
Best Management Practices Manual

Erosion and Sediment Control Best Management Practices:

**A Guide to Developing Stormwater Pollution Prevention Plans for
Construction Sites**

Prepared for
City of Watertown

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Executive Summary

Purpose

The Watertown Erosion and Sediment Control Best Management Practices Manual outlines requirements of the City of Watertown's Construction Site Stormwater Runoff Control Program and provides resources helpful to meeting these requirements. The expected audience for this document includes construction site owners, operators, and their consultants.

Overview

This document provides resources to develop a Stormwater Pollution Prevention Plan (SWPPP) for construction activity which incorporates best management practices (BMPs) appropriate for the City of Watertown. The following areas are discussed:

General Requirements

Erosion and Sediment Control BMP requirements are outlined based upon the size and type of construction project planned. A detailed outline of the necessary elements of a SWPPP for construction activity is provided, along with performance objectives for implementing BMPs.

Best Management Practices (BMPs)

BMPs are presented to aid the construction site owner in achieving appropriate levels of erosion control, sediment control, and drainageway protection. Good housekeeping practices and non-structural controls are included. A detailed description of each BMP is presented to aid owners in selecting the most beneficial combination of BMPs for their site. Detailed instructions are provided for implementing and installing individual BMPs.

Disposition of Temporary Measures, Inspections, and Maintenance

Guidelines to ensure adequate maintenance for installed BMPs are provided. These guidelines can be incorporated in the maintenance plan included in a SWPPP. Minimum requirements for inspection are also presented along with a schedule for discontinuing temporary measures.

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Acronyms

BMP	best management practices
HazMat	hazardous materials
MS4	municipal separate storm sewer systems
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
SDCL	South Dakota Codified Law
SD DENR	South Dakota Department of Environment and Natural Resources
SDDOT	South Dakota Department of Transportation
SOP	standard operating procedure
SWD	surface water discharge
SWPPP	Stormwater Pollution Prevention Plan
USEPA	United States Environmental Protection Agency
PLS	pure live seed

1. Introduction and Background

In 1987, Congress amended the Clean Water Act to require implementation, in two phases, of a comprehensive national program for addressing stormwater discharges. The first phase of the program, commonly referred to as “Phase I,” took effect on November 16, 1990. Under Phase I, the Environmental Protection Agency (EPA) established the permitting requirements for discharges of “stormwater associated with construction activity,” which EPA included in its definition of “stormwater discharges associated with industrial activity.” This definition included point source discharges from construction activities that disturb five or more acres of land. On December 8, 1999, EPA established Phase II of the Stormwater Regulations, which expanded the definition to include point source discharges from small construction activities that disturb between one and five acres of land. Phase II rules also require municipalities that operate municipal separate storm sewer systems (MS4) to obtain a permit.

To meet the conditions of the City of Watertown’s National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II Permit, the City must “develop, implement, and enforce requirements for construction activities to address pollutants in stormwater runoff to the MS4.” The City’s program includes requirements for all construction sites, with some variation in requirements based on site size and characteristics. The practices described in this manual address the requirements listed in the City of Watertown’s Construction Site Stormwater Runoff Control Program (Program). The Program’s Notice of Intent was updated in the City of Watertown’s 2004 Stormwater Phase II Annual Report to the South Dakota Department of Environment and Natural Resources (SD DENR). The City’s Program consists of the following:

“The City shall require construction site operators to develop a plan for City review and to implement appropriate erosion and sediment control best management practices (BMPs). This may be best accomplished by including this requirement in the newly revised City ordinance. These BMPs include preventive controls, erosion controls, sediment controls, stabilization requirements, and materials handling practices. The City shall consider a focus on providing performance-based BMPs. In some situations, irrigation requirements may be necessary in order for effective stabilization to occur. The City shall develop an erosion and sediment control design criteria manual for contractors to follow and assist them in developing their BMP plans.”

1.1 Impact of Construction Activities

Construction activities have the potential to produce many pollutants that may contaminate stormwater runoff. Pollutants such as sediment, pesticides, toxic chemicals, metals, and oil can contaminate stormwater and enter waters of the state. Clearing land of grass, trees, shrubs, rocks, and other ground cover can change natural water runoff patterns and increase erosion. Some construction activities require the use of toxic or hazardous materials, which contain metals and other materials that may be harmful to humans, fish, wildlife, and plants. When these materials are not properly handled or stored, the resulting leaks and spills can pollute stormwater and can impact drinking water sources and waters protected for recreation, aquatic life, and other beneficial uses. The intent of the stormwater

regulations is to improve and protect water quality by reducing or eliminating contaminants in stormwater. Stormwater runoff consists of rainwater and melted snow that runs off the land and directly, or indirectly by way of storm sewers, enters waters of the state, such as lakes, rivers, streams, wetlands, and ponds. The term “construction activity” includes point source discharges from areas undergoing operations such as clearing, grading, and excavation. Construction activities can include road building, construction of residential houses, office buildings, industrial sites, or demolition. It does not include agricultural activities or maintenance activities.

1.2 Objective of Erosion and Sediment Controls

Erosion controls provide the first line of defense in preventing off-site sedimentation and are designed to prevent erosion through protection and preservation of soil. Sediment controls are designed to remove sediment from runoff before the runoff is discharged from the site. The objectives for erosion and sediment control during construction include the following:

- Conduct all land disturbing activities in a manner that effectively reduces accelerated soil erosion and reduces sediment movement and deposition off-site.
- Schedule construction activities to minimize the total amount of soil exposed at any given time to reduce the period of accelerated soil erosion.
- Establish temporary or permanent vegetative cover on areas that have been disturbed as soon as possible after final grading is completed. Install pavement in areas that will be paved as soon as possible after final grading and base course construction is completed.
- Design and construct all temporary or permanent facilities for the conveyance of water around, through, or from the disturbed area to limit the flow of water to non-erosive velocities.
- Remove sediment caused by accelerated soil erosion from surface runoff water before it leaves the site.
- Stabilize the areas of land disturbance with final stabilization: permanent vegetative cover, pavement, or. stormwater quality control measures.
- Erosion and sediment controls must retain sediment on site to the best extent practicable

1.3 Acknowledgements

This *Erosion and Sediment Control Best Management Practices Manual (Manual)* has been developed based on models prepared by the Urban Drainage and Flood Control District of Denver, Colorado and for the City of Sioux Falls, South Dakota. Sources of other information that have also been included are the South Dakota General Permit for Stormwater Discharges Associated with Construction Activities, South Dakota Department of Transportation Erosion Control Manual, Illinois Urban Manual, Minnesota Pollution Control Agency Erosion Prevention and Sediment Control Manual, and City of Las Vegas Stormwater Pollution Guidance. Information from the various sources have been revised and adapted for inclusion in the Manual to meet the needs of the City of Watertown. A list of definitions is included in Attachment 1.

2. General Requirements of Construction Sites and Land Disturbing Activities

This Manual describes requirements related to erosion and sediment control for all construction sites and provides information useful to enacting appropriate erosion and sediment control. Construction sites have been broken down into categories, with different levels of requirements appropriate to each of the following specific categories:

- sites with disturbed area larger than one acre and not part of a subdivision or common plan of development,
- sites with disturbed area less than one acre and not part of a subdivision or common plan of development,
- sites with disturbed area less than one acre and part of a subdivision or common plan of development,
- sites with disturbed area larger than one acre and part of a subdivision or common plan of development,
- adjusted compliance for certain types of construction sites

Exhibit 1 lists each category with a description of its general requirements and a list of sections of this manual which contain descriptions of specific requirements relevant to each category.

EXHIBIT 1
General Requirements by Category of Construction Site

Category	General Requirements	Relevant Sections
Sites with disturbed area larger than one acre and not part of a subdivision or common plan of development	Must develop and submit a complete SWPPP including a SWPPP report and detailed drawings Must implement erosion and sediment control measures as described in report and shown on drawings	Section 2.1 and Section 2.2
Sites with disturbed area less than one acre and not part of a subdivision or common plan of development	Must implement erosion and sediment control measures as necessary to ensure that sediment does not leave the site	Section 2.1 and Section 2.3.1
Sites with disturbed area less than one acre and part of a subdivision or common plan of development	Must implement erosion and sediment control measures following SWPPP developed for the entire subdivision or development and as necessary to ensure that sediment does not leave the site	Section 2.1 and Section 2.3.2
Sites with disturbed area larger than one acre and part of a subdivision or common plan of development	Must develop and submit an <i>abbreviated</i> SWPPP including an <i>abbreviated</i> report and plan and detailed drawings	Section 2.1 and Section 2.3.3

EXHIBIT 1

General Requirements by Category of Construction Site

Category	General Requirements	Relevant Sections
	Must implement erosion and sediment control measures as described in report and shown on drawings	
Adjusted Compliance (agriculture, utilities, sidewalks and driveways)	Must ensure that sediment does not leave the site	Section 2.1 and Section 2.4

The statements in this document are intended solely as supporting documentation to aid in complying with stormwater regulations. This document is **not** a substitute for reading the “General Permit for Stormwater Discharges Associated with Construction Activities” and understanding all its requirements as they apply to the facility or site. Submittal of a SWPPP to the City does not supersede the requirement of the property owner or designated representative (Owner) to also obtain any required permits from the State of South Dakota, including, but not limited to:

- Notice of Intent to discharge stormwater associated with construction activity greater than 1 acre to the South Dakota Department of the Environment and Natural Resources
- Army Corps of Engineers 401/404 Wetland and Stream Impact Permit

Nothing in these criteria limits the right of the City to impose additional or more stringent standards.

2.1 Requirements and Expectations of All Sites

Specific expectations of ALL construction sites and land disturbing activities minimally include:

- Conduct all land-disturbing and construction activities in a manner that effectively reduces accelerated soil erosion and reduces the movement and off-site deposition of sediment and other construction-related materials.
- Schedule construction activities to minimize the total amount of soil exposed at any given time and to minimize the period of soil exposure.
- Erosion and sediment controls must retain sediment on the site and prevent discharge of sediment and other construction-related materials to adjacent properties and streets.
- In the event sediment and other construction-related materials are discharged from the site, as soon as possible but no later than the end of the work day in which the discharge occurred, the discharged materials shall be recovered, the affected properties shall be returned to the condition prior to the discharge, and the affected streets shall be swept or broomed. Street cleaning can be accomplished by a number of methods including, but not limited to, the use of mechanical street sweepers, mechanical street vacuum equipment, power brooms, or manual push brooms.

- Designate an area of the site for concrete washout and concrete equipment cleaning with the objective of preventing the discharge of concrete washout water and concrete equipment wash water off-site to adjacent properties and streets.
- Install stabilized construction site entrance/exit point(s), and direct all traffic to the stabilized construction entrance/exit point(s), prior to the delivery of any construction equipment or building materials.
- Preserve or establish permanent or temporary vegetation of the boulevard area of the public right-of-way.
- Install access barriers and down-gradient perimeter erosion and sediment controls prior to the delivery of any construction equipment or building materials to protect vegetated boulevard areas and to direct construction traffic to the stabilized construction site entrance/exit.
- Permanent stabilization of the project with permanent vegetation and final hard surfacing shall be completed within the timeframe allowed by the associated building or grading permit.

In the case of infrastructure construction projects, final stabilization with permanent vegetation and final hard surfacing shall be completed as soon as possible following the substantial completion of infrastructure installation. Every effort shall be made to complete final stabilization of the project site prior to the end of the growing season and prior to the close of the construction season due to climatic conditions. Unusually wet or otherwise abnormal climatic conditions may be sufficient justification to delay final stabilization measures to the beginning of the following construction and growing season, but do not relieve the operator of the requirement and responsibility for implementing and maintaining temporary stabilization measures and sediment control best management practices.

2.2 SWPPP Requirements for Sites Greater than One Acre of Disturbed Area

A SWPPP consisting of 1) a written narrative report and 2) detailed drawing(s) must be developed by a Professional Engineer (PE), or a Certified Professional in Erosion and Sediment Control (CPESC), or a Certified Professional in Stormwater Quality (CPSWQ) and submitted to the appropriate Public Works staff for review and acceptance. A SWPPP prepared in conjunction with subdivision planning and platting shall be submitted to the Planning & Zoning Official or Urban Planner, a SWPPP prepared in conjunction with a building permit application shall be submitted to the Building Official, and a SWPPP prepared in conjunction with a permit application for grading and drainage shall be submitted to the City Engineer. An example narrative report is shown in Attachment 2.

If there is a transfer of ownership after the *SWPPP* has been developed and before construction has been completed, the City of Watertown Public Works Office must be notified using the Change of Authorization/Name Change form found in Attachment 3.

2.2.1 SWPPP Report

The SWPPP Report shall contain the following:

- **Name, address, and telephone number of the applicant.** The name, address, and telephone number of the Professional Engineer (PE), or Certified Professional in Erosion and Sediment Control (CPESC), or Certified Professional in Stormwater Quality (CPSWQ) responsible for preparation of the *SWPPP Report* shall also be included if different from the applicant.
- **Project location.** Street address or nearest intersection, and township, range, section, and quarter-section, or the latitude and longitude, of the approximate center of the project. A location map may be included.
- **Project description.** A brief description of the overall project and the type of construction activity, and a description of the intended sequence of activities that disturb soils for major portions of the site.
- **Existing site conditions.** A description of the existing topography, vegetation, and drainage including overland flow paths, streams, rivers, curb and gutter, and storm sewer pipes, drop inlets, catch basins, and outfalls; and identify any wetlands on the site.
- **Adjacent areas.** A description of neighboring areas which might be affected by the land disturbance.
- **Receiving Waters.** A description of the downstream receiving waters, MS4, or other conveyance that receives stormwater flow from the site.
- **Soils.** A brief description of the soils on the site including information on soil type and names, mapping unit, erodibility, permeability, hydrologic soil group, depth, texture, and soil structure. (This information may be obtained from the soil report for the site, or if not available, from soil reports for adjacent sites.)
- **Areas.** The total surface area (in acres) of the site, and the total area (in acres) that is expected to be disturbed by excavation, grading, grubbing, or other activities during the life of the project..
- **Erosion and Sediment control measures.** A description of the methods which will be used to control erosion and sediment on the site. Include an explanation of why each measure is considered appropriate and who is responsible for implementation. (See Sections 3, 4, and 5).
- **Nonstructural control measures.** A description of the methods which will be used to control stormwater pollution, erosion, sediment, and spills on the site. Descriptions shall include methods for controlling litter, construction debris, and construction chemicals. Description shall also include procedures for detecting and measures for removing any offsite accumulations of sediment that have escaped from the project site, such as provisions made for street sweeping. During the construction process, the Owner is responsible for maintaining all compliance documentation records. (See Section 6).
- **Time schedule.** A time schedule indicating the anticipated starting and completion time periods of the site grading and/or construction sequence, including week or date of completion. The schedule shall include the installation and removal time periods of erosion and sediment control measures, and the time of exposure of each area prior to

the completion of temporary erosion and sediment control measures. The schedule shall include weekly inspections by the Owner of erosion and sediment control structures.

- **Permanent stabilization.** A brief description, including specifications, of how the site will be stabilized after construction is completed. The stabilization plan must meet the revegetation requirements described in Section 3.2.
- **Stormwater management considerations.** Explain how stormwater runoff from and through the site will be handled during construction. Include sizing calculations for temporary sediment traps, sediment basins, and stormwater ponds. Provide a brief description of the post-construction stormwater quality control measures to be included as a part of the site development.
- **Maintenance.** A description of routine erosion and sediment control BMP maintenance shall be included.
- **Employee training.** Owner is responsible for training all employees, contractors, and subcontractors to follow the SWPPP prior to entering the work area. Documentation of such training, such as copies of handout materials and sign-in sheets, must be maintained. Training shall include but not be limited to:
 - Define limits of construction and the method and location of physical demarcations
 - Define location and limits of stockpile areas if required
 - Remove sediment and debris on property
 - Remove, recover, and properly dispose of any sediment and debris that has been washed downstream off property, has been tracked off property, or has otherwise escaped from property
 - Locate stabilized staging area and protection requirements as required
 - Restrict use of vehicles or equipment on and off of un-stabilized areas with entrance and egress through the lot's construction entrance
 - Locate Concrete Washout Area on lot or subdivision as required
 - Identify required structural and non-structural BMP(s) that must be installed before commencing construction and how they are to be maintained
- **The following note.** "This SWPPP Report and attached *Erosion and Sediment Control Detailed Drawing(s)* are intended to fulfill the requirements of the City of Watertown. I understand that additional erosion control measures may be needed if unforeseen erosion problems occur or if the measures described in the submitted plan do not function as intended. The requirements of this plan shall run with the land and be the obligation of the landowner until such time as the plan is properly completed, modified or voided."
- **Signature page and statement.** Signature page for Owner acknowledging the review and acceptance of responsibility, and a statement by the Professional Engineer (PE), Certified Professional in Erosion and Sediment Control (CPESC), Certified Professional

in Stormwater Quality (CPSWQ) acknowledging responsibility for the preparation of the SWPPP for properties greater than one acre of disturbed area.

2.2.2 Erosion and Sediment Control Detailed Drawing(s)

The *Erosion and Sediment Control Detailed Drawing(s)* shall be separate from the narrative report. The drawing(s) shall be prepared at a minimum scale of one (1) inch equals one hundred (100) feet and include the following:

- **Property line.** The property lines for the site where the work will be performed.
- **Existing topography.** Existing topography shall be on the state plane coordinate system. Topographic drawings shall indicate the vertical datum to which the elevations are referenced, and shall include contour intervals sufficient to determine the character and topography of the land, but in no case shall the contour intervals be more than one foot for land with a slope of one (1) percent or less, two feet for a slope between one and ten (10) percent, and five feet for land with a slope exceeding ten percent.
- **Existing Conditions.** Location of all existing structures, natural and hydrologic features on the land and adjacent to the site as required for the final drainage plan. The plan shall show the location of the street, right of way, storm sewer, channel, or other waters receiving storm runoff from the site. Any potential wetlands identified on inventory maps or observed shall be clearly shown.
- **Proposed topography.** Proposed topography after construction shall be on the state plane coordinate system. Design topographic drawings shall indicate the vertical datum to which the elevations are referenced, and shall include contour intervals sufficient to determine the character and topography of the land, but in no case shall the contour intervals be more than one foot for land with a slope of one (1) percent or less, two feet for a slope between one and ten (10) percent, and five feet for land with a slope exceeding ten percent. The map shall show elevations, dimensions (drawn to scale), location, extent, and the slope of all proposed grading.
- **Proposed Facilities.** Location of all proposed structures and development on the site.
- **Clearing and grading.** Location of areas that are to be cleared and graded.
- **Soil stockpiles.** Location of areas designated for topsoil and subsoil storage.
- **Storage areas.** Location of areas designated for equipment, fuel, lubricants, chemical, and waste storage.
- **Temporary Roads.** Location of temporary roads designated for use during the construction period.
- **Plans of all erosion and sediment control measures.** Show all structural and nonstructural erosion controls, paved areas, retaining walls, planting, temporary or permanent soil erosion control measures, or other features to be constructed. Show any nearby surface waters and the drainage outfall location of the site.
- **Drainage Area Map** showing the drainage area boundary of land tributary to the site.

- **Matrix of best management practices.** A table containing a list and brief description of best management practices to be used at the site. This can be created from Exhibit 2, Section 2.5 of this Manual.
- **Details.** Design details of sediment controls, temporary diversions, and any practices used that are not referenced in these criteria.

2.2.3 Acceptance of SWPPP

A SWPPP must be accepted prior to issuance of a Building Permit or an Excavation and Grading Permit, or approval and recording of a subdivision plat. Acceptance of the SWPPP does not imply acceptance or approval of Drainage Plans, Utility Plans, Street or Road Plans, Design of Retaining Walls, or any other aspect of site development.

