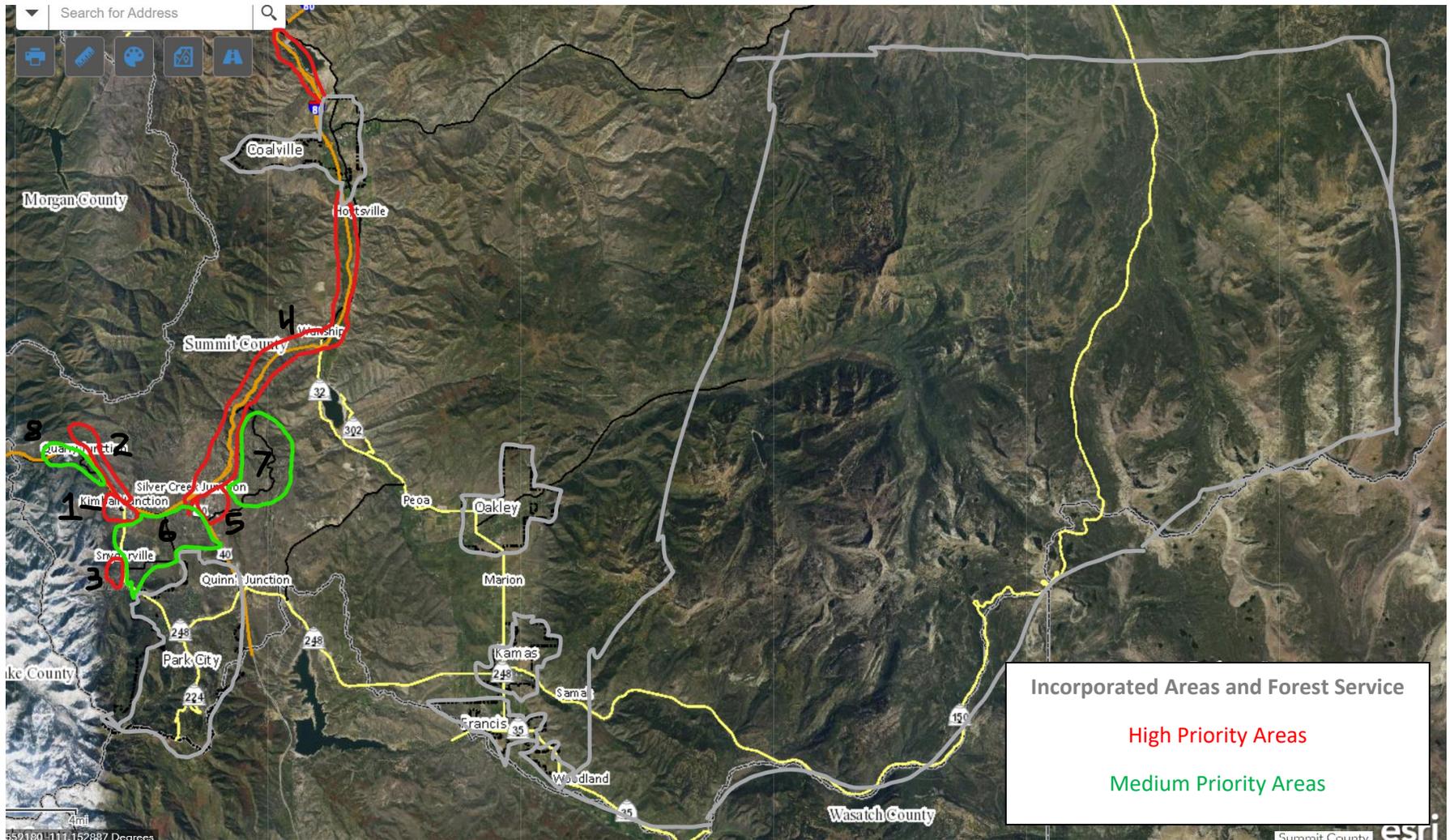
Kimball Junction – frequent illicit discharges, high population density, older infrastructure

East Canyon Creek Corridor – sensitive water body system, frequent complaints

Canyons Village – increased construction activity, high population density

I-80 Corridor (Silver Creek to Echo Reservoir) – frequent illicit discharges

Silver Creek Village – high population density, increased construction activity



Incorporated Areas and Forest Service

High Priority Areas

Medium Priority Areas

- High Priority Areas:**
1. Kimball Junction
 2. East Canyon Creek Corridor
 3. Canyons Village
 4. I-80 Corridor (Silver Creek to Echo Reservoir)
 5. Silver Creek Village