2.3 Abbreviated Requirements for Small Sites

2.3.1 Sites Less Than One (1) Acre of Disturbed Area and Not Part of Larger Subdivision Development

Individual projects less than one (1) acre of disturbed area that are not part of a larger subdivision project are not required to submit a narrative report or plan, but are required to implement erosion control measures as necessary to ensure that sediment does not leave the site. Refer to Section 2.1 Requirements and Expectations of All Sites for a description of specific requirements and expectations.

If the City determines that any site regardless of size is contributing sediments or other pollutants to the MS4, it can require specific erosion and sediment control measures to be put in place or can take enforcement action.

2.3.2 Sites Less Than One (1) Acre of Disturbed Area and Part of Larger Subdivision Development (Minor Impact Construction Sites)

Individual lots involving less than one (1) acre of disturbed area in a subdivision or larger common plan of development shall not be considered separate construction projects, but rather as a part of the subdivision development as a whole. It will be the responsibility of the Owner and their contractors to conform to all requirements of the SWPPP for the subdivision. Subdivision SWPPPs must incorporate a separate narrative report and detail drawing(s) describing minimum erosion control measures of typical individual lots within the subdivision or larger common plan of development or sale. It is understood that the City of Watertown may require additional erosion control measures if unforeseen erosion problems occur or if the submitted SWPPP control measures do not function as intended.

Such individual lots will be classified as “minor impact construction sites” if all the following conditions are met:

- The individual lot has been sold or transferred to a new owner.
- The subdivision owner and developer has submitted a SWPPP and detailed drawings for the entire subdivision site.
- A notice of intent has been submitted and the subdivision has coverage under a South Dakota general permit for stormwater discharges associated with construction activity.

- A South Dakota stormwater permit for the subdivision is maintained for the subdivision until both of the following are met:
 - Substantial build-out of the property has been completed. The subdivision owner and developer shall determine whether to meet the 90 percent build-out standard by lot or acreage. The subdivision owner and developer shall maintain documentation verifying how this build-out standard has been met prior to submitting a notice of termination of the general permit for stormwater discharges associated with construction activity to the SD DENR.
 - Areas not built-out have been permanently stabilized.
- The subdivision or larger common plan of development or sale has been reviewed pursuant to the City's subdivision ordinance.

A "minor impact construction site" shall generally not be required to submit individual SWPPP Report or detailed drawings.

A "minor impact construction site" shall be required to take erosion control measures as necessary to ensure that sediment does not leave the site. If the City determines that any site regardless of size is contributing sediments or other pollutants to the MS4, then it can require specific erosion and sediment control measures to be put in place or can take enforcement action.

Throughout build-out, a subdivision owner and developer shall implement and maintain BMPs and conditions of the SWPPP to control erosion and sediment problems on all property that has not been sold to another party or does not meet the specific conditions listed in this section.

Throughout build-out, a minor impact construction site owner and contractor shall implement and maintain the subdivision and individual lot BMPs and conditions of the SWPPP to control erosion and sediment problems on the individual lot that they own or upon which they build.

If there is a transfer of ownership (including the sale of an individual lot within a subdivision from one owner to another) after the SWPPP has been developed and before construction has been completed, the City of Watertown must be notified using the Change of Authorization/Name Change form found in Attachment 3.

2.3.3 Sites Greater Than One (1) Acre of Disturbed Area and Part of Larger Subdivision Development

In the case of individual lots greater than one (1) acre and part of a larger subdivision, a SWPPP is required; however, an abbreviated form of the SWPPP is acceptable. The specifics of what is required in this case are described below.

Abbreviated SWPPP Report

A narrative report shall be required, and must describe how the following four requirements will be accomplished:

- Owner is responsible for training all employees, contractors, and subcontractors to follow the subdivision SWPPP prior to entering the work area. Training/discussions with subcontractors shall include but not be limited to:
 - Define limits of construction and the method and location of physical demarcations
 - Define location and limits of stockpile areas if required
 - Remove sediment and debris on property
 - Remove, recover, and properly dispose of any sediment and debris that has been washed downstream off property, has been tracked off property, or has otherwise escaped from the property
 - Locate stabilized staging area and protection requirements as required
 - Restrict use of vehicles or equipment on and off of un-stabilized areas with entrance and egress through the lot's construction entrance
 - Locate Concrete Washout Area on lot or subdivision as required
 - Identify required structural and non-structural BMP(s) that must be implemented prior to construction and maintained
- Any proposed structural BMP (i.e. silt fence, vehicle tracking) shall be inspected and maintained by the Owner weekly and after precipitation events (greater than one-half (0.5) inch), snowmelt, or any runoff that causes surface erosion, sediment transport or vehicle tracking of debris off of property
- Owner shall be responsible for implementing and maintaining the lot's structural BMPs located on his/her property and within the limits of construction
- Owner shall ensure that soil, landscape materials, rock or mulch are not stockpiled, stored, or placed on streets, sidewalks, or stormwater flow lines

Abbreviated Erosion and Sediment Control Detailed Drawing(s)

The *Erosion and Sediment Control Detailed Drawing(s)* shall be separate from the narrative report and demonstrate the typical minimum erosion control measures for a standard planted lot within the subdivision. The drawing(s) shall be prepared at a minimum scale of one (1) inch equals fifty (50) feet and include the following: Detail drawing(s) shall include the following:

- Subdivision Name
- Subdivision Location
- Limits of Construction. Limits of construction shall be at the property lines or no more than ten (10) feet beyond property lines with authorization by adjacent property owner. Authorized limits of construction must be physically demarcated on the property. At a minimum the limits of construction must be marked with at least a four foot high post with at least the top 12" painted or coated with an orange fluorescent color at the corners of each authorized limit line.
- Selected erosion and sediment control BMPs as described in this manual.

A SWPPP must be accepted prior to issuance of a Building Permit or an Excavation and Grading Permit, or approval and recording of a subdivision plat. Acceptance of the SWPPP does not imply acceptance or approval of drainage plans, utility plans, street or road plans, design of retaining walls, or any other aspect of site development.

2.4 Adjusted Compliance

Adjustments to standard compliance with the construction site erosion control planning process will be in the form of an exemption to the Owner from preparing a SWPPP and applying for a Building Permit or an Excavation and Grading Permit for any of the following; however, this allowance for adjusted compliance does not remove the responsibility of the Owner from controlling erosion of soil at each construction site through the use of the techniques described in this Manual:

- Agricultural use of land.
- A sidewalk or driveway.
- Underground utility construction if confined entirely to a hard-surfaced area provided that runoff and erosion from soil stockpiles are properly confined and will not enter the drainage system. (Underground utility construction that is not located under hard-surfaced roads, streets, or sidewalks will be subject to site-specific BMPs as described in this manual).

2.5 Matrix of Best Management Practices

Exhibit 2 lists best management practices contained in this manual and describes when they are applicable.

EXHIBIT 2
Matrix of Best Management Practices

Practice	Section	Category	Description/Applicability
Mulching	3.1	Erosion	Perform in conjunction with seeding or separately after 2 week exposure and when area cannot be seeded
Revegetation	3.2	Erosion	Temporary revegetation required after 2 weeks except when winter conditions do not allow; permanent revegetation required within one year
Soil Stockpiles	3.3	Erosion	Should follow revegetation requirements, and not be located near drainageways
Roads and Parking Lots	3.4	Erosion	Aggregate should be installed as soon as possible
Erosion Control Blanket	3.5	Erosion	Preformed protective blanket for use where protection is critical such as drainageways and steep slopes
Vehicle Tracking and Temporary Construction Entrances	4.1	Sediment	Stabilized area for designated entrance to site to prevent tracking of sediment from site
Filter Strip/Grass Buffer	4.2	Sediment	Buffer strips of natural vegetation for the base of a disturbed area, suitable for buffers along, but not in drainageway
Wattle/Fiber Roll	4.3	Sediment	Elongated tube of compacted straw, used at base of

EXHIBIT 2
Matrix of Best Management Practices

Practice	Section	Category	Description/Applicability
			disturbed area or as check structure in drainageway
Silt Fence	4.4	Sediment	Temporary sediment barrier for the base of a disturbed area
Rock Check Dams	4.5	Sediment	Small rock dam constructed across a grassed swale or road ditch
Temporary Sediment Traps	4.6	Sediment	A small, temporary ponding basin formed by construction of an embankment
Sediment Basins	4.7	Sediment	A large, temporary ponding basin formed by construction of an embankment
Working Within or Crossing a Waterway	5.1	Drainage	Practices, methods, and facilities to limit the impact of work conducted within or crossing a waterway
Outlet Protection	5.2	Drainage	Small check dams to reduce velocity at flow outlet points of other structures
Inlet Protection	5.3	Drainage	Temporary blocking of inlets to prevent sediment from entering storm drains
Concrete Wash Water	6.1	Nonstructural	Practices related to handling concrete wash water
Dust Control/Street Sweeping	6.2	Nonstructural	Practices to limit surface and air transport of pollutants
Spill Prevention and Response	6.3	Nonstructural	Practices to prevent spills and leaks
Planning and Scheduling	6.4	Nonstructural	Plan construction activities in ways to reduce exposure of potential pollutants

3. Erosion Control Best Management Practices

The planning for the installation of permanent or temporary soil erosion controls is needed in advance of all major soil disturbance activities on the construction site. After construction begins, soil surface stabilization shall be applied within 2 weeks to all disturbed areas that may not be at final grade but will remain dormant (undisturbed). Within 14 days after final grade is reached on any portion of the site, permanent or temporary soil surface stabilization shall be applied to disturbed areas and soil stockpiles. When the initiation of stabilization measures are stopped due to snow cover, stabilization measures shall be resumed as soon as possible.

Soil surface stabilization protects soil from the erosive forces of raindrop impact, flowing water, and wind. Erosion control practices include mulching, establishment of vegetative cover, and the early application of gravel base on areas to be paved. Stabilization measures to be used shall be appropriate for the time of year, site conditions, and estimated duration of use. Exhibit 3 lists the maximum time limits of land exposure for selection of erosion controls.

EXHIBIT 3

Maximum Time Limits of Land Exposure for Selection of Erosion Controls

Condition of Exposed Land	Maximum Allowable Period of Exposure
Disturbed earth without construction activity	14 days
Mulching (only allowed without seeding when weather does not allow seeding)	6 months
Temporary Revegetation	12 months
Soil Stockpile without Revegetation	2 months
Early Application of Road Base (prior to installment of pavement)	2 months

3.1 Mulching

All disturbed areas shall be seeded and/or mulched within 14 days after final grade is reached on any portion of the site not otherwise permanently stabilized (see Temporary Revegetation within Section 3.2), in accordance with these guidelines:

- Mulch shall be applied to protect newly seeded areas, or to provide temporary cover on disturbed areas which will not require temporary revegetation. Mulch also shall be applied to areas which cannot be seeded due to winter conditions. Mulch shall consist of clean, weed- and seed-free, long-stemmed grass hay (preferred) or cereal grain straw. Hay is preferred as it is less susceptible to removal by wind. Mulch shall be applied evenly at a rate of two (2) tons per acre. At least 50 percent of the mulch, by weight, shall be ten (10) inches or more in length.

Mulch shall be anchored. This can be accomplished mechanically by crimping or with the aid of tackifiers or nets. Anchoring with a crimping implement is preferred, and is the recommended method for all areas equal to or flatter than 3:1. Mechanical crimpers shall be capable of tucking the long mulch fibers into the soil four (4) inches deep without cutting them. On small areas sheltered from the wind and from heavy runoff, spraying a tackifier on the mulch is satisfactory for holding it in place.

- For steep slopes (steeper than 3:1) and other special situations:** Blankets, anchored with staples, may be required in addition to mulch. A blanket is straw mulch that has been woven and often times include a synthetic layer or net. For application of tackifiers near water bodies, the product must be acceptable to SD DENR.

Hydraulic mulching shall be limited to those situations where it is too difficult to apply and anchor a mulch of long-stemmed grass hay or cereal straw; namely, slopes steeper than 3:1 or where access is limited. Wood cellulose fibers shall be mixed with water and a tackifying agent and applied at a rate of 1,500 pounds per acre with a hydraulic mulcher.

Mats, blankets, and nets are available to help stabilize steep slopes and drainage channels. Depending on the product, these may be used alone or in conjunction with grass or straw mulch. Normally, use of these products will be restricted to relatively

small areas. Mats made of jute, coconut fiber, or various geosynthetic fibers can be used in addition to mulch. Plastic netting may be used to anchor mulch.

Note: Some synthetic tackifiers or binders may be used to anchor mulch. Caution shall be used to prevent the introduction of any potentially harmful material into the environment. Manufacturer's recommendations shall be followed at all times.

3.2 Revegetation

Temporary revegetation is required on all disturbed areas having a period of exposure prior to final stabilization of two (2) weeks or longer (see temporary revegetation below).

Permanent revegetation is required on all disturbed areas and soil stockpiles (see Section 3.3) having a period of exposure of 1 year or longer, and the vegetative cover shall be established within one (1) year. Vegetation is not considered established until a ground cover is achieved which, in the opinion of the City, is sufficiently mature to control soil erosion and can survive severe weather conditions. Generally, vegetation will be considered satisfactory when growth has developed to the point that there are no single bare spots greater than three square feet in area.

3.2.1 Seedbed Preparation

Areas to be revegetated shall have soil conditions capable of supporting vegetation. Overlot grading will oftentimes bring to the surface subsoils that have low nutrient value, little organic matter content, few soil microorganisms, and conditions less conducive to infiltration of precipitation. Under certain conditions, soil amendments and treatments may be necessary to provide an adequate growth medium to sustain vegetation. Whenever possible, topsoil shall be salvaged for respreading on areas to be revegetated. The depth of soil stripping is determined by the depth of available topsoil.

At a minimum, the upper six (6) inches of topsoil shall be stripped and stockpiled, and respread to a thicker depth on surfaces not planned for buildings or impervious areas. If the surface is compacted, ripping of subsoils prior to topsoiling is recommended. Scarification will assist in placement of a stable topsoil layer on steeper slopes, and allow percolation and root penetration to greater depth.

Fertilizer can be added to improve nutrient levels necessary for plant growth. Other treatments, such as liming, can be used to adjust soil conditions as necessary with amendments. Soil testing is recommended to determine appropriate amendments required.

A suitable seedbed will enhance the success of revegetation efforts. The upper layer of soil shall be in a condition suitable for seeding at the proper depth and conducive to plant growth.

3.2.2 Temporary Revegetation

Temporary revegetation is required on all disturbed areas having a period of exposure prior to final stabilization of two (2) weeks or longer. All temporary seeding shall be protected with mulch. Temporary seedings of small grains like wheat, oats, barley should be mowed or tilled before seedheads mature, or volunteer seeds that fall to the ground will compete significantly with the permanent seeding that is applied later.

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped within two (2) weeks, plant an appropriate annual grass and mulch the planted areas. If seasonal arid conditions prevent vegetation from growing, the area shall be irrigated to allow vegetation to grow. If winter conditions prevent vegetation from growing, mulching should be practiced until temporary or permanent vegetation can be established.

For construction sites that include the construction of sidewalk, the “boulevard area” between the sidewalk and the roadway must have temporary or permanent vegetation installed within seven (7) calendar days of sidewalk installation.

Exhibit 4 lists the annual grasses generally suitable for the Watertown area. These are to be considered only as a general recommendation whenever specific design guidance for a particular site is not available.

EXHIBIT 4
Minimum Drill Seeding Rates for Annual Grasses

Species	Growth Season ^a	Pounds of Pure Live Seed (PLS)/acre ^b
Annual ryegrass	Cool	20
Cereal rye	Cool	30
Winter wheat/barley	Cool	30
Spring wheat/barley	Cool	30
Millet	Warm	20
Oats	Cool	60

Note: Drill seeding is performed using an implement that creates an opening (e.g. with disk openers) in the soil for seeding forages and small grains, with a relatively close row spacing. Drill seeding includes the use of small chains or other devices dragging behind to help cover the seeds. Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant material residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching shall be done as a separate operation to prevent the seeds from being encapsulated in the mulch.

^aIf irrigation water is applied in an appropriate manner, seeding dates for annual grasses can be extended throughout most of the growing season.

^bSeeding rates shall be increased by 50 percent if seeding is done by hydraulic seeding or using a Brillion Drill; or doubled if seed is broadcast.

3.2.3 Permanent Revegetation

Permanent revegetation is required on all disturbed areas and soil stockpiles (see Section 3.3) having a period of exposure of 1 year or longer, and the vegetative cover shall be established within one (1) year. Vegetation is not considered established until a ground cover is achieved which, in the opinion of the City, is sufficiently mature to control soil erosion and can survive severe weather conditions. Generally, vegetation will be considered satisfactory when growth has developed to the point that vegetation has achieved 70 percent coverage over the entire previously disturbed area, and there are no single bare spots greater than three square feet in area.

To provide vegetative cover on disturbed areas not paved or built upon for a period of over one (1) year, or for an indeterminate length of time, a perennial grass mix shall be planted. Each site will have different characteristics, and a landscape professional should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific mix and for planning purposes, South Dakota Department of Transportation (SDDOT) Type B permanent seed mixture as listed in Exhibit 5 can be used. Alternative seed mixtures for various site conditions are listed in Attachment 4. The pure live seed (PLS) rates of application recommended in these tables are considered to be minimum rates for seed applied using proper drill-seeding equipment. All permanent seeding shall be protected with mulch, and where necessary, erosion blankets and tackifiers.

EXHIBIT 5
SDDOT Type B Permanent Seed Mixture

Grass Species	Variety	Pure Live Seed (PLS) (Pounds/Acre)
Western Wheatgrass	Flintlock, Rodan, Rosana	9.0
Switchgrass	Dacotah, Forestburg, Nebraska 28, Pathfinder, Summer, Sunburst, Trailblazer	5.0
Indiangrass	Holt, Tomahawk	1.0
Big Bluestem	Bison, Bonilla, Champ, Pawnee, Sunnyview	1.0
Slender Wheatgrass	Adanac, Pryor, Primar, Revenue	2.0
Total		18.0

Source: SDDOT

The site shall be inspected by the Owner weekly and after storm events greater than one-half (0.5 inch) to ensure that required temporary and permanent vegetation is in place. Any area where required vegetation has been eroded or otherwise removed shall be replaced within 24 hours.

3.3 Soil Stockpiles

Soils stockpiles shall be seeded with a temporary or permanent grass cover within 2 months after completion of stockpile construction. Mulching is recommended to ensure vegetation establishment. Perimeter silt fence shall also be used. The site shall be inspected by the Owner weekly and after storm events greater than one-half (0.5-inches) to ensure that required soil stockpile stabilization is in place. Any area where required vegetation has been eroded or removed, or any measure removed, shall have that vegetation or measure replaced within 24 hours.

3.4 Roads and Parking Lots

Road cuts, road fills, and parking lot areas shall be paved as soon as possible in lieu of mulching. Early application of road base is suitable where a layer of coarse aggregate is specified for final road or parking lot construction. This practice may not be desirable in all instances and is not needed when final pavement construction will take place within 14 days of grading to final contours. All non-paved portions of road cut, fill, and parking lot

areas shall be seeded and mulched as soon as possible after final grading has occurred but in no case later than 14 days after grading has been completed.

3.5 Erosion Control Blanket

An erosion control blanket is a pre-formed protective blanket of straw or other plant residue, or plastic fibers formed into a mat typically with a plastic mesh on one or both sides. The purpose of using an erosion control blanket is to protect the soil surface from raindrop impacts and overland flow during the establishment of grass or other vegetation and to reduce evapotranspiration and retain moisture on seeded areas thus increasing the potential for germination and survival of the vegetation. Erosion control blanket material can biodegrade over time, however there are several manufacturers of synthetic blankets that do not degrade and provide permanent soil reinforcement. Erosion control blankets should be chosen so that they last long enough for the grass or other vegetation to become established.

Erosion control blankets shall be used where the protection of newly seeded areas is critical. This is especially important where flowing water may occur before the grass is established. The most common application for erosion control blankets is in the bottom of small channels and on steep embankments.

Erosion control blankets shall be installed after all topsoiling, fertilizing, liming, seeding, and mulching is completed. The blanket shall be in firm contact with the soil. It shall be anchored with the proper number, width, length, and spacing of fasteners per the manufacturer's recommendation.

On slopes and in small drains the blanket shall be unrolled upstream to downstream parallel to the direction of flow. The upstream end of each blanket shall be anchored in a minimum 6-inch deep anchor trench. These blankets, when laid side by side, shall overlap a minimum of 4 inches. When more than one blanket length is needed, the material shall be overlapped 12 inches over the downstream piece. All edges shall be stapled as per manufacturer's recommendation.

All erosion control blankets shall be inspected by the Owner weekly and after precipitation events greater than one-half (0.5) inches to check for damage due to water running under the blanket or if the blankets have been displaced. Where water has flowed under the blanket, more staples may be needed per given area or more frequent anchoring trenches installed within 24 hours. If significant erosion has occurred under the blanket then reseeding may be needed. Any erosion control blankets that have been displaced will need to be replaced and restapled within 24 hours.

Erosion control blankets shall be required as part of the site development plan. Plans and specifications for installing erosion control blankets shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum, the following information shall be included in the plan:

- Location of the erosion blanket
- Type of blanket
- Location and cross section of anchor trenches
- Installation procedure
- Inspection procedure
- Maintenance schedule

Standard Drawing 1 in Attachment 5 may be used in development of the plan sheet.

4. Sediment Control Best Management Practices

Sediment control will be site specific and can include:

- Vehicle tracking and temporary construction entrances
- Filter strips or grass buffers around the lower perimeter of the land disturbance
- Wattles or fiber rolls
- Silt Fence
- Rock Check Dam
- Temporary Sediment Trap
- Sediment basins
- Combination of any or all of these measures

All runoff leaving a disturbed area shall pass through a sediment control BMP before it exits the site and flows downstream. The installation of sediment control BMPs and sediment entrapment facilities shall begin before major land disturbance activities begin on a construction site. Sediment entrapment facilities are necessary to reduce sediment discharges to downstream properties and receiving waters. Sediment entrapment facilities are sediment control BMPs designed to capture the sediment, and include filter strips (grass buffers), wattles, silt fences, rock check dams, sediment traps, and sediment basins. The type of sediment entrapment facility to be used depends on the tributary area, basin slope and slope length of the upstream area. Exhibit 6 summarizes the recommended maximum tributary areas, slope lengths and slopes for four types of sediment entrapment facilities. Other technologies or approaches not listed may be used if accepted by the Public Works Office.

EXHIBIT 6
Sediment Entrapment Facility Properties

Sediment Control Facility	Maximum Tributary Drainage Areas (ac)	Maximum Tributary Slope Length (ft)	Maximum Tributary Slope Gradient
Filter Strips/Grass Buffers	n/a	50	6:1 (17%)
Wattles/Fiber Rolls	n/a	(see spacing requirements in Standard Drawing 3 within Attachment 5)	1:1 (100%)
Silt Fence	0.5 per 100 lineal ft	150	2:1 (50%)
Rock Check Dam	up to 10.0	n/a	n/a
Temporary Sediment Trap	up to 5.0	n/a	n/a
Sediment Basin	5.0 to 100.0	n/a	n/a

An established filter strip may be adequate for small sites, provided the 6:1 limits for tributary slope are not exceeded and the flow is not concentrated. Fiber rolls or silt fences may be used for somewhat larger areas depending on the upslope drainage area. When the tributary area is less than five (5) acres but greater than that allowed for silt fences, runoff shall be collected in diversion swales and routed through temporary sediment traps.

4.1 Vehicle Tracking and Temporary Construction Entrances

Wherever construction vehicles enter onto paved public roads, provisions shall be made to prevent the transport of sediment (mud and dirt) by vehicles tracking onto the paved surface.

For small sites (less than one (1) acre), there shall be a designated area where vehicles may enter and exit the site. This area shall be kept stabilized and any mud or debris tracked off-site by vehicles shall be cleaned up.

For sites greater than one (1) acre, a stabilized temporary construction site entrance shall be constructed. Whenever deemed necessary by the City, wash racks shall be installed to remove mud and dirt from the vehicle and its tires before it enters onto public roads.

A temporary construction entrance is a stone pad located where vehicles leave a construction site. The purpose of the stone pad is to provide an area where mud can be removed from tires before a vehicle leaves the site. The stone pad consists of clean rock (no fine materials) designed in such a way that vehicle tires will sink in slightly. This helps remove mud from the tires as the vehicle passes over the pad. If a wash rack is used, it provides an area where vehicle tires can be washed. Cattle guards may serve as a convenient and cost-effective wash rack.

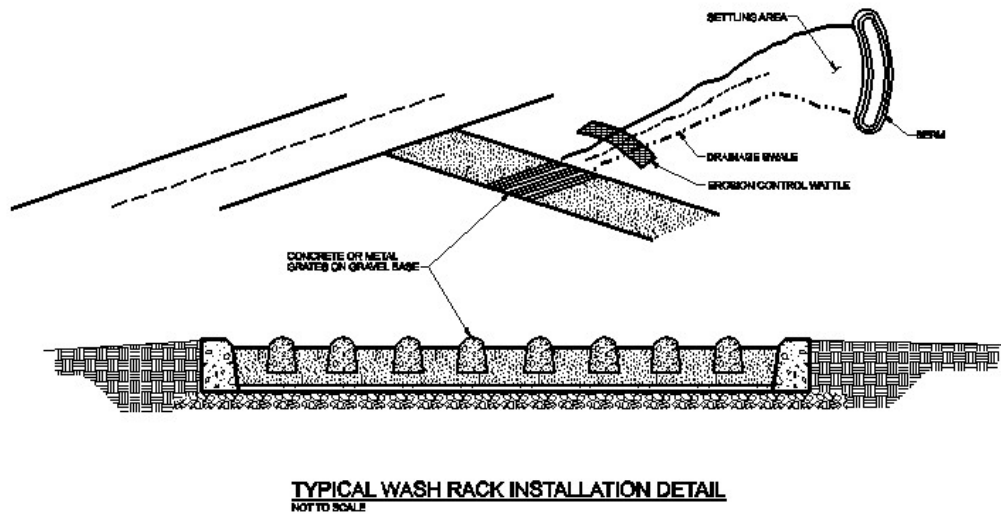
The effectiveness of temporary rock construction entrances for trapping sediment depends upon the length, depth of rock, frequency of use and maintenance, as well as the type of structure used. A newly installed rock construction entrance meeting the recommendations included here will be relatively effective for removing mud from tires before construction vehicles leave the site.

However, once the rock voids become clogged with mud, the practice will not serve its intended purpose until the rock is replaced.

The rock used for gravel pads should be a minimum 1- to 3-inch size, coarse aggregate. The aggregate should be placed in a layer at least 6 inches thick. Generally, larger aggregate is desired. The rock entrance should be at least 50 feet long; however, longer entrances may be required to adequately clean tires. Geotextile fabric may be needed under the rock to prevent migration of fine materials or mud from the underlying soil into the stone.

In some cases, the action of tires moving over a gravel pad may not adequately clean tires. In those cases, the tires may need to be washed with water before the vehicle leaves the site. A wash rack installed on the rock pad may make washing more convenient and effective. The wash rack would consist of a heavy grating over a lowered area. The grating may be a prefabricated rack, such as a cattle guard, or it may be constructed on-site of structural steel. The wash rack must be strong enough to support the vehicles that will cross it. Washing vehicle tires with pressurized water over a wash rack is very effective for removing mud and keeping the driving surface mud-free. Wash water will need to be directed to a suitable settling area and treated or recycled. Exhibit 7 shows a typical wash rack installation.

EXHIBIT 7
Typical Wash Rack Installation



Source: Minnesota Pollution Control Agency, *Protecting Water Quality in Urban Areas Manual*, Chapter 6
Erosion Prevention and Sediment Control

The rock pad needs occasional maintenance to prevent the tracking of mud onto paved roads. This may require periodic topdressing with additional rock or removal and reinstallation of the pad.

Construction entrance and exit areas must be inspected by the Owner weekly and after storm events greater than one-half (0.5 inch) to ensure that the entrance pad and wash rack remain in functional condition. The inspections shall also note where vehicle tracking may be carrying sediment off site. Any required repair or reinstallation of the pad shall be performed within 24 hours. Any sediment observed tracked off site shall be cleaned up immediately.

4.2 Filter Strips/Grass Buffers

Vegetated filter strips act to cause deposition of sediment within the area of vegetation. Buffer strips of natural vegetation can be left at the time of site grading or can be created by using sod. A dense ground cover is necessary or runoff will channelize within the area. A minimum width of 20 feet is recommended.

Grass buffers are uniformly graded and densely vegetated areas of turf grass. They require sheet flow to promote filtration, infiltration, and settling to reduce runoff pollutants. Grass buffers differ from grass swales as they are designed to accommodate overland sheet flow rather than concentrated or channelized flow. They can be used to remove larger sediment from runoff from impervious areas.

Whenever concentrated runoff occurs, it should be evenly distributed across the width of the buffer via a flow spreader. This may be a porous pavement strip or another type of structure used to achieve uniform sheet-flow conditions. Grass buffers can also be combined

with riparian zones in treating sheet flows and in stabilizing channel banks adjacent to major drainageways and receiving waters.

Design of grass buffers is based primarily on maintaining sheet-flow conditions across a uniformly graded, dense grass cover strip. When a grass buffer is used over unstable slopes, soils, or vegetation, rills and gullies will form that disrupt sheet flow. The resultant short-circuiting will negate the intended water quality benefits. Grass buffers should be protected from excessive pedestrian or vehicular traffic that can damage the grass cover and affect even sheet-flow distribution.

General guidance suggests that the hydraulic load should not exceed 0.05 cfs/linear foot of buffer during a 2-year storm to maintain a sheet flow of less than 1 inch throughout dense grass that is at least 2 inches high. The upstream flow shall be uniformly distributed over this length. The minimum design length (normal to flow) is therefore calculated as:

$$L_G = \frac{Q_{2\text{-year}}}{0.05}$$

In which:

L_g = Minimum design length (feet)

$Q_{2\text{-year}}$ = Peak discharge supplied to the grass buffers by a 2-year storm event (cfs)

Note: Longer lengths may be used.

The minimum width (W_G) (the distance along the sheet flow direction) of the grass buffer shall be determined by the following criteria for onsite and concentrated flow control conditions:

- Sheet Flow Control (use the larger value) of the following:

$$W_G = 0.2L_I \text{ or } 8 \text{ feet}$$

In which:

L_I = The length of flow path of the sheet flow over the upstream impervious surface (feet)

- Concentrated Flow Control (use the larger value)

$$W_G = 0.15(A_t/L_t) \text{ or } 8 \text{ feet}$$

In which:

A_t = The tributary area (square feet)

L_t = The length of the tributary (normal to flow) upstream of the grass buffer (feet)

A rectangular strip is preferred and should be free of gullies or rills that concentrate the overland flow. Design slopes shall not exceed 4 percent.

Flow through the buffer shall be evenly distributed along the design length. Slotted curbing, log spreaders, or other spreader devices can be used to apply flows. Concentrated flow supplied to the grass buffer must use a level spreader (or a similar concept) to evenly

distribute flow onto the buffer. The grass buffer shall have a dense turf to promote sedimentation and entrapment and to protect against erosion.

Filter strip/grass buffer areas shall be inspected by the Owner weekly and after storm events greater than one-half (0.5-inches) to ensure that the filter strip/grass buffer is in functional condition and that sediment has not built up in the area. Any sediment that has built up in the area shall be removed within 24 hours. Any required repair or reinstallation of the filter strip/grass buffer shall occur within 24 hours.

Standard Drawing 2 in Attachment 5 may be used in development of the plan sheet.

4.3 Wattles/Fiber Rolls

A wattle is an elongated tube of straw, coconut fibers or other material for restraining sediment. It may be installed as a temporary barrier at the base of a disturbed area. Erosion control wattles are also employed as check structures in swales or waterways (See Section 5.1) and for inlet protection (See Section 5.2).

Attachment 5, Standard Drawing 3 shows proper installation of an erosion control wattle. Erosion control wattles shall be installed in trench along a land contour and perpendicular to the water flow in a ditch. The midpoint of the wattle must be lower than the endpoints of the wattle to ensure that water flows over the wattle and not around either side. The Contractor shall dig a 3 to 5 inch trench across the existing ditch, install the wattle tightly in the trench so that daylight cannot be seen under the wattle, and then compact the soil excavated from the trench against the wattle on the uphill side as shown in Detail B of Attachment 5 Standard Drawing 3. Stakes shall have a top dimension of 1" x 2" or 2" x 2", and shall extend a minimum of 12 inches into the ground. Where installing running lengths of wattles, the Contractor shall butt the second wattle tightly against the first and shall not overlap the ends as shown in Detail B of Attachment 5 Standard Drawing 3.

The erosion control wattle shall be inspected by the Owner once every week and within 24 hours after every rainfall event of one-half (0.5) -inch precipitation or greater. Accumulated sediment shall be removed once every week or within 24 hours after every rainfall event of one-half (0.5) -inch precipitation or greater.

Standard Drawing 3 in Attachment 5 may be used in development of the plan sheet.

4.4 Silt Fence

A silt fence is a temporary sediment barrier made of a woven synthetic material stretched across and attached to supporting posts to filter runoff. A silt fence can be placed as a temporary barrier at the base of a disturbed area but is not recommended for use in a channel or swale. The material is durable and will last for more than one season if properly installed and maintained. A silt fence should be used where the size of the drainage area is no more than one quarter acre per 100 feet of silt fence length, the maximum slope length behind the barrier is 100 feet and the maximum gradient behind the barrier is 50 percent (2:1). Properly installed silt fence shall be entrenched into the ground, and the sediment barrier shall stand above ground at a height of at least two (2) feet. Wooden stakes that are utilized for silt fence construction must have a diameter of 2 inches or more (or length and width of at least 2 inches if rectangular posts are used), and must have a minimum height of

5 feet (including the portion of the post driven into the ground). Metal stakes are also acceptable.

In most applications, silt fence is placed downslope from a construction site or newly disturbed area to prevent eroded soils from being transported offsite. If possible, silt fence should be installed before earth disturbing activities have begun. Location of the fabric is critical to its performance. Silt fences should be installed where it will capture sediment from the project before it leaves the project. Silt fence often acts like a temporary dam and therefore should not be placed too close to an outlet end of a pipe. The sediment can partially or completely plug these pipes. For this reason it is generally better to place silt fence at the inlet end of pipes. Silt fence will also catch snow. This should be considered when selecting the locations and performing maintenance.

After the silt fence has been installed, it will be necessary for the Contractor to perform some maintenance on the fabric. Large amounts of sediment may need to be removed from the upstream side of the silt fence. Silt fences shall be inspected by the Owner weekly and immediately after each rainfall of one-half (0.5) -inch or greater. Any required repairs or sediment removal shall be performed immediately. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Any fabric that frays or begins to decompose shall be replaced immediately.

Removal of the silt fence should not be done until other sufficient erosion control methods, such as permanent vegetation or structural BMPs such as detention ponds, are in place.

The use and installation of the silt fence should be completed according to Standard Drawings 4a through 4d included in the Attachment 5. The Low Flow Silt Fence Standards (Standard Drawings 4a and 4b) shall be used in applications controlling sediment in sheet flow (for flows of 20-70 gal/min/sqft (0.05 – 0.16 cfs/sq ft)), and the High Flow Silt Fence Standards (Standard Drawings 4c and 4d) shall be used in applications controlling sediment in concentrated flow, such as in inlet protection (for flows of 70-145 gal/min/sqft (0.16 – 0.33 cfs/sq ft)). The units in the flow specifications are flow per square foot of silt fence area.

Standard Drawings 4a through 4d in Attachment 5 may be used in development of the plan sheet.

4.5 Rock Check Dam

A rock check dam is small rock dam constructed across a grassed swale or road ditch. The purposes of using a rock check dam are to 1) reduce the velocity of concentrated stormwater flows thereby reducing erosion of the swale or ditch, 2) trap sediment generated from adjacent areas or the ditch itself and 3) increase infiltration when suitable soils are present. This practice, utilizing a combination of rock sizes, is limited to use in small grassed swales or open channels that **drain 10 acres or less**. It shall not be used in a perennial stream where protection of the flowing stream is the objective.

Some specific applications include:

- Temporary ditches or swales that, because of their short time of service, cannot receive a non-erodible lining but still need protection to reduce erosion

- Permanent ditches or swales that cannot receive a permanent non-erodible lining for an extended period of time
- Either temporary or permanent ditches or swales that need protection during the establishment of grass linings
- An aid in the sediment trapping strategy for an active construction site. This practice is not a substitute for major perimeter trapping measures such as Temporary Sediment Trap in Section 4.6.

When coarse aggregate is used in rock check dams, gradations in the 1- to 3-inch range are generally acceptable. The drainage area of a ditch or swale being protected shall not exceed 2 acres when coarse aggregate is used alone.

If the drainage area of a ditch or swale being protected exceeds 2 acres, then rock meeting SDDOT Class A rip-rap standards shall be added on the downstream side of the dam. The drainage area of a ditch or swale being protected shall not exceed 10 acres.

The maximum height of the rock check dam shall be 3.0 feet. The top of the rock check dam shall be a minimum of 1.0 feet below the top of the ditch or swale. The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the rock at the center of the downstream dam. The center of the rock check dam shall be at least 6 inches lower than the sides to prevent scour and subsequent failure of the structure.

The rock shall be spread into position in approximately horizontal layers not to exceed three (3) feet in thickness. It shall be placed in a manner to produce a reasonably homogeneous stable fill that contains no segregated pockets of large or small fragments or large unfilled spaces caused by bridging of the larger rock fragments. No compaction will be required beyond that resulting from the placing and spreading operations.

The rock check dams shall be placed such that the resultant ponding will not cause inconvenience or damage to adjacent areas or structures. For added stability, the base of the rock check dam should be keyed into the soil to a minimum depth of 6 inches.

Filter fabric may be used under the rock to provide a stable foundation and to facilitate removal of the rock.

Rock check dams are effective in reducing flow velocity and thereby the potential for channel erosion. It is usually better to establish a protective vegetative lining before flow is confined or to install a structural channel lining than to install rock check dams.

Rock check dams installed in grass-lined channels may kill the vegetative lining if submergence after rains is too long and/or siltation is excessive.

If temporary rock check dams are used in grass-lined channels that will be mowed, care should be taken to remove all the rock when the rock check dam is removed. This should include any rocks that have washed downstream.

Plans and specifications for installing rock check dams shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

- Location where the practice will be installed
- Dimensions, elevations, and spacing between the dams
- Rock gradation and quality
- Fabric specification if used

All plans shall include installation, inspection, and maintenance schedules with the responsible person identified. Standard Drawings 5a and 5b in Attachment 5 may be used in development of the plan sheet.

Rock check dams shall be inspected by the Owner weekly and within 24 hours of one-half (0.5) -inches precipitation or more. If any erosion has taken place around or below the rock check dam or if rocks have been dislodged, repairs shall be made to prevent further damage. Sediment shall be removed once it has accumulated to one-half the height of the rock check dam. The center of the rock check dam shall also be inspected by the Owner weekly to ensure that the center of the dam is lower than the sides.

Unless they will be incorporated into a permanent stormwater management control, rock check dams must be removed when their useful life has been completed. In temporary ditches and swales, rock check dams should be removed and the ditch filled in when they are no longer needed. In permanent structures, rock check dams should be removed when a permanent lining can be installed. In the case of grass-lined ditches, rock check dams should be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the rock check dams should be seeded and mulched immediately after they are removed.