- Medium Priority Areas:**
6. Snyderville Basin
 7. Promontory
 8. Discovery Ridge/Woodward

Low Priority Areas:

All other areas not falling within High or Medium

Appendix G Summit County Facility Owned Inventory

SUMMIT COUNTY FACILITY OWNED INVENTORY

Location	Uses	Priority	Floor Drains	Floor Drain Discharge Location	Lined Pond	Outfall	Potential Stormwater Pollutants	Pollution Prevention	Incorporated or Unincorporated
3 Mile Landfill	Landfill	High*	0	-			See Landfill SWPPP	See Landfill SWPPP	Unincorporated
Public Works Facility	Maintenance	High*	9	Detention Pond	Yes	No	See Public Works SWPPP	See Public Works SWPPP	Unincorporated
Henefer Landfill	Landfill	High*	0	-			See Landfill SWPPP	See Landfill SWPPP	Unincorporated
Summit Shed	Parking/Vehicle Storage	Medium	0				Occasional temporary storage of vehicles, gravel stockpiles, glass recycling	Good Housekeeping, Regular clearing of stockpiles	Unincorporated
Courthouse	Office	Low	11	CWTP			Trash	Good Housekeeping	Incorporated-Coalville City
Courthouse Lot	Parking	Low	1	CWTP			Vehicles	Good Housekeeping, Proper Vehicle Maintenance	Incorporated-Coalville City
Coalville Search And Rescue	Parking/Vehicle Storage	Low	0				Trash	Good Housekeeping	Incorporated-Coalville City
Fairgrounds	Recreation	Medium	2	Detention Pond	No	No	Trash, Animal Waste	Bermed Facility, Good Housekeeping	Incorporated-Coalville City
Utah State Extension	Office	Low	0				Trash	Good Housekeeping	Incorporated-Coalville City
Coalville Library	Office/Library	Low	5	CWTP			Trash	Good Housekeeping	Incorporated-Coalville City
Justice center	Office/Jail	Low	40	SWR			Trash	Good Housekeeping	Unincorporated
Richins building (Summit County Library)	Office/Library	Low	2	SWR			Trash	Good Housekeeping	Unincorporated
Kamas Building	Office/Library	Low					Trash	Good Housekeeping	Incorporated-Kamas City
Summit County Health Department	Office	Low	15	SWR			Trash	Good Housekeeping	Unincorporated
Weed Department	Maintenance	Low	4	Detention Pond	Yes	No	See Public Works SWPPP	See Public Works SWPPP	Unincorporated
Coalville Seniors		Low	4	CWTP					Unincorporated
Kamas Search and Rescue	Parking/Vehicle Storage	Medium	10	Detention Pond	No	No	Trash, Gasoline, Vehicle Leaks	Good Housekeeping, Proper Vehicle Maintenance	Incorporated-Kamas City
Kamas Ambulance	Parking/Vehicle Storage	Low	4	KWTF			Trash	Good Housekeeping	Incorporated-Kamas City
Ledges Event Center (Fairgrounds)	Office	Low	8	CWTP			Trash	Good Housekeeping	Incorporated-Coalville City
Park Cook Shack	Kitchen	Low	12	CWTP			Trash	Good Housekeeping	Incorporated-Coalville City
Park Hill Bathrooms	Restrooms	Low	2	SWR			Trash	Good Housekeeping	Incorporated-Coalville City
District Court	Office	Low	17	SWR			Trash	Good Housekeeping	Unincorporated
Animal Control	Office/Pet Housing	Low	10	Detention Pond	Yes	No	See Public Works SWPPP	See Public Works SWPPP	Unincorporated

*NOTE: The assessment of High Priority Facilities is based on potential pollutants stored on site, potential pollutant-generating activities, proximity to sensitive land/waterbodies and the potential to discharge stormwater pollutants. The Facility Inventory will be reviewed annually and updated as necessary.

notes

CO Coalville
HE Henefer
UA Uintas

KA Kamas

OK Oakley

WS Wanship

SB Snyderville Basin

SWR Snyderville Water Reclamation

CWTP Coalville Water Treatment Plant

KWTF Kamas Waste Water Treatment Facility