For rock check dams that are made a part of a permanent stormwater management control, regular inspections should be made by the Owner to see if any erosion has occurred around or below the dam and if any rock has been dislodged. Immediately make all needed repairs to prevent further damage. If sediment trapping is to be a continuing function of the rock check dam, the sediment shall be removed when it has accumulated to one-half the depth of the rock check dam.

4.6 Temporary Sediment Traps

A sediment trap is a small, temporary ponding basin formed by construction of an embankment or excavated basin that is designed to fill with sediment. A sediment trap can be constructed by either excavating below grade or building an embankment across a swale. Excavated traps are less prone to failure than embankments. No pipe is used at the outlet, as in a sediment basin, and an open-channel spillway shall be included in the design. A minimum of 3,600 cubic feet of storage volume shall be provided for each tributary acre. The purpose of this practice is to detain sediment-laden runoff from small-disturbed areas for a sufficient period of time to allow the majority of sediment and other water-based debris to settle out.

Sediment traps should be considered when the following conditions are met:

- At the outlets of diversions, channels, slope drains, or other runoff conveyances that discharge sediment-laden water.
- Below areas that are 5 acres or less.

- Where access can be maintained for sediment removal and proper disposal.
- In the approach to a stormwater inlet located below a disturbed area as part of an inlet protection system.
- Structure life should be limited to 18 months.
- Where failure of the structure will not result in loss of life, damage to homes, commercial or industrial buildings, main highways or railroads; or in the use or service of public utilities.

Sediment trap designs shall provide for both sediment storage and detention storage.

The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. For construction periods exceeding one year, the one-year sediment load and a sediment removal schedule may be substituted.

The detention storage shall be composed of equal volumes of "wet" and "dry" detention storage. Each shall be sized for the runoff from either a 2-year, 24-hour storm from the area draining into the basin under maximum runoff conditions during construction, or 134 cubic yards/acre based on the area draining into the basin, whichever is greater. Half of the detention storage shall be below the permeable fill.

When an embankment is used, ensure that embankments for temporary sediment traps do not exceed 5 feet in height measured at the centerline from the original ground surface to the top of the embankment. Additional freeboard may be added to the embankment height to allow flow through a designed bypass location. Construct embankments with a minimum top width of 5 feet and side slopes of 2:1 or flatter.

The design height of the embankment shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. The height of the embankment shall be increased by 5 percent where the fill material is placed in lifts of 8 inches or less and compacted by heavy equipment traversing the fill. The height shall be increased by 10 percent when fill material is graded by a bulldozer.

The original ground under the embankment shall be scarified to a depth of 6 inches or more prior to placement of the fill material. Fill material shall not be placed over frozen ground. The earthen embankment shall be seeded with temporary or permanent vegetation in accordance with methods outlined in Section 3.2.

Where sediment pools are formed or enlarged by excavation, side slopes shall be 2:1 or flatter for safety.

The sediment trap spillway shall be constructed using a stone section of embankment located at the low point in the basin. The stone section serves two purposes: 1) the top section serves as a non-erosive spillway outlet for flood flow, and 2) the bottom section provides a means of dewatering the basin between runoff events.

A combination of coarse aggregate and riprap shall be used to provide for filtering/detention as well as outlet stability. Construct the outlet using well-graded stones where 50 percent of the stones pass through a 9-inch sieve and the maximum stone size is 14 inches. A

1-foot thick layer of 1/2-inch rock should be placed on the inside face to reduce drainage flow rate.

The side slopes of the spillway shall be at least 21 inches thick. The crest of the spillway outlet shall be a minimum of 1.5 feet below the settled top of the embankment. Filter cloth or geotextile shall be placed between the soil and the riprap to prevent piping. An alternative would be to excavate a trench across the riprap foundation and up the sides to the height of the embankment.

The spillway weir shall be at least 4 feet long and sized to pass the peak discharge of the 10 year frequency, 24-hour duration storm without failure, overtopping of the basin or significant erosion. A maximum flow depth of 1 foot, a minimum freeboard of 0.5 feet, and maximum side slopes of 2:1 are required. Weir length may be selected from Exhibit 8.

EXHIBIT 8
Weir Lengths Required for Given Drainage Areas

Drainage Area (acres)	Minimum Weir Length (ft.)
1	4
2	6
3	8
4	10
5	12

The release rate of the basin shall be that rate required to achieve minimum detention times of at least 10 hours. The elevation of the permeable fill outlet shall be placed such that it only drains the dry detention storage.

Spillway bypasses shall be directed to natural, stable areas. Bypass outlets shall be located so that flow will not damage the embankment.

Discharges from both the principal and emergency spillways of a sediment trap must be conveyed to a natural waterway in a channel of adequate capacity and stability. Where this channel intersects with the natural waterway, the discharge shall be less than 1 1/2 feet per second or otherwise below the velocity which will initiate erosion or scour within the receiving waterway. Overflows to stormwater facilities must have adequate capacity to receive the discharge from the sediment trap.

Where an emergency spillway is utilized, the spillway crest elevation should be at least 1.5 feet below the settled top of the embankment with the emergency spillway crest being 0.5 feet below the top of the embankment.

Locations for sediment traps shall be selected during site evaluation. Natural drainage divides shall be noted and trap sites selected so that runoff from potential sediment-producing areas can easily be diverted into the traps.

Traps shall be made readily accessible for periodic sediment removal and other necessary maintenance. Locations for sediment disposal shall be part of trap site selection. Clearly designate all disposal areas on the plans.

In preparing plans for sediment traps, it is important to consider provisions to protect the embankment from failure from storm runoff that exceeds the design capacity. Consider non-erosive emergency spillway bypass areas, particularly if there could be severe consequences from failure. If a bypass is not possible and failure would have severe consequences, consider alternative sites.

Sediment trapping is achieved primarily by settling within a permanent pool formed by excavation, or by a combination of excavation and embankment. Sediment-trapping efficiency is a function of surface area and inflow rate. Installations that provide pools with large length to width ratios reduce short-circuiting and allow more of the pool surface area for settling.

The minimum length of flow through the trap should be 10 feet and the minimum length to width ratio should be 2:1. If site conditions permit a greater travel distance through the basin and greater length to width ratio the water quality benefit provided by the sediment trap will be enhanced. The average trap permanent pool depth should be a minimum of 3 feet to prevent re-suspension of sediments.

Another method of improving the trapping efficiency is to place geotextile fabric between the riprap and coarse aggregate. If this is done, timely maintenance is needed to ensure that the outlet does not clog with sediment.

Because well-planned sediment traps are key measures to preventing off-site sedimentation, they should be installed in the first stages of project development.

Plans and specifications for temporary sediment traps shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

- Location of the sediment traps.
- Size of basin including width, length and depth.
- Minimum cross section of embankment.
- Minimum profile through spillway.
- Location of emergency spillway, if used.
- Gradation and quality of rock.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified. Standard Drawing 6 in Attachment 5 may be used in development of the plan sheet.

Temporary sediment traps shall be inspected by the Owner weekly and within 24 hours of a precipitation event greater than one-half (0.5) -inches. Sediment shall be removed so that the trap is restored to its original dimensions after the sediment has accumulated to one-half the design depth of the permanent pool.

The structure shall be checked for damage from erosion or piping. The depth of the spillway shall be checked to ensure it is a minimum of 1.5 feet below the low point of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.

After all sediment-producing areas have been permanently stabilized, the structure and all unstable sediment shall be removed. The area shall be smoothed to blend with the adjoining areas and stabilized properly.

4.7 Sediment Basins

Areas draining more than five (5) acres shall be routed through a sediment basin. Sediment basins shall be designed to a minimum 3,600 cubic feet of volume per tributary acre.

If the site is to include a stormwater quality or flood detention basin, the permanent detention facility may be used as the temporary sediment basin, provided the outlets are modified upon completion for this purpose. Such permanent detention facilities shall be restored to design grades, volumes, and configurations after site development is completed and the project is finalized. The outlet from a sediment basin shall be designed to empty its volume in no less than 16 hours, that is to have an average outflow rate of 7.0 gallons/minute/tributary acre, or less. The basin length shall be no less than twice the basin width. The inflow structures at the entrance of the basin shall be designed to dissipate inflow energy and to spread the flow so as to achieve uniform flow throughout the basin's width.

For drainage locations serving less than ten (10) acres, a sediment basin or a combination of sediment basin(s) and sediment traps providing storage for 3,600 cubic feet of storage per acre drained may be required along with silt fences or equivalent sediment controls on all sideslope and downslope boundaries of the construction area.

A sediment basin can be constructed by excavation or by erecting an earthen embankment across a low area or drainage swale. The basin can be either a temporary (up to 3 years) structure or a permanent stormwater control measure. Sediment basins can be designed to drain completely during dry periods, or they can be constructed so that a shallow, permanent pool of water remains between storm events. However, depending on the size of the basin constructed, the basin may be considered a wet pond and subject to additional regulation and permits.

Sediment basins are usually used for drainage areas of 5 to 100 acres. They can be temporary or permanent structures. Generally, sediment basins designed to be used for up to 3 years are described as temporary, while those designed for longer service are said to be permanent. Temporary sediment basins can be converted into permanent stormwater runoff management ponds, but they must meet all regulatory requirements for wet ponds.

Sediment basins are applicable in drainage areas where it is anticipated that other erosion controls, such as sediment traps, will not be sufficient to prevent off-site transport of sediment.

The potential sites for sediment basins should be investigated during the initial site evaluation. Basins should be constructed before any grading takes place within the drainage area. The design of the basin should be completed by a qualified Professional Engineer experienced in the design of dams.

Sediment basins with earthen embankments should be outfitted with a dewatering pipe and riser set just above the sediment removal cutoff level. The riser pipe should be located at the deepest point of the basin and extend no farther than 1 foot below the level of the earthen dam. A water-permeable cover should be placed over the primary dewatering riser pipe to prevent trash and debris from entering and clogging the spillway. To provide an additional path for water to enter the primary spillway, secondary dewatering holes can be drilled near

the base of the riser pipe, provided the holes are protected with gravel to prevent sediment from entering the spillway piping.

To ensure adequate drainage, the following equation can be used to approximate the total area of dewatering holes for a particular basin (Smolen et al., 1988):

$$A_o = (A_s \times (2h)) / (T \times C_d \times 20,428)$$

Where:

A_o = total surface area of dewatering holes, ft^2

A_s = surface area of the basin, ft^2

h = head of water above the hole, ft

C_d = coefficient of contraction for an orifice, approximately 0.6

T = detention time or time needed to dewater the basin, hours

In all cases, such structures should be designed by an appropriate professional based on local hydrologic, hydraulic, topographic, and sediment conditions.

Routine inspection and maintenance of sediment basins is essential to their continued effectiveness. Basins should be inspected by the Owner after each storm event to ensure proper drainage from the collection pool to determine the need for structural repairs. Erosion from the earthen embankment should be repaired immediately. Sediment basins must be located in an area that is easily accessible to maintenance crews for removal of accumulated sediment. Sediment should be removed from the basin when its storage capacity has reached approximately 50 percent. Trash and debris from around dewatering devices should be removed promptly after rainfall events.

The tributary drainage area of the proposed sediment basin shall not be more than 100 acres.

Sediment basins that impound 25 acre-feet of water or more require that a Location Notice be filed with SD DENR and may also require a Water Rights Permit from SD DENR. A structure is considered a dam by SD DENR if the height to the dam crest is greater than or equal to 25 feet and the storage at the dam crest (not at the spillway elevation) is greater than 15 acre feet or if the height to the dam crest is greater than 6 feet and the storage at the dam crest (not at the spillway elevation) is greater than or equal to 50 acre feet. The height of the dam is the difference in elevation between the natural bed of the watercourse or the lowest point on the toe of the dam, whichever is lower, and the crest elevation of the dam. Dams that meet this definition must follow specific SD DENR safety requirements. If there is any question as to whether a sediment basin may trigger these or other dam regulations, the Owner shall coordinate with SD DENR.

Standard Drawing 7 in Attachment 5 may be used in development of the plan sheet.

5. Drainageway Protection Best Management Practices

At times construction activities must occur adjacent to or within a drainageway. Whenever this occurs, bottom sediments will be disturbed and transported downstream. The goal of drainage protection is to minimize the movement of sediments resulting from construction

activities that take place within any drainageway. Temporary facilities can be installed to divert flowing water around such sediment-generating construction activities within drainageways.

5.1 Working Within or Crossing a Waterway

Whenever work occurs within a waterway, the following shall be considered as appropriate:

- Construction vehicles shall be kept out of a waterway to the maximum extent practicable. Where in-channel work is necessary, steps, such as temporary channel diversions, shall be taken to stabilize the work area during construction to control erosion. The channel (including bed and banks) shall be restabilized immediately after in-channel work is completed.
- Where an actively-flowing watercourse must be crossed regularly by construction vehicles, a temporary crossing shall be provided. Two primary methods are available: 1) a culverted crossing, and 2) a stream ford. A culverted crossing shall be designed to pass the 2-year design flow. A stream ford shall be lined with a minimum six (6) -inch thick layer of one-and-a-half- (1.5)-inch diameter rock. A permit is required for placement of fill in a waterway under Section 404 of the Clean Water Act. The Corps of Engineers Office in Pierre, South Dakota, shall be contacted about the requirements for obtaining a 404 permit.
- Whenever possible, construction in a waterway shall be sequenced to begin at the most downstream point and work progressively upstream installing required channel and grade control facilities.
- Work shall be completed in small segments, exposing as little of the channel at a time as possible.
- Where possible, all in-channel work shall be performed between September 15 and April 15.

5.2 Outlet Protection

The outlets of drains, culverts, sediment traps, and sediment basins shall be protected from erosion and scour. This may require the use of a rip rap apron at the outlet location.

Check dams or wattles can be used in ditches or swales and downstream of the outlets of temporary drains, culverts, sediment traps, and sediment basins. These devices reduce the velocity of concentrated flows and trap sediment eroded from the upstream ditch or swale.

Check dams may be used under the following conditions:

- In temporary or permanent swales that need protection during establishment of grass;
- In permanent swales that need protection prior to installation of a non-erodible lining;
- In temporary ditches or swales that need protection where construction of a non-erodible lining is not practicable.

Check dams providing outlet protection shall meet all requirements of Section 4.5.

5.3 Inlet Protection

All storm sewer inlets which are made operable during construction shall be protected to prevent sediment-laden runoff from entering the conveyance system without first being filtered or otherwise treated to remove sediment.

Inlets may be temporarily blocked to prevent sediment-laden runoff from entering storm sewers. Inlet protection measures shall be removed after upstream disturbed areas are stabilized.

Inlets may be protected using wattles, filter fabric, silt fence, or other similar methods. See Section 4.3 Erosion Control Wattles, Section 4.4 Silt Fence and Standard Drawings 3 and 4a through 4d in Attachment 5 for detailed examples.

Caution must be used in temporarily blocking inlets to ensure that localized flooding conditions do not develop.

6. Good Housekeeping and Non-structural Best Management Practices

6.1 Concrete Wash Water

The following standards apply to the mixing and handling of concrete on construction sites.

Both dry and wet materials should always be stored under cover and protected from rainfall and runoff. Dry materials shall be protected from wind. Bags of cement must be secured after they are open. Wind-blown cement powder should be kept away from gutters, storm drains, rainfall, and runoff. Employees should be trained to be aware of the impacts of improper disposal of concrete/mortar wastes and washwater.

Fresh concrete, mortar or plaster shall be mixed only for use during the same day. Small mixers shall be set up and operated on tarps or heavy plastic dropcloths. An on-site area shall be designated for dumping excess concrete. Random dumping around the site shall not be allowed. Washout shall never be disposed of into the street, storm drains, drainage ditches, or streams. Washout shall be directed to a containment pond, pit, or bermed area large enough for liquid and solid waste. Washout shall be pumped back into the mixer for reuse whenever possible.

Water collected in a pond, trap, or basin shall be allowed to evaporate or infiltrate into soil. Excess concrete shall be allowed to harden so it can be broken up and disposed of in trash.

During saw cutting operations, slurry must not be discharged to the storm drain system. Slurry shall be vacuumed and pumped to a holding tank for disposal or to a containment pond. When washing concrete to remove fine particles or expose the aggregate, discharge to the storm drain should be avoided by directing the water to a bermed or dirt area. Concrete sweepings from exposed aggregate shall not be washed into the street or storm drain. Aggregate sweepings shall be collected and returned to base stockpile or disposed of in the trash. When cleaning up after driveway or sidewalk construction, fine material shall be washed onto dirt or grassy areas, not down the driveway or into the street or storm drain.

Exposed stockpiles of mortar, sand, and other similar materials must be covered with plastic tarps to protect from rain. All materials should be stored as far away from creeks and storm drains as practical.

6.2 Dust Control / Street Sweeping

Use dust control measures to reduce the surface and air transport of dust and other pollutants. For paved areas, sweep, rather than wash dirt or debris from the surface. When land is disturbed, minimize dust transport by applying the following measures as appropriate:

- **Vegetative Coverings:** Temporary seeding and mulching may be applied to cover bare soil and to prevent wind erosion. The soil must be kept moist to establish cover.
- **Barriers:** Solid board fences or other materials can be used to control air currents and blown soil. Barriers placed at right angles to prevailing wind currents at intervals of about 15 times the barrier height are effective in controlling wind erosion.
- **Irrigation:** The site is sprinkled with water until the surface is wet and repeated as necessary. If this method is to be employed at a construction site, it is recommended that a temporary gravel rock entrance be created to prevent mud from spreading onto local streets.

6.3 Spill Prevention and Response

Spill prevention and response includes measures to be taken to ensure that spills do not result in water quality impacts. Spills and leaks together are one of the largest sources of stormwater pollutants and in most cases are avoidable.

The following preventative strategies are recommended where fluids are commonly present:

- Identify all equipment that may be exposed to stormwater, pollutants that may be generated, and possible sources of leaks or discharges.
- Perform regular maintenance of each piece of equipment to check for proper operation, leaks, malfunctions, and evidence of leaks or discharge (stains). Develop a procedure for spill reporting, clean up, and repair.
- Drain or replace motor oil or other automotive fluids in an area away from streams or storm or sanitary sewer inlets. Collect spent fluids and recycle or dispose of properly.
- In fueling areas, clean up spills with dry clean up methods (absorbents), and use damp cloths on gas pumps and damp mops on floors instead of a hose.

An important part of spill prevention is training. All Contractor employees shall be trained in spill prevention practices and adhere to them.

The best way to prevent pollutants from entering the storm drains is to prevent stormwater from contacting equipment or surfaces that may have oil, grease, or other pollutants. Some good activities to help prevent negative impacts on stormwater quality include:

- Properly dispose of stormwater that has collected in containment areas (may need permit if contaminated).
- Adopt effective housekeeping practices.
- Ensure adequate security to prevent vandalism.

It is important to identify potential spill areas and their drainage points to determine preventative measures and spill response actions. Areas and activities that are most vulnerable to spills include transportation facilities where vehicle spills could be a problem:

- Loading and unloading areas
- Storage areas
- Process activities
- Dust or particulate generating processes
- Waste disposal activities

In addition to these areas, evaluate spill potential in other areas (access roads, parking lots, power generating facilities, etc.). It is also important to estimate the possible spill volume and drainage paths.

Proper outdoor materials handling procedures include:

- For permanent and long-term (greater than 3 months) storage, keep bulk solid materials (including raw materials, sand, gravel, topsoil, compost, concrete, packing materials, and metal products) covered or protected from stormwater.
- Isolate and consolidate bulk materials from stormwater runoff by providing berms or other means to keep the material from migrating into drainage systems.
- When possible, store materials such as salt, hazardous materials, and other materials prone to leaching when exposed to stormwater on a paved surface.
- Locate material storage areas away from storm drains, ponds, and drainage ways.
- Hazardous materials must be stored according to federal, state, and local HazMat requirements.
- Adopt procedures that reduce the chance of spills or leaks during filling or transfer of materials.
- Substitute less or non-toxic materials for toxic materials.

Proper spill response procedures are as follows:

- Wipe up small spills with a shop rag, store shop rags in covered rag container, and dispose of properly (or take to professional cleaning service and inform them of the materials on the rag).
- Contain medium-sized spills with absorbents (kitty litter, sawdust, etc.) and use inflatable berms or absorbent rolls or “snakes” as temporary booms for the spill. Store

and dispose of absorbents properly. Wet/dry vacuums may also be used, but not for volatile fluids.

- For large spills, first contain the spill and plug storm drain inlets where the liquid may migrate offsite, then clean up the spill. Contact appropriate emergency response agency according to State and local requirements.

A **Spill Prevention Plan** identifies areas where spills can occur onsite, specifies materials handling procedures, storage requirements, and identifies spill cleanup procedures. The purpose of this plan is to establish standard operating procedures, and the necessary training to minimize the likelihood of accidental releases of pollutants that can contaminate stormwater runoff. Stormwater contamination assessment, flow diversion, record keeping, internal reporting, training, and preventative maintenance are associated BMPs that can be incorporated into a comprehensive Spill Prevention Plan.

A Spill Prevention Plan is applicable to facilities that transport, transfer, and store hazardous materials, petroleum products, and fertilizers that can contaminate stormwater runoff. A Spill Prevention Plan shall include the following information:

- A description of the facility including the nature of the facility activity, and general types and quantities of chemicals stored at the facility.
- A site plan showing the location of storage areas of chemicals, the location of storm drains, site drainage patterns, fire-fighting equipment and water source locations, and the location and description of any devices used to contain spills such as positive control valves.
- Notification procedures to be implemented in the event of a spill such as phone numbers of key personnel and appropriate regulatory agencies.
- Instructions regarding cleanup procedures.
- Designated personnel with overall spill response cleanup responsibility.
- Quick notification of the Watertown Fire Department for spills that cannot be handled by local site staff.

A summary of the plan shall be written and posted at appropriate points identifying the spill cleanup coordinators, location of cleanup kits, and phone numbers of regulatory agencies to be contacted in the event of a spill. Cleanup of spills shall begin immediately. No emulsifier or dispersant shall be used. In fueling areas, absorbent shall be packaged in small bags for easy use and small drums shall be available for storage of absorbent and/or used absorbent. Absorbent materials shall not be washed down the floor drain or into the storm sewer.

Emergency spill containment and cleanup kits shall be located at the facility site. The contents of the kit shall be appropriate to the type and quantities of chemicals or goods stored at the facility. The following procedures shall be followed when implementing an emergency spill cleanup plan:

- Key personnel shall receive formal training in plan execution with additional training to the people who are likely to be the first on the site. All employees shall have a basic knowledge of spill control procedures.

- A plan summary shall be posted at appropriate site locations. The summary shall include the identification of the spill cleanup coordinators, location of cleanup equipment, and phone numbers of site personnel and regulatory agencies to be contacted in the event of a spill.
- Perform the following notifications in the event of a spill:
 - Codington County Emergency Management (605) 882-6272
 - Watertown Fire Department 911
 - City of Watertown Public Works Director (605) 882-6204 x14
 - National Response Center (800) 424-8802
 - State and Federal Agencies as required by the material spilled
- Containment and cleanup of any spills shall begin immediately.
- Absorbents shall be readily used in fueling areas.

An inventory of cleanup materials shall be maintained onsite and strategically deployed based on the type and quantities of chemicals present.

6.4 Planning and Scheduling

When planning and scheduling construction activities, the following practices will serve to limit erosion and sediment pollution:

Existing vegetation should only be removed when necessary. When planning a project, consider leaving in place as much existing vegetation as possible. If possible, excavation, grading and paving operations should be planned for dry weather periods. Grading operations should be phased to limit the extent of disturbed areas and duration of exposure.

For the duration of a construction project, a specific area of the site should be set aside for material storage and equipment maintenance. This location should be as far away from storm drain inlets, ditches, or streams as possible.

Proper waste disposal must be practiced. If possible, recycle solvents, water-based paint, vehicle fluids, broken asphalt and concrete, wood, and cleared vegetation. All waste that cannot be recycled shall be stored in dumpsters covered with tarps or plastic sheeting. Dumpsters must be emptied often enough to ensure that they do not overflow.

Material in excess of what is required to complete the project should not be stored on site. Construction site operators should conduct training sessions to educate employees about erosion and sediment control practices described in this manual. Weekly inspections of erosion control practices should be conducted by the Owner as described in this manual.

7. Disposal of Temporary Measures

All temporary erosion and sediment control measures shall be removed and disposed of within 30 days after final site stabilization is achieved or after the temporary measures are no longer needed, whichever occurs earliest, or as authorized by the Office of the City Engineer. For example, a site containing only one building shall have temporary erosion control measures removed after building construction is complete and final landscaping is

in place. Temporary erosion control measures shall be removed from a commercial construction site or residential subdivision only after streets are paved and all areas have achieved final stabilization. Trapped sediment and disturbed soil areas resulting from the disposal of temporary measures shall be returned to final plan grades and permanently stabilized to prevent further soil erosion.

The professional preparing the SWPPP shall submit, as part of the narrative report, a schedule of removal dates for temporary control measures. The schedule shall be consistent with key construction items such as street paving, final stabilization of disturbed areas, or installation of structural stormwater controls.

8. Maintenance

All temporary and permanent erosion and sediment control practices shall be maintained and repaired by the Owner during the construction phase as needed to ensure continued performance of their intended function. Some specific maintenance requirements are described in each BMPs' individual Section. All facilities shall be inspected by the Owner weekly and following each precipitation event (greater than one-half (0.5) -inches or snowmelt event that results in runoff.

The professional preparing the SWPPP shall submit, as part of the narrative report, a schedule of planned maintenance activities for temporary and permanent erosion and sediment control measures. The schedule shall be consistent with the level of maintenance required for the control measures proposed in the plan.

9. Inspections

The Owner shall ensure that qualified personnel such as the construction site superintendent or project manager inspect the site at least once every 7 calendar days and within 24 hours of the end of a storm of one-half (0.5) inch precipitation or greater to confirm plan compliance. Inspections are also required after snowmelt events resulting in runoff and any event or activity resulting in surface erosion, sediment transport, or vehicle tracking of debris off of property. Action to address any problem areas found during inspection must occur as soon as possible. Such sites will be considered as potential violations until addressed. The plan shall be revised and implemented in no case later than 7 calendar days following the inspection.

The inspection shall look for evidence of or the potential for pollutants entering the drainage system or leaving the site and shall include: disturbed areas of the construction site that have not been finally stabilize; areas used for storage of materials; structural and non structural control measures; and locations where vehicles enter or exit the site.

A report summarizing the areas inspected, name(s) and title(s) of personnel making the inspection, the date(s) of the inspection, major observations and corrective actions taken shall be made and retained as part of the plan for a least 3 years. Such reports shall identify any incidents of non-compliance. Where an inspection does not identify any incidents of non-compliance, the report shall contain a certification that the site is in compliance with the plan and permit. The Site Inspection Form in Attachment 6 may be used to conduct site investigations. Compliance documentation is the responsibility of the Owner.

10. Noncompliance

If the City determines that construction activities have occurred without a submitted SWPPP required as described in this Manual or that the required execution, maintenance, inspection of BMP measures as described in the submitted plan have not occurred to satisfaction of the City, then the Owner is subject to enforcement actions as allowed by the City of Watertown Ordinances. Enforcement actions may include:

- Withholding of grading or building permit or building inspections
- Warning letter/inspection report
- Letter of noncompliance
- Stop-work order
- Withholding of the Certificate of Occupancy
- Permit revocation by the City of Watertown and/or SD DENR
- Notice of violation and order with monetary fines
- Municipal summons

In addition, any person who violates a permit condition or makes any false statement, representation, or certification, may be subject to enforcement action under South Dakota Codified Law (SDCL), Chapter 34A-2.

11. References

City of Las Vegas, Nevada, *Stormwater Pollution - What You Should Know For...General Construction & Site Supervision*, 2005.

City of Sioux Falls, South Dakota, *Chapter 11 Drainage Improvements*, 2004.

City of Sioux Falls, South Dakota, *Chapter 12 Erosion Control*, 2004.

Minnesota Pollution Control Agency, *Protecting Water Quality in Urban Areas – A Manual: Chapter 6 Erosion Prevention and Sediment Control*, 2000.

Smolen, M.D., D.W. Miller, L.C. Wyatt, J. Lichthardt, and A.L. Lanier. 1988. *Erosion and Sediment Control Planning and Design Manual*. North Carolina Sedimentation Control Commission, North Carolina Department of Environment, Health, and Natural Resources, and Division of Land Resources Land Quality Section, Raleigh, NC.

South Dakota Department of Environment and Natural Resources, *General Permit for Stormwater Discharges Associated with Construction Activities*, 2002.

South Dakota Department of Transportation, *Erosion Control Manual*, 2004.

US Department of Agriculture Natural Resources Conservation Service and Illinois Environmental Protection Agency, *Illinois Urban Manual*, 2002.

US Environmental Protection Agency. Sediment Basin and Rock Check Dam Fact Sheet, <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/>, 2006.

Attachment 1
List of Definitions

Attachment 1

List of Definitions

Best Management Practices (BMPs): schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the state. BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Control Measures: any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the state.

Erodibility: The susceptibility of a particular soil type to erosion by water or wind.

Erosion: The wearing away of the land surface by water, wind, ice or other geological agents, including the detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

Erosion Control Measures: Practices that slow or stop erosion.

Final Stabilization: either:

- a.** all soil disturbing activities at the site have been completed and a uniform perennial vegetative cover with a density of 70% of the native cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed; or
- b.** for individual lots in residential construction, that either: **1)** the permittee has completed final stabilization as specified in part **(a)** above, or **2)** the permittee has established temporary stabilization for an individual lot before the property owner assumes operational control of the property and the permittee informs the property owner of the need for, and benefits of, final stabilization; or
- c.** for construction projects on land used for agricultural purposes, final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to “waters of the state,” and areas which are not being returned to their pre-construction agricultural use must meet the final stabilization criteria in **(a)** or **(b)** above.

Land Disturbing Activity: Grading, cut, fill, stockpiling of dirt, removal of vegetation, or any other alteration or disturbance of the ambient land surface.

Larger Common Plan of Development or Sale: a contiguous area where multiple separate and distinct construction activities are planned to occur at different times on different schedules as a part of one plan.

Mapping Unit: Soil name and symbol given in the Soil Conservation Service Soil Survey for each soil type.

Operator: the owner, party, person, general contractor, corporation, or other entity that has operational control over a construction project. The operator is responsible for ensuring compliance with all conditions of the permit and with development and implementation of the “stormwater pollution prevention plan”.

Permanent: Installation of land-surface cover, or erosion and sediment control measures that will remain in place for a long period of time.

Pollutant: Anything which causes or contributes to pollution. 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, so that same 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 constructing a building or structure; and noxious or offensive matter of any kind.

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, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Sedimentation: The process of solid materials, both inorganic (mineral) and organic, coming to rest on the earth’s surface either above or below sea level.

Sediment: Particulate solid material, either inorganic or organic, that will settle or be deposited in a liquid under the force of gravity.

Sediment Barrier: Straw bale barrier (dike) or a silt fence.

Sediment Basin: A depression, either excavated or formed by a dam, that holds water and debris and facilitates sedimentation of soil particles. Normally used for drainage areas equal to and greater than 5.0 acres.

Sediment Trap: A small depression that holds water and debris and facilitates sedimentation. Normally used for drainage areas less than 5.0 acres.

Stormwater: for the purpose of this manual, means stormwater runoff, snow melt runoff, or surface runoff and drainage associated with construction activity.

Stormwater Associated with Construction Activity: the stormwater runoff from construction activities including clearing, grading, and excavating, that result in the disturbance of five or more acres of total land area or which may be part of a larger common plan of development or sale if the larger common plan will ultimately disturb five or more acres of land.

Temporary: Installation of erosion or sediment control measures, either structural or nonstructural, that are planned to be removed or inactivated after a period of time.

Waters of the State: all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state, but not waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA other than cooling ponds as defined in 40 C.F.R. § 423.11(m) (July 1, 1991).

Attachment 2
Example SWPPP Report

Example SWPPP Report

Prepared For:

Ajax Development Inc.

1234 A Street

Watertown, SD 57201

Phone: (605) 555-0000

Prepared By:

Acme Consultants, Inc.

43560 Square Feet Street

Watertown, SD 57201

Phone: (605) 555-1212

February 2008

I. Introduction

Name, Address, and Telephone Number

Owner:

Ajax Development, Inc.
1234 A Street
Watertown, SD 57201
Phone: (605) 555-0000

Erosion Control Consultant:

John Smith, P.E.
Acme Consultants, Inc.
43560 Square Feet Street
Watertown, SD 57201
Phone: (605) 555-1212

Project Location

The project is located at 100 B Street in the SW quarter of Section __, Township __, Range __ of the 6th principal meridian located in Codington County, South Dakota.

Project Description

The Project consists of the development of a 6.2 acre parcel with two office buildings. The project involves constructing two office buildings, two parking lots, an access road, a box culvert over Dry Creek and associated site utilities. The box culvert will be constructed first to provide access to the site. Following site grading, temporary vegetation and road base will be installed. Utility and building construction will then begin. Paving and landscaping will be the final phase of the project.

Existing Site Conditions

Most of the existing site is vegetated with native grass. The plant density is estimated to be 50 percent coverage of the ground surface. Cottonwood trees and other riparian vegetation are found adjacent to Dry Creek. The site drains to Dry Creek except the southeast portion which drains offsite to the southeast. About 0.2 acres of wetlands are found next to Dry Creek. The riparian and wetland vegetation will not be disturbed by the site development. The existing slopes on the site range from 2 percent to 19 percent adjacent to the creek.

Adjacent Areas

Land use in the vicinity is commercial. The land immediately to the south and east has been developed for commercial use. Areas to the north and west are undeveloped and vegetated with native grass. Dry Creek runs along the west border of the property. Sediment control measures will be taken to prevent damage to Dry Creek. Approximately 2 acres of grassland to the north contribute runoff to the construction area.

Receiving Waters

Runoff from the site discharges to Dry Creek which runs along the west border of the property and is presently a stable, gently flowing perennial stream.

Soils

The soil in the project area is mapped as Renwash loam, 0-2 percent slope. The upper 17 inches consists of dark gray loam. The subsoil consists of brown and grayish brown, gravelly loamy sand. Renwash soils are considered well-drained with permeability rates greater than 0.6 in/hr at the surface and 20 in/hr in the underlying gravelly material. The soil erodibility factor (K value) ranges from 0.28 at the surface to 0.1 in the subsoil. Renwash soils are classified in the B hydrologic soil group. Depth to the high water table is greater than 3.5 feet.

Areas

The total site surface area is 6.2 acres. The project will involve grading approximately 5.2 acres of the parcel. Approximately 1 acre of wetland and riparian property adjacent to Dry Creek will remain undisturbed.

Erosion and Sediment Control Measures

All listed measures will be the responsibility of the general contractor.

1. **Soil Stockpiles:** The upper 6 inches of topsoil will be stockpiled and re-spread on surfaces not planned for buildings or impervious areas. Soil stockpiles will be seeded with a temporary grass cover within 2 weeks of stockpile construction.
2. **Roads and Parking Lots:** Road cuts, road fills, and parking lot areas will be paved as soon as final grade is reached.
3. **Mulching/Temporary Revegetation:** All non-paved areas will be seeded within 14 days of final grading. Mulch shall be applied to protect newly seeded areas.
4. **Sediment Basin:** A sediment basin will be constructed in the southeast corner of the property. All water from disturbed areas will be directed to the basin before leaving the site. The contributing drainage area reaching the disturbed

site is approximately 7.2 acres, consisting of the disturbed 5.2 acres and 2 acres to the north of the site. Basin calculations are can be found at the end of this report.

5. Vehicle Tracking and Temporary Construction Entrance: A temporary gravel construction entrance will be installed near the northeast corner of the property. Geotextile fabric will be placed under the entrance.
6. Silt Fence: A silt fence will be constructed around the south boundary of the site and along the edge of the project area adjacent to Dry Creek. A buffer (>20 feet) will be maintained between the silt fence and Dry Creek.
7. Grass-Lined Channel: A grass-lined channel will intercept runoff before it reaches the silt fence and convey water to the sediment basin. An erosion control blanket will be installed in the channel bottom until grass is established. As slopes in the channel will be less than 2 percent, check dams or other velocity reduction practices will not be necessary.

Nonstructural Control Measures

Standard good housekeeping practices for management of concrete wash water and spill prevention will be employed. Dust control is not expected to be an issue due to the small area of exposure and the relatively short time of exposure (not to exceed 9 months). Should excessive dust be generated, it will be controlled by sprinkling.

Any sediment and debris that has been washed or tracked off the site will be removed. Solvents, water-based paint, vehicle fluids, broken asphalt and concrete, wood, and cleared vegetation will be recycled when possible. All waste that cannot be recycled will be stored in dumpsters covered with tarps or plastic sheeting. Dumpsters will be emptied regularly to ensure that they do not overflow.

Time Schedule

The construction schedule is as follows:

Install Construction Entrance, Sediment Basin and Silt Fence Barriers:	September 15-September 30
Site Grading and Grass Swale Construction and Stabilization	September 30-October 15
Install Base Course and Mulch to all Exposed Soil Areas:	October 15-October 20
Utility and Building Construction:	October 20-April 1

Paving and Landscaping: April 1-April 15

Removal of Erosion Control Measures: April 15-April 20

The schedule will minimize the exposure of unprotected areas. The perimeter controls will be installed prior to site grading. Weekly inspections will be conducted by the Owner of erosion and sediment control structures. Inspections will begin during installation of control structures (approximately September 15) and continue through project completion.

Permanent Stabilization

Permanent landscaping will include bluegrass sod and trees and shrubs and will be maintained to ensure vegetative cover is sufficient to control soil erosion and survive severe weather. Temporary revegetation will be installed on all disturbed areas having a period of exposure prior to final stabilization of two (2) weeks or longer. The sediment basin will be converted to the site detention pond after sod is installed (refer to the site Drainage Report for the detention requirements).

Stormwater Management Considerations

Stormwater will sheet flow from the building areas toward the creek, then be intercepted and routed to a sediment basin via a grass swale during construction. The sediment basin outlet will release to Dry Creek. Post-development stormwater quality control will be provided by the detention pond and vegetated filter strip adjacent to Dry Creek.

Maintenance

All erosion and sediment control practices will be checked for stability and operation following every rainfall event greater than 0.5 inches but in no case less than once every 7 days. Any needed repairs will be made immediately to maintain all practices as designed and installed for their appropriate phase of the project. An inspection report shall be prepared and maintained as part of the plan for at least 3 years.

The sediment basin will be cleaned out when the level of sediment reaches 2.0 feet below the top of the riser. Gravel will be cleaned or replaced when the sediment pool no longer drains properly. Sediment will be removed from behind the silt fence when it becomes approximately 0.5 feet deep at the fence. The silt fence will be repaired as necessary to maintain a barrier.

All seeded areas will be fertilized and reseeded as necessary to maintain dense vegetative cover.

Employee Training

Training will be provided to all employees, contractors, and subcontractors to follow the Erosion and Sediment Control Plan before they are allowed to enter the work area.

This *SWPPP Report* and attached *Erosion and Sediment Control Detailed Drawing(s)* are intended to fulfill the requirements of the City of Watertown. I understand that additional erosion control measures may be needed if unforeseen erosion problems occur or if the measures described in the submitted plan do not function as intended. The requirements of this plan shall run with the land and be the obligation of the landowner until such time as the plan is properly completed, modified or voided.

I have reviewed this report and accompanying *Erosion and Sediment Control Detailed Drawings(s)* and accept responsibility for their contents.

Owner

I have prepared this report and accompanying *Erosion and Sediment Control Detailed Drawings(s)* and accept responsibility for their contents.

PE, CPESC, or SPSWQ (signature required for sites greater than 1 acre)

Calculations

Sediment Basin

Tributary Area = 7.2 acres

Required Volume = 3,600 ft³/acre x 7.2 acres = 25,920 ft³

Use a 54 ft. x 120 ft. x 4.0 ft. deep sediment basin

Sediment Basin Dewatering Holes

Surface Area of the basin = 6,480 ft²

Head of water above the hole = 4 ft

Coefficient of contraction for orifice = 0.6

Detention Time = 16 hours

Total surface area of dewatering holes = $(6,480 \text{ ft}^2 \times (2 \times 4 \text{ ft})) / (16 \text{ hours} \times 0.6 \times 20,428) = 0.26 \text{ ft}^2 = 38 \text{ in}^2$

Attachment 3
City of Watertown
Change of Authorization/Name Change

CITY OF WATERTOWN

CHANGE OF AUTHORIZATION/NAME CHANGE

for a Stormwater Pollution Prevention Plan Submitted to the City of Watertown
Stormwater Phase II Construction Site Best Management Practices Program

Stormwater Pollution Prevention Plan Tracking Number:_____

Previous Company/Operator Name:_____

New Company/Operator Name: _____

Contact Person:_____

Mailing Address:_____

Email Address:_____

Facility Address:_____

Legal Location:_____

Storm Water Receiving Waters: _____

Municipal Storm Sewer/City: _____

Please include a brief description of activities conducted at the site:_____

Date transfer of permit responsibility, coverage and liability becomes effective*:_____

*Include the written agreement between the two facilities which includes this date.

Send to: City of Watertown
Office of Public Works
City Hall
23 Second Street NE
P.O. Box 910
Watertown, SD 57201-0910

**** NOTE: Any change in location and/or operation requires that the facility's Stormwater Pollution Prevention Plan be updated and revised to reflect all operational changes.**

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." and I,

_____, the applicant in the above matter after being duly sworn upon oath hereby
certify the following information in regard to this application:

South Dakota Codified Laws Section 1-40-27 provides:

"The secretary may reject an application for any permit filed pursuant to Titles 34A or 45, including any application by any concentrated swine feeding operation for authorization to operate under a general permit, upon making a specific finding that:

(1) *The applicant is unsuited or unqualified to perform the obligations of a permit holder based upon a finding that the applicant, any officer, director, partner or resident general manager of the facility for which application has been made:*

- (a) *Has intentionally misrepresented a material fact in applying for a permit;*
- (b) *Has been convicted of a felony or other crime involving moral turpitude;*
- (c) *Has habitually and intentionally violated environmental laws of any state or the United States which have caused significant and material environmental damage;*
- (d) *Has had any permit revoked under the environmental laws of any state or the United States; or*
- (e) *Has otherwise demonstrated through clear and convincing evidence of previous actions that the applicant lacks the necessary good character and competency to reliably carry out the obligations imposed by law upon the permit holder; or*

(2) *The application substantially duplicates an application by the same applicant denied within the past five years which denial has not been reversed by a court of competent jurisdiction. Nothing in this subdivision may be construed to prohibit an applicant from submitting a new application for a permit previously denied, if the new application represents a good faith attempt by the applicant to correct the deficiencies that served as the basis for the denial in the original application.*

All applications filed pursuant to Titles 34A and 45 shall include a certification, sworn to under oath and signed by the applicant, that he is not disqualified by reason of this section from obtaining a permit. In the absence of evidence to the contrary, that certification shall constitute a prima facie showing of the suitability and qualification of the applicant. If at any point in the application review, recommendation or hearing process, the secretary finds the applicant has intentionally made any material misrepresentation of fact in regard to this certification, consideration of the application may be suspended and the application may be rejected as provided for under this section.

Applications rejected pursuant to this section constitute final agency action upon that application and may be appealed to circuit court as provided for under chapter 1-26."

Pursuant to SDCL 1-40-27, I certify that I have read the forgoing provision of state law, and that I am not disqualified by reason of that provision from obtaining the permit for which application has been made.

NOTE: The Notice of Intent must be signed by the authorized chief elective, an executive officer or a corporate responsible official of the applicant, or by the applicant, if an individual.

I declare and affirm under the penalties of perjury that this certification has been examined by me, and to the best of my knowledge and belief, is in all things true and correct.

Name (print) _____
Title _____
Signature _____
Date _____

**PLEASE ATTACH SHEET DISCLOSING ALL FACTS PERTAINING TO SDCL 1-40-27 (1) (a) THROUGH (e).
ALL VIOLATIONS MUST BE DISCLOSED, BUT WILL NOT
AUTOMATICALLY RESULT IN THE REJECTION OF AN APPLICATION.**

SDDENR must also be notified of change of ownership. SDDENR may be contacted at:

Department of Environment and Natural Resources
Surface Water Quality Program
523 East Capitol
Pierre, SD 57501-3181
[1-800-SD-STORM](tel:1-800-SD-STORM)

Attachment 4

Seed Mixtures for Various Site Conditions

EXHIBIT 1

Minimum Drill Seeding Rates for Perennial Grasses^a

Seed Mix	Pounds of PLS/acre
SDDOT Type C Seed Mixture (Less than 5 acres)	
Western Wheatgrass (Flintlock, Rodan, Rosanna)	16.0
Slender Wheatgrass (Adanac, Pryor, Primar, Revenue)	2.0
Total	18.0
SDDOT Type G Seed Mixture (Steep grades, long backslopes, or erosive soils)	
Western Wheatgrass (Flintlock, Rodan, Rosanna)	9.0
Switchgrass (Dacotah, Forestburg, Nebraska 28, Pathfinder, Summer, Sunburst, Trailblazer)	5.0
Indiangrass (Holt, Tomahawk)	1.0
Big Bluestem (Bison, Bonilla, Champ, Pawnee, Sunnyview)	1.0
Oats or Winter Wheat	10.0
Total	26.0
Alkali Soil Seed Mix	
Alkar tall wheatgrass	28.0
Total	28.0
Fertile Loamy Soil Seed Mix (Option 1)	
Lincoln smooth brome	4.0
Bonilla big bluestem	4.0
Forestburg switchgrass	2.0
Pierre sideoats grama	4.0
Total	14.0
Fertile Loamy Soil Seed Mix (Option 2)	
Matua bromegrass	4.0
Western wheatgrass	4.0
Forestburg switchgrass	2.0
Pierre sideoats grama	4.0
Total	14.0
High Water Table Soil Seed Mix (Option 1)	
Garrison creeping foxtail	1.0
Reed canarygrass	1.0
Lincoln smooth brome	3.0
Forestburg switchgrass	1.0

EXHIBIT 1

Minimum Drill Seeding Rates for Perennial Grasses^a

Seed Mix	Pounds of PLS/acre
Alkar tall wheatgrass	5.5
Total	11.5
High Water Table Soil Seed Mix (Option 2)	
Garrison creeping foxtail	5.75
Reed canarygrass	5.75
Total	11.5
Transition Turf Seed Mix (Option 1)	
Kentucky bluegrass	0.5
Durar hard fescue	1.0
Perennial ryegrass	3.0
Lincoln smooth brome	3.0
Total	7.5
Transition Turf Seed Mix (Option 2)	
Kentucky bluegrass	1.0
Seville perennial ryegrass	3.5
Matua brome	3.0
Total	7.5
Sandy Soil Seed Mix (Option 1)	
Bonilla big bluestem	3.0
Pierre sideoats grama	3.0
Lincoln smooth brome	4.0
Forestburg switchgrass	1.0
Indian grass	1.0
Total	12.0
Sandy Soil Seed Mix (Option 2)	
Pennlawn red fescue	6.0
Hard fescue	3.0
Chewings fescue	3.0
Total	12.0
Heavy Clay, Rocky Foothill Seed Mix (Option 1)	
Alkar tall wheatgrass	9.0
Pierre sideoats grama	4.0

EXHIBIT 1

Minimum Drill Seeding Rates for Perennial Grasses^a

Seed Mix	Pounds of PLS/acre
Lincoln smooth brome	5.0
Total	18.0
Heavy Clay, Rocky Foothill Seed Mix (Option 2)	
Alkar tall wheatgrass	9.0
Pierre sideoats grama	4.0
Matua brome grass	5.0
Total	18.0

^a

All of the above seeding mixes and rates are based on drill seeding followed by crimped hay or straw mulch. These rates shall be doubled if seed is broadcast and shall be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching shall be done as a separate operation.

^b

If the site is to be irrigated, the transition turf seed rates shall be doubled.

To provide temporary erosion control between the seeding dates, utilize surface roughening (on the contour or perpendicular to prevailing winds) and apply a mulch as specified above.

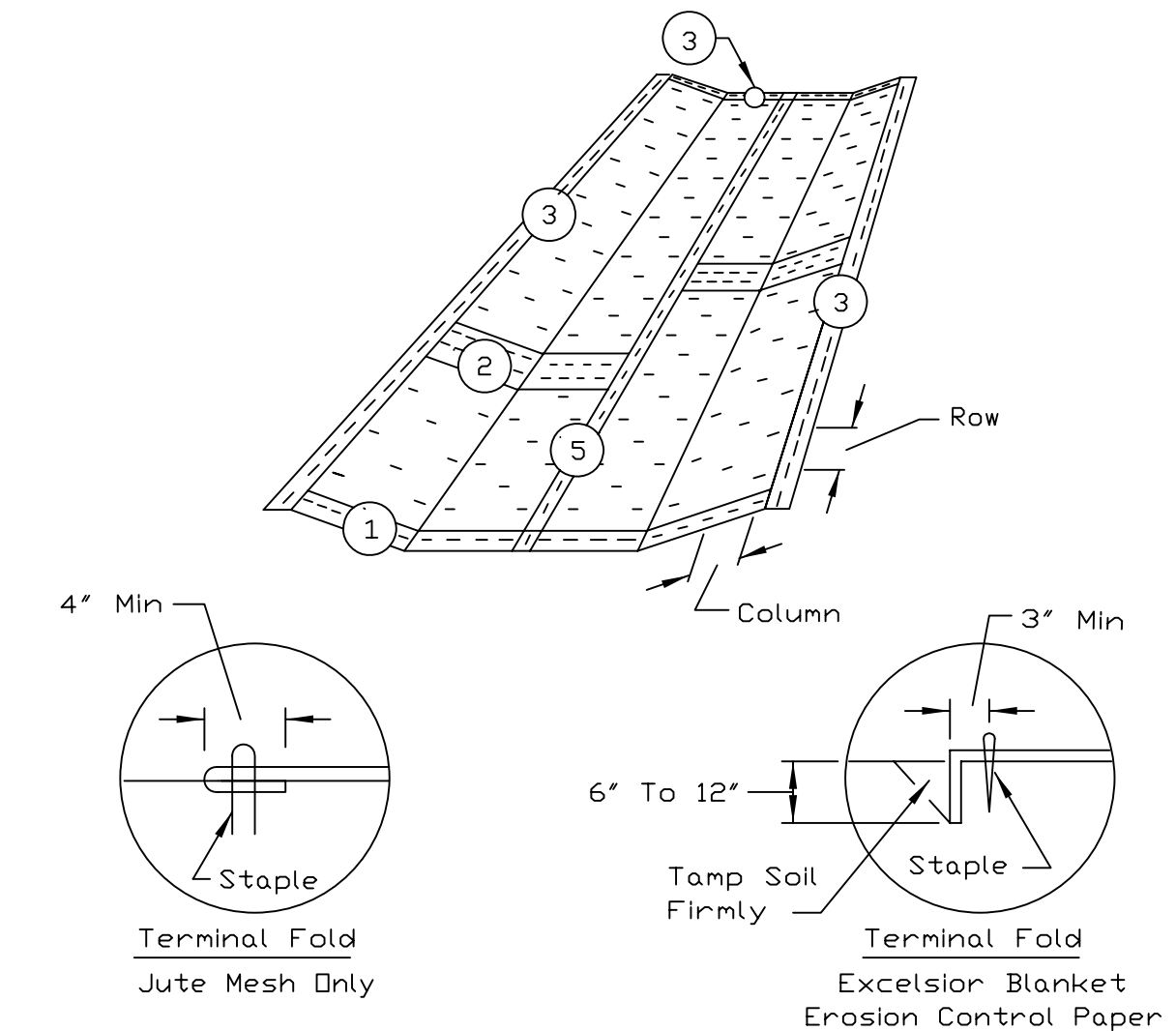
Perennial grasses can be seeded using a drill seeder in areas previously planted with a temporary grass cover. In this case, the annual grass may need to be mowed before perennial grasses are seeded. Broadcast seeding or hydroseeding shall not be done on areas that have a live crop of annual grasses without first reworking and preparing the topsoil.

Seeding options are to be identified on the plan drawings.

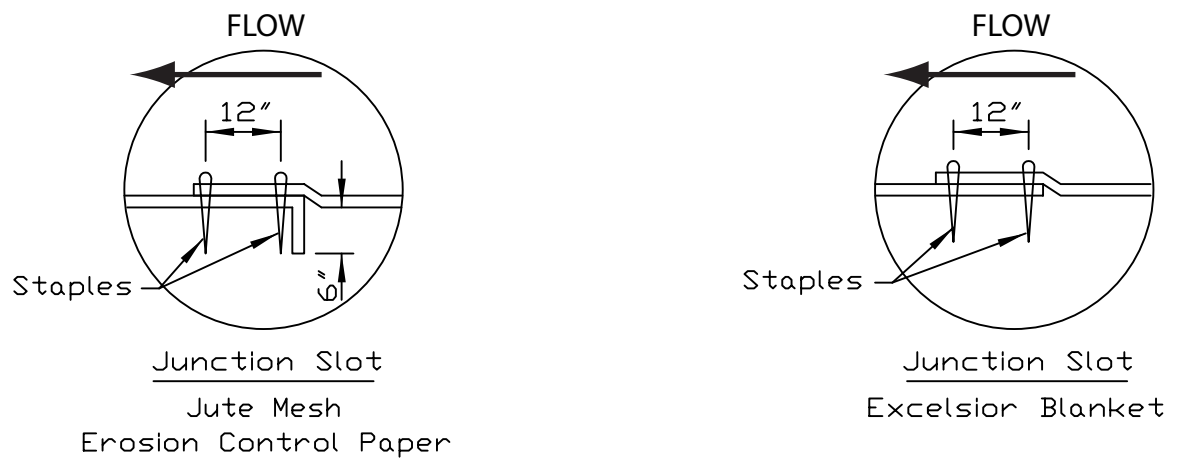
Sources: Sioux Falls Chapter 12 Erosion Control Manual, SDDOT

Attachment 5
Standard Drawings

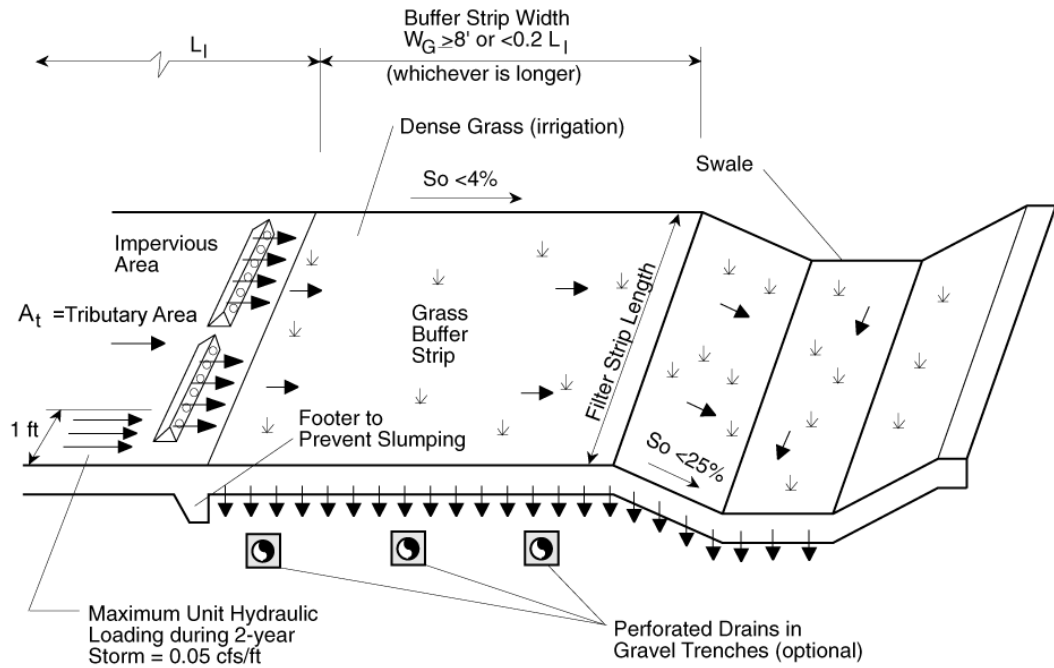
EROSION BLANKET PLAN



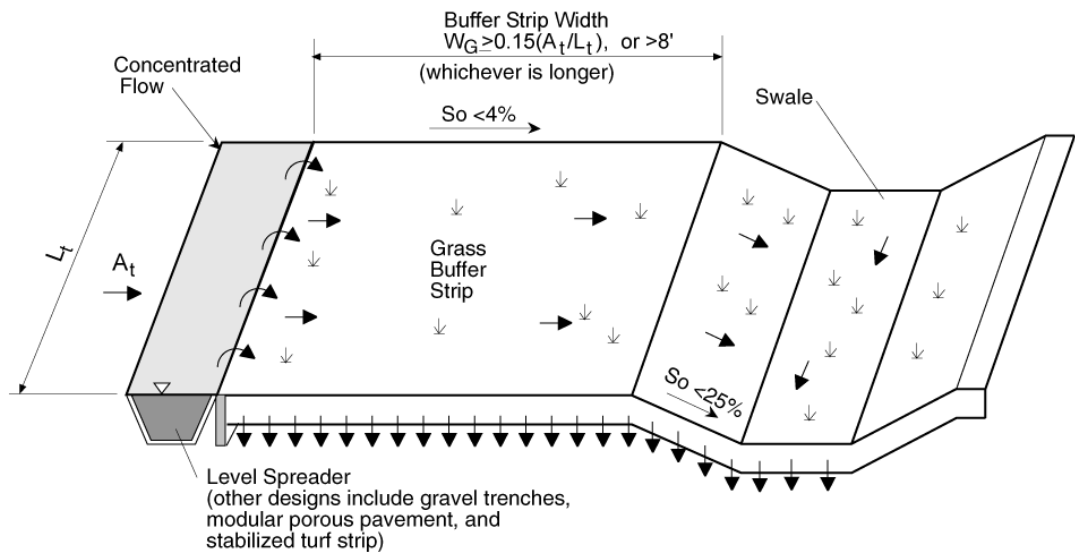
DETAIL 1



DETAIL 2

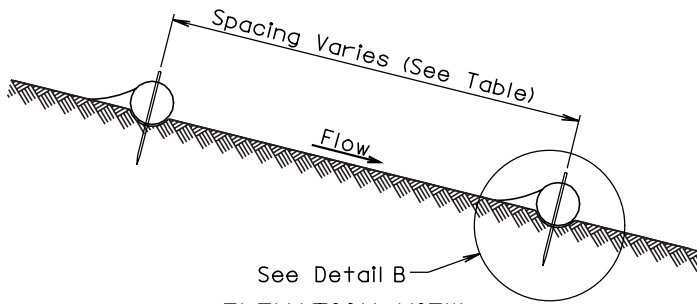


SHEET FLOW CONTROL



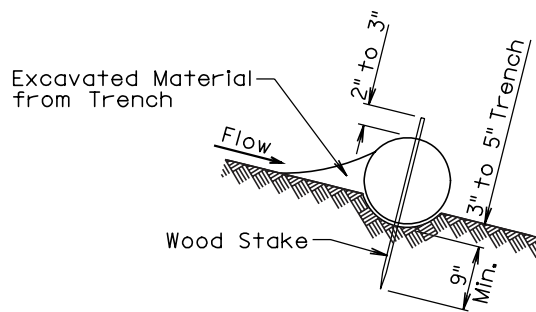
CONCENTRATED FLOW CONTROL

Note: Not to Scale

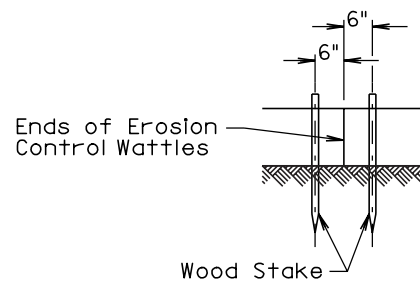


**ELEVATION VIEW
CUT OR FILL SLOPE INSTALLATION**

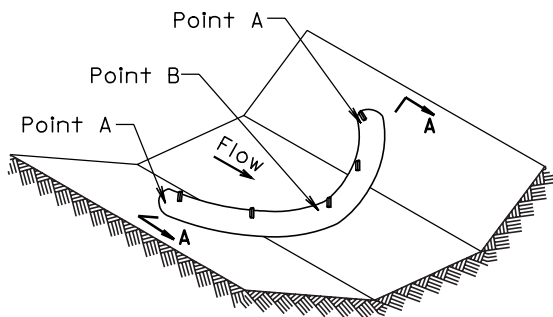
CUT OR FILL SLOPE INSTALLATION	
Slope	Spacing (Ft)
1:1	10
2:1	20
3:1	30
4:1	40



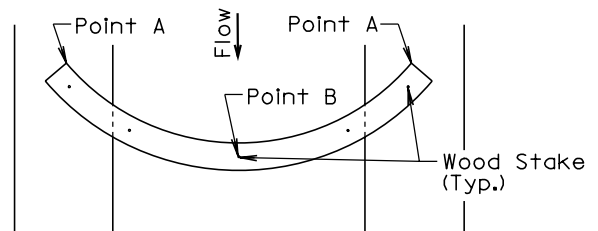
**DETAIL B
(TYPICAL OF ALL INSTALLATIONS)**



DETAIL C

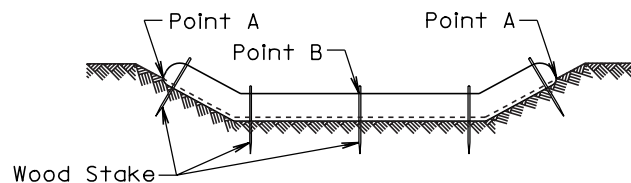


**ISOMETRIC VIEW
DITCH INSTALLATION**



**PLAN VIEW
DITCH INSTALLATION**

DITCH INSTALLATION	
Grade	Spacing (Ft)
2%	150
3%	100
4%	75
5%	50

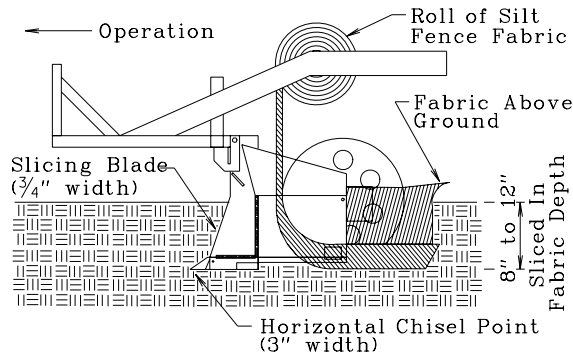


SECTION A-A

SHEET 1 OF 2

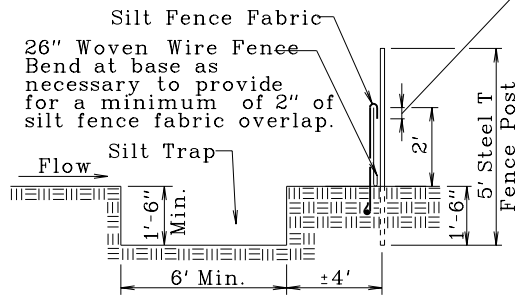
CH2MHILL

MACHINE SLICED LOW FLOW SILT FENCE INSTALLATION

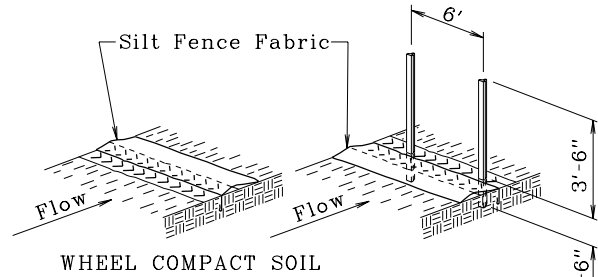


- ① INSTALL SILT FENCE FABRIC BY MACHINE SLICING METHOD.

Silt fence fabric shall be overlapped a minimum of 2" at top of woven wire fence.

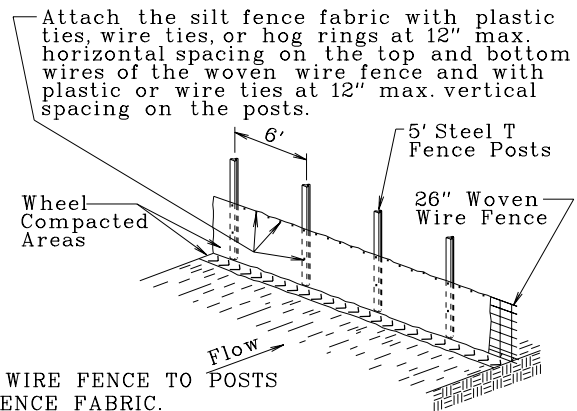


- ③ ATTACH 26" WOVEN WIRE FENCE TO POSTS AND ATTACH SILT FENCE FABRIC.

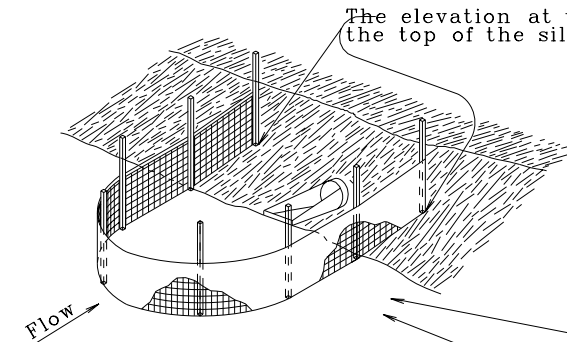


DRIVE STEEL T FENCE POSTS

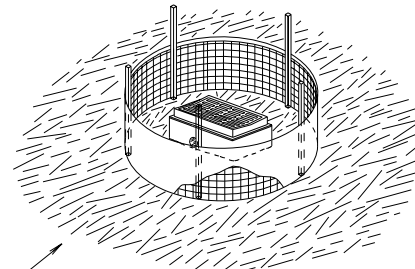
- ② WHEEL COMPACT SOIL ABOVE SLICED IN PORTION OF FABRIC AND THEN DRIVE STEEL T FENCE POSTS.



The elevation at these locations shall be, at a minimum, higher than the top of the silt fence fabric at its lowest elevation.



The silt fence length and width may be adjusted due to a larger pipe, multiple pipe, or other circumstances during construction as determined by the Engineer.



The radius of the silt fence shall be the minimum capable by the slicing machine. The post spacing shall be 3' for these types of applications of silt fence. All the other components of the silt fence shall be the same as shown above.

GENERAL NOTES:

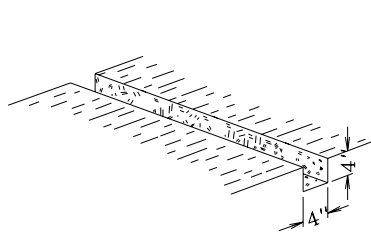
A silt trap shall be provided when specified by a plan note. All costs for constructing the silt trap shall be incidental to the contract unit price per cubic yard for "Silt Trap".

If a trench can not be dug or the silt fence fabric can not be sliced in due to the type of earthen material (such as rock), then a row of 30 to 40 pound sandbags butted end to end shall be provided on top of the extra length of silt fence fabric to prevent underflow.

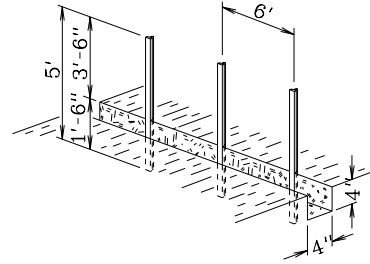
LOW FLOW SILT FENCE AND SILT TRAP

SHEET 2 OF 2

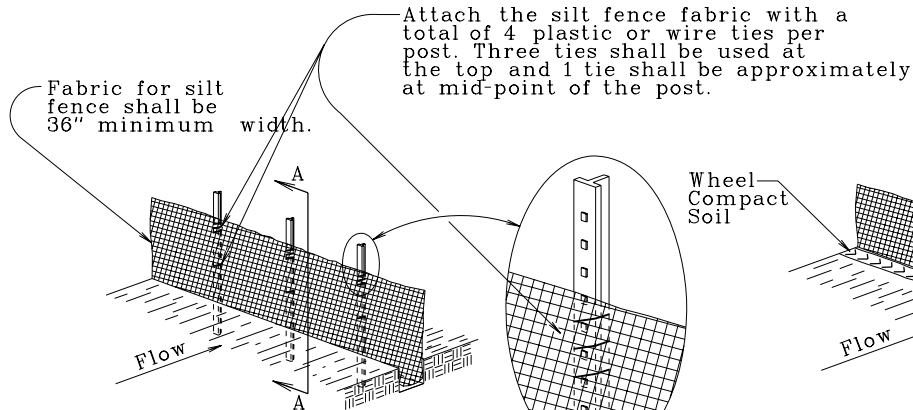
MANUAL HIGH FLOW SILT FENCE INSTALLATION



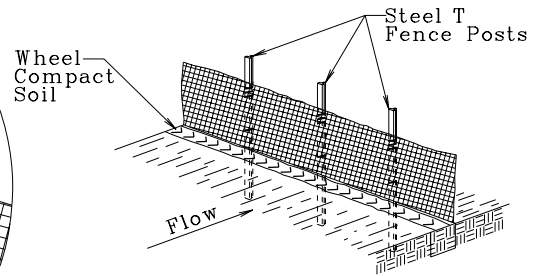
① EXCAVATE TRENCH



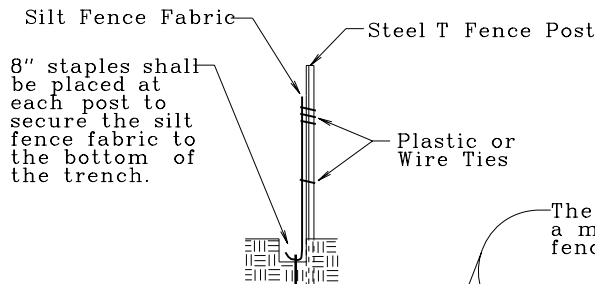
② DRIVE STEEL T FENCE POSTS



③ ATTACH SILT FENCE FABRIC

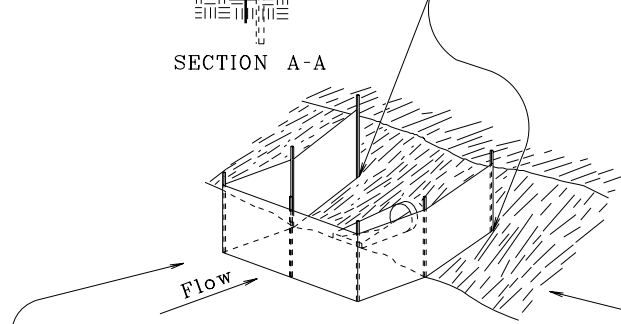


④ BACKFILL TRENCH AND WHEEL COMPACT SOIL

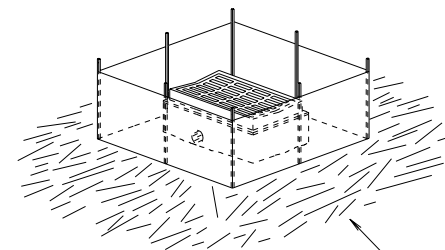


SECTION A-A

The elevation at these locations shall be, at a minimum, higher than the top of the silt fence fabric at its lowest elevation.



The silt fence length and width may be adjusted due to a larger pipe, multiple pipe, or other circumstances during construction as determined by the Engineer.

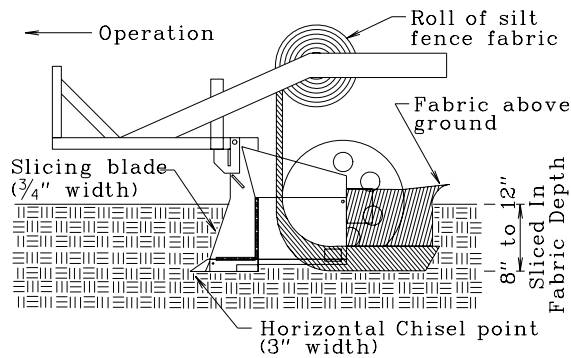


Post spacing shall be 3' for these types of applications of silt fence. All other components of the silt fence shall be the same as shown above.

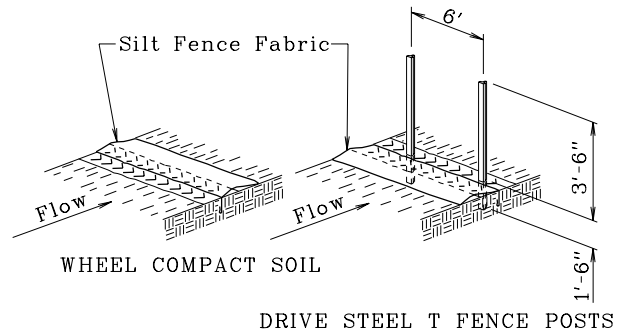
HIGH FLOW SILT FENCE

SHEET 1 OF 2

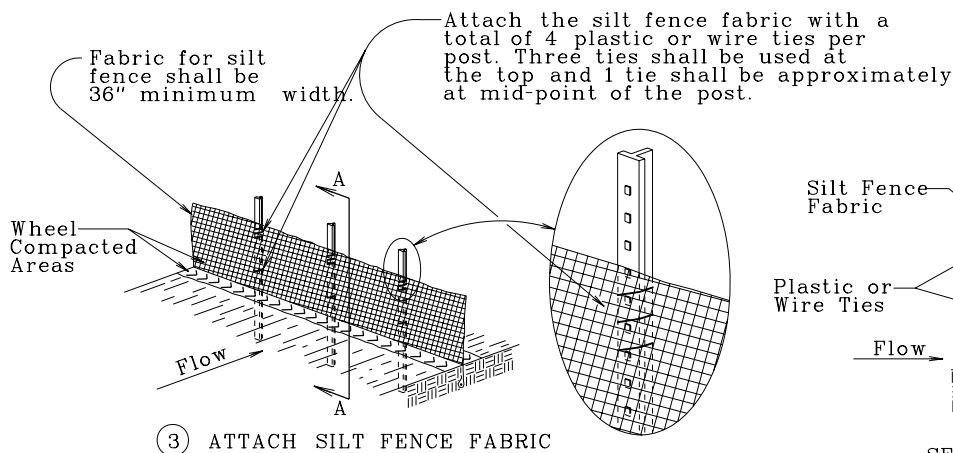
MACHINE SLICED HIGH FLOW SILT FENCE INSTALLATION



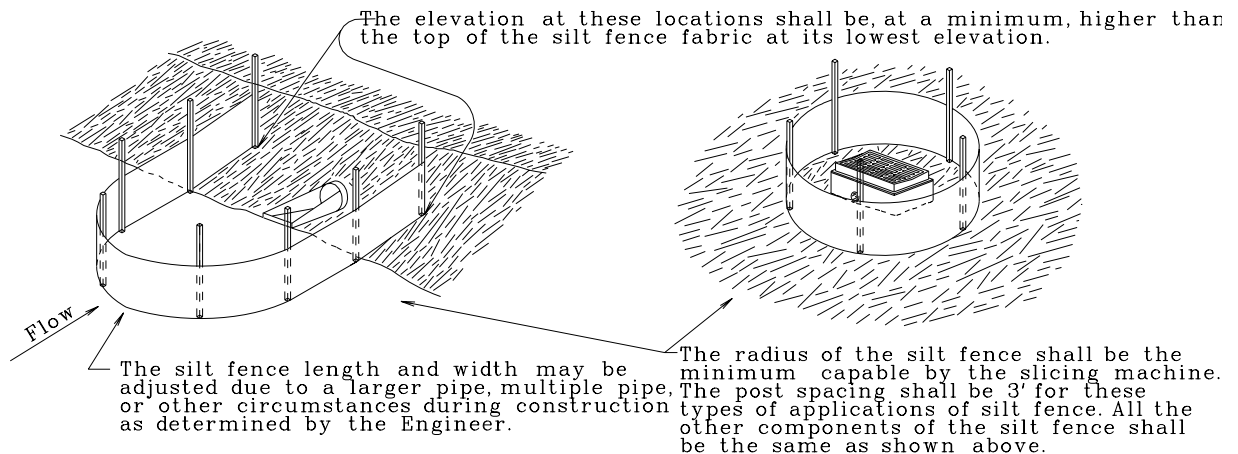
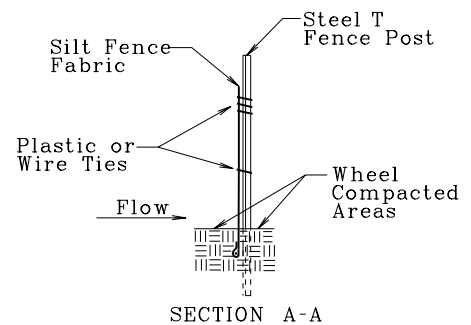
- ① INSTALL SILT FENCE FABRIC BY MACHINE SLICING METHOD.



- ② WHEEL COMPACT SOIL ABOVE SLICED IN PORTION OF FABRIC AND THEN DRIVE STEEL T FENCE POSTS.



- ③ ATTACH SILT FENCE FABRIC



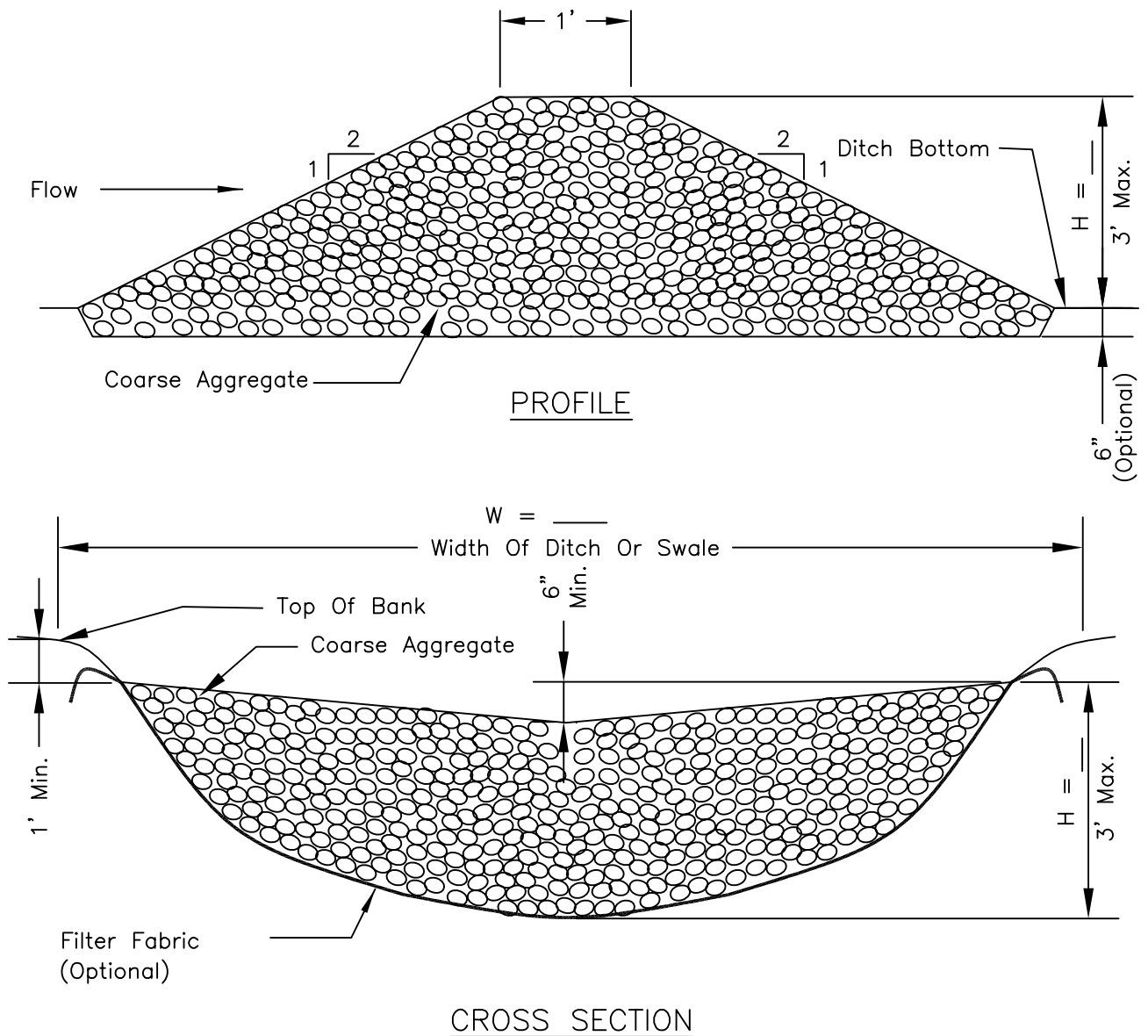
GENERAL NOTE:

If a trench can not be dug or the silt fence fabric can not be sliced in due to the type of earthen material (such as rock), then a row of 30 to 40 pound sandbags butted end to end shall be provided on top of the extra length of silt fence fabric to prevent underflow.

HIGH FLOW SILT FENCE

SHEET 2 OF 2

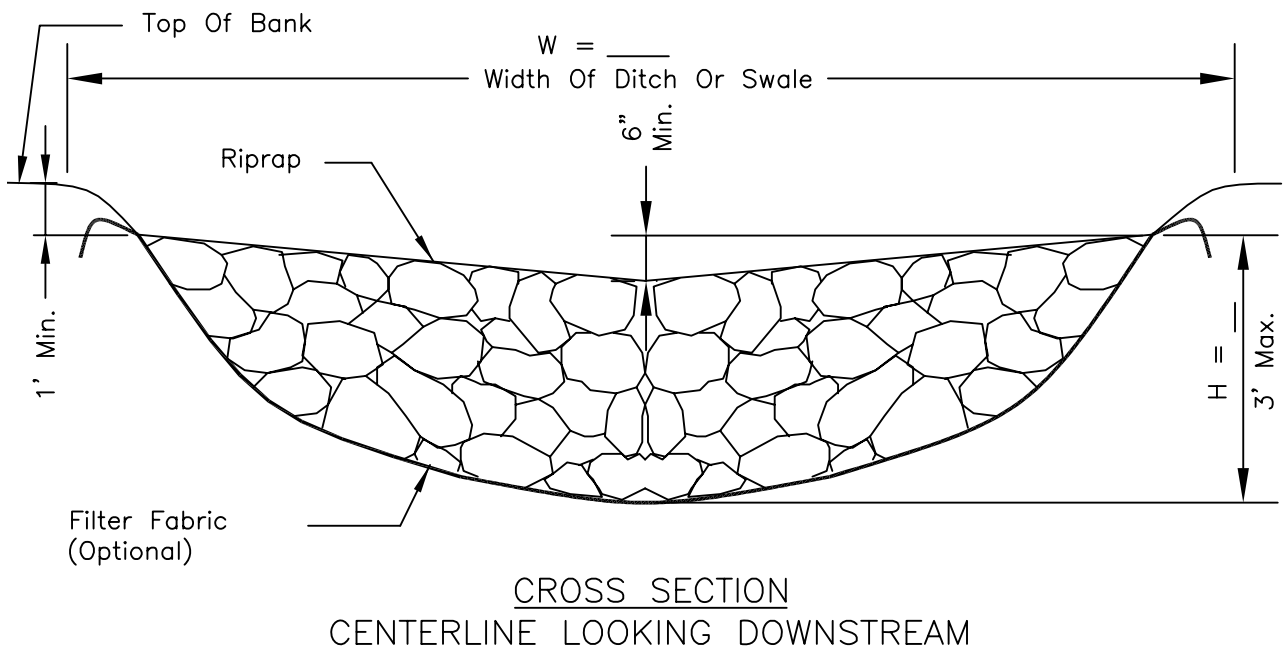
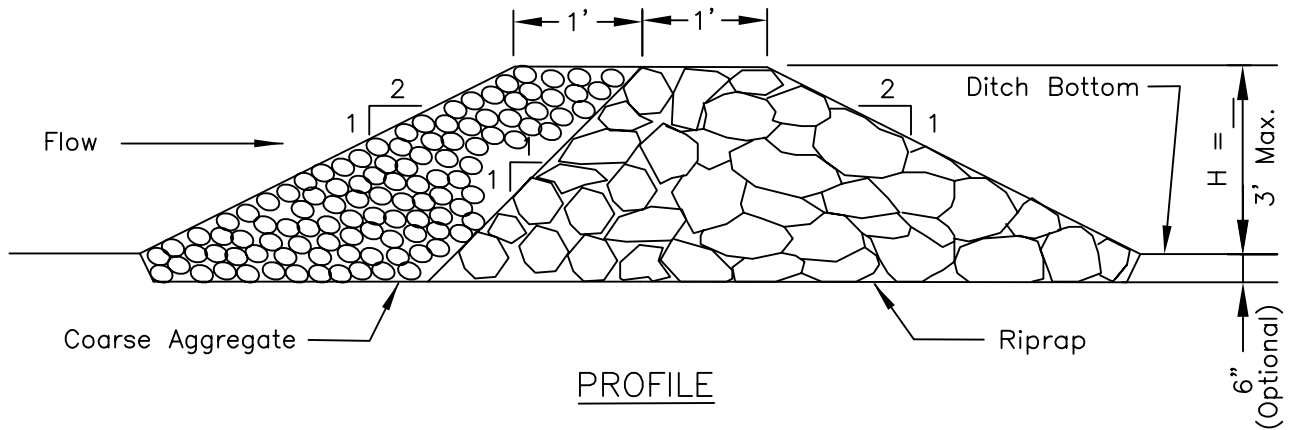
ROCK CHECK DAM – COARSE AGGREGATE



NOTES:

1. For added stability, the base of the dam may be keyed 6 inches into the soil.
2. Drainage area to each dam shall be less than 2 acres.
3. Use Standard Drawing 5b for drainage areas of 2 to 10 acres.

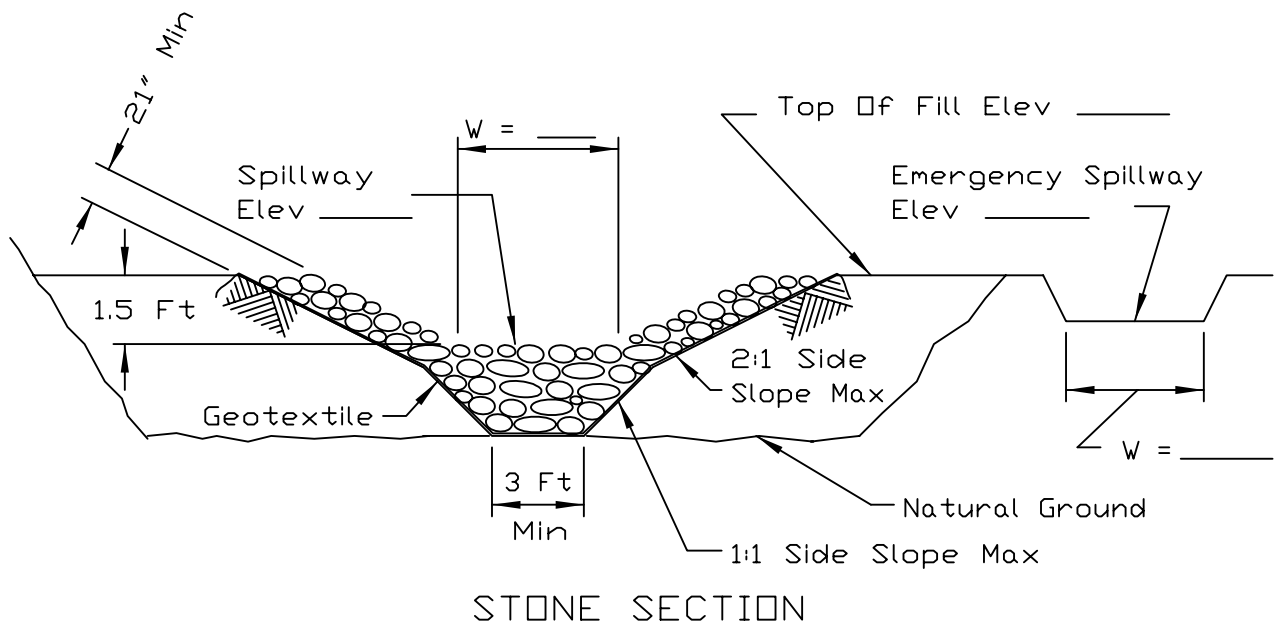
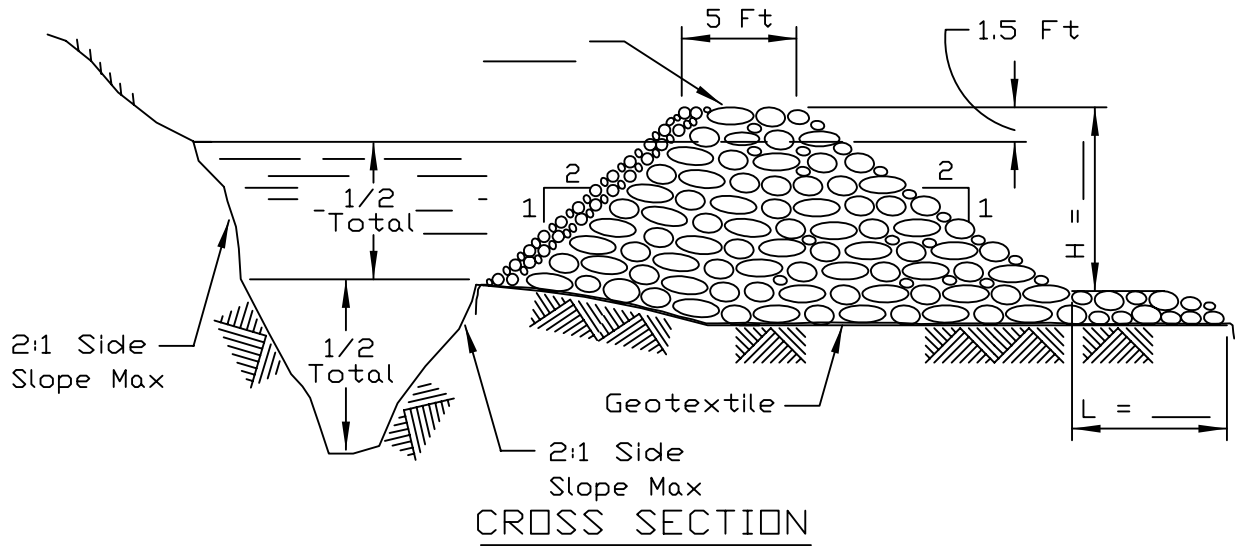
ROCK CHECK DAM - RIPRAP



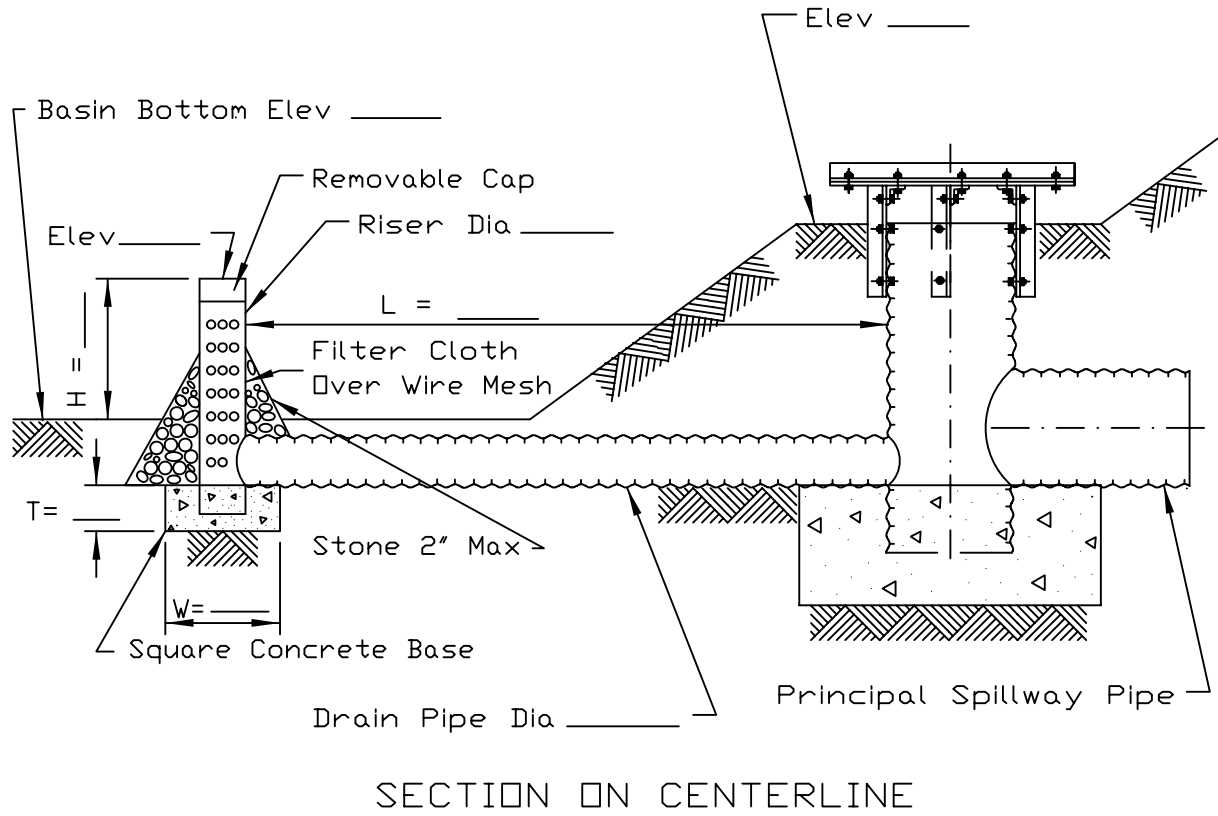
NOTES:

1. Riprap shall meet gradation requirements specified in *Erosion and Sediment Control Best Management Practices Manual*.
2. For added stability, the base of the dam may be keyed 6 inches into the soil.
3. Maximum drainage area to each dam is 10 acres.
4. Standard Drawing 5a may be used for drainage areas under 2 acres.

TEMPORARY SEDIMENT TRAP



SEDIMENT BASIN DEWATERING DEVICE



NOTES:

1. Slotted inlets shall be fabricated from corrugated metal or smooth steel.
2. Slots shall be cut cleanly and deburred. Ends of slots may be round or square.
3. Gravel filter, if used, shall be pit run sand and gravel with a maximum particle diameter of 2".
4. Fabricated or standard elbow; fabricated or standard tee with the pipe or plug in upstream end; or standard tee with one end embedded in concrete.
5. Thirty 1" diameter holes per foot of riser may be substituted for the 1"x 4" slots for 6" diameter risers.
6. Drain pipe shall be the same material and gauge as the principle spillway pipe.

Attachment 6

Site Inspection and Maintenance Form

Stormwater Pollution Prevention Plan for Construction Sites

SITE INSPECTION AND MAINTENANCE FORM

City of Watertown

SITE: _____

NAME OF INSPECTOR: _____ DATE: _____

TYPE OF INSPECTION: ☐ WEEKLY ☐ AFTER RAINFALL EVENT ☐ OTHER

APPROXIMATE RAINFALL DEPTH: _____

GENERAL SITE CONDITIONS AND VEGETATION

Inspection:

Area of site:

Date last disturbed:

Date of next disturbance:

Type of Temporary or
Permanent Stabilization:

Condition of Stabilization
or Vegetation BMPs:

Maintenance to be performed: _____ On or Before: _____

Who to perform: _____ Date Performed: _____

SOIL STOCKPILES

Type of Material
Stockpiled:

Location on Site:

Type of Temporary or
Permanent Stabilization:

Condition of Stabilization
or Vegetation BMPs:

Maintenance to be performed:

On or Before: _____

Who to perform: _____

Date Performed: _____

EROSION CONTROL BLANKET

Date of Inspection: _____

Inspection:

Location of erosion control blanket? _____

Is the barrier in place and effective? _____

Is there evidence of water running under blanket or displacement? _____

Is there any observed erosion? _____

Maintenance to be performed:

On or Before: _____

Who to perform: _____

Date Performed: _____

CONSTRUCTION ENTRANCES/EXITS

Date of Inspection: _____

Location on Site:

Condition of Entrance or
Exit Pad or Wash Rack:

Is there evidence of material tracked off site? _____

Maintenance to be performed: _____ On or Before: _____

Who to perform: _____ Date Performed: _____

FILTER STRIPS/GRASS BUFFERS

Date of Inspection: _____

Inspection:

Location of filter strip/grass buffer? _____

Is area eroded? _____

Has sediment built up? _____

Maintenance to be performed: _____ On or Before: _____

Who to perform: _____ Date Performed: _____

WATTLE/FIBER ROLL

Date of Inspection: _____

Inspection:

Location of wattle/fiber roll? _____

Is area eroded? _____

Has sediment built up? _____

Maintenance to be performed: _____ On or Before: _____

Who to perform: _____ Date Performed: _____

SILT FENCE

Date of Inspection: _____

Inspection:

Location of silt fence? _____

Is the barrier in place and effective? _____

Is there evidence of washout or overtopping? _____

Is there evidence of undercutting or end-arounds? _____

Height of silt build up. _____

Maintenance to be performed: _____ On or Before: _____

Who to perform: _____ Date Performed: _____

ROCK CHECK DAM

Date of Inspection: _____

Inspection:

Location of rock check dam? _____

Is the barrier in place and effective? _____

Is there evidence of erosion around or downstream of check dam? _____

Has rock been dislodged? _____

Has sediment built up? _____

Maintenance to be performed:

On or Before: _____

Who to perform: _____

Date Performed: _____

SEDIMENT TRAP

Date of Inspection: _____

Inspection:

Location of sediment trap? _____

Is the barrier in place and effective? _____

Has rock been dislodged? _____

Height of sediment build-up, as percentage of permanent pool design depth? _____

Maintenance to be performed:

On or Before: _____

Who to perform: _____

Date Performed: _____

SEDIMENT BASIN

Date of Inspection: _____

Inspection:

Location of sediment basin? _____

Is the barrier in place and effective? _____

Has rock been dislodged? _____

Height of sediment build-up, as percentage of permanent pool design depth? _____

Maintenance to be performed:

On or Before: _____

Who to perform: _____

Date Performed: _____

ADDITIONAL COMMENTS

Signature: _____

Date: _____

Changes Required to the Soil Erosion and Sedimentation Control Plan

Reason for Changes:
