EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES: REFERENCE MANUAL

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DEPARTMENT OF TRANSPORTATION

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THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

March 2003

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RESEARCH PROGRAMS

Erosion and Sediment Control Best Management Practices: Reference Manual

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Montana Department of Transportation

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16. Abstract

The Erosion and Sediment Control Construction Best Management Practices Manual was developed to assist in the design, construction, and post-construction phases of MDT projects. This manual provides background to State and Federal regulations associated with erosion and sediment control practices including a general overview of the erosion and sediment processes. Best Management practices are listed within the manual based on application categories. Each BMP is described; its applications and limitations are listed, as well as its design criteria. The design phase includes development of construction plans, NOI, and SWPPP. Construction phase includes the finalization of the SWPPP, NOI, and the implementation of BMPs. Post-Construction phase includes monitoring, maintenance, and removal activities.

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Acronyms

AASHTO	American Association of Highway and Transportation Officials
AC	Asphalt Concrete
ADL	Aerially Deposited Lead
Ar	Arsenic
ASTM	American Society of Testing and Materials
BMPs	Best Management Practice
BOD	Biochemical Oxygen Demand
Cd	Cadmium
COD	Chemical Oxygen Demand
CPESC	Certified Professional in Erosion and Sediment Control
Cu	Copper
CWA	Clean Water Act
DEQ	Montana Department of Environmental Quality
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highways Administration
g/m^2	Gram per square meter
HDPE	High Density Polyethylene
Hg	Mercury
kg/ha	Kilogram per hectacre
Kn	Kilonewtons
Kpa	Kilopascal
l/ha	Liter per hectacre
l/m^2	Liter per square meter
L:W	Length to width
Lbs/acre	Pounds per acre
M	Meter
m^3/s	Cubic meter per second
MDT	Montana Department of Transportation
Mm	Millimeter
MPDES	Montana Pollution Discharge Elimination System
MSDA	Material Safety Data Sheets
Ni	Nickel
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
^oC	Degree Celsius
OSHA	Occupational Safety and Health Administration
Pb	Lead
PCCP	Portland Cement Concrete Pavement
PE	Professional Engineer
PLS	Pure Live Seed
PMS	Project Management System
RWQCB	Regional Water Quality Control Board
SWPPP	Stormwater Pollution and Prevention Plan
USDOT	United States Department of Transportation
USLE	Universal Soil Loss Equation
V:H	Vertical to Horizontal
WPCM	Water Pollution Control Manager
Zn	Zinc
Caltrans	State of California Department of Transportation

Section 1
Introduction and Background
1.1 Purpose and Scope

The purpose of this Erosion and Sediment Control Manual is to describe the procedures and methods to reduce erosion and sedimentation associated with highway-related pre-construction, construction, and post construction activities. The processes of soil erosion and deposition are natural, ongoing geological mechanisms caused by the transportation and settlement of soil particles through mechanisms like water or wind. While these mechanisms are natural processes that provide stream and floodplain formation and shaping, construction activities can accelerate these natural processes and produce more sediment than are beneficial to waterways. Highway construction activities occur in both rural and urbanized areas. In both circumstances, two mechanisms can occur that increase erosion and thereby increase sediment in waterways. First, construction activities and urbanization can significantly increase the impervious area, preventing precipitation from infiltrating into the soil. The resulting increase in the volume of runoff from a given area often results in higher water velocities in streams and drainage channels, thus increasing the potential for soils to be eroded. Secondly, construction activities generally necessitate the removal of natural ground cover that acts to hold topsoil in place during precipitation events. Removal of this vegetation leaves soil unprotected against storm runoff. Consequently, erosion and sedimentation are increased drastically, which results in reduced water drainage and storage capacities. This increase in erosion and sediment can cause flooding and significant degradation of the water quality in the receiving water bodies. Contaminants that are bound to sediment particles can also be transported into the waterways through storm water runoff. These contaminants, in combination with the sediment, can decrease water quality, harming both wildlife and vegetation.

The Environmental Protection Agency (EPA) recommends that a management systems approach be used to achieve effective construction storm water management as opposed to an approach that focuses on individual storm water practices. A management systems approach addresses numerous individual practices and evaluates the overall cost and effectiveness of the entire storm water control system. Within this manual, numerous Best Management Practices (BMPs) that are currently utilized for erosion and sediment control are described in detail. These BMPs are the tools that designers, contractors, construction, and maintenance staff can use to create an erosion and sediment control management plan that will control the unwanted release of pollutants to Montana's waterways. This manual also provides guidance for the design, construction, and post-construction phase implementations of BMPs for construction activities. The organization of this manual is shown below.

- Section 1 provides the purpose and scope of this manual and background information on the federal and state regulations.
- Section 2 describes the concepts and impacts of erosion and sedimentation.
- Section 3 includes a list and description of BMPs useful for temporary erosion and sedimentation control.
- Section 4 provides a description of activities and tools to be used for temporary erosion and sediment control during the design process.

- Section 5 describes temporary erosion and sediment control procedures to follow during the construction phase.

- Section 6 provides information on the post-construction phase BMPs and tools to be utilized during this process.

Much of the text in Section 1 is direct language taken from the Montana Department of Environmental Quality, the U.S. Environmental Protection Agency, and the Federal Highway Administration's web sites. (http://www.epa.gov/; http://www.fhwa.dot.gov/, and http://www.deq.state.mt.us/)

1.2 Erosion and Sediment Control Contact List

Agency	Telephone Number
Montana Department of Environmental Quality (DEQ) Permitting/Compliance Division – Water Protection Bureau	(406) 444-3080
Environmental Protection Agency (EPA) Region 8	(303) 312-6312
Montana Department of Transportation (MDT) Districts Billings Butte Glendive Great Falls Missoula	 (406) 252-4138 (406) 494-9600 (406) 377-5296 (406) 454-5880 (406) 523-5800
MDT- Environmental Services Bureau	(406) 444-7228
MDT- Erosion & Sediment Control	(406) 444-7224

1.3 Regulations and Permits

1.3.1 Federal Requirements

The Clean Water Act (CWA) prohibits the discharge of any pollutant to waters of the United States from a point source (well defined location) unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Phase I of the NPDES storm water program addresses, among other discharges, discharges from large construction activities disturbing 2 ha (5 acres) or more of land. Phase II of the NPDES storm water program addresses small construction activities disturbing between 0.4 and 2 ha (1 and 5 acres). Those sites disturbing less than 0.4 ha (1 acre) are regulated as small construction activity in the cases that these sites are part of a larger planned disturbance between 0.4 ha and 2 ha (1 and 5 acres). The permitting authority can also require a NPDES permit if the permitting authority decides that potential for violation of water quality standards or significant contribution of pollutants exists. Phase II became final on December 8, 1999 with small construction permits applications due by March 10, 2003, with specific compliance dates set by the NPDES permitting authority of each State (EPA – Storm water Phase II Final Rule).

The specific requirements for storm water controls on construction activities will be defined by the NPDES permitting authority, which is the DEQ unless the construction site is located on Tribal lands. If the construction site is located on Tribal land, the EPA region 8 will be the permitting authority. In the

state of Montana (not including Tribal lands), a Montana Pollution Discharge Elimination System (MPDES) permit will be required. Existing Phase I general permits for large construction activities will be used as a guide for the Phase II permits for small construction activities. To obtain a General Permit under the MPDES from DEQ, a Notice of Intent (NOI) package for storm water discharges associated with construction activities must be prepared, submitted, and approved by DEQ.

1.3.2 MPDES Storm Water Discharge General Permit

DEQ, under the authority of the Montana Water Quality act, regulates the discharge of pollutants into state waters through the adoption of water quality standards and the permit application process. A MPDES permit is required from DEQ for storm water discharge associated with construction activity. This includes a discharge from construction activities due to disturbance from clearing, grading, and excavation, except for operations that result in the disturbance of less than one acre of total land area. Construction activity also includes the disturbance of less than 0.4 hectacre (one acre) of total land area that is a part of a larger common plan of development or sale, if the larger common plan will ultimately disturb 0.4 hectacre (one acre) or more. Regardless of the acreage of disturbance, construction activity includes any other activity designated by DEQ to have the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to surface waters. For storm water discharge associated with construction activity which has disturbance less than 2 hectacre (five acres), the acreage of disturbance does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

The MPDES permit application , requirements, and forms are included in Appendices B through H.

1.3.2.1 DEQ Notice of Intent

Federal and State guidance states that any person who is the operator of a storm water discharge associated with construction activity which requires coverage under the General Permit shall submit a complete Notice of Intent (NOI) package to the regulatory authority. The NOI package shall consist of the following submittals:

- A signed and complete NOI form;
- A signed and complete Storm Water Pollution Prevention Plan (SWPPP); and
- Required application and annual fees.

Upon receipt of the complete NOI package, the regulatory authority will provide a confirmation letter acknowledging the receipt of the package to the identified operator. If a complete NOI package is not submitted, compliance for storm water discharge associated with construction activity under the General Permit will not initiate until all required items are received by the regulatory authority. The operator should submit complete NOI packages, with all components submitted at the same time, to ensure efficient NOI processing by the regulatory authority, to prevent delay of construction activity, and to minimize potential storm water discharge compliance problems.

Effective immediately upon the submittal of a complete NOI package for coverage under the General Permit and lasting though the expiration date, the following limitations apply:

- There must be no discharge of process wastewater pollutants to surface waters. Discharges to surface waters of material other than storm water must be in compliance with a NPDES permit other than the General Permit.

- All discharges to surface waters covered by the General Permit must be composed entirely of storm water. Discharges must consist of water generated only through rainfall precipitation and snowmelt.

- A discharge of storm water associated with construction activity must not cause or contribute to a violation of water quality standards.

The NOI form and package requirements are included in Appendices C and D of this manual.

1.3.2.2 SWPPP

In order to characterize the construction activity, potential sources of pollutants, and BMPs to ensure pollutants do not reach surface waters, operators are required to develop and implement a SWPPP. A SWPPP replaces what was formerly referred to as an Erosion Control Plan. The SWPPP must be submitted to regulatory agencies at the same time as the NOI. SWPPP guidance can be found in EPA's web site (http://cfpub.epa.gov/npdes/stormwater/cpermit.cfm). At a minimum the SWPPP must include the following information:

1. Site Description: Each plan must at a minimum, provide a description of the following:

    a. The nature of the construction activity, including a proposed implementation schedule for major activities.

    b. Estimates of the total area of the site and the area of the site that is expected to undergo disturbance related to construction activity.

    c. Site map(s) indicating:

        - Areas of total development and, at a minimum, areas of "disturbance" related to construction activity (including support activities related to a construction site, concrete or asphalt batch plants, equipment staging yards, material storage areas, material borrow areas, etc.);

        - Drainage patterns;

        - Approximate slopes anticipated after major grading activities;

        - Approximate staging areas for soils or wastes;

        - Areas used for the storage of fuel(s);

        - Location of all erosion and sediment control measures or structures;

        - Areas where vegetative measures are to be implemented;

- The location of impervious structures (including buildings, roads, parking lots, outdoor storage areas, etc.) after construction is completed;
- The location of all surface waters on or near to the construction activity site (including perennial and intermittent water bodies, ephemeral streams, springs, wetlands with standing water, etc.);
- The boundary of the 100-year floodplain, if determined; and
- A north arrow and map scale.

d. The American Association of State Highway and Transportation Officials (AASHTO) soil classification and erodibility of sediment and other earth material to be disturbed at the project site, including cut/fill material to be used.

e. For a storm water discharge associated with construction activity with construction-related disturbance of 2 ha (5 acres) or more of total land area, an estimate of the runoff coefficient of the site and the increase in impervious area after the construction addressed in the NOI is completed.

f. The names of receiving surface waters and a description of the size, type, and location of each point source discharge or outfall. If there is no distinguishable point source discharge or outfall to the receiving surface waters, a description of storm water runoff flow and drainage patterns into the receiving surface waters must be provided. If the discharge is to a municipal separate storm sewer, the location of any storm sewer discharge into receiving surface waters.

g. A description of storm water discharges from support activities related to a construction site (e.g. concrete or asphalt batch plants, equipment staging yards, material storage areas, etc.).

2. BMPs and Storm Water Management Controls (Montana Department of Environmental Quality Permit for Storm Water Discharges Associated with Construction Activity).

Each operator(s) covered by the General Permit shall develop, as part of the SWPPP, a description of BMPs and storm water management controls appropriate for the site, including a brief description of applicable local erosion and sediment control requirements. The following minimum components must be addressed, including a schedule for implementation, unless otherwise authorized in writing by the Department.

a. A description of stabilization measures which must, to the degree practicable, preserve existing vegetation and re-vegetate areas of construction-related disturbance as soon as possible after grading or construction. In developing vegetative measures, the operator(s) shall consider: temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer/filter strips, grassed waterways, erosion control blankets, and tree and shrub planting.

b. A description of structural measures which indicates how, to the degree practicable, the operator(s) will divert storm water flows from exposed soil, store these flows, or otherwise limit runoff from exposed areas of the site. In developing structural measures, the operator(s) shall

consider: straw bale dikes, silt fences, earth dikes, brush barriers, drainage swales, check dams, subsurface drains, pipe slope drains, rock outlet protection, drain inlet and outlet protection, temporary drain diversions, sediment traps, temporary sediment basins, infiltration trenches or basins, and retaining walls. The operator(s) should also consider the proximity of structural measures with respect to floodplains, and if there are other alternatives, avoid the placement of structural BMPs within the floodplain.

c. None of the temporary control structures, including silt fences and straw bale dikes, shall be removed until permanent vegetation and site stabilization has taken place. The only exception to this would be where temporary control structures need to be moved or removed in order to allow continuing construction activities to occur, in which case equivalent measures must be implemented to ensure the same level of protection in minimizing potential pollutant discharges.

d. Off-site vehicle tracking of sediments from the construction site must be controlled or minimized, particularly onto paved road surfaces, in order to minimize the potential impairment of storm water quality.

e. When trucking saturated soils from the site, either tight leak-proof trucks must be used or loads must be required to drain until drippage has been reduced to less than 3.75 liters (1 gallon) per hour before leaving the site.

The SWPPP form and requirements can be found in Appendix E.

1.3.3 AASHTO Highway Drainage Manual and FHWA Final Rule

On July 26, 1994, the Federal Highway Administration (FHWA) published its Final Rule adopting AASHTO Guidelines to be followed on all projects funded under title 23, United State Code. As a part of this rule, state highway agencies were directed to apply these guidelines or their own more stringent guidelines.

With its Final Rule, the FHWA committed to ensuring that all highway construction projects are located, designed, constructed, and maintained according to standards that will minimize erosion and control associated sedimentation. Volume III of the AASHTO Highway Drainage Guidelines provides excellent guidance concerning these factors. The following is a summary of some of the important issues.

- This regulation and the accompanying guidelines apply to all projects funded under title 23 United States Code. This includes projects on or off the National Highway System.
- Erosion and sediment control plan sheets shall be included in the plans and specifications for all applicable projects, not just larger or more complex projects. It is no longer satisfactory to specify that the contractor is responsible for all damages resulting from the construction operation or to leave the development of erosion and sediment control to the contractor or to project personnel after the project has been awarded.
- Erosion and sediment control plan sheets shall be developed by qualified personnel.

- As a minimum, erosion and sediment control plan sheets should identify erosion and sediment sensitive areas and provide a mechanism for minimizing any adverse effects. It is not acceptable to provide a bid item for various erosion and sediment control items without including a corresponding plan indicating how and where these items shall be placed.

- During construction, erosion and sediment control plan sheets should be periodically evaluated to assess the effectiveness of the implemented management practices. Erosion and sediment control plan sheets should be revised and updated as needed to ensure that the intended purpose is achieved.

1.4 Designer, Engineer/Inspector, Contractor, and Post-Construction Responsibilities

The four principle parties involved in designing, implementing, and monitoring of erosion and sediment controls are the designer, engineer/inspector, contractor, and post construction personnel. Each party has specific roles and responsibilities that are described below.

Designer Responsibilities

- Research construction project site conditions.

- Understand the scope of the construction project including duration of the construction and the time of year construction will commence.

- Submit the NOI package with all the required submittals to the DEQ or to the EPA if the construction site is located on Tribal land.

- Ensure that topography and drainage are clearly delineated within the SWPPP.

- Provide a SWPPP and erosion and sediment control plan sheets with sufficient bid items to address erosion and sediment throughout project construction.

Engineer/Inspector Responsibilities

- Have knowledge and understanding of the SWPPP and general permit conditions.

- Ensure the contractor submits revision to the SWPPP if required.

- Ensure contractor maintains the erosion and sediment control facilities as needed.

- Know how to properly install BMPs to control erosion and contain sediment.

- Ensure that contractor and project comply with all applicable permits.

Contractor Responsibilities

- Bid on job with knowledge of site conditions.

- Construct BMPs as described on plans and specifications.

- Maintain erosion control facilities and modify when needed to be effective.

- Update SWPPP as work progresses and modify plan as conditions change.
- Be familiar with requirements of general permits.
- Inspect BMP installation during construction activities.

Post-Construction Personnel Responsibilities

- Monitor BMPs for effictiveness.
- Maintain all erosion and sedimentation controls after construction activities are completed.
- Remove temporary BMPs after sufficient reestablishment of vegetation.

1.5 DEQ Notice of Termination

When a site has been finally stabilized or when the operator at a site changes, the operator shall submit a standard DEQ Notice of Termination (NOT) form. The NOT form can be found in Appendices G and H. Failure to submit a NOT shall result in additional annual permit fee accumulation until notification has been received.

Section 2
Erosion and Sedimentation Processes
2.1 Concepts of Erosion and Sedimentation

Each year the Montana Department of Transportation (MDT) completes numerous highway construction projects where soils are disturbed. This disturbance can increase the potential for excess erosion if not properly addressed. Excess soil erosion from construction projects removes the soil surface layer rich in nutrients and transports the sediments into surface waters contributing to sediment loading and contamination from contaminants transported with the sediments. The excess sediment collects in reservoirs, lakes, rivers, and streams reducing their water holding capacity and quality; consequently being detrimental to aquatic life. While erosion and sedimentation are natural processes that help shape Montana's rivers and valleys, intrusive activities such as highway construction can greatly accelerate these natural processes causing serious and costly problems. The implementation of BMPs to prevent soil erosion and the resulting sedimentation from entering the waterways during the early stages of planning can significantly reduce serious and costly problems in the future.

The principles of erosion and sedimentation, and the associated pollutants that can accompany sedimentation, are provided in this section as a background to understanding how to prevent excess erosion from occurring during construction projects and how to best contain the sediments that are released.

2.1.1 Types of Erosion

Erosion is often described as the detachment of soil particles from the ground surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Once detachment occurs, the particles are transported by agents like water or wind. Principles of water and wind erosion are discussed below.

2.1.1.1 Water Erosion

The types of erosion associated with the flow or movement of water can be categorized as follows:

- **Splash Erosion:** This type of erosion is caused by the impact of raindrops on bare or sparsely vegetated soil. The soil particles are detached and transported by runoff creating a water/soil solution. The pouring action destroys the soil structure forming a hard crust once the soil dries. The crust prevents future water from infiltrating, hindering plant establishment which can cause further erosion.

- **Sheet Erosion**: As the name implies, this type of erosion is caused by sheet type flows over soil surfaces. True sheet flow is uncommon because water most often concentrates in surface depressions. Soil particles dislodged or loosened by splash erosion are entrained in the runoff water and transported down gradient. This type of erosion is characterized by the uniform removal of material from the ground surface.

- **Rill/Gully Erosion:** This type of erosion occurs when water flows over the surface of the soil and accumulates in depressions. Once the water reaches sufficient velocity to cut into the depression, it creates channels (rills) which transport sediment. As the scouring action of the water intensifies, larger channels (gullies) are created. This action releases large amounts of sediments.

- **Stream Bank Erosion:** This type of erosion occurs in natural drainage channels and occurs naturally in all streams. Stream bank erosion can be accelerated by upstream development or disturbances to the stream banks. This type of erosion can begin with erosion of the toe of the stream bank that may lead to bank sloughing into the creek.

- **Shoreline Erosion:** This type of erosion occurs at lakeshores and ocean coastlines. It is characterized by sloughing of banks and mass wasting of material in to the water body. It is caused by high-energy wave action.

- **Snow Melt Erosion:** This type of erosion occurs when large volumes of snow allowed to accumulate in disturbed areas cause significant erosion. As moisture accumulates in the soils, the soil expands during freezing causing the soil particles to detach. The snow melts and becomes runoff transporting detached sediment downstream. Also, water stored in structures like sediment ponds tend to freeze, reducing their holding capacity and subsequently leading to flooding and concentrated flow.

2.1.1.2 Wind Erosion

The second main type of erosion is wind erosion. This type of erosion usually occurs in flat poorly vegetated areas. As the soil particles dry and loosen, the wind lifts the particles and transports them to other locations. Although this is a natural process, construction activities create temporary bare areas which are receptive to erosion. A minimum velocity is required to move the particle. The velocity, called threshold velocity, is related to the particle size, the cloddiness of particles, and the surface conditions.

There are three main types of wind erosion which are described below:

- **Suspension Erosion:** This type of erosion is attributed to the movement of very fine particles due to impact with other particles or due to the wind itself. The particles are suspended in the air and transported long distances at high altitudes.

- **Saltation Erosion:** This type of erosion is when large quantities of soil particles are lifted into the air by the wind forces and moved mainly horizontally across the surface. The particles bounce onto the surface lifting other particles and causing damage to the surface and to the vegetation.

- **Surface Creep Erosion:** This type of erosion is caused when heavy particles roll across the soil surface after they come in contact with smaller particles that moved by saltation or by suspension.

2.1.2 Sediments and Pollutants

Erosion is the predominant source of suspended material; however, erosion is a naturally occurring process. As such, attention should focus on erosion rates above those occurring naturally or prior to development. Although erosion rates are difficult to determine, every effort should be made to reduce erosion caused by construction projects and existing facilities. This can be accomplished by implementing BMPs.

A wide variety of constituents exist in the environment and may be found in runoff from highways and highway-related facilities. A constituent becomes a pollutant if it enters receiving waters in a quantity sufficient to impair a beneficial use (e.g. aquatic habitat, water supply, recreation). Each receiving waterway or water body is unique as to the characteristics that contribute to this beneficial use and the type and quantity of constituents that would impair its use.

Suspended sediment material (i.e., soil, gravel, etc.) in storm water runoff is considered a pollutant of primary importance. Excess suspended particles, or high turbidity in waterways and water bodies have environmental and economic implications. The quality of aquatic life habitats degrade as the quantity of sediments increase. The high turbidity prevents the sunlight from reaching the lower sections of the water bodies; therefore, reducing photosynthesis and consequently reducing food production. The sunlight is absorbed in the water, increasing the temperature, which changes the natural aquatic habitats. The sediment settles on the bottom of the water bodies, creating a smooth crust that harms fish spawning habitats. Excess sediments can also be costly because they can affect adjacent properties and clog catch basins and storm drains, causing flooding and resulting in higher maintenance costs. When sediments enter streams and lakes, they create cloudy or turbid water conditions as well as reducing the flow capacity of the water bodies. These conditions can interfere with industrial and recreational activities. In addition, sediments can transport many other pollutants, including metals, and other organic pollutants.

Contaminated sediments affect small creatures such as worms, crustaceans, and insect larvae that inhabit the bottom of a water body, known as the benthic environment. Some kinds of toxic sediments kill benthic organisms, reducing the food available to larger animals such as fish. EPA lists five major types of pollutants found in sediments. These include nutrients, bulk organics, halogenated hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), and metals. EPA's description of these major pollutants is provided below:

- **Nutrients:** Nutrients, including phosphorous and nitrogen compounds such as ammonia, can be toxic to benthic organisms. Elevated levels of phosphorous can promote the unwanted growth of algae. This can lead to depletion of oxygen in the water causing the algae to die and to decay. Decomposition of vegetation can generate unpleasant odors and tastes, as well as unsightly conditions. Elevated nutrient levels can be encountered where channels and storm drains are disturbed and where sewer lines and fertilized vegetated areas are excavated.

- **Bulk Organics:** A class of hydrocarbons that includes oil and grease. Construction activities require the present of hydrocarbons as fuels, solvent, lubricants, and many other applications. If these compounds are released into the environment they might work they way into the water bodies via erosion. Hydrocarbons can be toxic to aquatic and faunal habitats as well as consume oxygen during their decay process resulting in fish kill and unsightly conditions. On construction sites, the storage, transfer, and usage of these compounds should be performed following all federal, state, and local regulations.

- **Halogenated Hydrocarbons or Persistent Organics:** A group of chemicals that are very resistant to decay. Organochlorine compounds such as (DDT) and (PCBs) are in this category. These compounds bioaccumulate in the food chain becoming toxic to aquatic life, wildlife, and humans. The main sources of these compounds are atmospheric deposition, urban, industrial, and municipal discharges from past and ongoing activities. When encountered, these compounds should be treated as hazardous waste and the appropriate governmental agencies should be contacted, as well as all the federal, state, and local regulations shall be followed.

- **PAHs:** A group of organic chemicals that includes several petroleum products and their by products. These compounds are very toxic and most of them are carcinogens. They tend to be persistent in the

environment, absorbent in soil particles, bioaccumulative in living tissue, and lethal to several organisms. Urban runoff from industrial, urban, and municipal sources is suspected to be a major contributor of PAH in water bodies, as well as atmospheric deposition.

- **Metals:** The main metals of concern are iron, manganese, lead, cadmium, zinc, mercury, arsenic, and selenium. The major sources of metals are inactive and active mines, and atmospheric deposition from urban, industrial, and municipal discharges.

In Montana, many areas have been mined for precious metals. The mining areas typically exhibit high metal concentrations in the ore, waste rock, and tailings presenting a threat to human health and the environment. Erosion and sedimentation of these materials can be dangerous to the environment and should be avoided. Mining waste is often characterized by oxidation zones which results in soils or wastes having a very uniform texture and colors such as gray, red, or yellow. Special care should be taken when construction activities disturb areas affected by mining activities. The appropriate MDT and DEQ environmental departments should be contacted and the federal, state, and local regulations should be followed.

Contaminated sediments do not always remain at the bottom of a water body. Any activity that stirs up the water, such as a storm or a boat's propeller, can resuspend sediments. Resuspension may result in the direct exposure of animals in the water and not just the bottom-dwelling organisms, to toxic contaminants.

2.2 Impacts of Erosion and Sedimentation

2.2.1 Economical Impacts

Montana incurs significant direct and indirect costs as a result of excess erosion and sedimentation caused by construction activities. Improper BMP use or uncontrolled construction sites cause excess erosion which can lead to soil loss and flooding. The direct costs of excess erosion and sedimentation are readily seen, such as the cost to repair and revegetate a side slope, and dredging of navigational waterways. Indirect costs associated with excess erosion and the resulting sedimentation are not as easy to see and can be overlooked at construction sites. For example, a loss of water storage capacity in reservoirs and lakes due to accumulation of sediments can lead to flooding, downstream damage to streams or private property due to increased stream velocities, and the need to build new reservoirs to increase the water storage capacity. Another example is the loss of soils that are capable to support plant growth, requiring the addition of fertilizers and nutrients. Every year, approximately 230 million cubic meters (300 million cubic yards) of sediment are dredged to deepen harbors and clear shipping lanes in the United States. Roughly 2 to 9 million cubic meters (3 to12 million cubic yards) of these sediments are so contaminated that they require special, and sometimes costly, handling and disposal (EPA, 2002). All these items can be extremely expensive.

Wind erosion can also have economic impacts including: increased highway maintenance and repair; frequent cleaning of personal property; damage to personal property; damage to crops and landscape vegetation; as well as related health problems.

2.2.2 Environmental Impacts

Damage to Montana's environment from excess erosion and sedimentation is most readily seen in the rivers and streams. High turbidity from sedimentation, deposition of excess sediments, and steam bank erosion are a few examples. Loss of valuable topsoil also limits the quality and quantity of vegetation in areas impacted by excessive erosion. Reclamation of some of Montana's steep slopes experiencing excess erosion is very expensive.

Pollutants contained within the sediments are also damaging to the environment. The EPA estimates that approximately 10 percent of the sediment underlying our nation's surface water is sufficiently contaminated with toxic pollutants to pose potential risks to human health and to the environment.

2.3 Principles of Erosion and Sediment Control

Erosion control practices during construction activities protect the soil surface by using soil stabilization BMPs. Erosion control treats soil as a valuable resource that needs to be protected from erosion mechanisms. Sediment control practices trap soil particles after they have been dislodged and prevent or minimize their movement off site. Sediment controls are generally passive systems that rely on filtering and/or settling soil particles before they leave the site.

The understanding of the nature of the contaminants, the basic erosion and sedimentation processes, and the erosion and sedimentation control principals provide the basis for selection and design of storm water quality controls. The principal types of controls to be considered are source controls and treatment controls. Source controls prevent pollutants from being generated at the source. The primary example of source controls is soil stabilization measures. Treatment controls capture and remove particles suspended in runoff that were eroded despite implementation of source control measures. Examples of temporary treatment controls are silt fences and hay bale dikes. The purpose of temporary BMPs used during construction activities is to limit the detachment and subsequent transport of sediment as close to the source as practicable. For example, it is more desirable to minimize erosion from a construction zone by establishing vegetation than to trap sediment below the construction zone with silt fencing.

Planning considerations for runoff control are also very important. A site must be evaluated for drainage patterns. External flows originating offsite should be temporarily (or permanently) diverted around the work area. Runoff controls internal to the site usually divert and direct sediment-laden water to collection and trapping facilities prior to discharge from the site. When management practices for erosion control and storm water management are designed, two components of surface runoff need to be predicted: runoff volume and peak rate of discharge.

In order to address the requirements of pollution reduction at construction sites, a variety of techniques should be employed to reduce soil erosion, reduce site sediment loss and manage construction-generated waste and construction related toxic materials. EPA stresses that a management systems approach should be used that addresses numerous individual practices and evaluates the overall cost and effectiveness of the entire storm water control system. In other words, no single BMP should be used. All of the BMP tools provided in Section 3 should be considered in combination for each construction site in order to develop an erosion and sediment control plan that is protective of Montana residents' health and the environment.

2.3.1 Vegetation

Vegetation is the key to long-term soil stability. Sediment controls are dependent on the reestablishment of vegetation on disturbed areas. Vegetation serves to physically impede runoff by the presence of stems and leaves which retard runoff shear stress and protect the soil surface. Vegetation also greatly increases water infiltration into the soil by facilitating the development of soil structure, macropores, and roughness. A vegetated soil surface might exhibit 80-99% less runoff compared to a barren soil surface depending on the soil texture and vegetation cover. Rapid establishment of vegetation is a critically important component of long-term stability. A number of construction practices are available which promote successful vegetation development.

- **Minimize the extent of vegetation disturbance:** Fewer acres of disturbed soil equate to lower sediment yield and lower BMP cost. Vegetation removal should be avoided in all areas where disturbance is not required. Stands of existing vegetation within the right-of -way may be left undisturbed. Surface Soil Stablization BMP SS-2 describes techniques for preservation of existing vegetation. Particular attention should be paid to preservation of vegetation in wet areas, on stream banks, and on steep slopes where revegetation is difficult. In areas where vegetation is not removed, care should be taken to avoid parking vehicles, staging, developing haul roads, and other activities that lead to soil compaction and vegetation trampling.

- **Salvage of topsoil during construction:** This measure is highly desirable for promotion of robust plant growth. Topsoil is differentiated from subsoil by the presence of soil structure, nutrients, microorganism, and organic matter. Soil development in Montana proceeds very slowly requiring hundreds of years for each inch of topsoil development. Therefore, salvage of topsoil provides a significant resource to the seeded plants improving the probability of rapid and robust plant growth in the short-term.

- **Direct haul of topsoil:** To have topsoil directly from salvage areas to replacement areas without intermediate stockpiling is desirable for vegetation establishment. Conversely, soil quality diminishes when stored in topsoil stockpiles, especially over long periods of time. If topsoil must be stockpiled, effort should be made to minimize the amount of time that soil is stored prior to replacement. Since topsoil is essentially a living material, loss of plant propagules, nutrients, and beneficial soil organisms are expected after prolong stockpiling of topsoil resulting in the loss of vegetation productivity.

- **Minimize compaction of replaced topsoil:** To promote water infiltration and root development, compaction of replaced topsoil shall be minimized. Compacted soil is a leading cause of runoff and poor vegetation establishment that can be caused by excessive vehicle traffic.

- **Minimize the spread of weeds in disturbed areas:** To minimize the spread of weeds, only weed free seed shall be used. Noxious weeds are a significant problem in Montana and at construction sites. Construction equipment and vehicles should not be parked in weed infested areas and vehicles brought onsite should be free of weed seeds.

Section 3
Best Management Practices

In order to address the requirements of pollution prevention at construction sites, a variety of techniques should be employed to reduce soil erosion, reduce site sediment loss, and manage some of the more common construction-generated wastes and construction related toxic materials. This section provides design criteria for a variety of techniques to address these issues. These BMPs consist of temporary methods to reduce pollution from a construction site. Hazardous and toxic wastes and construction-generated wastes will require coordination with multiple state and/or federal agencies, and the procedures and requirements for management of these wastes are not fully described in this document. Hazardous and toxic waste issues should be coordinated with EPA, MDT Environmental Services Bureau, and DEQ.

The BMP fact sheets listed in Section 3 were developed by the State of California Department of Transportation (Caltrans) and have been modified for Montana. The National Menu of Best Management Practices for Storm Water Phase II developed by EPA was used in Section 3 to verify that the BMPs listed in this section are consistent with EPA guidance. The majority of BMPs address soil loss from the site. For construction sites, soil loss in the form of erosion and sedimentation due to storm events, snowmelt, and wind constitute the majority of pollution generated. BMPs that address erosion and sediment control are typically more site specific than waste and toxics management. Erosion and sediment control BMPs are dependent on site slopes, drainage patterns, and drainage quantities along with other site-specific conditions. Waste management consists primarily of "good housekeeping" practices that are dependent on the type of construction, and the quantity and type of building materials.

In preparing the SWPPP, the designer can first use the BMP selection guide to determine BMPs applicable to the site. The fact sheets following the selection guide details the design requirements, maintenance requirements, limitations, and purpose of each of the techniques. In order to address the requirements of pollution reduction at MDT construction sites, a variety of techniques should be employed to reduce soil erosion and sedimentation.

3.1 Temporary Soil Stabilization BMPs

Temporary soil stabilization consists of preparing the soil surface and applying one of the BMPs shown in Table 3.1-1, or combination thereof, to disturbed soil surfaces. Temporary soil stabilization shall be applied to disturbed soils of construction projects in conformance with the MDT Standard Specifications and Section 5.2 - Erosion and Sediment Control Construction Process, of this manual. These BMPs are primarily used in perimeter areas around construction sites to either limit flows across the site or limit the erosion in areas disturbed, but not active.

Temporary concentrated flow conveyance controls, SS-9 through SS-11, are grouped with the temporary soil stabilization BMPs and consist of a system of BMPs that are used alone or in combination to intercept, divert, convey, and discharge concentrated flows with a minimum of soil erosion, both on site and downstream (off-site). Temporary concentrated flow conveyance controls may be required to direct run-on around or through the project in a non-erodible fashion.

Table 3.1-1 Temporary Soil Stabilization BMPs

ID	BMP Name	Primary Purpose
SS-1	Scheduling	Sequencing of BMPs
SS-2	Preservation of Existing Vegetation	Protection of desirable vegetation by limiting soil detachment
SS-3	Hydraulic Mulch	Protection of disturbed soil with mulch by limiting soil detachment
SS-4	Temporary Seeding	Provide soil protection through new plant growth
SS-5	Soil Binders	Soil stabilization for wind and water
SS-6	Straw Mulch	Protect disturbed soil with straw mulch by limiting soil detachment
SS-7	Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats	Protect disturbed soil or slopes
SS-8	Wood Mulching	Protect disturbed soil with wood mulch
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	Intercept, divert, and convey surface run-on
SS-10	Outlet Protection/Velocity Dissipation Devices	Prevent scour of exiting storm water flows
SS-11	Slope Drains	Route overland flow into a pipe to protect slope
SS-12	Slope Roughening	Reduce runoff velocity, increase infiltration, trap sediments, and create microenvironment for seeding
SS-13	Terraced Slope	Reduce velocity and allow upland deposition
SS-14	Vegetated Buffer	Prevent soil erosion and catch sediment
SS-15	Erosion Seeding	Erosion control on steep slopes

3.2 Temporary Sediment Control BMPs

Construction activities normally result in soil disturbances on construction sites due to grading operations, clearing, and other activities. BMPs shall be installed to contain the detached sediments from being transported off site by using techniques like soil sedimentation and sediment trapping. Temporary sediment control practices shall be implemented in conformance with the criteria presented in Section 5 - Erosion and Sediment Control Construction Phase Process, of this manual. Temporary sediment control practices include the BMPs listed in Table 3.2-1.

Table 3.2-1 Temporary Sediment Control BMPs

ID	BMP Name	Primary Purpose
SC-1	Silt Fence	Slow and filter runoff to retain sediment
SC-2	Desilting Basin	Large pond with controlled outflow which allows sediment to settle out of runoff
SC-3	Sediment Trap	Reducing sediment before it enters live water bodies
SC-4	Check Dam	Provides minor detention and retention of sediment for small swales and concentrated flows
SC-5	Fiber Rolls	Intercept runoff and remove sediment
SC-6	Gravel Bag Berm	Intercept runoff and remove sediment
SC-7	Street Sweeping and Vacuuming	Prevent sediment from entering waterway
SC-8	Sandbag Barrier	Intercept runoff and remove sediment
SC-9	Straw Bale Barrier	Intercept runoff and remove sediment
SC-10	Storm Drain Inlet Protection	Intercept sediment at curb and field inlets. Should be used in conjunction with other on-site techniques.
SC-11	Dugout Ditch Basin	Provides minor detention and retention of sediment for small swales and concentrated flows

3.3 Wind Erosion Control BMPs

Wind erosion control consists of applying water or other dust palliatives as necessary to prevent or control dust nuisance. The wind erosion control BMP is shown in Table 3-3.1. Additionally, other BMPs sometimes used to reduce wind erosion are BMPs SS-3 through SS-7.

Table 3.3-1 Wind Erosion Control BMPs

ID	BMP Name	Primary Purpose
WE-1	Wind Erosion Control	Prevent or alleviate dust nuisance

3.4 Snow Accumulation and Snow Melt BMPs

Snow accumulation, icing, and snowmelt cause significant problems in Montana particularly in Montana's upper mountain valleys. Heavy accumulation of snow in disturbed areas or poor snow removal practices can lead to severe erosion and sediment transport. In addition, freezing can cause BMPs to fail resulting in sediment discharge. Other soil stabilization and sediment control BMPs may also be effective. Snow accumulation and snow melt BMPs are shown in Table 3.4-1.

Table 3.4-1 Snow Accumulation and Snow Melt BMPs

ID	BMP Name	Primary Purpose
SN-1	Snow Management	Reduce the volume of runoff in disturbed areas
SN-2	Snow Accumulation	Reduce the volume of runoff in disturbed areas
SN-3	Freeze Reduction	Increase effectiveness of structures and BMPs

3.5 Tracking Control BMPs

Tracking control consists of preventing or reducing vehicle from tracking soil on the tires off site and consequently entering a storm drain or watercourse. Tracking control BMPs are shown in Table 3.5-1.

Table 3.5-1 Tracking Control BMPs

ID	BMP Name	Primary Purpose
TC-1	Stabilized Construction Entrance/Exit	Reduces offsite sediment tracking from trucks and construction equipment
TC-2	Stabilized Construction Roadway	Control of dust and erosion created by vehicular traffic
TC-3	Entrance/Outlet Tire Wash	Reduces offsite sediment tracking from trucks and construction equipment

3.6 Non-Storm Water Management BMPs

Non-storm water management BMPs are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with storm water. These practices involve day-to-day operations of the construction site and are usually under the control of the Contractor. These BMPs are also referred to as "good housekeeping practices," which involve keeping a clean, orderly construction site. Table 3.6-1 lists the non-storm water management BMPs.

Table 3.6-1 Non-Storm Water Management BMPs

ID	BMP Name	Primary Purpose
NS-1	Water Conservation Practices	Conserving water on construction sites
NS-2	Dewatering Operations	Manage pollutants from dewatering operations
NS-3	Paving and Grinding Operations	Minimize pollution of storm water during paving operations
NS-4	Temporary Stream Crossing	Minimize pollution at waterway crossings
NS-5	Clear Water Diversion	Intercepts clear surface water runoff upstream of a project site
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	Recognize illicit connections or illegally dumped or discharged materials
NS-7	Potable Water/Irrigation	Reduce potential pollutants during discharge of water lines.
Vehicle and Equipment Operations		
NS-8	Vehicle and Equipment Cleaning	Procedures to minimize or eliminate discharge of pollutants from cleaning operations
NS-9	Vehicle and Equipment Fueling	Procedures to eliminate the discharge of fuel spills into waterways
NS-10	Vehicle and Equipment Maintenance	Procedures to eliminate the discharge of pollutants into waterways from maintenance activities

3.7 Waste Management and Materials Pollution Control BMPs

Waste management and materials pollution control BMPs, like non-storm water management BMPs, are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with storm water. These BMPs also involve day-to-day operations of the construction site and are under the control of the Contractor. They are additional "good housekeeping practices," which involve keeping a clean, orderly construction site.

Materials pollution control (also called materials handling) consists of implementing procedural and structural BMPs for handling, storing, and using construction materials to prevent the release of those materials into storm water discharges. The objective is to reduce the opportunity for rainfall to come in contact with these materials. These controls shall be implemented for all applicable activities, material usage, and site conditions. Table 3.7-1 lists the waste management and materials pollution control BMPs.

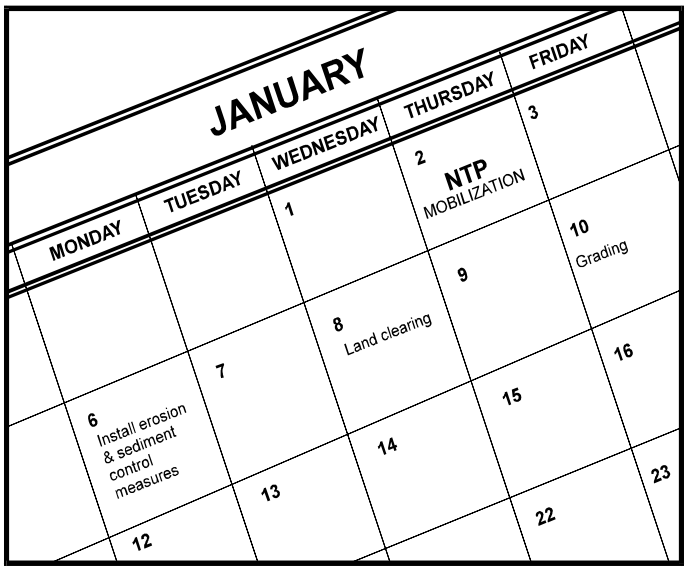
Table 3.7-1 Waste Management and Materials Pollution Control BMPs

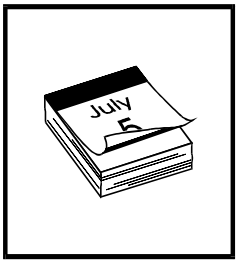
ID	BMP Name	Primary Purpose
WM-1	Material Delivery and Storage	Proper handling and storage of materials
WM-2	Material Use	Procedures for eliminating or reducing the discharge of materials to waterways
WM-3	Stockpile Management	Procedures for eliminating or reducing pollution of storm water from stockpiles
WM-4	Spill Prevention and Control	Prevent and control spills
WM-5	Solid Waste Management	Management of packaging, building materials, etc.
WM-6	Hazardous Waste Management	Management of paints, chemicals, fertilizer, pesticides, oil and grease, etc.
WM-7	Contaminated Soil Management	Procedures for eliminating or reducing pollution of storm water from contaminated soils
WM-8	Concrete Waste Management	Procedures for eliminating or reducing pollution of storm water from concrete wastes
WM-9	Sanitary/Septic Waste Management	Procedures for eliminating or reducing pollution of storm water from sanitary /septic wastes
WM-10	Liquid Waste Management	Procedures for eliminating or reducing pollution of storm water from liquid wastes

3.8 Best Management Practices Fact Sheets

The remainder of Section 3 provides fact sheets for each of the BMPs listed above. These BMPs constitute the tools available for transportation designers, contractors, construction managers, and maintenance personnel to utilize in the field to control erosion and sedimentation during construction activities.

Scheduling SS-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

This BMP involves developing a schedule for every project that includes sequencing of construction activities with the implementation of construction site BMPs such as temporary soil stabilization (erosion control) and temporary sediment controls measures. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Appropriate Applications

Any construction project where soils will be disturbed will benefit from a BMP sequencing schedule that is generated in conjunction with the construction-sequencing schedule. BMP sequencing can help minimize land disturbance during construction.

Limitations

The BMP sequencing schedule must be agreed upon between MDT and the construction contractor. BMP scheduling is only effective if the scheduled is followed closely and modified as required throughout the construction project.

Design Guidelines and Considerations

- Plan the project and develop an implementation schedule of construction site BMPs. The schedule is designed to clearly show how the BMPs relate to soil-disturbing and re-stabilization activities. The construction schedule is typically incorporated into the SWPPP.

- A BMP schedule includes details on the implementation and deployment of:

  - temporary soil stabilization BMPs,

  - temporary sediment control BMPs,

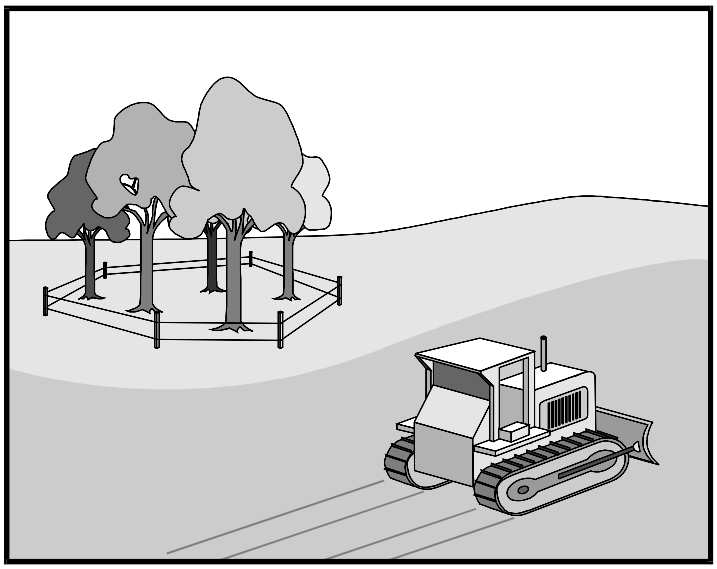
- tracking control BMPs,
- wind erosion control BMPs,
- non-storm water BMPs, and
- waste management and materials pollution control BMPs.

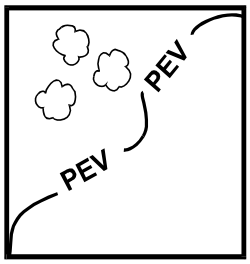
- Also included in the BMP schedule are dates for significant long-term operations or activities that may have planned non-storm water discharges such as dewatering, saw cutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, etc.
- Coordinate sequencing and create a timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, pouring foundations, installing utilities, etc., to minimize the active construction area during the peak storm seasons.
- Stabilize non-active areas as soon as practical.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment controls on all disturbed areas prior to the onset of rain.
- Be prepared year-round to deploy soil stabilization and sediment control practices. Erosion may be caused during dry seasons by unseasonable rainfall, wind, and vehicle tracking. Keep the site stabilized year-round, and retain and maintain sediment trapping devices in operational condition.
- Trenching of utility lines is often required on construction projects. Sequence trenching and excavation activities so that most open portions are closed before new trenching or excavations begin.
- Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
- Consider scheduling when establishing permanent vegetation (appropriate planting time for specified vegetation).
- Schedule BMP Maintenance, Inspection, and Removals.

Maintenance, Inspection, and Removal

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted or when directed by the Engineer.
- Include anticipated BMP removal information on the schedule.

Preservation of Existing Vegetation SS-2





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Preservation of existing vegetation relates to the identification and protection of desirable vegetation. Benefits of preservation of existing vegetation include minimizing disturbance on construction sites, erosion control, detention, and infiltration of storm water, biofiltration, velocity dissipation and aesthetic value.

Appropriate Applications

- Preserve existing vegetation at areas on a site where no construction activity is planned or where activities may occur at a later date.
- Beneficial for use in wetlands, floodplains, stream banks, steep slopes and other areas where erosion controls would be difficult to establish, install, or maintain.
- Preservation of existing vegetation is also used to maintain pre-construction drainage patterns to avoid vegetation die off as a result of water flows being intercepted and diverted away from the existing vegetation.
- On a year-round basis, temporary fencing can be installed prior to clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur later. Upon Engineer's approval, flagging or verbal designation of vegetation preservation areas may be substituted for temporary fencing.
- No grading or disturbances occurs in areas identified on the plans to be preserved.
- Protection of existing vegetation requires planning, and may limit the area available for construction activities.

Design Guidelines and Considerations

- Preservation of existing vegetation is best provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur later.

- Preservation of existing vegetation needs to conform to scheduling requirements set forth in the special provisions.

- Mark areas to be preserved with temporary fencing made of orange polypropylene that is stabilized against ultraviolet light. MDT Standard Specifications and Detail Drawings outline the installation of temporary fencing.

- Minimize the disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling.

- Consider the impact of grade changes to existing vegetation and the root zone.

- Locate construction materials, equipment storage, and parking areas to minimize root compaction. Staging areas should be selected to avoid negatively impacting large areas of existing vegetation.

- Keep equipment away from trees to prevent trunk and root damage.

- Maintain existing irrigation systems.

- Protective devices are only effective if all personnel understand and honor them. No heavy equipment, vehicular traffic, or stock piles of construction materials shall be permitted within the drip line of trees. Removed trees shall not be felled, pushed, or pulled into any retained trees. Fires shall not be permitted within 30 m (100 ft) of the drip line of any retained trees. No toxic or construction materials - including paint, acid, nails, gypsum board, chemicals, fuels, and lubricants - shall be stored within 15 m (50 ft) of the drip line of any retained trees, nor shall they be disposed of in any way which would injure vegetation.

Maintenance, Inspection, and Removal

- During construction, clearly marked limits of disturbance should be observable at all times. Irrigate or maintain the existing vegetation in conformance to the requirements in the landscaping plan. If damage to protected trees still occurs, notify the MDT Agronomist and arrange for any repairs. Remove fencing and flagging according to the BMP removal schedule.

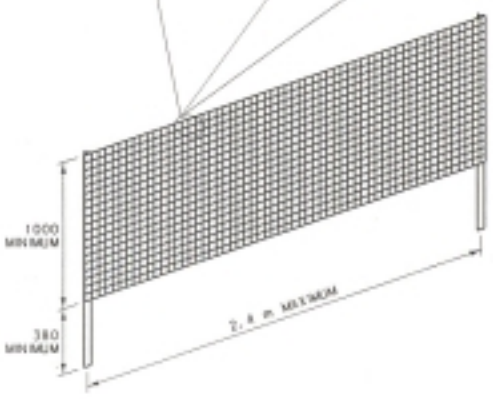
SYMBOL: ——————— ———PEV———

PRESERVATION OF EXISTING VEGETATION SS-21

PRESERVATION OF EXISTING VEGETATION IS THE IDENTIFICATION AND PROTECTION OF DESIRABLE VEGETATION THAT PROVIDES EROSION AND SEDIMENT CONTROL BENEFITS. PROVIDE PRESERVATION OF EXISTING VEGETATION PRIOR TO COMMENCEMENT OF CLEARING AND GRUBBING OPERATIONS OR OTHER SOIL DISTURBING ACTIVITIES. MARK THE AREA AS DESIGNATED ON THE CONSTRUCTION PLANS USING TEMPORARY FENCING MADE OF ORANGE POLYPROPYLENE THAT IS STABILIZED AGAINST ULTRAVIOLET LIGHT. AFFIX FENCING TO METAL "T" POST USING 3.05 mm WIRE. PLACE FENCING AN ADEQUATE DISTANCE FROM TREES AND BUSHES TO PREVENT ROOT AND IRRIGATION SYSTEM DAMAGE.

UPON WRITTEN APPROVAL BY THE ENGINEER, THE CONTRACTOR MAY BE ALLOWED TO FLAG OR VERBALLY DESIGNATE AREAS OF EXISTING VEGETATIVE PRESERVATION.

PRESERVATION OF EXISTING VEGETATION MAY BE USED IN CONJUNCTION WITH VEGETATIVE BUFFER (SS-14), WIND EROSION CONTROL (WE-1) AND SNOW ACCUMULATION (SN-1).

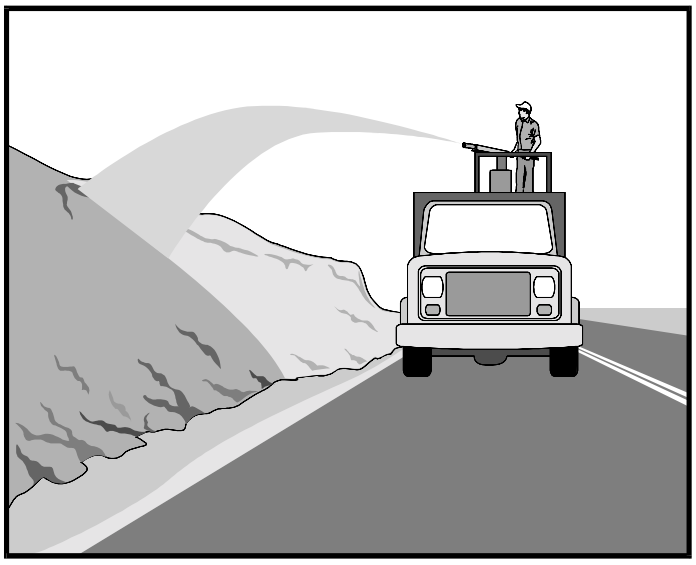


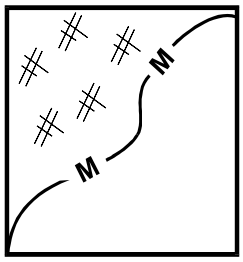
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
PRESERVATION OF EXISTING VEGETATION ISS-21	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Hydraulic Mulch SS-3





BMP Objectives
- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Hydraulic mulch consists of applying a mixture of small pieces of cellulose fibers that can be made from shredded wood fiber or recycled paper and a stabilizing emulsion and tackifier (if desired) with hydro-mulching equipment. This will protect exposed soil from erosion by raindrop impact or wind. Mulching can also provide protection and warmth for seed growth.

Appropriate Applications

- Hydraulic mulch is applied to disturbed areas requiring temporary protection until permanent vegetation is established or to disturbed areas that must be re-disturbed.
- Avoid use in areas where the mulch would be incompatible with immediate earthwork activities and would have to be removed.
- Hydraulic mulch is most effective when used in conjunction with erosion or temporary seeding applications.

Limitations

- Wood fiber hydraulic mulches are generally short-lived (only last a part of a growing season).
- Hydraulic matrices need 24 hours to dry before rainfall occurs to be effective.

Design Guidelines and Considerations

- Prior to application, roughen embankment and fill areas by rolling with a crimping, punching type roller, or by track walking. Track walking shall only be used where other methods are impractical.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

- Selection of hydraulic mulches by the Contractor must be approved by the Engineer.

- Materials for wood fiber based hydraulic mulches and hydraulic matrices shall conform to MDT Standard Specifications.

- Refer to BMP SS-5 (Soil Binder) for tackifier requirements.

- Recycled paper mulch must contain 100% post-consumer paper.

Hydraulic Mulches

- Wood cellulose fiber mulch and recycled paper fiber mulch shall conform to MDT Standard Specifications.

- Apply as a liquid slurry using a hydraulic application machine (i.e., hydroseeder). Follow manufacture's recommendations for application rates, for mulch and stabilizing emulsion, to achieve complete coverage of target area.

Hydraulic Matrices

- Apply a wood fiber base layer and a paper fiber top layer, both mixed with acrylic polymers as binders. Apply as a liquid slurry using a hydraulic application machine (i.e., hydroseeder) at minimum rate of 841 kg/ha (750 lb/acre) wood fiber mulch, 1,140 kg/ha (1020 lb/acre) recycled paper mulch and 520 liters/ha (55 gal/acre) of acrylic copolymer or as specified by the special provisions, to achieve complete coverage of the target area.

- Alternatively, a bonded fiber matrix shall be applied at the rate specified in the special provisions. The bonded fiber matrix shall be applied at a rate of 3,400 to 4,500 kg/ha (3025 to 4000 lbs/acre) based on manufacturers recommendation, to achieve complete coverage of the target area unless specified in the special provision. Do not apply immediately before, during, or after a rainfall.

Maintenance, Inspection, and Removals

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when soils are not being reworked. Inspect mulch before expected rain storms and repair any damaged ground cover and re-mulch exposed areas.

- After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

SYMBOL:

HYDRAULIC MULCH SS-3

HYDRAULIC MULCH CONSISTS OF APPLYING A MIXTURE OF SMALL PIECES OF CELLULOSE FIBERS WHICH CAN BE MADE FROM SHREDDED WOOD FIBERS OR RECYCLED PAPER AND A STABILIZING EMULSION AND TACKIFIER (SUBJECT TO ENGINEERS DISCRETION) USING HYDRO-MULCHING EQUIPMENT. HYDRAULIC MULCH IS APPLIED TO DISTURBED AREAS REQUIRING TEMPORARY PROTECTION UNTIL PERMANENT VEGETATION IS ESTABLISHED OR DISTURBED AREAS THAT MUST BE RE-DISTURBED FOLLOWING AN EXTENDED PERIOD OF INACTIVITY.

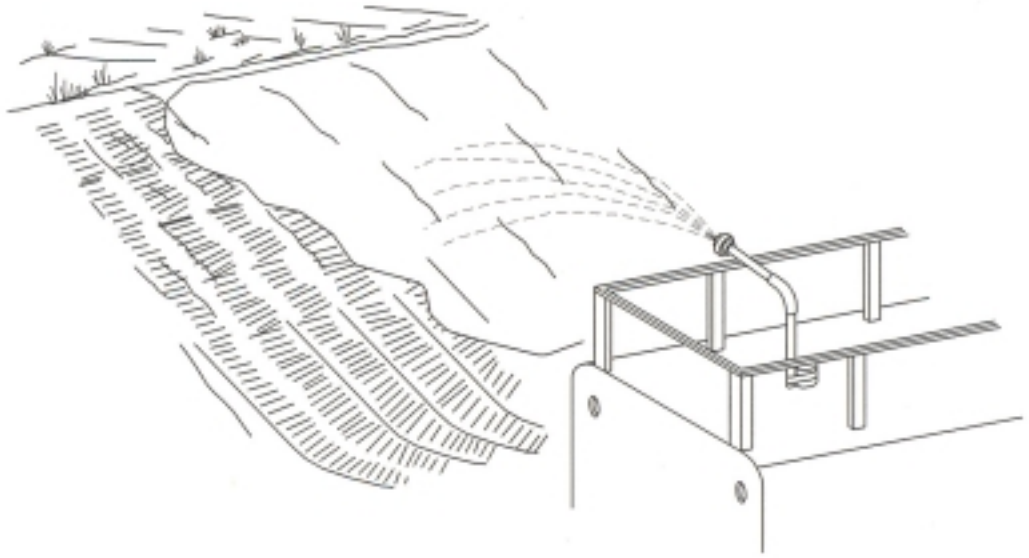
APPLY HYDRAULIC MULCH A MINIMUM OF 24 HOURS PRIOR TO A STORM EVENT TO ALLOW FOR ADEQUATE DRYING.

HYDRAULIC MULCH SELECTION MUST MEET MDT SPECIFICATIONS AND BE APPROVED BY THE ENGINEER PRIOR TO PLACEMENT. ROUGHEN EXISTING EMBANKMENT FOLLOWING GUIDELINES SPECIFIED IN BMP SS-12. WHEN EITHER TEMPORARY SEEDING OR PERMANENT SEEDING IS COMBINED WITH THE HYDRAULIC MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO HYDRAULIC MULCHING OPERATIONS. REFER TO BMPs SS-4 AND SS-5 FOR SEEDING REQUIREMENTS. REMOVE ANY OVER SPRAY FROM ROADWAYS OR SIDEWALKS IMMEDIATELY FOLLOWING APPLICATION.

REAPPLY HYDRAULIC MULCH TO ANY DISTURBED AREAS FOLLOWING A RAIN EVENT OR RESULTING FROM CONSTRUCTION ACTIVITIES.

RECYCLED PAPER MULCH SHOULD CONTAIN 100% POST CONSUMED PAPER.

REFER TO BMP SS-5 (SOIL BINDER) FOR TACKIFIER REQUIREMENTS. ADD ENVIRONMENTALLY SAFE GREEN DYE AS A VISUAL AID DURING APPLICATION.



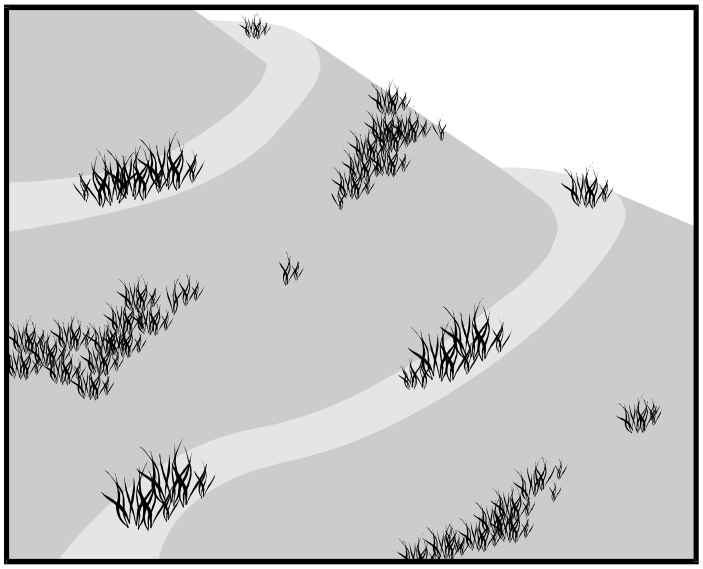
HYDRAULIC MULCH		
PRODUCT	MATERIAL	APPLICATION RATE *
PAPER-BASED HYDRAULIC MULCH	PAPER	1 120 kg/ha (MIN)
WOOD-BASED HYDRAULIC MULCH	WOOD OR WOOD & PAPER	1 120 kg/ha (MIN)

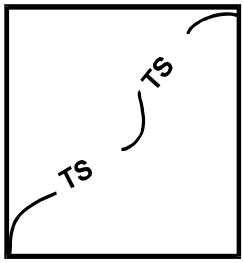
* APPLICATION RATES VARY WITH SLOPE & MUST BE APPROVED BY THE ENGINEER

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-??
HYDRAULIC MULCH (SS-3)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Temporary Seeding SS-4





BMP Objectives
- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Well-established vegetative cover is one of the best erosion control measures available. **Temporary seeding** is the establishment of a temporary vegetative cover on areas with a **slope of 3:1** or flatter that will be exposed for longer than 14 days and that will undergo further disturbance. Temporary seeding is not the same as erosion seeding. **Erosion seeding** (as shown in SS-15) is the immediate seeding of freshly exposed cut and fill **slopes steeper than 3:1** that will not undergo further disturbance. Cereal barley is used as the vegetative cover for temporary seeding. Erosion seeding uses a mixture of seed.

Appropriate Applications

- Temporary seeding is used on disturbed areas requiring temporary protection until permanent vegetation is established, or areas that must be re-disturbed following an extended period of inactivity. Temporary seeding can provide rapid erosion protection on disturbed areas. Once established temporary seeding also traps sediments, promotes infiltration, and improves the appearance of the site. Temporary seeding is a relatively inexpensive erosion control measure.

Limitations

- Rock slopes that cannot be excavated by ripping are not temporarily seeded.
- Temporary seeding may not be appropriate in dry areas or periods without supplemental irrigation.
- Areas impacted by construction traffic will not have successful vegetative growth.
- Temporary seeding should only be utilized when there is sufficient time and conditions are favorable for the vegetation to become established.

- Mulching may be necessary in addition to temporary seeding during the establishment of vegetation because temporary vegetation takes several weeks to establish.

- Steep slopes are not to be seeded with the temporary seeding mix. Erosion seeding shall be substituted for temporary seeding when slopes steeper than 3:1.

- Temporary vegetation is not appropriate for short-term inactivity (less than 14 days).

- Seeding applications may require fertilizer to establish on poor quality soils.

Design Guidelines and Considerations

- Seeding dates and application rates are as follows:

April 1 – June 30	Cereal Barley – 13.5 kg/ha (12.0 lbs/ac)
July 1 – August 31	Temporary Seeding Not Recommended
Sept. 1 – Nov. 15	Cereal Barley – 13.5 kg/ha* (12.0 lbs/ac)

* Do not temporary seed in this timeframe if the area is to be permanently seeded that fall.

- Contact the MDT agronomist, through the Engineer, prior to using substitutions or placing temporary seeding outside these dates. Substitutions shall be approved in writing by the Engineer during the construction phase.

- Drill seed slopes of 3:1 or flatter.

- Following to application, roughen the slopes, or areas to be seeded with the furrows trending along the contours.

- Mulch should be considered in combination with temporary seeding to enhance plant establishment. Mulch will help keep seeds in place and will moderate soil moisture and temperature until the seeds germinate.

- All seeds shall be in conformance with MDT Standard Specifications. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, manufacture's guarantee, and dates of test.

- Follow-up applications shall be made as needed to cover spots of poor germination, and to maintain adequate soil protection.

Maintenance, Inspection, and Removal

- All seeded areas shall be inspected for failures, re-seeded, and mulched within the planting season, using no less than half the original application rates. Any temporary seeding efforts that do not provide adequate cover must be revegetated as required by the Engineer.

- After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

SYMBOL: ———————— ———TS———

TEMPORARY SEEDING SS-4:

TEMPORARY SEEDING IS THE ESTABLISHMENT OF A TEMPORARY VEGETATIVE COVER BY SEEDING WITH CEREAL BARLEY. USE TEMPORARY SEEDING ON AREAS 3:1 OR FLATTER THAT WILL BE EXPOSED FOR LONGER THAN 14 DAYS AND THAT WILL UNDERGO FURTHER DISTURBANCE. EXCLUDE ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING.

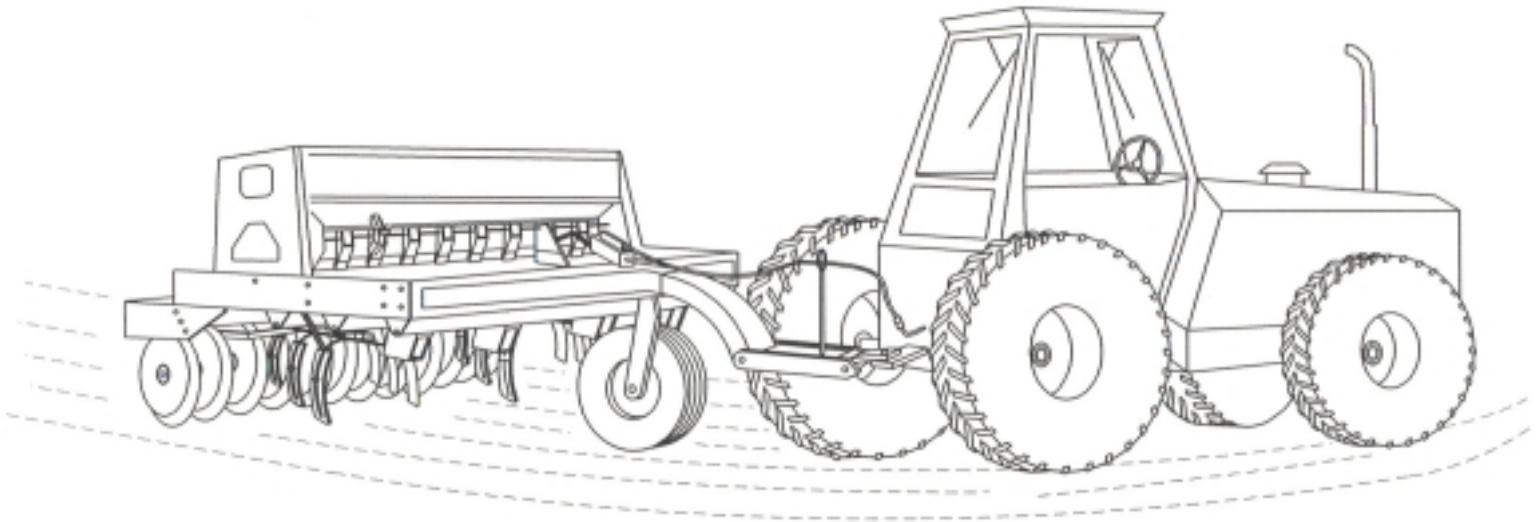
SEEDING DATES AND APPLICATION RATES ARE AS FOLLOWS:

APR. 1 TO JUN. 30: CEREAL BARLEY AT 13.5 kg/ha
JUL. 1 TO AUG. 31: TEMPORARY SEEDING NOT RECOMMENDED
SEP. 1 TO NOV. 15: CEREAL BARLEY AT 13.5 kg/ha

DO NOT TEMPORARY SEED FROM SEP. 1 TO NOV. 15 IF THE AREA IS TO BE PERMANENTLY SEEDED THAT FALL.

CONTACT THE MDT AGRONOMIST, THROUGH THE ENGINEER, PRIOR TO USING SUBSTITUTIONS OR PLACING TEMPORARY SEEDING OUTSIDE THESE DATES. DRILL SEED SLOPES OF 3:1 OR FLATTER. FOR SLOPES STEEPER THAN 3:1, REFER TO EROSION SEEDING.

ANY TEMPORARY SEEDING EFFORTS THAT DO NOT PROVIDE ADEQUATE COVER MUST BE RE SEEDED AS REQUIRED BY THE ENGINEER.



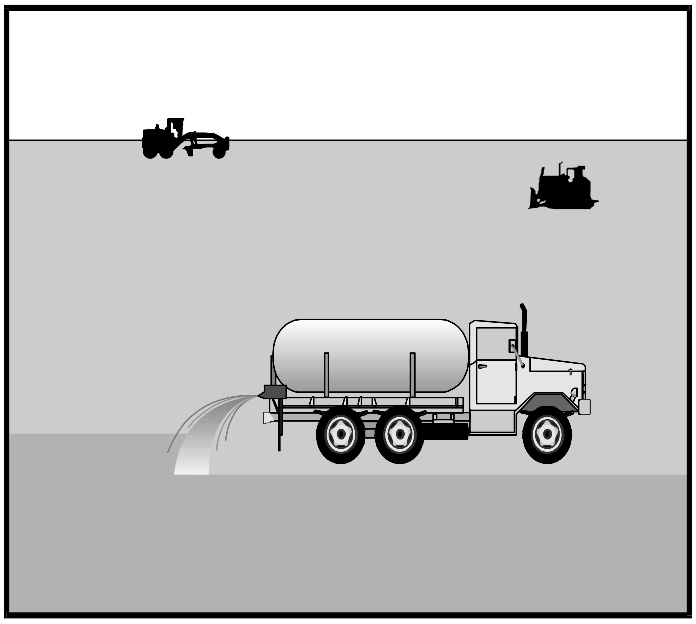
SLOPES 3:1 OR FLATTER

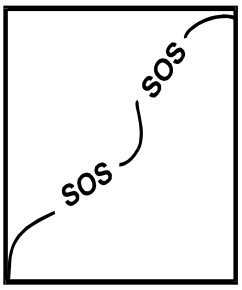
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
TEMPORARY SEEDING (SS-4)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Soil Binder SS-5





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Soil binders consist of applying and maintaining polymeric or lignin sulfonate soil stabilizers or emulsions. Soil binders are materials applied to the soil surface to temporarily prevent water-induced erosion of exposed soils on construction sites. Soil binders typically also provide dust, wind, and soil stabilization (erosion control) benefits.

Appropriate Applications

Soil binders are applied to disturbed areas requiring short-term protection. Because soil binders can often be incorporated into the earth work, they may be a good choice for areas where grading activities will soon resume.

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time as prescribed by the manufacturer, which may be 24 hours or longer until fully effective.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.

- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.

- Soil binders may not cure if low temperatures occur within 24 hours of application.

Design Guidelines and Considerations

General Considerations

- Regional soil types will dictate which soil binders are appropriate for use.

- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and shall not stain paved or painted surfaces.

- Some soil binders are compatible with existing vegetation.

- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

- Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on the Detail Drawings.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders. Soil binders may also be used for dust control using the provided dust control application rates. The dust control application rates will not be adequate to provide protection from water-induced erosion.

- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.

- Frequency of application - The frequency of application can be affected by subgrade conditions, surface type, traffic volumes, climate, and maintenance schedule. Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean-up.

- After considering the above factors, the soil binders are generally appropriate as follows:

  - *Copolymer:* Appropriate for long term soil stabilization in areas where cross-traffic might occur, or where stabilization needs to be achieved in conjunction with preserving existing vegetation. Longevity can be up to 2 years, it has a high resistance to abrasion,

and is compatible with existing vegetation. However, it is also relatively costly which makes it less desirable for short-term or frequent applications.

- *Lignin sulfonate:* Appropriate for short- or medium-term soil stabilization applications in low traffic areas. The moderate relative cost makes it less desirable to reapply frequently, though it typically lasts longer than psyllium or guar. With only moderate penetration and a low resistance to abrasion, it would be more suited to areas which will not be disturbed frequently by construction activities. Lignin sulfonate can have an unpleasant odor when applied.
- *Psyllium/Guar:* Appropriate for typical soil stabilizing situations or short-term applications. Because of the relatively low cost, they can be applied more frequently. Their high penetration provides good stabilization, but their moderate resistance to abrasion limits their longevity. They are not very compatible with vegetation.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before application. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. Refer to manufacture's specifications, but in general, the following steps shall be followed:

- Follow manufacturer's recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas. Track walking shall only be used where rolling is impractical.
- Soil binders shall not be applied during or immediately before rainfall.
- Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
- Do not apply soil binders to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 4^0C (40^0F).
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's specifications for specific cure times.
- For liquid agents:
  - Crown or slope ground to avoid large depressions.
  - Uniformly pre-wet ground at 0.14 to 1.4 l/m^2 (0.003 to 0.03 gal/ft^2) or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 150 to 300 mm (6 to 12 in).
  - Allow treated area to cure for the time recommended by the manufacturer, typically, at least 24 hours.

- Apply second treatment before first treatment becomes ineffective, using 50% application rate.

- In low humidities, reactivate chemicals by re-wetting with water at 0.5 to 0.9 l/m^2 (0.01 to 0.02 gal/ft^2).

Maintenance, Inspection, and Removal

- Reapplying the selected soil binder may be needed for proper maintenance. High traffic areas shall be inspected on a daily basis, and lower traffic areas should be inspected on a weekly basis.

- After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

SYMBOL:

SOIL BINDERS SS-5:

SOIL BINDERS CONSIST OF APPLYING AND MAINTAINING POLYMERIC OR LIGNIN SULFONATE SOIL STABILIZERS OR EMULSIONS. SOIL BINDERS ARE MATERIALS APPLIED TO THE SOIL SURFACE TO TEMPORARILY PREVENT WATER-INDUCED EROSION OF EXPOSED SOILS ON CONSTRUCTION SITES. SOIL BINDERS TYPICALLY ALSO PROVIDE DUST, WIND AND SOIL STABILIZATION BENEFITS. BECAUSE SOIL BINDERS CAN OFTEN BE INCORPORATED INTO THE WORK, THEY MAY BE A GOOD CHOICE FOR AREAS WHERE GRADING ACTIVITIES MAY SOON RESUME.

DUE TO THE TEMPORARY NATURE OF SOIL BINDERS, REAPPLICATION MAY BE REQUIRED OVER AREAS WITH PEDESTRIAN AND VEHICLE TRAFFIC.

SOIL BINDER TYPE AND APPLICATION PROCEDURES REQUIRE THE ENGINEER'S APPROVAL PRIOR TO PLACEMENT. APPLY PER MANUFACTURES SPECIFICATIONS.

REAPPLY SOIL BINDERS, AS SPECIFIED BY THE ENGINEER, IN HIGH TRAFFIC AREAS AND FOLLOWING RAIN EVENTS TO ENSURE AN ADEQUATELY MAINTAINED SURFACE.

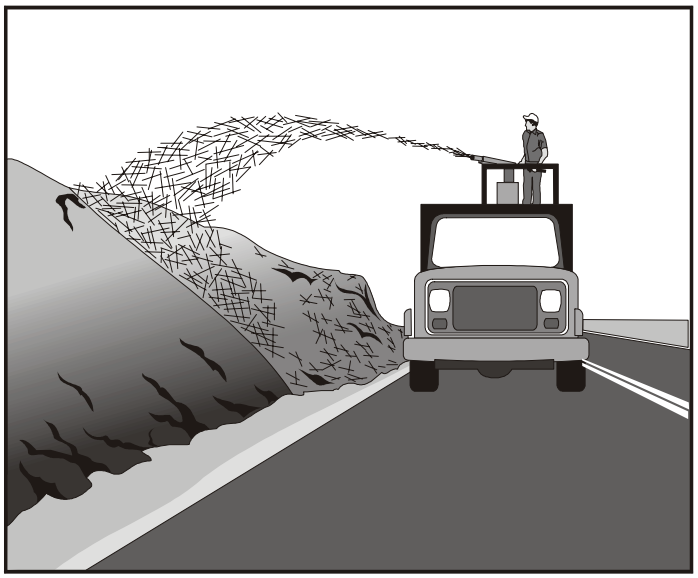
PROPERTIES OF SOIL BINDERS FOR EROSION CONTROL

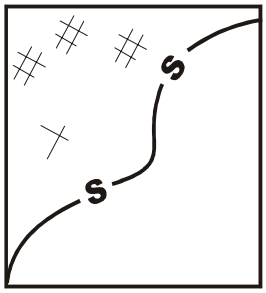
CHEMICALS	COPOLYMER	LIGNIN SULFONATE	PSYLLIUM	GUAR
COMMENTS	FORMS SEMIPERMEABLE TRANSPARENT CRUST, RESISTS ULTRAVIOLET RADIATION & MOISTURE INDUCED BREAKDOWN.	PAPER INDUSTRY WASTE PRODUCT. ACTS AS DISPERSING AGENT. BEST IN DRY CLIMATES. CAN BE SLIPPERY.	EFFECTIVE ON DRY, HARD SOILS. FORMS A CRUST.	EFFECTIVE ON DRY, HARD SOILS. FORMS A CRUST.
RELATIVE COST	HIGH	MODERATE	LOW	LOW
ENVIRONMENTAL HAZARD	LOW	LOW	LOW	LOW
PENETRATION	MODERATE	MODERATE	HIGH	HIGH
EVAPORATION	MODERATE	MODERATE	MODERATE	MODERATE
LEACHING RESISTANCE	LOW	HIGH	HIGH	HIGH
ABRASION RESISTANCE	HIGH	LOW	MODERATE	MODERATE
LONGEVITY	1 TO 2 YEARS	6 MONTHS TO 1 YEAR	3 TO 6 MONTHS	3 TO 6 MONTHS
MINIMUM CURING TIME BEFORE RAIN	24 HOURS	24 HOURS	24 HOURS	24 HOURS
COMPATIBILITY WITH EXISTING VEGETATION	GOOD	POOR	POOR	POOR
MODE OF DEGRADATION	CHEMICALLY DEGRADABLE	BIOLOGICALLY/PHYSICALLY/CHEMICALLY	BIOLOGICALLY DEGRADABLE	BIOLOGICALLY DEGRADABLE
LABOR INTENSIVE	NO	NO	NO	NO
SPECIALIZED APPL. EQUIPMENT	YES	YES	YES	YES
LIQUID/POWDER	LIQUID	POWDER	POWDER	POWDER
SURFACE CRUSTING	YES	YES, BUT DISSOLVED ON REWETTING	YES, BUT DISSOLVED ON REWETTING	YES, BUT DISSOLVED ON REWETTING
CLEAN-UP	SOLVENTS	SOLVENTS	WATER	WATER
EROSION CONTROL APPLICATION RATE	APPLY 800-1000 l/ha	APPLY 5600-6500 l/ha)	APPLY 170 kg/ha WITH 560-2200 kg/ha FIBER MULCH	APPLY 110-220 kg/ha WITH 560-2200 kg/ha FIBER MULCH
DUST CONTROL APPLICATION RATE	APPLY 280-520 l/ha	LOOSEN SURFACE 25-50 mm. NEED 4-8% FINES. APPLY 470-1900 l/ha.	APPLY 170 kg/ha.	APPLY 45-70 kg/ha.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
SOIL BINDERS (SS-5)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Straw Mulch SS-6





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a tackifier.

Appropriate Applications

- Straw mulch is used for soil stabilization as a temporary surface cover on disturbed areas until soils can be prepared for re-vegetation and permanent vegetation is established.
- Also typically used in combination with temporary and/or permanent seeding strategies to enhance plant establishment.

Limitations

- Availability of erosion control contractors and straw may be limited due to high demand.
- When straw blowers are used to apply straw mulch, the treatment areas must be within 45 m (150 ft) of a road or surface capable of supporting trucks.
- Straw mulch applied by hand is more time intensive and potentially costly.
- May have to be removed prior to permanent seeding or soil stabilization.
- "Punching" of straw does not work in sandy soils.

Design Guidelines and Considerations

- Straw shall be certified weed free and shall follow MDT Standard Specifications.
- A tackifier is the preferred method for anchoring straw mulch to the soil on slopes.

- Crimping, punch type rollers, or track-walking may also be used to incorporate straw mulch into the soil on slopes. Track walking shall only be used where other methods are impractical.

- Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.

- Straw mulch with tackifier shall not be applied during or immediately before rainfall.

Application Procedures

- Apply loose straw at a minimum rate of 4,490 kg/ha (4000 lbs/acre), or as indicated in the Special Provisions, either by machine or by hand distribution.

- The straw mulch must be evenly distributed on the soil surface.

- Anchor the mulch in place by using a tackifier or by "punching" it into the soil mechanically.

- A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier shall be selected based on longevity and ability to hold the fibers in place.

- A tackifier is typically applied at a rate of 140 kg/ha (125 lbs/ac). In windy conditions, the rates are typically 200 kg/ha (175 lbs/ac).

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity. If the selected method is incorporation of straw mulch into the soil, then do as follows:

    - Applying and incorporating straw shall follow the requirements in MDT Standard Specifications.

    - On small areas, a spade or shovel can be used.

    - On slopes with soils, which are stable enough, and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a "crimper."

    - On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. The netting shall be held in place using wire staples, geotextile pins or wooden stakes (as described in BMP SS-7, "Geotextiles, Plastic Covers and Erosion Control Blankets/Mats").

Maintenance, Inspection, and Removals

- The key consideration in maintenance, inspection, and removal is that the straw needs to last long enough to achieve erosion control objectives.

- Reapplication of straw mulch and tackifier may be required by the Engineer to maintain effective soil stabilization over disturbed areas and slopes.

SYMBOL: ——————— ———SM———

STRAW MULCH SS-6:

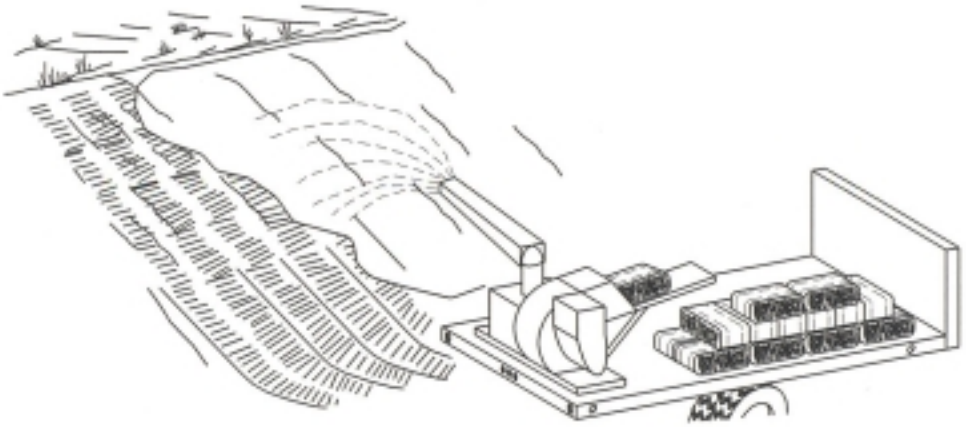
STRAW MULCH CONSISTS OF PLACING A UNIFORM LAYER OF STRAW AND ANCHORING IT INTO THE SOIL WITH A STUDDED ROLLER OR DISK OR BINDING THE STRAW TOGETHER WITH AN ENGINEER APPROVED TACKIFIER.

USE STRAW MULCH FOR SOIL STABILIZATION AS A TEMPORARY SURFACE COVER ON DISTURBED AREAS UNTIL SOILS CAN BE PREPARED OR RE-VEGETATION/PERMANENT VEGETATION IS ESTABLISHED. STRAW MULCH IS COMMONLY USED IN COMBINATION WITH TEMPORARY SEEDING, BMPs SS-4 & SS-15, AND/OR PERMANENT SEEDING TO ENHANCE PLANT ESTABLISHMENT.

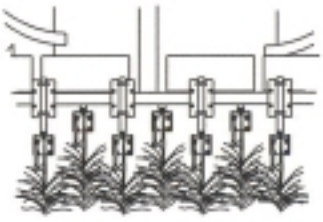
ALL STRAW MULCH IS REQUIRED TO BE CERTIFIED WEED FREE AND DERIVED FROM WHEAT, BARLEY OR RICE. ENGINEERS APPROVAL IS REQUIRED PRIOR TO ANY PLACEMENT OF STRAW MULCH.

STRAW MULCH CAN BE APPLIED BY HAND OR BLOWN UNDER LOW WIND CONDITIONS. OBTAIN ENGINEERS APPROVAL FOR PLACEMENT METHODS PRIOR TO PLACEMENT. EVENLY DISTRIBUTE STRAW MULCH AT A MINIMUM LOOSE RATE OF 4 490 kg/ha. IMMEDIATELY FOLLOWING PLACEMENT, CRIMP OR APPLY TACKIFIERS TO RETAIN MULCH. CRIMP USING DISKS OR A PUNCH-TYPE ROLLER. IF TACKIFIERS ARE USED, FOLLOW GUIDELINES PROVIDED IN BMP SS-5. WHEN EITHER TEMPORARY OR PERMANENT SEEDING IS COMBINED WITH THE STRAW MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO STRAW MULCH PLACEMENT. REFER TO BMPs SS-4 AND SS-15 FOR SEEDING GUIDELINES.

REAPPLICATION OF STRAW MULCH AND TACKIFIER MAY BE REQUIRED BY THE ENGINEER TO MAINTAIN EFFECTIVE SOIL STABILIZATION OVER DISTURBED AREAS AND SLOPES.



STRAW BLOWER

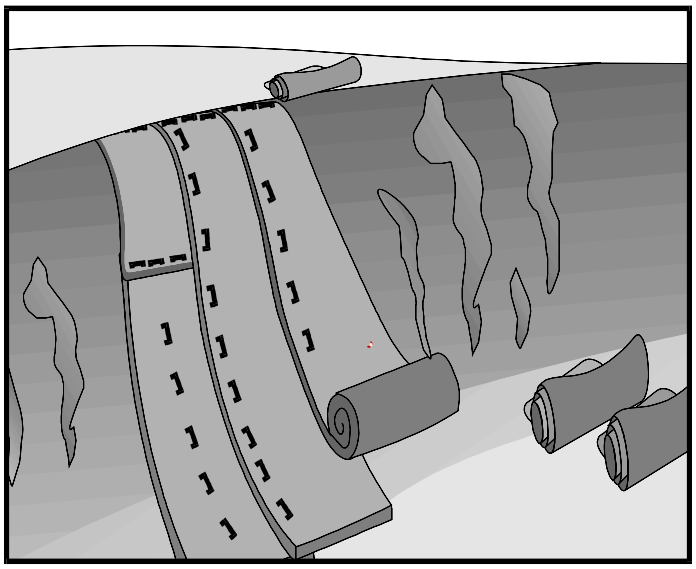


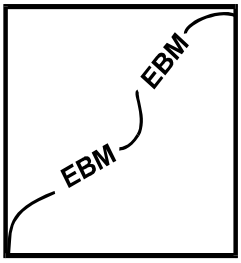
STRAW CRIMPING

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
STRAW MULCH (SS-6)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats SS-7





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

This BMP involves the placement of geotextiles, plastic covers, or erosion control blankets/mats to stabilize disturbed soil areas and protect soils from erosion by wind or water.

Appropriate Applications

These measures are used when disturbed soils may be particularly difficult to stabilize, including the following situations:

- Steep slopes, generally steeper than 3:1.
- Slopes where the erosion hazard is high.
- Slopes and disturbed soils where mulch must be anchored.
- Disturbed areas where plants are slow to develop adequate protective cover.
- Channels with flows velocities exceeding 1.0 m/s (3 ft/s).
- Channels intended to be vegetated.
- Stockpiles.
- Slopes adjacent to water bodies.

Limitations

- Blankets and mats are more expensive than other erosion control measures, due to labor and material costs. This usually limits their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels.

- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).

- Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.

- Plastic sheeting is easily vandalized or torn. In addition plastic sheeting is susceptible to photodegradation and must be disposed of at a landfill.

- The use of plastic sheeting results in 100 percent runoff, which may cause serious erosion problems in the areas receiving the increased flow.

- The use of plastic shall be limited to covering stockpiles, or very small graded areas for short periods of time (such as through one damaging storm event), until alternative measures, such as seeding and mulching, may be installed.

Design Guidelines and Considerations

Material Selection

There are many types of erosion control blankets and mats, and selection of the appropriate type should be based on the specific type of application and site conditions. Selection(s) made by the Contractor must be approved by the Engineer prior to placement. The following criteria are helpful in the selection of the appropriate material:

- Cost
    - Material cost
    - Preparation cost
    - Installation cost
    - Add-ons
- Effectiveness
    - Reduction of erosion
    - Reduction of flow velocity
    - Reduction of runoff
- Acceptability
    - Environmental compatibility

- Institutional/regulatory acceptability
- Visual impact

- Vegetation Enhancement
  - Native plant compatibility
  - Moisture retention
  - Temperature modification
  - Open space/coverage

- Installation
  - Durability
  - Longevity
  - Ease of installation
  - Safety

- Operation and Maintenance
  - Maintenance frequency

Geotextiles

- Geotextile materials shall meet MDT Geosynthetics specifications.

- Geotextiles may be reused if, in the opinion of the Engineer, they are suitable for the use intended.

Plastic Covers

- Plastic cover material used for temporary soil stabilization shall be polyethylene sheeting and shall have a minimum thickness of 6 mils. Plastic covers shall be anchored by sandbags placed no more than 3 m (10 ft) apart and by keying into the tops of slopes to prevent infiltration of surface waters under the plastic. All seams shall be taped or weighted down their entire length, and there shall be at least a 300 mm to 600 mm (12 to 24 in) overlap of all seams.

- Plastic covers may be reused if, in the opinion of the Engineer, they are suitable for the use intended.

Erosion Control Blankets/Mats

- Erosion control blankets/mats shall meet MDT soil retention/erosion control blankets and mats specifications.

Geosynthetics Construction

- Follow MDT geosynthetics construction specifications, detail drawings, and the project special provisions.

Maintenance, Inspection, and Removal

- Areas treated with temporary soil stabilization shall be inspected and maintained to provide adequate erosion control. Temporary soil stabilization shall be reapplied or replaced on exposed soils when greater than 10 percent of the previously treated area becomes exposed or exhibits visible erosion.

- All blankets and mats shall be inspected periodically after installation.

- Installation shall be inspected after significant rainstorms to check for erosion and undermining. Any failures shall be repaired immediately.

- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.

- When no longer required for the work, temporary soil stabilization shall be properly disposed.

SYMBOL:

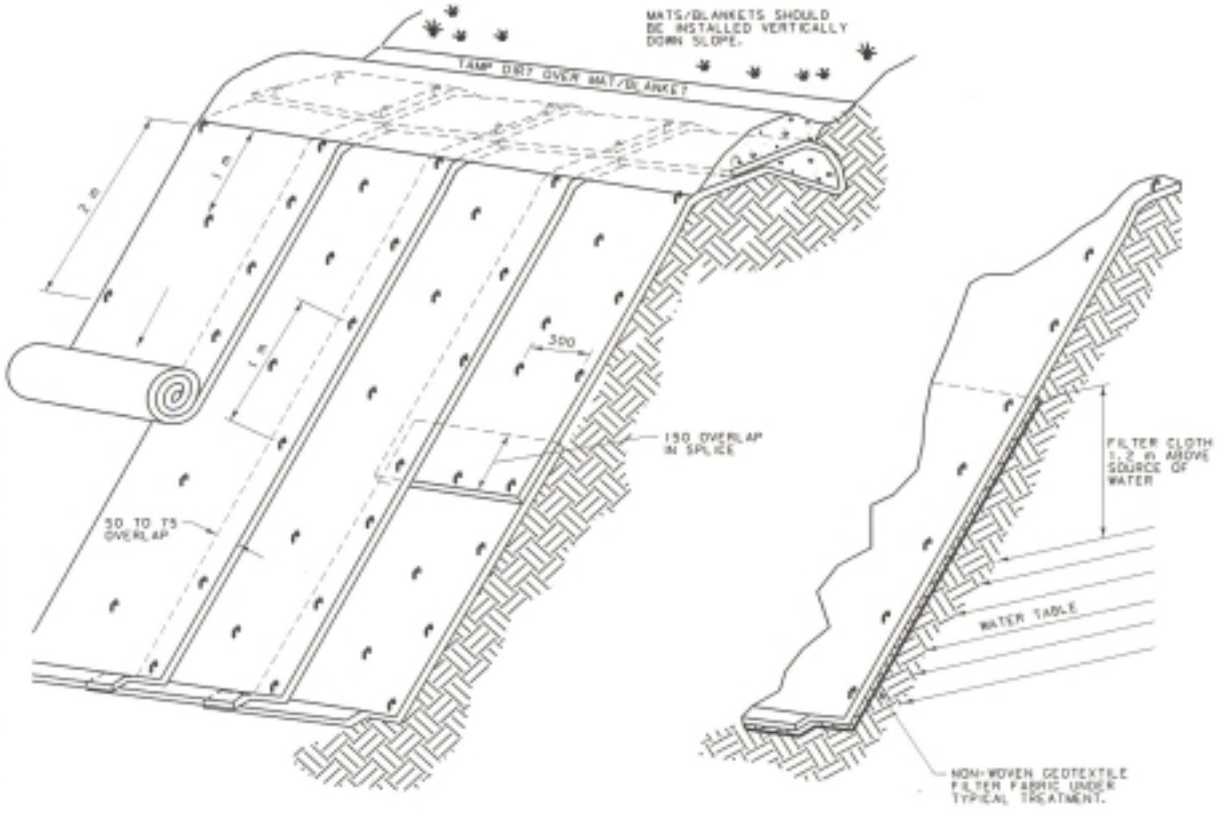
GEOTEXTILES, PLASTIC COVERS & EROSION CONTROL BLANKETS/MATS SS-7:

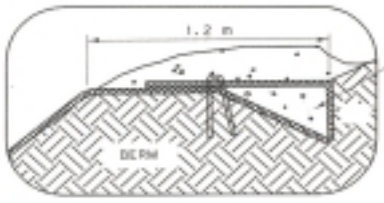
GEOTEXTILES, PLASTIC COVERS, AND EROSION CONTROL BLANKETS/MATS ARE USED TO STABILIZE DISTURBED SOIL AREAS AND PROTECT SOILS FROM EROSION BY WIND AND WATER. THESE PRODUCTS CAN BE USED ON STEEP SLOPES, SLOPES WITH HIGH EROSION HAZARDS, SLOPE WHERE MULCHES CAN NOT BE ANCHORED, UNPROTECTED CHANNELS AND HIGH FLOW CHANNELS.

INSTALL GEOTEXTILES AND EROSION CONTROL BLANKETS/MATS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT SECTION 622.

PROVIDE GEOTEXTILE MATERIALS MEETING MDT STANDARD SPECIFICATION T13.

LIMIT USE OF PLASTIC COVERS TO COVERING STOCKPILES, OR VERY SMALL GRADED AREAS FOR SHORT PERIODS OF TIME (SUCH AS THROUGH ONE IMMINENT STORM EVENT) UNTIL ALTERNATIVE MEASURES MAY BE INSTALLED. PLASTIC COVERS ARE REQUIRED TO BE POLYETHYLENE SHEETING HAVING A MINIMUM THICKNESS OF 6 mil. ANCHOR PLASTIC COVERS WITH SANDBAGS PLACED NO MORE THAN 3 m APART AND BY KEYING INTO THE TOP OF SLOPE TO PREVENT INFILTRATION OF SURFACE WATERS UNDER THE PLASTIC. TAPE OR WEIGHT DOWN THE ENTIRE LENGTH OF ALL SEAMS WITH AT LEAST 300 mm TO 600 mm OVERLAP.

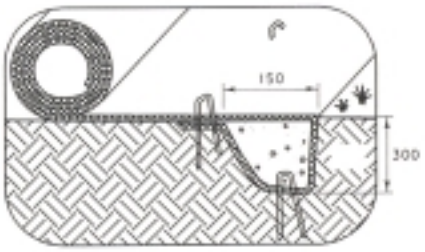




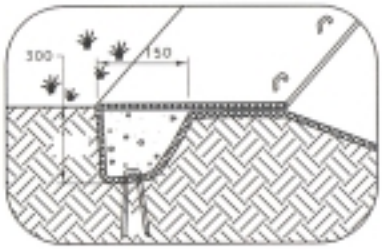
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

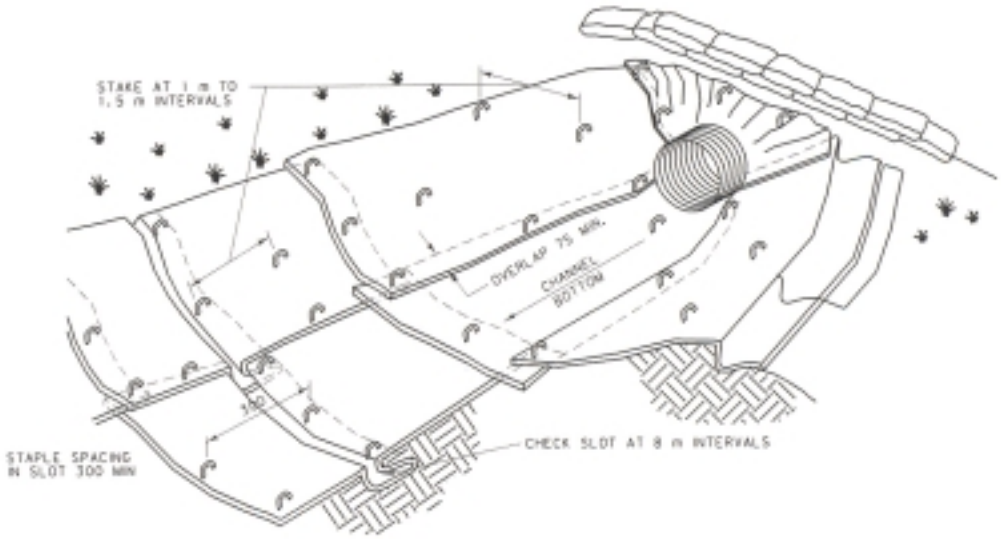
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-30
GEOTEXTILES, PLASTIC COVERS & EROSION CONT. BLANKETS/ MATS (SS-7) (SHEET 1)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	



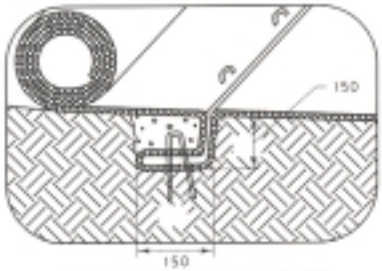
INITIAL CHANNEL ANCHOR TRENCH



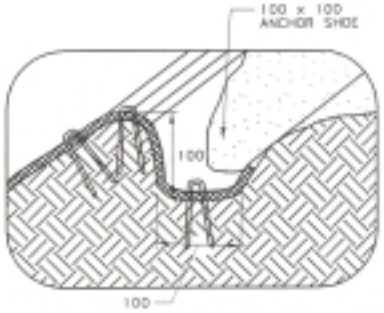
TERMINAL SLOPE & CHANNEL ANCHOR TRENCH



TYPICAL CHANNEL DETAIL - ISOMETRIC VIEW



INTERMITTENT CHECK SLOT



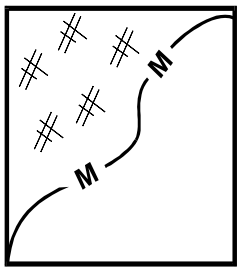
LONGITUDINAL ANCHOR TRENCH

PRELIMINARY

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
GEOTEXTILES, PLASTIC COVERS & EROSION CONT. BLANKETS/ MATS (SS-T) (SHEET 2)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Wood Mulching SS-8



BMP Objectives
- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark, or compost. Wood mulch is mostly applicable to landscape projects.

The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Appropriate Applications

Wood mulching is considered a temporary soil stabilization alternative in the following situations:

- As a stand-alone temporary surface cover on disturbed areas until soils can be prepared for revegetation and permanent vegetative cover can be established.
- As short term, non-vegetative ground cover on slopes to reduce rainfall impact, decrease the velocity of sheet flow, settle out sediment, and reduce wind erosion.

Limitations

- Wood mulch may introduce unwanted plant species.
- Shredded wood does not withstand concentrated flows and is prone to sheet erosion.
- Green material has the potential for the presence of unwanted weeds and other plant materials.
- Delivery system is primarily by manual labor, although pneumatic application equipment is available.

Design Guidelines and Considerations

Mulch Selection

There are many types of mulches, and selection of the appropriate type shall be based on the type of application and site conditions. Engineers approval is required prior to use of wood mulches since some mulch use on construction projects may not be compatible with planned or future projects. Selection of wood mulches by the Contractor shall comply with MDT Standard Specifications and must be approved by the Engineer.

Application Procedures

After existing vegetation has been removed, roughen embankment and fill areas by rolling with a punching type roller or by track walking. Wood mulch can be applied once the surface has been prepared. The application procedures for wood mulches vary significantly depending upon the type of mulching method specified. Two (2) methods are highlighted here:

- Green Material: This type of mulch is produced by recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand, although pneumatic methods are available. Mulch shall be composted to kill weed seeds.
  - It can be used as a temporary ground cover with or without seeding.
  - The green material shall be evenly distributed on site to a depth of 75 mm (3 in).
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Refer to limitations for conditions where shredded wood/bark is suitable.
  - Distribute wood/bark by hand, or approved pneumatic methods.
  - The mulch shall be evenly distributed across the soil surface to a depth of 75 mm (3 in).
- Avoid mulch placement onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
- All material must be removed before resuming earthwork activities.

Maintenance, Inspection, and Removal

- Regardless of the mulching technique selected, the key consideration in maintenance and inspection is that the mulch needs to last long enough to achieve erosion-control objectives. If the mulch is applied as a stand-alone erosion control method over disturbed areas, it shall last the length of time the site will remain barren or until final re-grading and revegetation.
- When wood mulch is used as ornamental or landscaping application inspection and maintenance shall focus on longevity and integrity of the mulch.

SYMBOL: ———————— ————M————

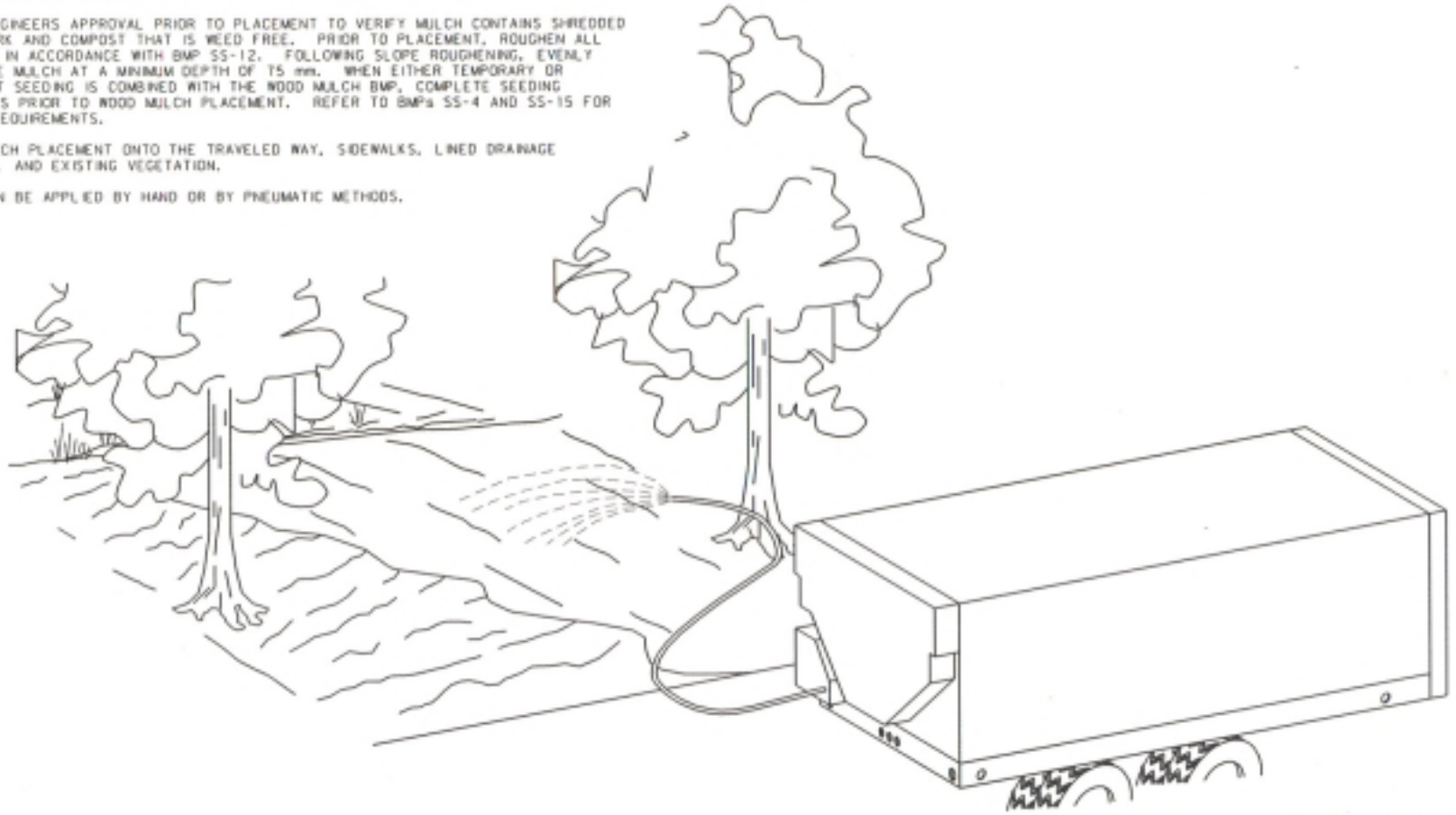
WOOD MULCH SS-8:

WOOD MULCHING CONSISTS OF APPLYING A MIXTURE OF SHREDDED WOOD MULCH, BARK, OR COMPOST. WOOD MULCH IS MOSTLY APPLICABLE TO LANDSCAPE PROJECTS. WOOD MULCHING REDUCES EROSION BY PROTECTING BARE SOIL RAINFALL IMPACT, INCREASING INFILTRATION, AND REDUCING RUNOFF. DO NOT USE WOOD MULCH WHERE CONCENTRATED RUNOFF FLOWS MAY EXIST.

OBTAIN ENGINEERS APPROVAL PRIOR TO PLACEMENT TO VERIFY MULCH CONTAINS SHREDDED WOOD, BARK AND COMPOST THAT IS WEED FREE. PRIOR TO PLACEMENT, ROUGHEN ALL SURFACES IN ACCORDANCE WITH BMP SS-12. FOLLOWING SLOPE ROUGHENING, EVENLY DISTRIBUTE MULCH AT A MINIMUM DEPTH OF 75 mm. WHEN EITHER TEMPORARY OR PERMANENT SEEDING IS COMBINED WITH THE WOOD MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO WOOD MULCH PLACEMENT. REFER TO BMPs SS-4 AND SS-15 FOR SEEDING REQUIREMENTS.

AVOID MULCH PLACEMENT ONTO THE TRAVELED WAY, SIDEWALKS, LINED DRAINAGE CHANNELS, AND EXISTING VEGETATION.

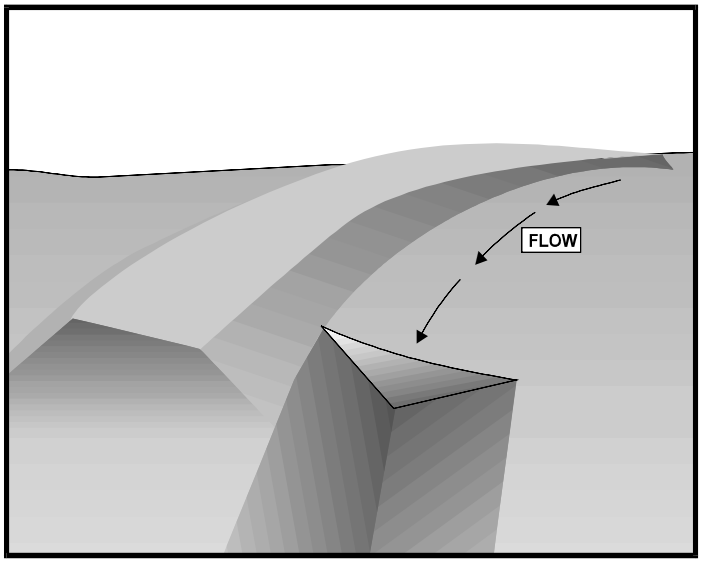
MULCH CAN BE APPLIED BY HAND OR BY PNEUMATIC METHODS.

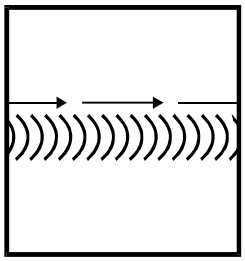


PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
WOOD MULCH (SS-8)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Earth Dikes/Drainage Swales and Lined Ditches SS-9





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Earth dikes/drainage swales and lined ditches are structures that intercept, divert and convey surface run-on, generally sheet flow, to prevent erosion.

Appropriate Applications

- Earth dikes/drainage swales and lined ditches may be used to:
  - Convey surface runoff down sloping land.
  - Intercept and divert runoff to avoid sheet flow over sloped surfaces.
  - Divert and direct runoff towards a stabilized watercourse, drainage pipe, or channel.
  - Intercept runoff from paved surfaces.
- Earth dikes/drainage swales and lined ditches also may be used:
  - Below steep grades where runoff begins to concentrate.
  - Along roadways and facility improvements subject to flood drainage.
  - At the top of slopes to divert run-on from adjacent or undisturbed slopes.
  - At bottom and mid-slope locations to intercept sheet flow and convey concentrated flows.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Earth dikes/drainage swales and lined ditches are not suitable as sediment trapping devices.
- May be necessary to use other soil stabilization and sediment controls, such as check dams, plastics, and blankets to prevent scour and erosion in newly graded dikes, swales, and ditches.

Design Guidelines and Considerations

- Care must be applied to correctly size and locate earth dikes, drainage swales, and lined ditches. Excessively steep, unlined dikes and swales are subject to erosion and gully formation.
- Use a lined ditch for high flow velocities.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff from the right-of-way onto other property.
- When possible, install and utilize dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Maintenance, Inspection, and Removals

- Inspect temporary measures prior to predicted storm events and as soon as possible after storm events, and regularly (approximately once per week) during the construction season.
- Inspect ditches and berms for washouts. Replace lost or damaged linings, or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment, and repair linings and embankments as needed or as directed by the Engineer.
- Temporary conveyances shall be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

SYMBOL: ——— CELL

EARTH DIKES/DRAINAGE SWALES & LINED DITCHES SS-9:

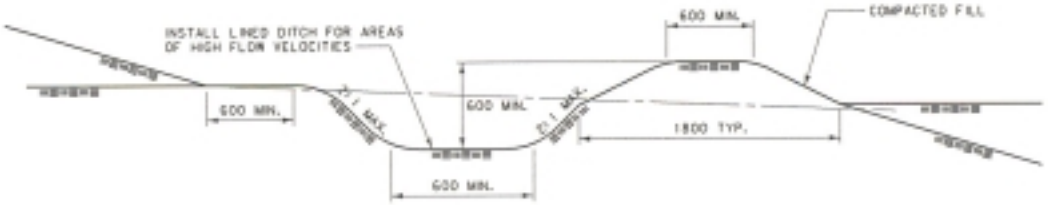
EARTH DIKES, DRAINAGE SWALES AND LINED DITCHES ARE STRUCTURES THAT INTERCEPT, DIVERT, AND CONVEY SURFACE RUN-ON, GENERALLY SHEET FLOW, TO PREVENT EROSION. THESE DEVICES MAY BE IMPLEMENTED ON A PROJECT-BY-PROJECT BASIS WITH OTHER BMPs WHEN DETERMINED NECESSARY AND FEASIBLE BY THE ENGINEER. DIKES, SWALES AND DITCHES ARE CONVEYANCE MEASURES AND ARE NOT INTENDED TO TRAP SEDIMENT. SEDIMENT CONTROL BMPs CAN BE USED IN CONJUNCTION WITH THESE CONVEYANCE DEVICES.

WHEN POSSIBLE, INSTALL AND UTILIZE DIKES, SWALES AND DITCHES EARLY IN THE CONSTRUCTION PHASE. CONSTRUCT SWALES ALONG THE TOP AND BOTTOM OF CUT AND FILL SLOPES, AS SPECIFIED IN THE PLANS OR AS DESIGNATED BY THE ENGINEER. "V" BOTTOM DITCHES CAN BE USED FOR SWALE CONSTRUCTION FOLLOWING ENGINEERS APPROVAL. USE SEDIMENT CONTROL DEVICES FOR RUNOFF THAT IS DIVERTED FROM DISTURBED AREAS. CONVEY FLOWS FROM UNDISTURBED AREAS INTO A STABILIZED AREA AT NON-EROSIVE VELOCITIES. DO NOT PLACE DIKES, SWALES, AND DITCHES IN A MANNER THAT ALLOWS HIGHWAY RUNOFF TO ENTER ONTO OTHER PROPERTY'S RIGHT-OF-WAY.

USE LINED DITCHES FOR AREAS OF HIGH FLOW VELOCITIES FOLLOWING THE GUIDELINES SPECIFIED IN SS-7 (GEOTEXTILES, PLASTIC COVERS & EROSION CONTROL BLANKETS/MATS) AND/OR SS-11 (SLOPE DRAINS). SEED ALL UNLINED PORTIONS OF DITCHES, DIKES AND SWALES THAT WILL BE IN USE FOR MORE THEN 14 DAYS IN ACCORDANCE WITH SS-15 (EROSION SEEDING).

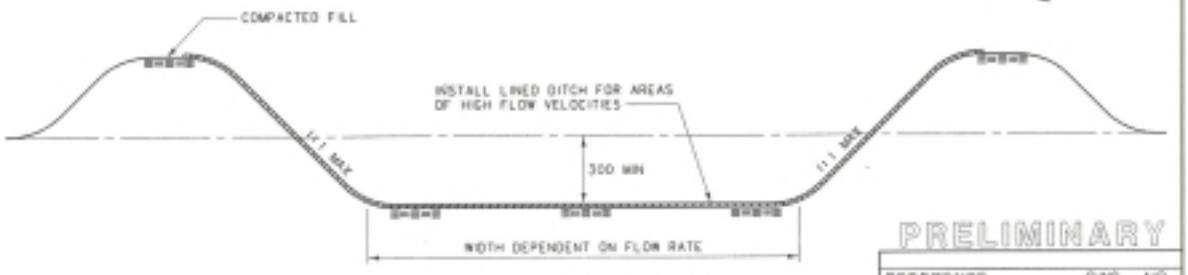
INSPECT DIKES, SWALES, AND DITCHES AFTER RAINFALL EVENTS. REMOVE DEBRIS AND SEDIMENT, AND REPAIR LININGS AND EMBANKMENTS AS NEEDED OR AS SPECIFIED BY THE ENGINEER.

REMOVAL ALL DIKES, SWALES AND LINED DITCHES FROM THE CLEAR ZONES EXPEDIENTLY UPON COMPLETION OF CONSTRUCTION ACTIVITIES.



TYPICAL DRAINAGE SWALE

TYPICAL EARTH DIKE



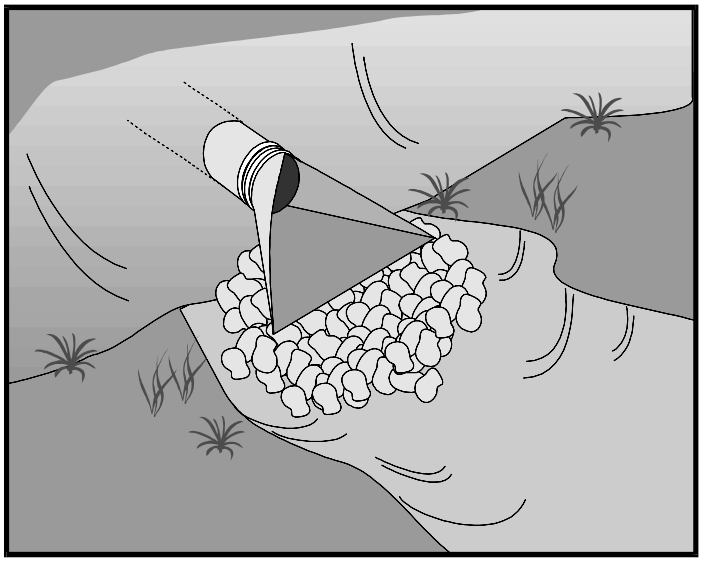
TYPICAL TRAPEZOIDAL DITCH

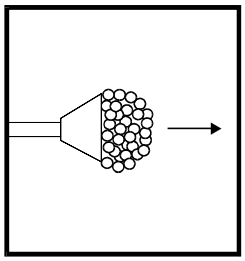
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-??
EARTH DIKES/DRAINAGE SWALES & LINED DITCHES (SS-9)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Outlet Protection/Velocity Dissipation Devices SS-10





BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

These devices are temporarily placed at pipe outlets to prevent scour and reduce the velocity and/or energy of exiting storm water flows. The devices shall be used for temporary pipe placement and temporary stabilization until the final work is completed. MDT Hydraulics Section designs permanent outlet protection and velocity dissipation devices.

Appropriate Applications

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Loose rock may be washed away during high flows.
- Grouted riprap may break up in areas of freeze and thaw.

- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Design Guidelines and Considerations

- There are many types of energy dissipater's, with rock being the one that is represented in the attached Detail Drawings. This is only one example and the Engineer may approve any other type of device proposed by the Contractor.

- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction.

- Carefully place riprap to avoid damaging the filter fabric.

- For proper operation of apron:

    - Align apron with receiving stream such that a straight line is created. If a curve is needed to fit site conditions, place it in upper section of apron.

    - If size of apron riprap is large, protect underlying filter fabric with a gravel blanket.

- Outlets on slopes steeper than 10 percent shall have additional protection.

Maintenance, Inspection, and Removal

- Inspect temporary measures prior to predicted storm events, and as soon as possible after storm events, and regularly (approximately once per week) during the construction season.

- Inspect apron for displacement of dissipation devices and/or damage to the underlying fabric and repair as needed.

- Inspect for scour beneath the dissipation devices and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

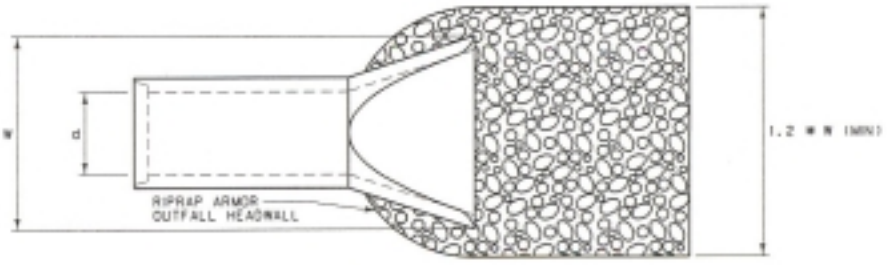
- Temporary devices shall be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

SYMBOL: CELL

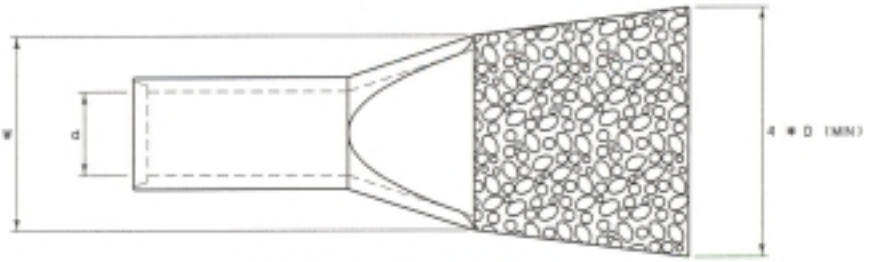
OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES SS-10

OUTLET PROTECTION AND VELOCITY DISSIPATION DEVICES ARE PLACED AT PIPE OUTLETS TO PREVENT SCOUR AND REDUCE THE VELOCITY AND/OR ENERGY OF EXITING STORM WATER FLOWS. THESE DEVICES CAN BE USED AT THE OUTLETS OF PIPES, DRAINS, CULVERTS, SLOPE DRAINS, DIVERSION DITCHES, SWALES, CONDUITS OR CHANNELS AND SHOULD BE IMPLEMENTED ON A PROJECT-BY-PROJECT BASIS WITH OTHER BMPs WHEN DETERMINED NECESSARY BY THE ENGINEER.

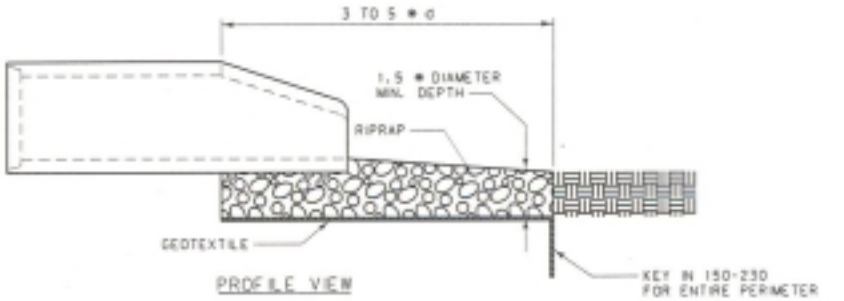
FOLLOW GUIDELINES BELOW FOR SIZING OUTLET PROTECTION AND VELOCITY DISSIPATION DEVICES. FOLLOWING ENGINEER'S APPROVAL, OTHER MATERIALS MAY BE SUBSTITUTED FOR RIPRAP. GEOTEXTILE PLACEMENT MAY BE ELIMINATED FOLLOWING ENGINEERS APPROVAL. PLACE TYPE I OR TYPE 2 BANK PROTECTION AT PIPE OUTLET. FOR PIPE DIAMETERS LARGER THAN 600 mm AND/OR HIGH FLOWS, THE APPLICATION IS NOT CONSIDERED TEMPORARY AND A MONTANA REGISTERED ENGINEER'S DESIGN IS REQUIRED.



PLAN VIEW - CHANNELIZED FLOW
(OUTFALL TO CHANNEL OR DITCH)



PLAN VIEW - UNCHANNELIZED FLOW
(OUTFALL TO UNCONFINED SURFACE-OVERLAND FLOW)



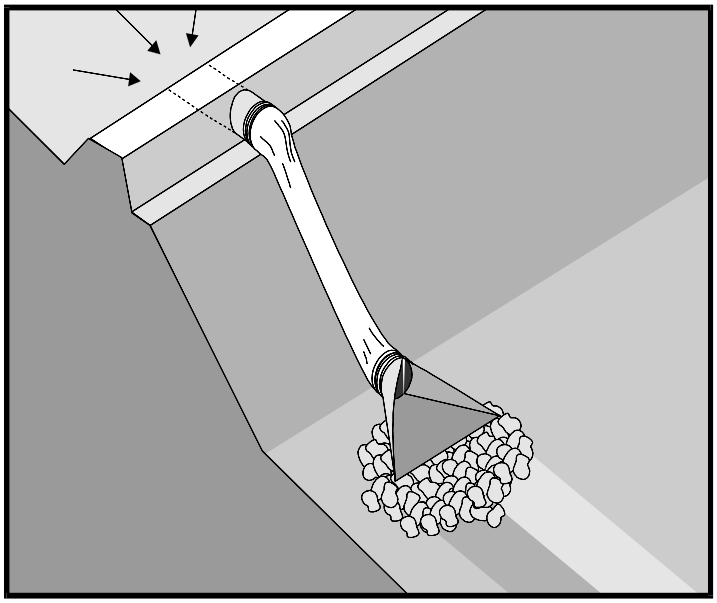
PROFILE VIEW

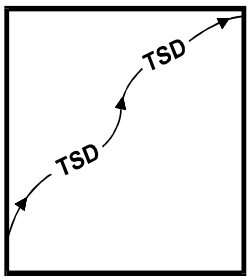
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES (SS-10)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

Slope Drains SS-11





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A slope drain is a temporary pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area. Slope drains are often used with lined ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Appropriate Applications

- Slope drains may be used at construction sites where slopes may be eroded by surface runoff.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Severe erosion may result when slope drains fail by over topping, piping, or pipe separation.

Design Guidelines and Considerations

- When using slope drains, limit drainage area to 4 ha (10 acre) per pipe. For larger areas, use a rock-lined channel or a series of pipes.
- Maximum slopes are generally limited to 2:1 as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to and from slope drains with interceptor dikes. See BMP SS-8, "Earth Dikes/Drainage Swales, and Lined Ditches."
- Slope drains can be placed above or buried underneath the slope surface.

- Slope drain materials, including pipes, riprap, synthetic liners, and concrete, need to comply with MDT Standard Specifications or project special conditions.

- When installing slope drains:

  - Install slope drains perpendicular to slope contours.

  - Compact soil around and under entrance, outlet, and along length of pipe.

  - Securely anchor and stabilize pipe and appurtenances into soil.

  - Check to ensure that pipe connections are watertight.

  - Protect area around inlet with geosynthetic liner meeting MDT Standard Specifications. Protect outlet with riprap or other energy dissipation device. For high-energy discharges, reinforce riprap with concrete or use reinforced concrete device.

  - Protect inlet and outlet of slope drains: use standard flared end sections at entrances and exists for pipes 300 mm (12 in) and larger in diameter.

Maintenance, Inspection, and Removal

- Inspect before and after each rainstorm, and weekly until the tributary drainage area has been stabilized. Follow routine inspection procedures for inlets thereafter.

- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.

- Inspect slope drainage for accumulations of debris and sediment.

- Remove built-up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.

- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).

- Remove temporary slope drains when permament drains are completed.

SYMBOL: ———————— ——TSD——

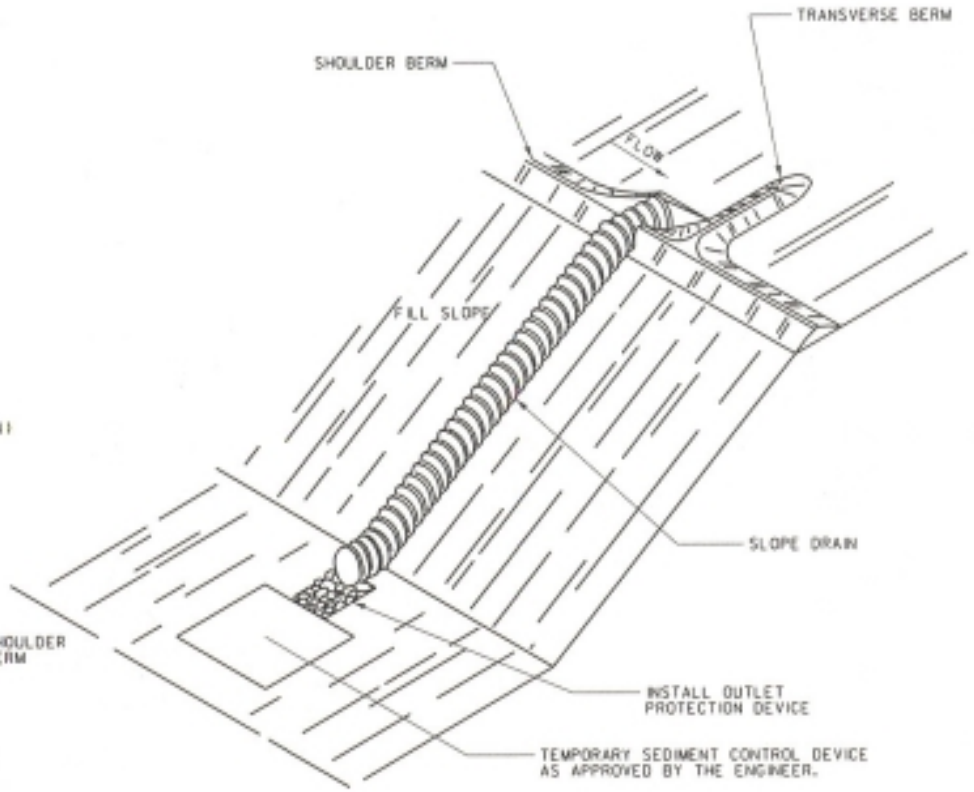
SLOPE DRAINS SS-11

A SLOPE DRAIN IS A PIPE OR LINED CHANNEL USED TO INTERCEPT AND CONVEY SURFACE RUNOFF OR GROUNDWATER INTO A STABILIZED WATERCOURSE, TRAPPING DEVICE, OR STABILIZED AREA. THIS DEVICE MAY BE USED AT CONSTRUCTION SITES WHERE SLOPES MAY BE ERODED BY SURFACE RUNOFF.

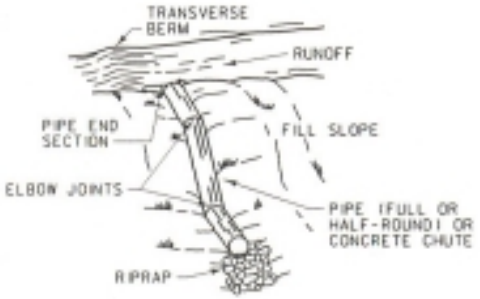
DO NOT EXCEED A DRAINAGE AREA OF 4 ha PER SLOPE DRAIN PIPE. FOR AREAS LARGER THAN 4 ha USE ROCK LINED CHANNELS. DO NOT PLACE SLOPE DRAINS ON SLOPES THAT EXCEED 2:1 SLOPES. INCORPORATE BMP SS-9 (EARTH DIKES/DRAINAGE SWALES & LINED DITCHES) TO AID IN FLOW DIVERSION.

INSTALL SLOPE DRAINS AS FOLLOWS:
- INSTALL DRAINS PERPENDICULAR TO SLOPE
- COMPACT SOIL AROUND INLET, OUTLET AND LENGTH OF STRUCTURE
- SECURELY ANCHOR SLOPE DRAINS INTO SOIL
- ENSURE CONNECTIONS ARE WATER TIGHT
- PROTECT INLET AND OUTLET WITH BMP SS-10 (OUTLET PROTECTION & VELOCITY DISSIPATION)

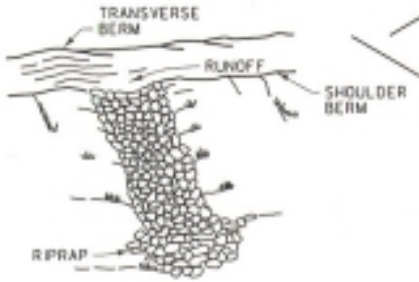
ALL MATERIALS REQUIRE ENGINEER'S APPROVAL PRIOR TO PLACEMENT.



PIPE SLOPE DRAIN

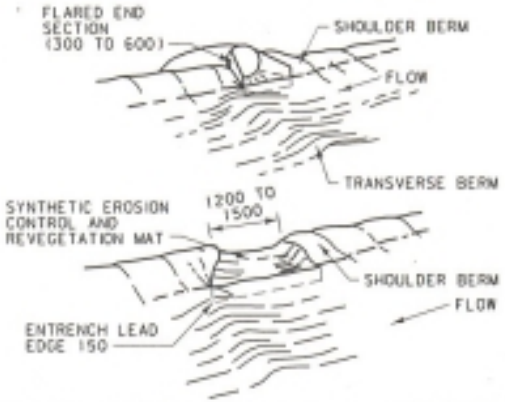


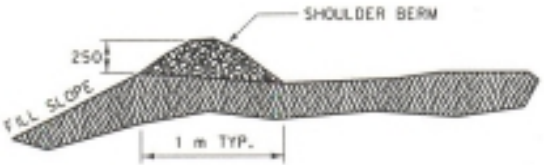
RIPRAP SLOPE DRAIN



DITCH LINER: SYNTHETIC EROSION CONTROL AND REVEGETATION MAT

SLOPE DRAIN INLETS





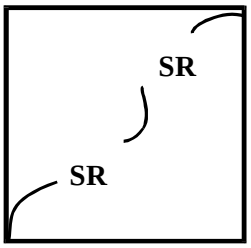
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-72
SLOPE DRAINS (SS-11)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Slope Roughening SS-12



BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Soil roughening is a temporary erosion control practice often used in conjunction with grading. Soil roughening involves increasing the relief of a bare soil surface with horizontal grooves or tracking using construction equipment. Slopes that are not fine graded and that are left in a roughened condition can also reduce erosion. Soil roughening reduces runoff velocity, increases infiltration, reduces erosion, traps sediment, and prepares the soil for seeding and planting.

Appropriate Applications

Soil roughening works well on slopes steeper than 3:1, on piles of excavated soil, and in areas with highly erodible soils. This technique is especially appropriate for soils that are frequently moved or disturbed because roughening is relatively easy to accomplish. To slow erosion, roughening should be done as soon as possible after the vegetation has been removed. Roughening can be used with both seeding and temporary mulching to stabilize an area. For steeper slopes and slopes that will be left roughened for longer periods of time, a combination of surface roughening and vegetation is appropriate. Roughening should be performed immediately after grading activities have ceased (temporarily or permanently) in an area.

Limitations

Soil roughening is not appropriate for rocky slopes. Soil compaction might occur when roughening with tracked machinery. Soil roughening is of limited effectiveness in anything more than a gentle or shallow depth rain. If roughening is washed away in a heavy storm, the surface shall be re-roughened.

Design Guidelines and Considerations

Graded areas with smooth, hard surfaces increase erosion potential by decreasing the amount of storm water infiltration. A rough soil surface allows surface ponding and slows storm water velocities. Grooves in the soil are cooler and provide more favorable moisture conditions than hard, smooth surfaces. These conditions promote seed germination and vegetative growth. It is important to avoid excessive compacting of the soil surface, especially when tracking,

because soil compaction inhibits vegetation growth and causes higher runoff velocity. Therefore, it is best to limit roughening with tracked machinery to sandy soils that do not compact easily and to avoid tracking on heavy clay soils, particularly when wet. Bare soil areas should be seeded immediately following slope roughening. Proper dust control procedures also should be followed when soil roughening.

There are different methods for achieving a roughened soil surface on a slope. The selection of an appropriate method depends on the type of slope and the available equipment. Roughening methods include grooving and tracking. Factors to consider when choosing a method are slope steepness, mowing requirements, whether the slope is formed by cutting or filling, and available equipment. The following methods can be used for surface roughening.

Grooving. This technique uses machinery to create a series of ridges and depressions that run across the slope along the contour. Grooves should be made using an appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth on a front-end loader bucket. The grooves should be made more than 75 mm (3 in) deep and less than 380 mm (15 in) apart.

Tracked. Roughening with tracked machinery should be limited to sandy soils to avoid undue compaction of the soil surface. Tracked machinery should be operated perpendicular to the slope to leave horizontal depressions in the soil. Tracking is generally not as effective as other roughening methods.

Fill slope roughening for areas that will not be mowed. Fill slopes with a gradient steeper than 3:1 should be placed in lifts and compacted per MDT Standard Specifications. To obtain a roughened slope, the face of the slope should consist of loose, non-compacted, 100-150 mm lifts (4 in- 6 in). Grooving or tracking should be used to roughen the face of the slopes. The final slope face should not be bladed or scraped.

Cuts, fills, and graded areas that will be mowed. Mowed slopes should be made no steeper than 3:1. These areas should be roughened with shallow grooves less than 25 mm (1 in) deep and more than 250 mm (10 in) apart using normal tilling, disking, or harrowing equipment (a cultipacker-seeder can also be used). Excessive roughness is undesirable where mowing is planned.

Maintenance, Inspection, and Removal

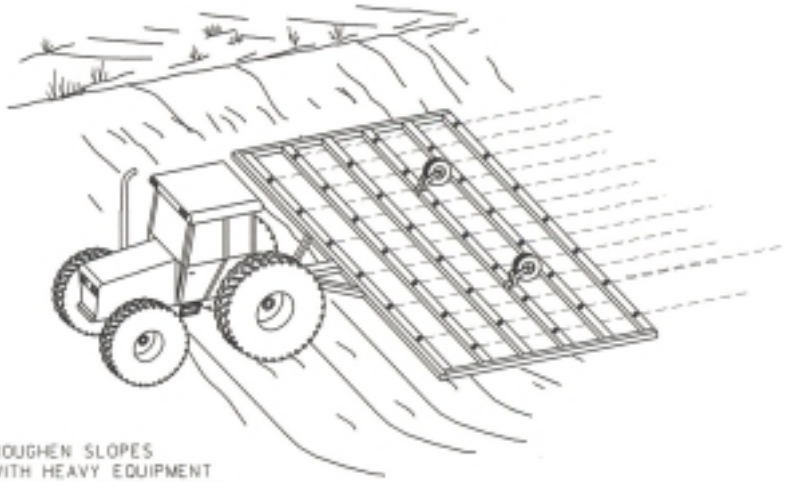
Areas need to be inspected after storms, since roughening might need to be repeated. Weekly inspection of roughened slopes will indicate where additional erosion and sediment control measures are needed. If rills appear, they should be filled, graded again, and reseeded immediately. Proper dust control methods should be used.

SYMBOL: ——————— ——SR——

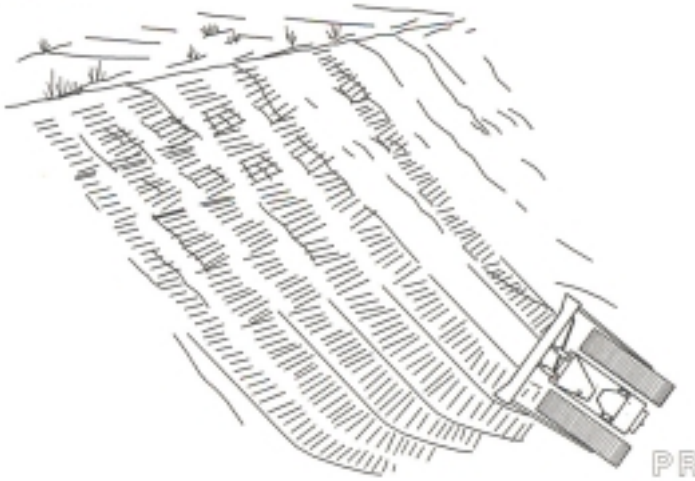
SLOPE ROUGHENING SS-12:

SLOPE ROUGHENING IS A VERY ROUGH SOIL SURFACE ON SLOPES RESULTING FROM CONSTRUCTION ACTIVITIES OR THE SYSTEMATIC ROUGHENING USING HEAVY EQUIPMENT TO CREATE RIDGES OR FURROWS PERPENDICULAR TO THE SLOPE. THE RIDGES OR FURROWS ARE TO BE EQUAL TO OR GREATER THAN 50 mm IN HEIGHT AND NO FURTHER THAN TWICE THE HEIGHT OF THE RIDGE OR FURROW APART. SLOPE ROUGHENING IS A GOOD FIRST LINE OF DEFENSE TO CONTROL EROSION AND SEDIMENT RUNOFF. DEGREE OF SLOPE ROUGHENING IS DEPENDENT ON THE GRADES AND PROXIMITY TO WATER RESOURCES.

ALL SLOPES STEEPER THAN 3:1 AND GREATER THAN 1500 VERTICAL MILLIMETERS REQUIRE SLOPE ROUGHENING. EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. ROUGHEN DISTURBED SLOPES OR LEAVE IN A ROUGHENED CONDITION. APPROPRIATE SUPPLEMENTS INCLUDE SOIL STABILIZATION BMPs SUCH AS TEMPORARY SEEDING OR EROSION SEEDING. WHEN FILL SLOPES ARE WITHIN 15 m OF SURFACE WATER, EARTH DIKES/DRAINAGE SWALES & LINED DITCHES (SS-9) AND/OR A SEDIMENT CONTROL BMP ARE REQUIRED.



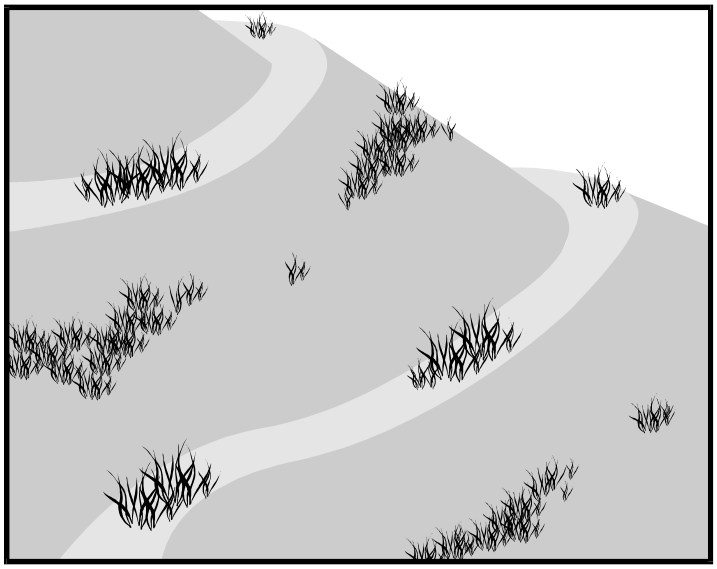
ROUGHEN SLOPES
WITH HEAVY EQUIPMENT
OR LEAVE IN ROUGHENED
CONDITION

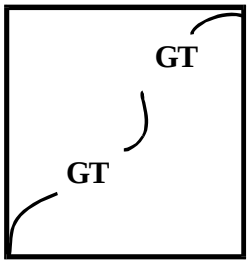


PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-27
SLOPE ROUGHENING (SS-12)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Gradient Terraces SS-13





BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Gradient terraces are made of either earthen embankments or ridge and channel systems. They reduce damage from erosion by collecting and redistributing surface runoff to stable outlets at slower speeds and by increasing the distance of overland runoff flow. They also surpass smooth slopes in holding moisture and help to minimize sediment loading of surface runoff.

Appropriate Applications

Gradient terraces are most suitable for un-vegetative slopes that have existing or expected water erosion problem and they are only effective when there are suitable runoff outlets provided. They are usually limited to use on long, steep slopes.

Limitations

Gradient terraces are not appropriate for use on sandy, or shallow soils. Sloughing could occur if too much water permeates the soil in a terrace system and cut and fill costs could increase substantially. Terraces should not be constructed on slopes containing rocky or sandy soil.

Design Guidelines and Considerations

Gradient terraces should be designed with adequate and appropriate outlets and should be installed according to a well-developed plan. Acceptable outlets include grassed waterways, vegetated areas, or tile outlets. Any outlet that is used should be able to redirect surface runoff away from the terraces and toward an area that is not susceptible to erosion or other damage.

Design considerations include:

- Whenever possible, vegetative cover should be used in the outlet.
- The terrace's water surface design elevation should be no lower than the outlet's water surface design elevation when both are performing at design flow.

- During construction of the terrace system, dust control procedures should be followed.
- Proper vegetation/stabilization practices should be followed while constructing these graded terraces.

Maintenance, Inspection, and Removal

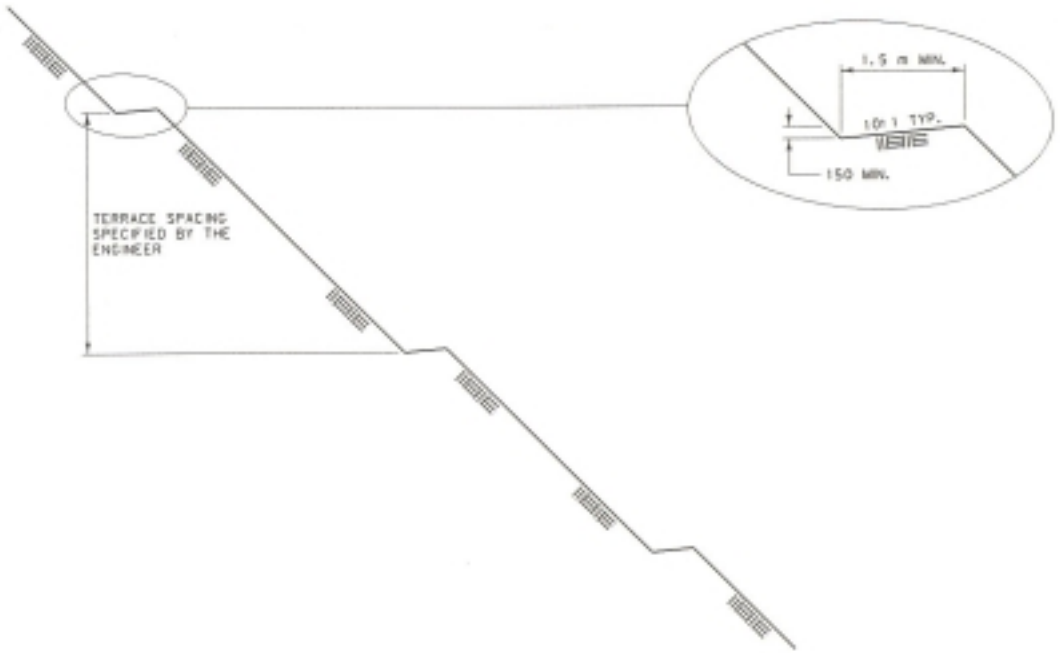
- Regular inspections of the terraces should occur after any major storms and during the weekly BMP inspections to ensure that the terraces are structurally sound and have not been subject to erosion.

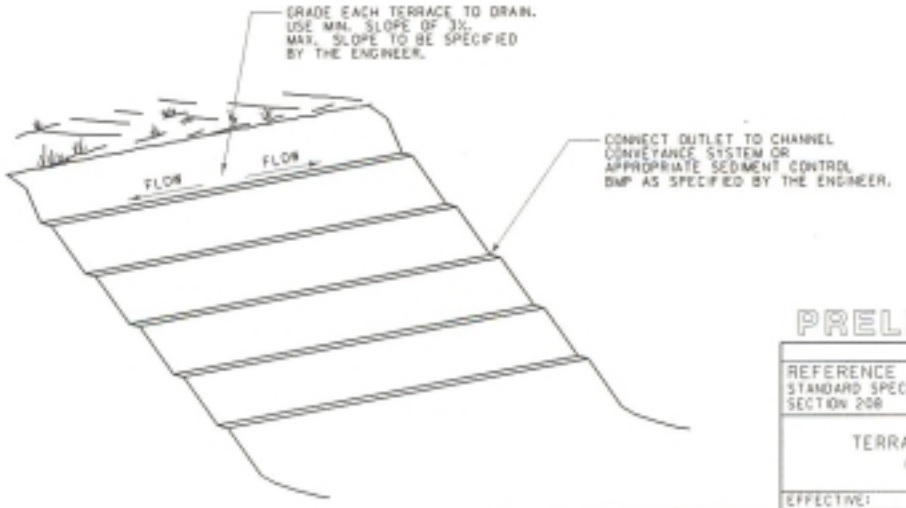
SYMBOL: ——————— ———TS———

TERRACED SLOPES SS-13

TERRACED SLOPES ARE MADE OF EITHER EARTHEN EMBANKMENTS OR RIDGE AND CHANNEL SYSTEMS THAT ARE PROPORTIONALLY SPACED AND ARE CONSTRUCTED WITH AN ADEQUATE GRADE. TERRACES REDUCE DAMAGE FROM EROSION BY COLLECTING AND REDISTRIBUTING SURFACE RUNOFF TO STABLE OUTLETS AT SLOWER VELOCITIES AND BY INCREASING THE DISTANCE OF OVERLAND RUNOFF FLOW. THIS BMP IS USUALLY LIMITED TO USE ON LONG STEEP SLOPES WITH A WATER EROSION PROBLEM, OR WHERE IT IS ANTICIPATED THAT WATER EROSION WILL BE A PROBLEM. TERRACED SLOPES ARE NOT APPROPRIATE FOR USE ON SANDY, STONY, OR SHALLOW SOILS.

DESIGN TERRACED SLOPES WITH ADEQUATE AND APPROPRIATE OUTLETS. ENGINEER'S APPROVAL IS REQUIRED PRIOR TO MODIFICATIONS OF SPECIFIED TERRACED SLOPES.



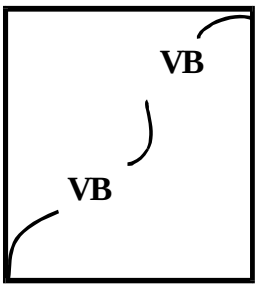


ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
TERRACED SLOPES (SS-13)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Vegetated Buffer SS-14



BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Vegetated buffers are areas of either natural or established vegetation that are maintained to protect the water quality of neighboring areas. Buffer zones reduce the velocity of storm water runoff, provide an area for the runoff to permeate the soil, contribute to ground water recharge, and act as filters to catch sediment.

Appropriate Applications

Vegetated buffers can be used in most areas that are able to support vegetation, but they are most effective and beneficial on floodplains, near wetlands, along stream banks, and on steep, unstable slopes. They are also effective in separating land use areas that are not compatible and protecting wetlands or water bodies from construction activities that might be potential sources of non-point source pollution.

Limitations

Vegetated buffers require plant growth before they can be effective, and land on which to plant the vegetation must be available. If the cost of the land is very high, buffer zones might not be cost-effective. Although vegetated buffers help to protect water quality, they usually do not effectively counteract concentrated storm water flows to neighboring or downstream wetlands. Vegetative buffer zones require additional sediment control BMPs when slopes have significant lengths or steepness.

Design Guidelines and Considerations

To establish an effective vegetative buffer, the following guidelines should be followed:

- ■ Soils should not be compacted.

- Slopes should be less than 20:1.
- Buffer widths should be determined after careful consideration of slope, vegetation, soils, depth to impermeable layers, runoff sediment characteristics, type and quantity of storm water pollutants, and annual rainfall.
- Buffer widths should increase as slope increases.
- Zones of vegetation including grasses, deciduous and evergreen shrubs, and understory and overstory trees, should be intermixed.
- In areas where flows are concentrated and velocities are high, buffer zones should be combined with other structural or nonstructural BMPs as a pretreatment.

Maintenance, Inspection, and Removal

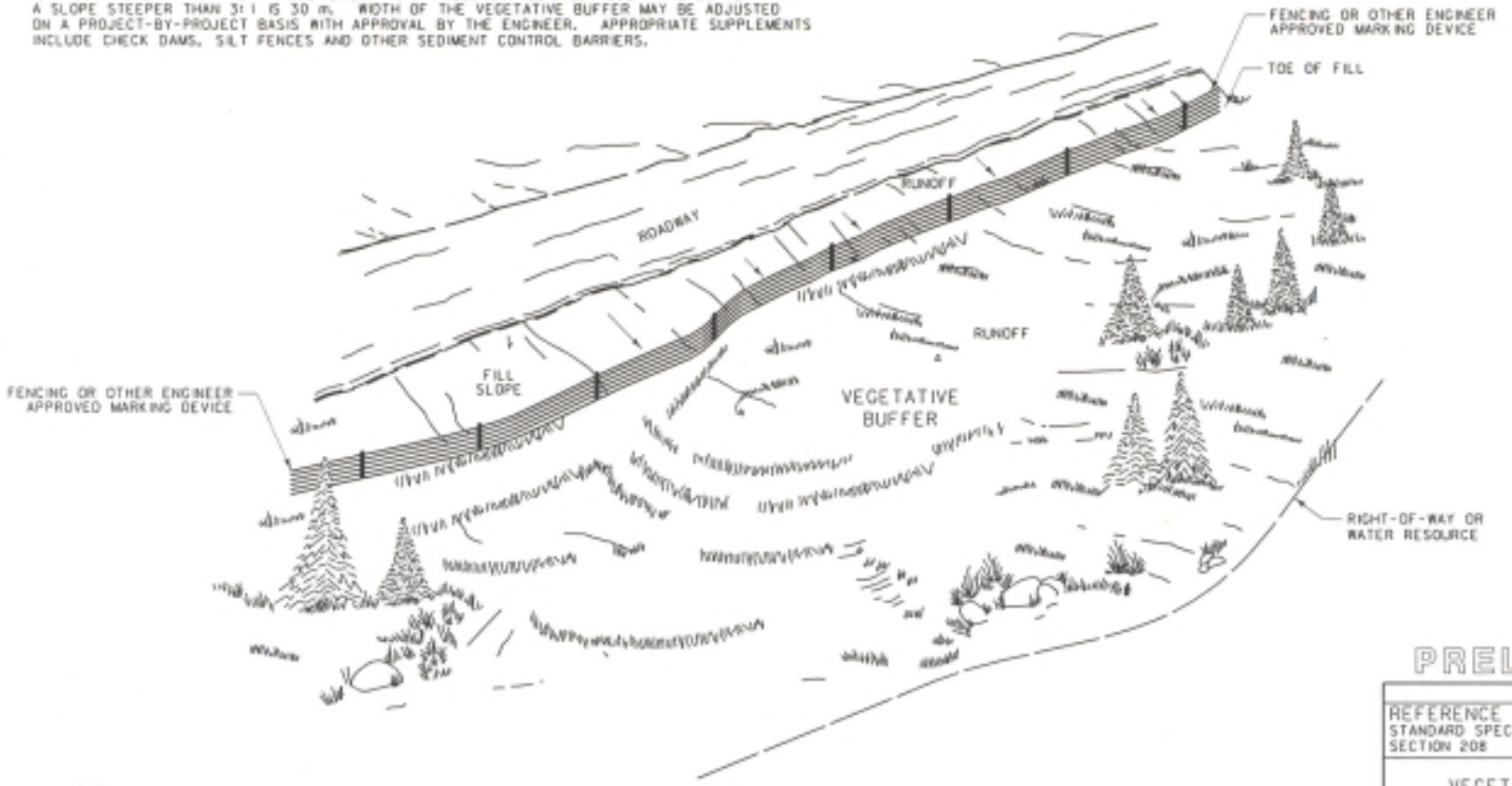
- Keeping vegetation healthy in vegetated buffers requires routine maintenance, which can include weed and pest control, mowing, fertilizing, liming, irrigating, and pruning. Inspection and maintenance are most important when buffer areas are first installed. Once established, vegetated buffers do not require much maintenance beyond the routine procedures listed earlier and periodic inspections of the areas, especially after any heavy rainfall and at least once a year. Inspections should focus on encroachment, gully erosion, density of vegetation, evidence of concentrated flows through the areas, and any damage from foot or vehicular traffic. Remove any sediment that has encroached onto the vegetative buffer and has a depth greater than 150 mm (6 in).

SYMBOL: ——————— ———VB———

VEGETATIVE BUFFER SS-14:

VEGETATIVE BUFFER IS AN UNDISTURBED AREA OR STRIP OF ESTABLISHED VEGETATION. A VEGETATIVE BUFFER PROVIDES A LIVING SEDIMENT FILTER TO REDUCE RUNOFF VELOCITIES AND ALLOW CAPTURE AND SETTLING OF COARSE-GRAINED SEDIMENT. VEGETATIVE BUFFERS REDUCE OR PREVENT SEDIMENTATION FROM LEAVING THE RIGHT-OF-WAY.

IDENTIFY EXISTING VEGETATIVE BUFFERS BEFORE CONSTRUCTION OCCURS AND MARK AREA PER SS-2 (PRESERVATION OF EXISTING VEGETATION) OR WITH SC-1 (SILT FENCE). ESTABLISHED VEGETATIVE BUFFERS SHOULD INCLUDE GRASSES AND SHRUBS. IRRIGATION, FERTILIZATION AND WEED AND PEST CONTROL MAY BE REQUIRED IN ORDER TO ESTABLISH AND MAINTAIN AN EFFECTIVE VEGETATIVE BUFFER. KEEP EQUIPMENT AND FILL MATERIAL OFF OF VEGETATIVE BUFFERS. ALWAYS CONSIDER VEGETATIVE BUFFER BUFFERS WHEN WATER RESOURCES ARE ADJACENT TO OR NEAR DISTURBANCES AND REQUIRE PROTECTION. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE BUFFER WITH A SLOPE OF 3:1 OR FLATTER IS 15 m. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATIVE BUFFER WITH A SLOPE STEEPER THAN 3:1 IS 30 m. WIDTH OF THE VEGETATIVE BUFFER MAY BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS WITH APPROVAL BY THE ENGINEER. APPROPRIATE SUPPLEMENTS INCLUDE CHECK DAMS, SILT FENCES AND OTHER SEDIMENT CONTROL BARRIERS.

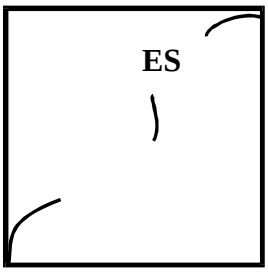


PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
VEGETATED BUFFER (SS-14)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Erosion Seeding SS-15



BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Well-established vegetative cover is one of the best erosion control measures available. Erosion seeding is the immediate seeding of freshly exposed slopes. Use erosion seeding on cut and fill slopes steeper than 3:1 that will not undergo further disturbance. Erosion seeding is not the same as temporary seeding. Temporary seeding (as shown in SS-4) is the establishment of a temporary vegetative cover on areas with a slope of 3:1 or flatter that will be exposed for longer than 14 days and that will undergo further disturbance. Erosion seeding uses a mixture of seed.

Appropriate Applications

Erosion seeding is used on freshly exposed slopes requiring temporary protection until permanent vegetation is established. Erosion seeding provides erosion protection on disturbed areas and traps sediments, promotes infiltration, and improves the appearance of the site. Erosion seeding is a relatively inexpensive erosion control measure.

Limitations

- Rock slopes that cannot be excavated by ripping are not seeded.
- Erosion seeding may not be appropriate in dry areas or periods without supplemental irrigation.
- Erosion seeding vegetation may have to be removed before permanent vegetation is applied.

Design Guidelines and Considerations

- The erosion seed mix and rate of application are found in the MDT Erosion Seeding (SS-15) Detail Drawing.

- Freshly exposed slopes are to be seeded daily, regardless of the time of year.
- Accomplish seeding by manual broadcasting with a shoulder-harnessed spreader seeder or its equivalent.
- Store the recommended mix on-site prior to initiation of slope excavation.
- If one or more species is unavailable, contact the MDT Agronomist, through the Engineer, for the substitute. Substitutions shall be approved in writing by the Engineer during the construction phase.
- The following considerations should be addressed if a hydroseeder is approved by the MDT Agronomist, through the Engineer, instead of manual broadcasting with a shoulder-harnessed spreader:
  - Hydroseeding typically consists of applying a mixture of fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects exposed soils from erosion by water and wind. In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to soil conditions, maintenance requirements, site topography, sensitive adjacent areas, season and climate, water availability, vegetation types, and plans for permanent vegetation.
  - Selection of hydroseeding mixtures shall be approved through the Engineer by the MDT Agronomist.
  - The following steps shall be followed for implementation:
  - Seed mix shall comply with MDT Erosion Seeding (SS-15) Detail Drawing and the project's special provisions.
  - Hydroseeding can be accomplished using a multiple-step or one-step process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
  - Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet-inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 kg (4.5 lbs) of inoculant per 100 kg (220 lbs) of seed.
  - Follow-up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
  - Avoid over-spray onto the travel way, sidewalks, lined drainage channels, and existing vegetation.

Maintenance, Inspection, and Removal

- All seeded areas shall be inspected for failures and re-seeded within the planting season following guidance from the MDT Agronomist. Any temporary revegetation efforts that do not provide adequate cover must be revegetated as required by the Engineer.

- After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

SYMBOL: ———————— ———ES———

EROSION SEEDING BMP SS-15:

EROSION SEEDING IS THE IMMEDIATE SEEDING OF FRESHLY EXPOSED SLOPES. USE EROSION SEEDING ON CUT AND FILL SLOPES STEEPER THAN 3:1 THAT ARE NOT SUBJECT TO FURTHER DISTURBANCE. EVALUATE ROCK AREAS THAT CANNOT BE RIPPED ON A PROJECT-BY-PROJECT BASIS FOR THE NEED OF EROSION SEEDING. THESE AREAS WILL RECEIVE EROSION SEEDING FOLLOWING THE ENGINEER'S APPROVAL. SEEDING DOES NOT REPLACE OR SUBSTITUTE FOR FINAL SEEDING ACTIVITIES SPECIFIED IN THE SEEDING SPECIAL PROVISION.

SEED COMPLETED SECTIONS DAILY, REGARDLESS OF THE TIME OF YEAR. ACCOMPLISH SEEDING BY MANUAL BROADCASTING WITH A SHOULDER-HARNESSED SPREADER SEEDER WITH NO MULCH OR FERTILIZER APPLIED. TRACK AREAS FOLLOWING SEEDING IN ACCORDANCE TO BMP SS-12, SLOPE ROUGHENING. HYDROSEEDING MAY ONLY BE USED AS APPROVED BY THE MDT AGRONOMIST, THROUGH THE ENGINEER. STORE THE RECOMMENDED SEED MIX ON-SITE PRIOR TO INITIATION OF SLOPE EXCAVATION. IF ONE OR MORE SPECIES IS UNAVAILABLE, CONTACT THE MDT AGRONOMIST, THROUGH THE ENGINEER, FOR THE SUBSTITUTE. THE SEED MIX AND RATE OF APPLICATION ARE AS FOLLOWS:

DISTRICT	SPECIES	kg/ha PLS
1 (MISSOULA)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	CRITANA THICKSPIKE WHEATGRASS	5.5
	COVAR SHEEP FESCUE	2.0
	CEREAL BARLEY	5.5
2, 3, 5 (BUTTE, GREAT FALLS, BILLINGS)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	SODAR STREAMBANK WHEATGRASS	5.5
	COVAR SHEEP FESCUE	2.0
	CEREAL BARLEY	5.5
4 (GLENDIVE)	CANADA WILDRYE	3.5
	SECAR BLUEBUNCH WHEATGRASS	5.5
	ROSANA WESTERN WHEATGRASS	5.5
	LODORM GREEN NEEDLEGRASS	3.5
	CEREAL BARLEY	5.5

SLOPES STEEPER THAN 3:1

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208

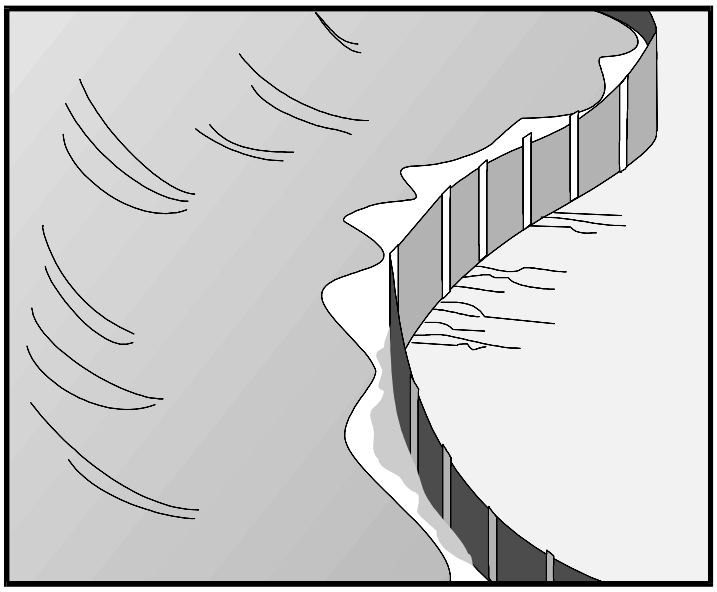
DWG. NO. 208-??

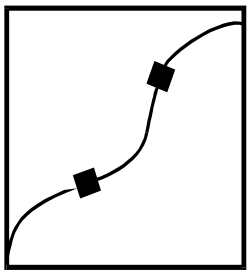
EROSION SEEDING (SS-15)

EFFECTIVE:

CDM Camp Dresser & McKee Inc.

Silt Fence SC-1





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A silt fence is a temporary linear sediment barrier of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

Silt fences are placed:

- Below the toe of exposed and erodible slopes.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.

Limitations

- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1.
- Must be maintained to remain effective.
- Not intended for use in streams, channels, or anywhere flow is concentrated.
- Difficult to install and maintain in windy areas.
- Must be removed and disposed of.

Design Guidelines and Considerations

- Do not use below slopes subject to creep, slumping, or landslides.
- Do not use in streams, channels, or anywhere flow is concentrated.
- Do not use silt fences to divert flow.
- The maximum length of slope upgradient of the silt fence should be 60 m (200 ft) or less to minimize flow volumes and velocities and increase the effectiveness of the silt fence.
- Slope of areas draining to fence should be less than 1:1 but can be used below steeper slopes at the Engineers discretion.
- Limit to locations suitable for temporary ponding or deposition of sediment.
- Fabric life span generally limited to between five and eight months. Longer periods may require fabric replacement.
- Lay out in accordance with MDT Standard Specifications for Geosynthetics Construction and the Silt Fence (SC-1) Detail Drawing.
- For slopes steeper than 2:1 and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence or use stabilized silt fencing installation method as shown in the Silt Fence (SC-1) Detail Drawing.
- For slopes adjacent to water bodies, additional soil stabilization BMPs shall be used.
- Materials shall conform to MDT Standard Specification - Geosynthetic Construction and Miscellaneous Materials.
- Generally, silt fences should be used in conjunction with soil stabilization source controls up slope to provide effective control.
- Trenches should not be excavated wider and deeper than necessary for proper installation of the temporary linear sediment barriers.
- Excavation of the trenches should be performed immediately before installation of the temporary linear sediment barriers.
- Silt fences should be set back at least 1 m (3 ft) from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable.
- Construct the length of each silt fence section so that the change in base elevation along the section does not exceed 1/3 the height of the barrier. This will minimize the chance of storm water from the higher elevation areas traveling along the silt fence from overtopping the silt fence in the lower elevation areas. Each silt fence reach should be limited to 150 m

(500 ft) in order to minimize the amount of water that may accumulate in lower elevation areas.

- When stabilized silt fences are required, they should be installed with steel posts and wire backing following MDT Standard Specifications and the Silt Fence (SC-1) Detail Drawing.

- Cross barriers (barriers that limit water movement along the silt fence) should be a minimum of 1/3 and a maximum of 1/2 the height of the silt fence. Cross barrier placement along silt fencing is shown in the Silt Fence (SC-1) Detail Drawing.

Maintenance, Inspection, and Removal

- Repair undercut silt fences as soon as possible.

- Repair or replace split, torn, slumping, or weathered fabric as soon as possible.

- Inspect silt fence when rain is forecast. Perform necessary maintenance, or maintenance required by the Engineer.

- Inspect silt fence following rainfall events. Perform maintenance as necessary, or as required by the Engineer.

- Maintain silt fences to provide adequate sediment holding capacity. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height. Removed sediment should be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

- Silt fences that are damaged and become unsuitable for the intended purpose, as determined by the Engineer, should be removed from the site and disposed of outside the right-of-way in conformance with the Standard Specifications. Replace damaged silt fence with new silt fence in accordance to MDT Special Provisions and Detail Drawings.

- Holes, depressions or other ground disturbance caused by the removal of the temporary silt fences should be backfilled and repaired.

- Remove silt fence when no longer needed or as required by the Engineer. Fill and compact postholes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.

SYMBOL: ——————— ———SF———

SILT FENCE SC-1:

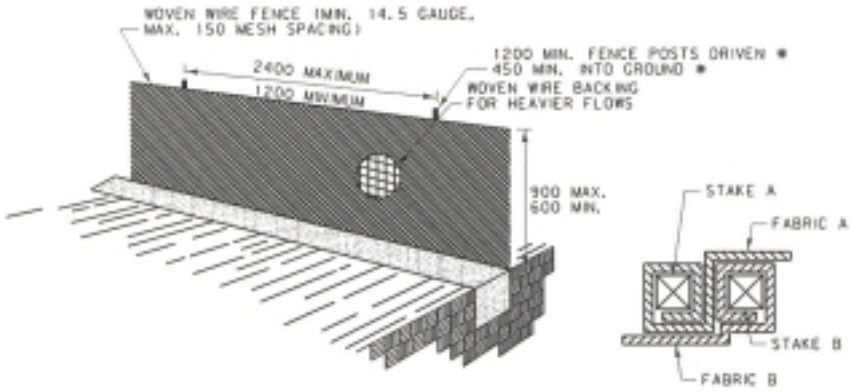
SILT FENCE IS A SINGLE OR SERIES OF FILTER FABRIC SEDIMENT BARRIER STRETCHED AND ATTACHED TO SUPPORTING POSTS. THE FENCE BOTTOM IS ENTRENCHED.

SILT FENCES ARE USED FOR SHEET FLOWS TO ASSIST IN SEDIMENT CONTROL BY RETAINING SOME OF THE ERODED SOIL PARTICLES AND SLOWING THE RUNOFF VELOCITY TO ALLOW PARTICLE SETTLING. APPLICATIONS INCLUDE WATER RESOURCE PROTECTION, INLET PROTECTION, BANK PROTECTION, AND TOE OF SLOPE PROTECTION. INSTALL SILT FENCES PRIOR TO DISTURBING AREAS REQUIRING THIS BMP OR AS SLOPE GRADES ARE ACHIEVED. MAXIMUM CUT OR FILL SLOPE FOR A SILT FENCE IS 2:1. FOLLOW MDT STANDARD SPECIFICATION 622 FOR SILT FENCE MATERIALS AND INSTALLATION.

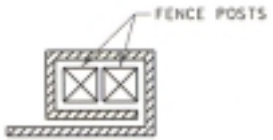
THERE ARE TWO TYPE OF SILT FENCE INSTALLATIONS:
- UNSTABILIZED - SILT FENCE SUPPORTED WITH EITHER WOOD OR METAL FENCE POSTS.
- STABILIZED - SILT FENCE SUPPORTED WITH METAL POSTS AND WITH WOVEN WIRE BACKING.

ENTRENCHMENT - THE INITIAL SILT FENCE INSTALLATION REQUIRES ONLY THE VERTICAL ENTRENCHMENT COMPONENT UNLESS THE ENGINEER DETERMINES BOTH VERTICAL AND HORIZONTAL ENTRENCHMENT COMPONENTS ARE NECESSARY. IF THE FENCE REQUIRES REPLACEMENT DUE TO FAILURE FROM PULLOUT OR UNDERCUTTING, THE SUBSEQUENT INSTALLATION WILL INCLUDE BOTH VERTICAL AND HORIZONTAL ENTRENCHMENT COMPONENTS.

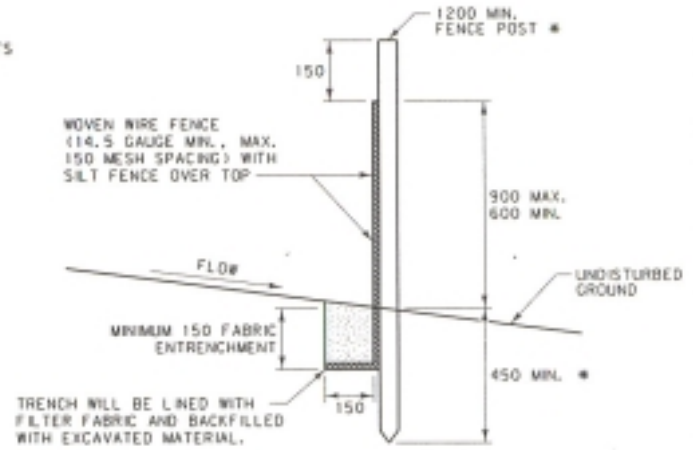
SILT FENCES ARE USED BETWEEN THE EDGE OF CONSTRUCTION DISTURBANCE AND A WATER RESOURCE, AND AT A CRITICAL RESOURCE OR RIGHT-OF-WAY LINE THAT IS ADJACENT TO CONSTRUCTION ACTIVITY. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING DRAINAGES. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. WOVEN WIRE BACKING IS NECESSARY WHEN DEALING WITH HEAVIER FLOW VELOCITIES AND SEDIMENT OR AS A ROCK BARRIER. REMOVE SEDIMENT FROM BEHIND THE FENCE WHEN IT ACCUMULATES TO ONE-THIRD THE ORIGINAL HEIGHT. EITHER GRADE AND SEED OR REMOVE THE SEDIMENT DEPOSITS PRIOR TO REMOVAL OF THE FENCE. DISTANCES BETWEEN SILT FENCE WHEN USED FOR SEDIMENT RETENTION ARE AS FOLLOWS:
- FROM 2% TO 3% PLACE SILT FENCE AT 150 METER SPACING
- FROM 3% TO 4% PLACE SILT FENCE AT 90 METER SPACING
- FROM 4% + PLACE SILT FENCE AT 45 METER SPACING



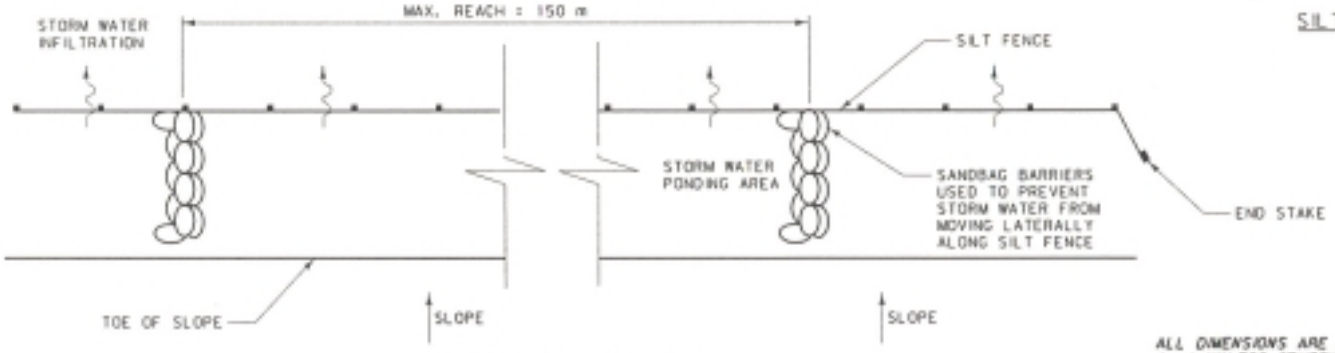
JOINING SECTION DETAIL



END STAKE DETAIL



SILT FENCE - CROSS SECTION



SILT FENCE - PLAN VIEW

* FOR CLEAR ZONE APPLICATIONS USE MAX. POST LENGTH OF 1500 mm WITH A MIN. BURIAL DEPTH OF 450 mm.

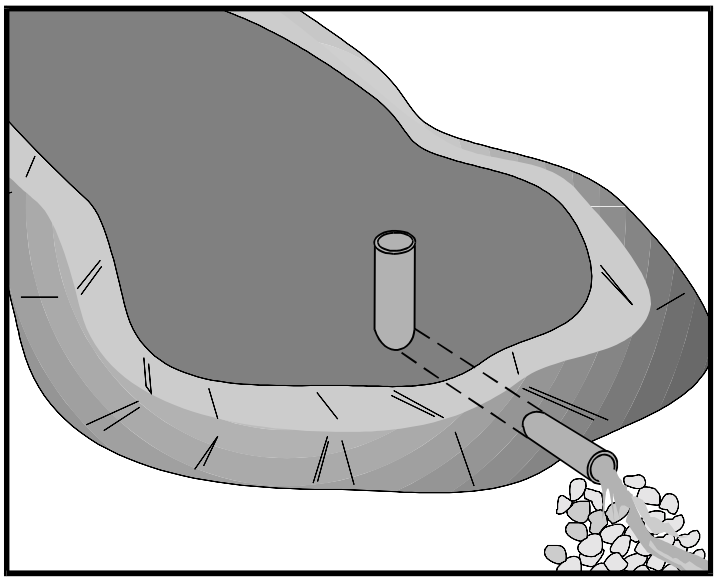
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

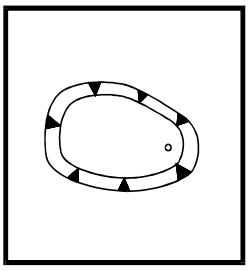
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-??
SILT FENCE ISC-1)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Desilting Basin SC-2





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A desilting basin is a temporary basin formed by excavation and/or constructing an embankment so that sediment-laden runoff is temporarily detained under slow flowing conditions, allowing sediment to settle out before the runoff is discharged. MDT's Hydraulics Section is responsible for the design of desilting basins that will be left as permanent structures.

Appropriate Applications

Desilting basins shall be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses; and
- At outlets of disturbed soil areas with areas between 2 ha (5 acres) and 4 ha (10 acres).

Limitations

- Alternative BMPs must be thoroughly investigated for erosion control before selecting temporary desilting basins.
- Requires large surface areas to allow sediment to settle.
- Not appropriate for drainage areas greater than 30 ha (75 acres).
- Not to be located in live streams.
- If safety is a concern, basins may require protective fencing.
- Size may be limited by availability of right-of-way.

Design Guidelines and Considerations

- Limit the contributing area of the desilting basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the desilting basin.

- Desilting basins shall be designed to have a capacity equivalent to 100 m^3 (1500 ft^3) of storage (as measured from the top of the basin to the principal outlet,) per hectare (acre) of contributory area. This design is less than that required to capture 0.01 mm (0.0004 in) particle size, but larger than that required to capture particles 0.02 mm (0.0008 in) or larger.

- The length of the basin shall be more than twice the width of the basin; the length shall be determined by measuring the distance between the inlet and the outlet.

- The depth must be no less than 1 m (3 ft) nor greater than 1.5 m (5 ft).

- Any basin meeting the definition of a "High Hazard Dam" must be designed by a professional civil engineer registered in the state of Montana. Basins capable of impounding more than 1000 m^3 (35,000 ft^3), must also be designed by a professional Civil Engineer registered with the state of Montana. Temporary desilting basin design must be approved by the Engineer prior to the basin construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

- Design and locate desilting basins so that they can be maintained. Construct desilting basins prior to construction activities.

- Desilting basins, regardless of size and storage volume, shall include features to accommodate overflow or bypass flows that exceed the design storm event. The calculated basin volume and proposed location shall be submitted to the Engineer for approval prior to the basin construction.

- Basins shall be designed to drain within 72 hours following storm events.

- The outflow from the desilting basin shall be provided with outlet protection to prevent erosion and scouring of the embankment and channel.

- Basin shall be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, (3) where failure would not cause loss of life or property damage, and (4) where the basins can be maintained on a year-round basins to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

- Areas under embankments, structural works, and desilting basin must be cleared, stripped of vegetation.

- Basin inlets shall be located to maximize travel distance to the basin outlet.

- Rock or vegetation shall be used to protect the basin inlet and slopes against erosion.

- A forebay (a reservoir or channel constructed upstream of the basin) may be provided to remove debris and larger particles.

- Principal outlet shall consist of a corrugated metal, HDPE, or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure shall be designed to accommodate the inflow design storm.

- Structure shall be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.

- Attach riser pipe (watertight connection) to a horizontal pipe (barrel) which extends through the embankment to toe of fill. Provide anti-seep collars on the barrel.

- Cleanout level shall be clearly marked on the riser pipe.

- Avoid dewatering of groundwater to the desilting basin during the rainy season. Insignificant quantities of accumulated precipitation may be dewatered to the desilting basin unless precipitation is forecasted within 24 hours.

- Chain link fencing around each desilting basin may be specified by the Engineer to prevent unauthorized entry to the basin or if safety is a concern. Fencing shall be in accordance with MDT Standard Specifications Section 607 - Fences.

- One of the dewatering configurations shown below for the principal outlet may be used. The Contractor shall verify that the outlet is properly designed to handle the design and peak flows.

Outlet #1, See Detailed Drawings

- Perforate the top 1/3 of the riser with 13 mm (1/2 in) diameter holes spaced 200 mm (8 in) vertically and 250 mm (10 in) - 300 mm (12 in) horizontally.

- Place 19 mm (3/4 in) gravel over perforated holes to approximately 50 mm (2 in) minimum thickness to assist in prevention of clogging of dewatering holes. Gravel will naturally settle into a cone surrounding the riser pipe.

Outlet #2, See Detailed Drawings

- Perforate the lower 1/2 of the riser pipe with 13 mm (1/2 in) diameter holes spaced approximately 75 mm (3 in) apart, in each outside valley (corrugated metal pipe).

- Place 19 mm (3/4 in) gravel over perforated holes to approximately 50 mm (2 in) minimum thickness to assist in prevention of clogging of dewatering holes. Gravel will naturally settle into a cone surrounding the riser pipe.

Outlet #3, See Detailed Drawings

- Provide two 25 mm (1 in) diameter holes above the sediment storage volume on opposite sides of the non-perforated riser pipe. This will typically provide sufficient detention time for basins to drain approximately 4 ha (10 acre).

- Construct an emergency spillway to accommodate flows not carried by the principal spillway. Spillway shall consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.

- Spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, shall be a minimum of 6 m (20 ft) in length.

- Use outlet protection at the pipe outlet. See BMP SS-10, "Outlet Protection/Velocity Dissipation Devices."

Maintenance, Inspection, and Removal

- Inspect temporary desilting basins before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect at least every 24 hours.

- Examine basin banks for seepage and structural soundness.

- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed, or as directed by the Engineer.

- Check inlet and outlet area for erosion and stabilize if required, or if directed by the Engineer.

- Remove sediments when storage zone is 1/3 full.

- Check fencing for damage and repair as needed or as directed by the Engineer.

SYMBOL: ———————

DESILTING BASIN SC-2:

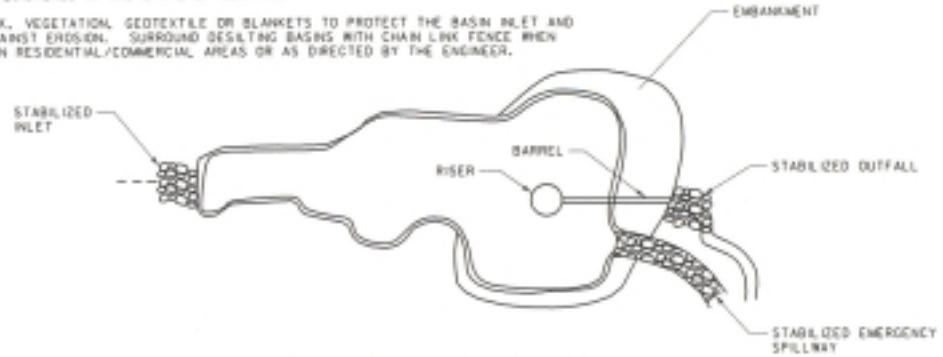
A DESILTING BASIN IS A TEMPORARY BASIN FORMED BY EXCAVATION AND/OR CONSTRUCTING AN EMBANKMENT SO THAT SEDIMENT-LADEN RUNOFF IS TEMPORARILY DETAINED UNDER SLOW FLOWING CONDITIONS, ALLOWING SEDIMENT TO SETTLE OUT BEFORE THE RUNOFF IS DISCHARGED.

USE DESILTING BASINS FOR DISTURBED AREAS BETWEEN 2 ha AND 4 ha WHERE SEDIMENT-LADEN WATER MAY ENTER THE DRAINAGE SYSTEM OR WATERCOURSE.

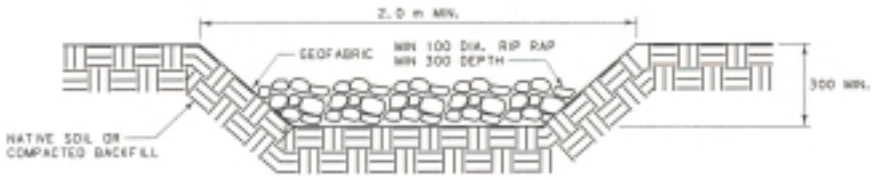
DO NOT USE DESILTING BASINS FOR DRAINAGE AREAS GREATER THEN 30 ha AND DO NOT LOCATE BASINS WITHIN LIVE STREAMS.

SIZE DESILTING BASINS SUCH THAT THERE IS 100 m³ PER 1 ha OF CONTRIBUTING AREA, LENGTH MUST BE EQUAL OR LARGER THAN TWICE THE WIDTH, DEPTH MUST BE BETWEEN 1 m AND 1.5 m. ANY BASIN MEETING THE DEFINITION OF A "HIGH HAZARD DAM" MUST BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE STATE OF MONTANA. BASINS LARGER THAN 1000 m³ MUST ALSO BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE STATE OF MONTANA.

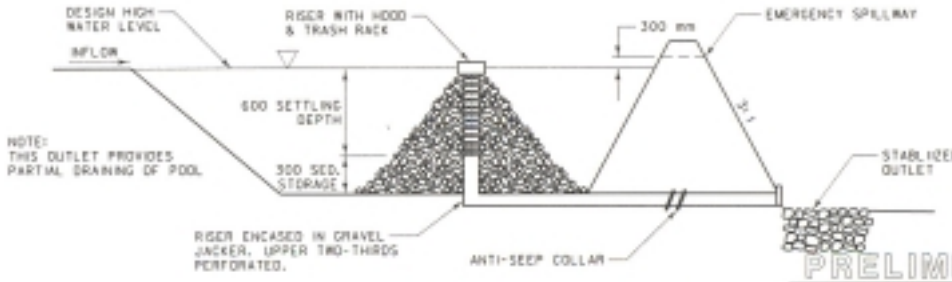
PLACE ROCK, VEGETATION, GEOTEXTILE OR BLANKETS TO PROTECT THE BASIN INLET AND SLOPES AGAINST EROSION. SURROUND DESILTING BASINS WITH CHAIN LINK FENCE WHEN DESIGNED IN RESIDENTIAL/COMMERCIAL AREAS OR AS DIRECTED BY THE ENGINEER.



TYPICAL DESILTING BASIN - TOP VIEW



TYPICAL DESILTING BASIN - EMERGENCY SPILLWAY CROSS SECTION

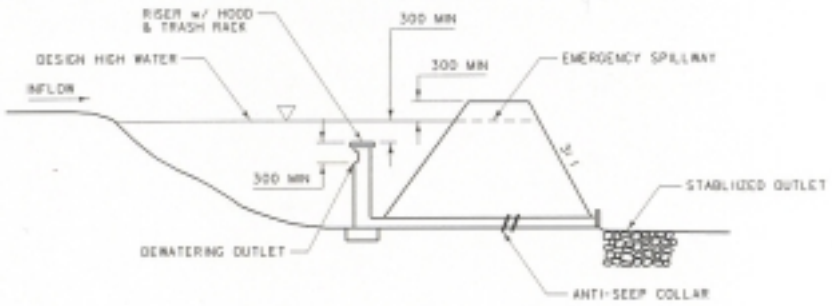


TYPICAL DESILTING BASIN - OUTLET #1

PRELIMINARY

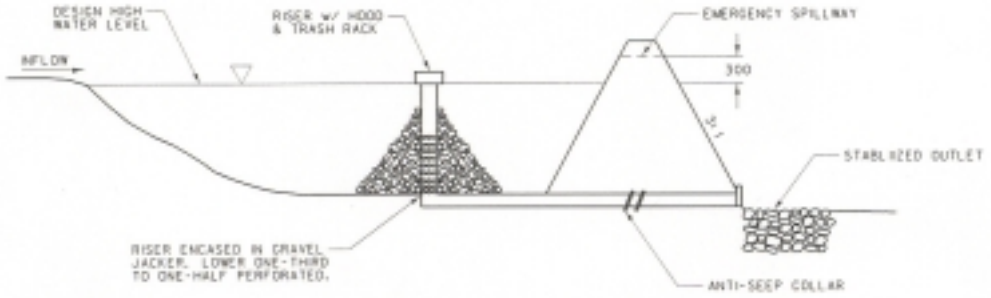
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
DESILTING BASIN (SC-2) (SHEET 1)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.



NOTE:
THIS OUTLET PROVIDES NO
DRAINING OF PERMANANT POOL

TYPICAL DESILTING BASIN - OUTLET #2



NOTE:
THIS OUTLET PROVIDES
COMPLETE DRAINING OF POOL

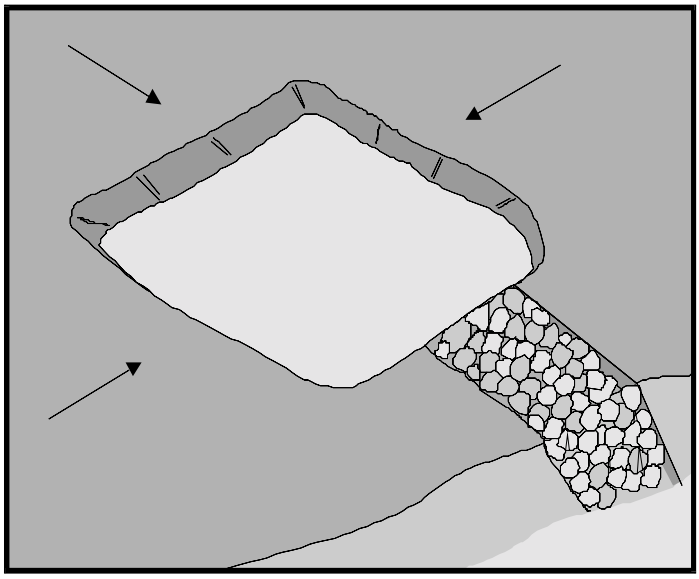
TYPICAL DESILTING BASIN - OUTLET #3

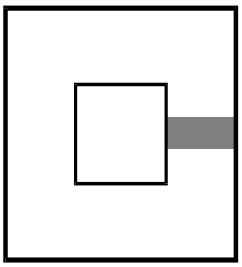
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
DESILTING BASIN (SC-2) (SHEET 2)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

Sediment Trap SC-3





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A sediment trap is a temporary basin with a controlled release structure, formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Appropriate Applications

- Sediment traps may be used on construction projects where the contributing drainage area is less than 2 ha (5 acres). Traps would be placed where sediment laden storm water may enter a storm drain or watercourse, and around and/or up-slope from storm drain inlet protection measures.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Engineer.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to allow sediment to settle.
- Not appropriate for drainage areas greater than 2 ha (5 acres).
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Not to be located in live streams.
- Size may be limited by availability of right-of-way.

Design Guidelines and Considerations

- Construct sediment traps prior to rainy season and construction activities.

- Trap shall be located: (1) where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance.

- Trap shall be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 130 m^3/ha (1850 ft^3/acre) and 65 m^3/ha (925 ft^3/acre) of contributing drainage area, respectively, based on 12.7 mm (1/2 in) of runoff volume over a 24-hr period. Multiple traps and/or additional volume may be required to accommodate site-specific rainfall and soil conditions.

- Any sediment trap meeting the definition of a "High Hazard Dam" must be designed by a professional Civil Engineer registered in the state of Montana. Sediment traps capable of impounding more than 1000 m^3 (35000 ft^3), must also be designed by a professional Civil Engineer registered with the state of Montana. Sediment trap designs must be reviewed by the MDT Hydraulics Section and approved by the Engineer prior to the sediment trap construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet.

- Areas under embankments, structural works, and sediment traps shall be cleared and stripped of vegetation.

- Trap shall have a length to width ratio greater than 3:1 or baffles are required to prevent short circuiting of the inlet flow.

- Trap inlets shall be located to maximize the travel distance to the trap outlet. Use rock or vegetation to protect the trap outlets against erosion.

- Chain link fencing around large sediment traps may be specified by the Engineer to prevent unauthorized entry to the trap or if safety is a concern. Fencing shall be in accordance with MDT Standard Specifications.

- To dewater the trap, the outlet shall be constructed in one of the following two ways:

    - Use corrugated metal, HDPE, or reinforced concrete riser pipe with dewatering holes encased in gravel to prevent floating debris from flowing out of the trap or obstructing the system.

    - Construct a crushed stone outlet section of the embankment at the low point of the trap. The stone section serves as a non-erosive spillway outlet for flood flows and the bottom section provides a means of dewatering the trap between rainfall events.

Maintenance, Inspection, and Removal

- Inspect sediment traps before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect sediment traps at least every 24 hours.

- Check trap banks for seepage and structural soundness.
- Check outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed or as directed by the Engineer.
- Check outlet area for erosion and stabilize if required, or as directed by the Engineer.
- Remove accumulated sediment when the volume has reached 1/3 the original trap volume.
- Properly disposed of sediment and debris removed from the trap.
- Check fencing for damage and repair as needed or as directed by the Engineer.

SYMBOL: ———————

SEDIMENT TRAP SC-31

A SEDIMENT TRAP IS A TEMPORARY BASIN THAT WITH A CONTROLLED RELEASE STRUCTURE, FORMED BY EXCAVATING OR CONSTRUCTION OF AN EARTHEN EMBANKMENT ACROSS A WATERWAY OR LOW DRAINAGE AREA.

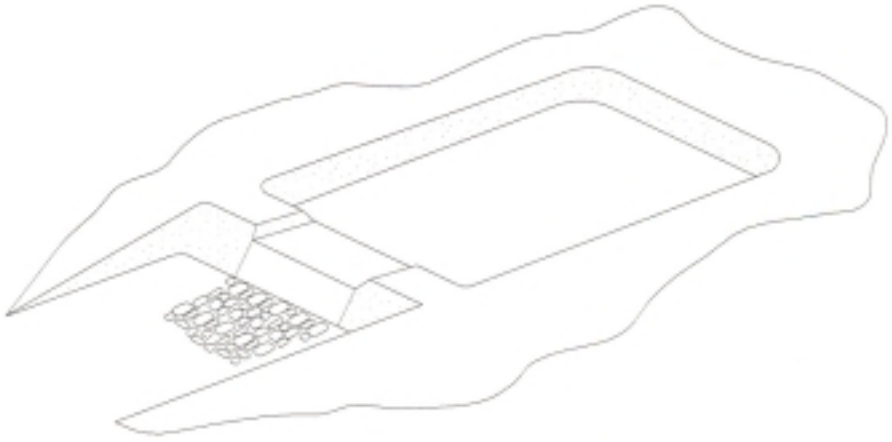
USE SEDIMENT TRAPS WHEN DISTURBED AREAS ARE LESS THAN 2 ha. THIS BMP CAN BE USED TO PROVIDE ADDITIONAL PROTECTION FOR A WATER BODY OR FOR REDUCING SEDIMENT BEFORE IT ENTERS A DRAINAGE SYSTEM.

SEDIMENT BASINS ARE NOT APPROPRIATE FOR DRAINAGE AREAS LARGER THAN 2 ha AND ONLY REMOVE LARGE TO MEDIUM SIZED PARTICLES. DO NOT USE SEDIMENT TRAPS IN LIVE STREAMS.

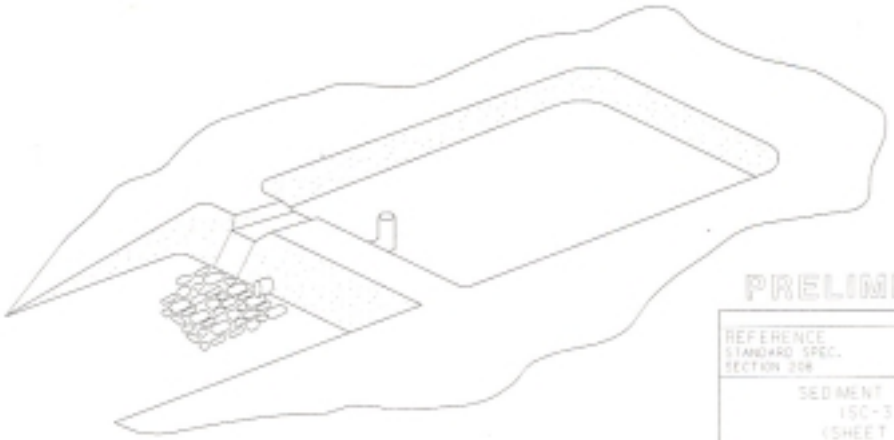
A MINIMUM SETTLING ZONE OF 130 m³ PER ha AND A MINIMUM SEDIMENT ZONE OF 65 m³ PER ha IS REQUIRED FOR EACH SEDIMENT TRAP. ANY TRAP MEETING THE DEFINITION OF A "HIGH HAZARD DAM" MUST BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER LICENSED IN THE STATE OF MONTANA. ALL TRAPS LARGER THAN 1000 m³ REQUIRE A DESIGN BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MONTANA.

PLACE ROCK, VEGETATION, GEOTEXTILE OR BLANKETS TO PROTECT THE TRAP'S INLET, OUTLET AND SLOPES AGAINST EROSION. ENCLOSE THE SEDIMENT TRAP WITH CHAIN LINK FENCE WHEN PLACED IN RESIDENTIAL/COMMERCIAL AREAS OR AS DIRECTED BY THE ENGINEER.

REFER TO BMP SC-2 FOR RISER PIPE CONFIGURATIONS AND OVERFLOW SPILLWAY DESIGNS.



TYPICAL SEDIMENT TRAP WITH SPILLWAY TYPE OUTFALL



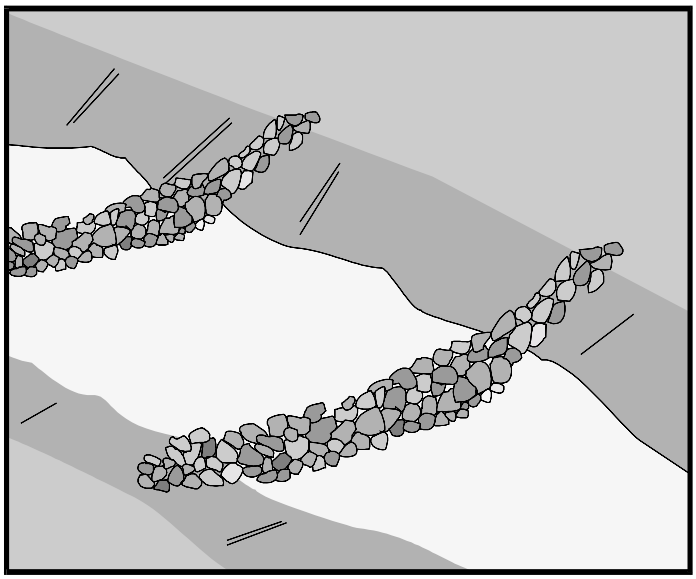
TYPICAL SEDIMENT TRAP WITH RISER PIPE TYPE OUTFALL

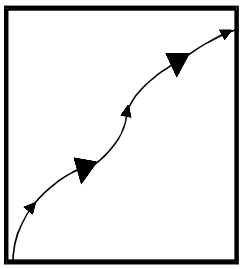
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
SEDIMENT TRAP (SC-31) (SHEET 1)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Check Dams SC-4





BMP Objectives
- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A check dam is a small device constructed of rock, sandbags, or fiber rolls, placed across a natural or man-made channel or drainage ditch. Check dams reduce scour and channel erosion by reducing flow velocity and encouraging sediment dropout.

Appropriate Applications

- Check dams may be installed in the following:
  - In small open channels which drain 4 ha (10 acres) or less.
  - In steep channels where storm water runoff velocities exceed 1.5 m/s (5 ft/s).
  - During the establishment of grass linings in drainage ditches or channels.
  - In temporary ditches where a short length of service does not warrant establishment of erosion-resistant linings.
- Check dams can be left in place following construction activities and allowed to accumulate sediment and vegetation as approved by the Engineer.

Limitations

- Not to be used in live streams.
- Not appropriate in channels which drain areas greater than 4 ha (10 acres).
- Not to be placed in channels, which are already grass-lined unless erosion is expected, as installation may damage vegetation.

- Require extensive maintenance following high velocity flows and may have to be replaced.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam. Check dams may be left in place and allowed to accumulate sediment and vegetation.
- Not to be constructed from straw bales or a silt fence.
- Can be difficult to seed around.

Design Guidelines and Considerations

- Check dams shall be placed at a distance and height to allow small pools to form behind them.
- Install the first check dam approximately 5 m (15 ft) from the outfall device and at regular intervals based on slope gradient and soil type.
- High flows (typically a 2-year storm or larger) shall safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams may be removed when grass has matured sufficiently to protect the ditch or swale if the removal does not jeopardize the established vegetation.

Maintenance, Inspection, and Removal

- Inspect check dams after each storm event. Repair damage as needed or as required by the Engineer.
- Remove sediments when depth reaches 1/3 of the check dam height.
- Remove accumulated sediment prior to permanent seeding or soil stabilization or seed accumulated sediment to stabilize.
- Remove check dams and accumulated sediment when check dams are no longer needed or when required by the Engineer. Check dams can be left in place following construction activities and allowed to accumulate sediment and vegetation as approved by the Engineer.
- Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

SYMBOL:

CHECK DAMS SC-4:

A CHECK DAM IS A SMALL DEVICE CONSTRUCTED OF GRAVEL, SANDBAGS, OR FIBER ROLLS, PLACED ACROSS A NATURAL OR MAN-MADE CHANNEL OR DRAINAGE DITCH. CHECK DAMS REDUCE SCOUR AND CHANNEL EROSION BY REDUCING FLOW VELOCITIES AND ENCOURAGING SEDIMENT DROPOUT.

CHECK DAMS MAY BE INSTALLED IN SMALL CHANNELS WITH DRAINAGE AREAS OF 4 ha OR LESS AND/OR STEEP CHANNELS WHERE STORM WATER RUNOFF VELOCITIES EXCEED 1.5 m/s. THE MAXIMUM HEIGHT FOR CHECK DAMS WITHIN THE CLEAR ZONE IS 150 mm.

CHECK DAMS CANNOT BE USED IN LIVE STREAMS OR FOR DRAINAGE AREAS LARGER THAN 4 ha. IN ADDITION, CHECK DAMS CANNOT BE CONSTRUCTED FROM SILT FENCE.

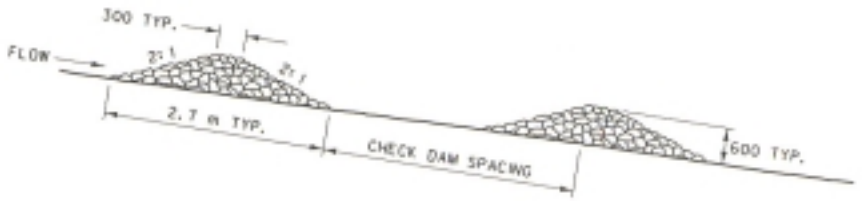
PLACE CHECK DAMS AT A DISTANCE THAT WILL ALLOW SMALL POOLS TO BE FORMED BEHIND EACH DAM. INSTALL THE FIST CHECK DAM APPROXIMATELY 5 METERS FROM THE OUTFALL DEVICE. PLACE MULTIPLE CHECK DAMS SUCH THAT BACKWATER FROM THE DOWNSTREAM DAM WILL REACH THE TOE OF THE UPSTREAM DAM. ROCK MAY BE PLACED BY HAND OR BY MECHANICAL METHOD TO ACHIEVE COMPLETE DITCH OR SWALE COVERAGE.

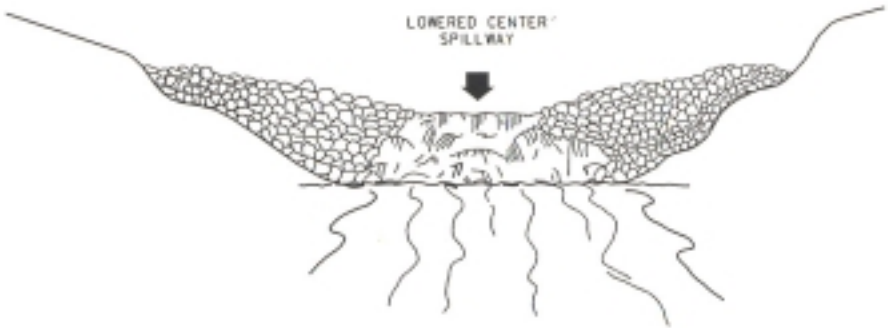
CHECK DAMS CONSTRUCTED FROM GRAVEL MUST BE 100% PASSING THE 50 mm SCREEN AND 10% MAXIMUM PASSING THE 4.75 mm SIEVE. DAM MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE. REFER TO BMPs SC-5 AND SC-8 FOR USE OF FIBER ROLLS AND SAND BAGS AS CHECK DAMS.

REMOVE SEDIMENT FROM BEHIND THE DAM WHEN IT ACCUMULATES TO ONE-HALF THE ORIGINAL HEIGHT UNLESS ITS DRAINAGE AREA HAS BEEN STABILIZED.

DISTANCES BETWEEN CHECK DAMS ARE AS FOLLOWS:
- FROM 1% TO 3% PLACE CHECK DAMS AT 90 METER SPACING
- FROM 3% TO 4% PLACE CHECK DAMS AT 60 METER SPACING
- FROM 4% + PLACE CHECK DAMS AT 30 METER SPACING

CHECK DAM SPACING MAY BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS BY THE ENGINEER. DO NOT USE CHECK DAMS ON 1-2% GRADES UNLESS DETERMINED NECESSARY BY THE ENGINEER.





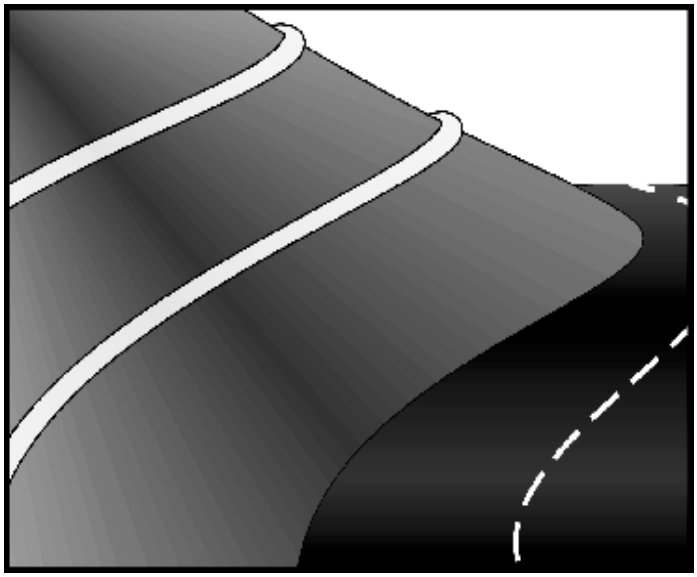
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

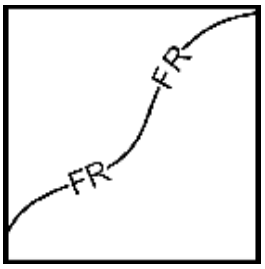
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
CHECK DAMS (SC-4)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Fiber Rolls SC-5





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A fiber roll consists of straw, flax, or other similar materials that are rolled and bound into a tight tubular roll and placed on the face of slopes at regular intervals to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some removal of sediment from the runoff.

Appropriate Applications

- May be used along the top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- Fiber rolls may be used as check dams if approved by the Engineer.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Although fiber rolls provide some sediment removal, this BMP is not to be used in place of a linear sediment barrier (i.e., a silt fence, sandbag barrier, or straw bale barrier).

Design Guidelines and Considerations

Fiber Roll Materials

- Fiber rolls shall be either:
  - prefabricated rolls; or,
  - rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 200 mm (8 in) diameter.

- Bind roll at each end and every 1.2 m (4 ft) along length of roll with jute-type twine.

Installation

- Entrench and install fiber rolls as shown in the Fiber Rolls (SC-5) Detail Drawing.
- If more than one fiber roll is placed in a row, the rolls shall be butted; not overlapped. Stake butted fiber rolls ends to maintain a tight joint.

Removal

- Fiber rolls are typically left in place as removals may cause damage to the stabilized slope.
- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill, compact and seed holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Maintenance, Inspection, and Removal

- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform maintenance as needed or as required by the Engineer.
- Inspect fiber rolls as soon as possible following storm events and a least daily during prolonged rainfall. Perform maintenance as needed or as required by the Engineer.

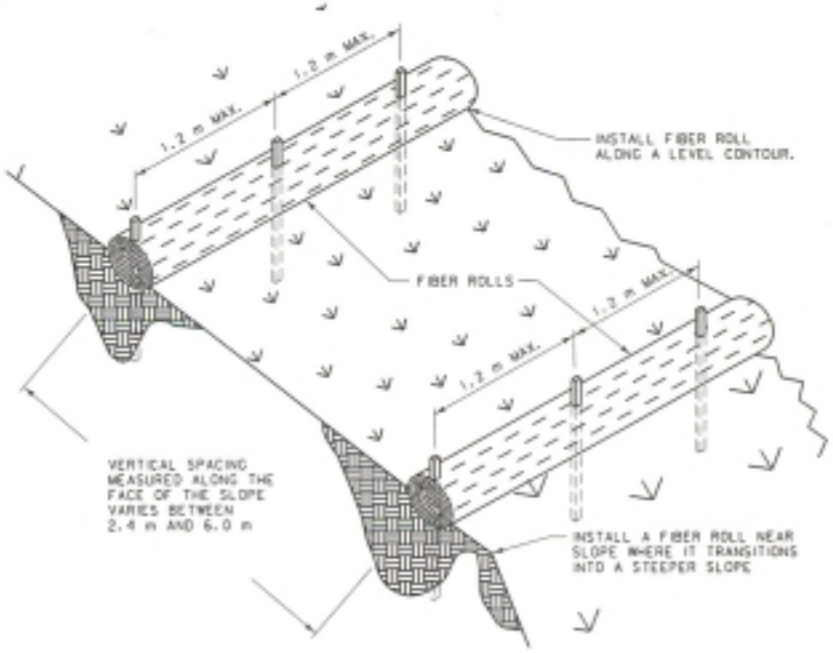
SYMBOL: ———— —— FR ——

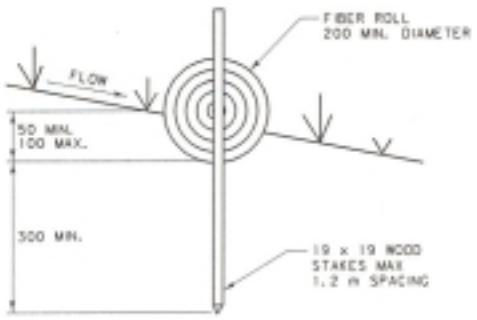
FIBER ROLLS SC-5:

A FIBER ROLL CONSISTS OF EROSION CONTROL BLANKET MATERIAL THAT IS PREFABRICATED, OR ROLLED AND BOUND IN THE FIELD INTO A TIGHT TUBULAR ROLL AND PLACED ON THE FACE OF SLOPES AT REGULAR INTERVALS TO INTERCEPT RUNOFF, REDUCE ITS FLOW VELOCITY, RELEASE THE RUNOFF AS SHEET FLOW, AND PROVIDE SOME REMOVAL OF SEDIMENT FROM THE RUNOFF.

FIBER ROLLS MAY BE USED ALONG THE TOP, FACE, AND AT GRADE BREAKS OF EXPOSED AND ERODIBLE SLOPES TO SHORTEN SLOPE LENGTH AND SPREAD RUNOFF AS SHEET FLOW. ROLLS MAY BE USED AS CHECK DAMS IF APPROVED BY THE ENGINEER. FOR USE AS CHECK DAMS, PLACE FIBER ROLLS AT 15 m MAXIMUM SPACING OR AS APPROVED BY THE ENGINEER.

ALTHOUGH FIBER ROLLS PROVIDE SOME SEDIMENT REMOVAL, FIBER ROLLS ARE NOT TO BE USED IN PLACE OF A LINEAR SEDIMENT BARRIER (I.E., SILT FENCE, SANDBAG BARRIER, OR STRAW BALE BARRIER).



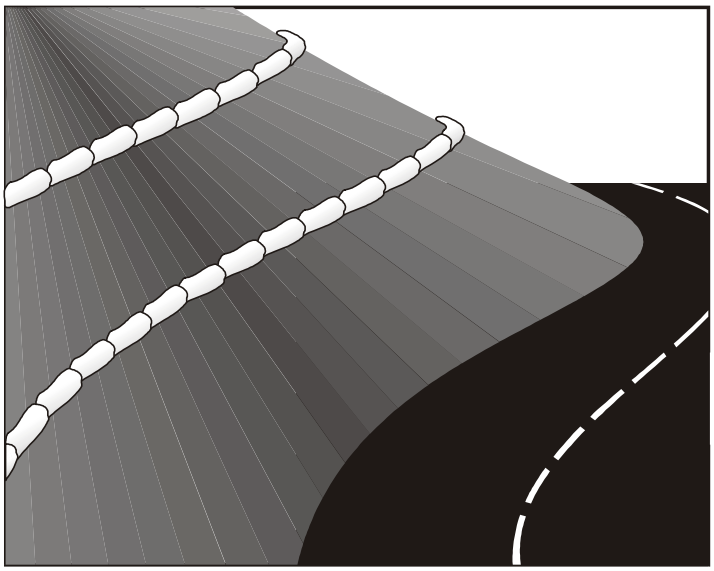


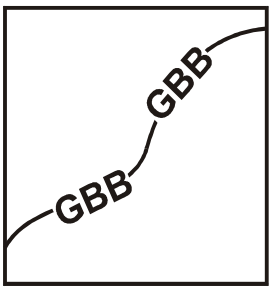
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
FIBER ROLLS (SC-5)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Gravel Bag Berm SC-6





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A gravel bag berm consists of a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff, reduce runoff velocity, release runoff as sheet flow, and provide some sediment removal.

Appropriate Applications

- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Although this BMP will remove some sediment, it is not to be used in place of a linear sediment barrier (i.e., a silt fence, sandbag barrier, or straw bale barrier).
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Limited durability for long-term projects.

Design Guidelines and Considerations

- Bag material and size are shown in the Gravel Bag Berm (SC-6) Detail Drawing.
- Gravel Bag Berm installation is described in the Gravel Bag Berm (SC-6) Detail Drawing.
- Tightly abut bags.

Maintenance, Inspection, and Removal

- Inspect gravel bag berms before predicted storm events, as soon as possible after storm events, and weekly during construction activities.

- Reshape or replace gravel bags as needed, or as directed by the Engineer.

- Inspect gravel bag berms for sediment accumulation and remove sediments when accumulation reaches 1/3 the berm height. Removed sediment shall be incorporated within the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

- Remove gravel bag berms when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Sediment accumulation may remain if seeded and stabilized. Gravel from bags can be left in place; however, the bags should be removed.

SYMBOL: ———————— ———GBB———

GRAVEL BAG BERM SC-6:

A GRAVEL BAG BERM CONSISTS OF A SINGLE ROW OF GRAVEL BAGS THAT ARE INSTALLED END-TO-END TO FORM A BARRIER ACROSS A SLOPE TO INTERCEPT RUNOFF, REDUCE RUNOFF VELOCITY, RELEASE RUNOFF AS SHEET FLOW, AND PROVIDE SOME SEDIMENT REMOVAL. GRAVEL BAG BERMS CAN BE USED ALONG THE FACE AND AT GRADE BREAKS OF EXPOSED AND ERODIBLE SLOPES TO SHORTEN SLOPE LENGTHS AND SPREAD RUNOFF AS SHEET FLOW.

THESE DEVICES ARE NOT TO BE USED IN PLACE OF A LINEAR SEDIMENT BARRIER (I.E., SILT FENCE, SANDBAG BARRIERS, OR STRAW BALE BARRIERS).

USE WOVEN POLYPROPYLENE, POLYETHYLENE, OR POLYAMIDE FABRIC OR BURLAP MATERIAL FOR BAGS. BAG MATERIAL IS REQUIRED TO HAVE A MINIMUM UNIT WEIGHT OF 135 g/m², MULLEN BURST STRENGTH EXCEEDING 2 070 kPa AND AN ULTRAVIOLET STABILIZATION EXCEEDING 70%.

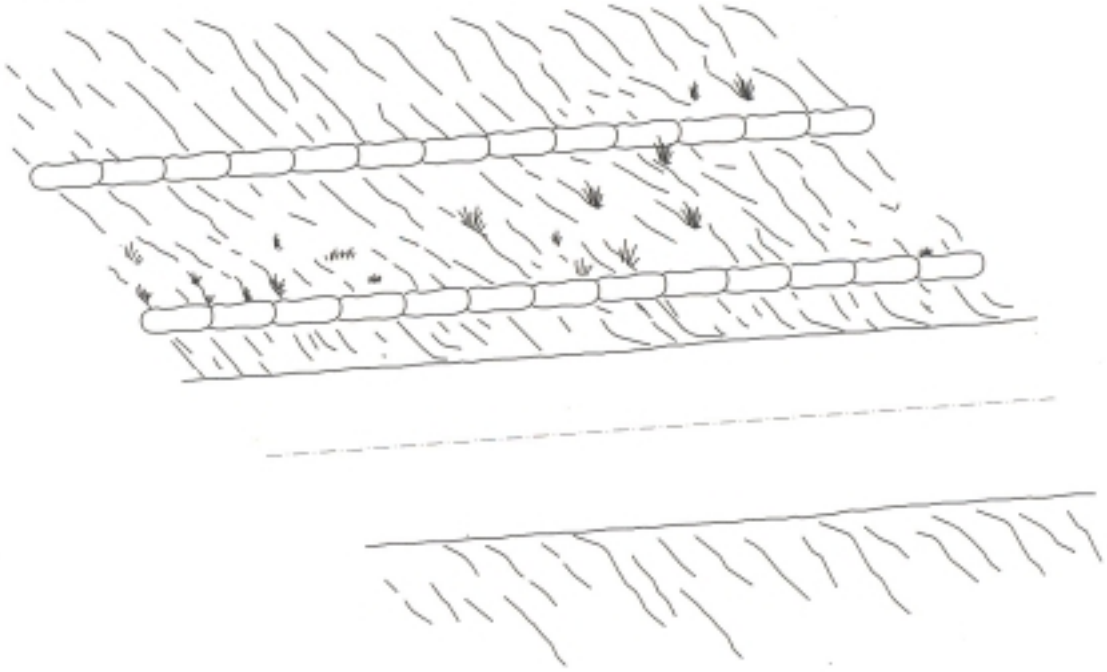
USE GRAVEL BAGS HAVING A LENGTH OF 450 mm, WIDTH OF 300 mm, THICKNESS OF 75 mm, AND A MASS OF APPROXIMATELY 15 kg. ALTERNATIVE BAG SIZES REQUIRE ENGINEERS APPROVAL PRIOR TO USE.

FILL GRAVEL BAGS APPROXIMATELY 75% FULL WITH GRAVEL CONSISTING OF 100% PASSING THE 19 mm SCREEN AND 10% MAXIMUM PASSING THE 4.75 mm SIEVE. FILL MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE. FILL MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER.

TIGHTLY PLACE GRAVEL BAGS TO MINIMIZE GAPS BETWEEN BAGS. BAGS MAY BE STAGGERED ON A PROJECT-BY PROJECT BASIS AS APPROVED BY THE ENGINEER.

PLACE GRAVEL BAG BERMS AT 2.4 TO 6 m SPACING ALONG THE SLOPE. FOR ABNORMALLY STEEP OR SHALLOW SLOPES FOLLOW ENGINEERS GUIDELINES.

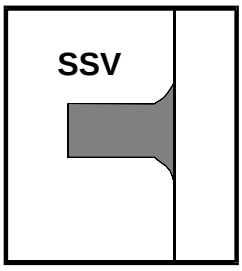
ALL BAGS PLACED WITHIN THE CLEAR ZONE REQUIRE MEASURES TO PROTECT GRAVEL FROM FREEZING. ALL FREEZE REDUCTION METHODS REQUIRE ENGINEERS APPROVAL PRIOR TO IMPLEMENTATION.



PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
GRAVEL BAG BERM (SC-6)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Street Sweeping and Vacuuming SC-7



BMP Objectives
- ● Soil Stabilization
- ● Sediment Control
- ● Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Practices to remove tracked sediment to prevent the sediment from entering a storm drain or watercourse.

Appropriate Applications

These practices are implemented anywhere sediment is tracked from the project site onto public or private paved roads, typically at points of egress.

Limitations

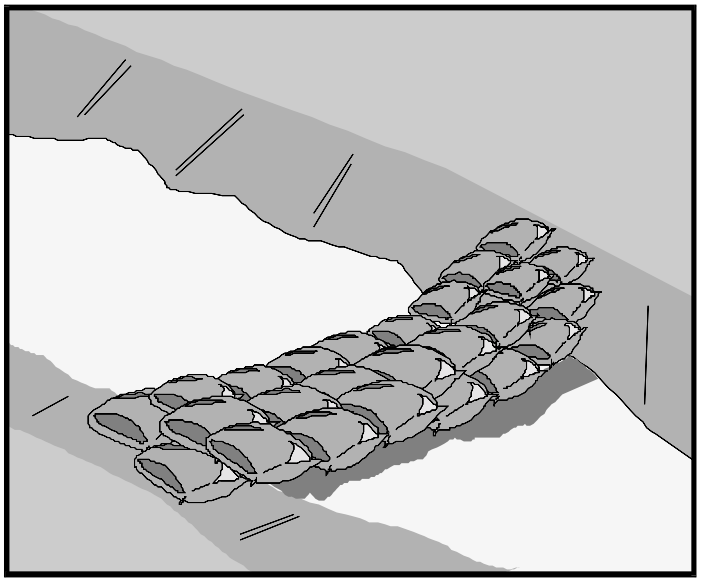
- Sweeping and vacuuming may not be effective when soil is wet or muddy.
- Do not use kick brooms or sweeper attachments.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking shall be swept and vacuumed on a daily basis.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

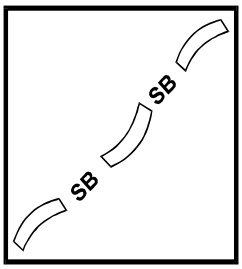
Maintenance, Inspection, and Removal

- Inspect ingress/egress access points daily and sweep tracked sediment as needed, or as required by the Engineer.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.

- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite in conformance with the provisions in MDT Standard Specifications.

Sandbag Barrier SC-8





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A sandbag barrier is a temporary linear sediment barrier consisting of stacked sandbags, designed to intercept and slow the flow of sediment-laden sheet flow runoff. Sandbag barriers allow sediment to settle from runoff before water leaves the construction site. Sandbags can also be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (see BMP SC-10, "Storm Drain Inlet Protection") to divert and/or detain flows.

Appropriate Applications

- Along the perimeter of a site.
- Along streams and channels.
- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around stockpiles.
- Across channels to serve as a barrier for utility trenches or provide a temporary channel crossing for construction equipment, to reduce stream impacts.
- Parallel to a roadway to keep sediment off paved areas.
- At the top of slopes to divert roadway runoff away from disturbed slopes.
- To divert or direct flow or create a temporary sediment basin.
- During construction activities in stream beds when the contributing drainage area is less than 2 ha (5 acres).

- When extended construction period limits the use of either silt fences or straw bale barriers.
- Along the perimeter of vehicle and equipment fueling and maintenance areas or chemical storage areas.
- To capture and detain non-storm water flows until proper cleaning operations occur.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.
- To temporarily close or continue broken, damaged or incomplete curbs.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Limit the drainage area upstream of the barrier to 2 ha (5 acres).
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.

Design Guidelines and Considerations

- Bag material and size are shown in the Sand Bag Barrier (SC-8) Detail Drawing.
- Gravel Bag Berm installation is described in the Sand Bag Barrier (SC-8) Detail Drawing.
- When used as a linear control for sediment removal:
    - Install along a level contour.
    - Turn ends of sandbag row up slope to prevent flow around the ends.
    - Generally, sandbag barriers shall be used in conjunction with temporary soil stabilization controls up slope to provide effective control.
- When used for concentrated flows:
    - Stack sandbags to required height using a pyramid approach as shown in the Detailed Drawings.
    - Upper rows of sandbags shall overlap joints in lower rows.
- Construct sandbag barriers with a set-back of at least 1m (3 ft) from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the sandbag

barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

Maintenance, Inspection, and Removal

- Inspect sandbag barriers before predicted and as soon as possible after each storm event, and weekly throughout the construction season.
- Reshape or replace sandbags as needed, or as directed by the Engineer.
- Repair washouts or other damages as needed, or as directed by the Engineer.
- Inspect sandbag barriers for sediment accumulations and remove sediments when accumulation reaches 1/3 the barrier height. Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way in conformance with the Standard Specifications.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area.

SYMBOL: ———— ——SB——

SAND BAG BARRIERS SC-8

A SANDBAG BARRIER IS A TEMPORARY LINEAR SEDIMENTATION BARRIER CONSISTING OF STACKED SANDBAGS, DESIGNED TO INTERCEPT AND SLOW THE FLOW OF SEDIMENT-LADEN SHEET FLOW RUNOFF. SANDBAGS CAN ALSO BE USED WHERE FLOWS ARE MODERATELY CONCENTRATED, SUCH AS DITCHES, SWALES, AND STORM DRAIN INLETS TO DIVERT AND/OR DETAIN FLOWS.

LIMIT THE USE OF SANDBAG BARRIERS TO DRAINAGE AREAS OF 2 ha OR SMALLER. DUE TO THE BAG MATERIAL, SANDBAG BARRIERS HAVE A TENDENCY TO FAIL OVER LONG-TERM PROJECTS.

USE WOVEN POLYPROPYLENE, POLYETHYLENE, OR POLYAMIDE FABRIC OR BURLAP MATERIAL FOR BAGS. BAG MATERIAL IS REQUIRED TO HAVE A MINIMUM UNIT WEIGHT OF 135 g/m², A MULLEN BURST STRENGTH EXCEEDING 2 070 kPa AND AN ULTRAVIOLET STABILIZATION EXCEEDING 70%.

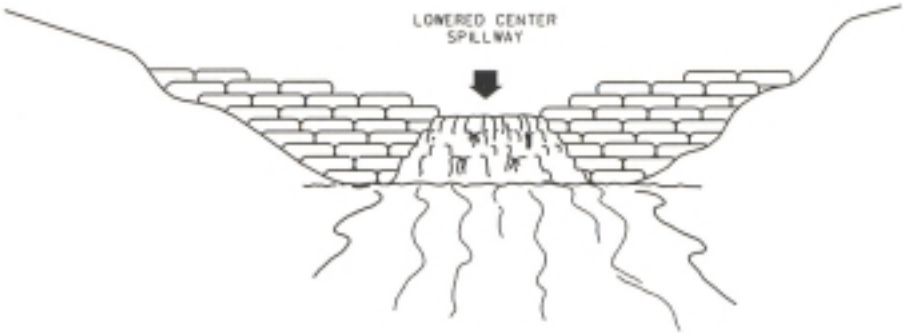
USE SANDBAGS HAVING A LENGTH OF 450 mm, WIDTH OF 300 mm, THICKNESS OF 75 mm, AND A MASS OF APPROXIMATELY 15 kg. ALTERNATIVE BAG SIZES MAY REQUIRE ENGINEER'S APPROVAL PRIOR TO USE.

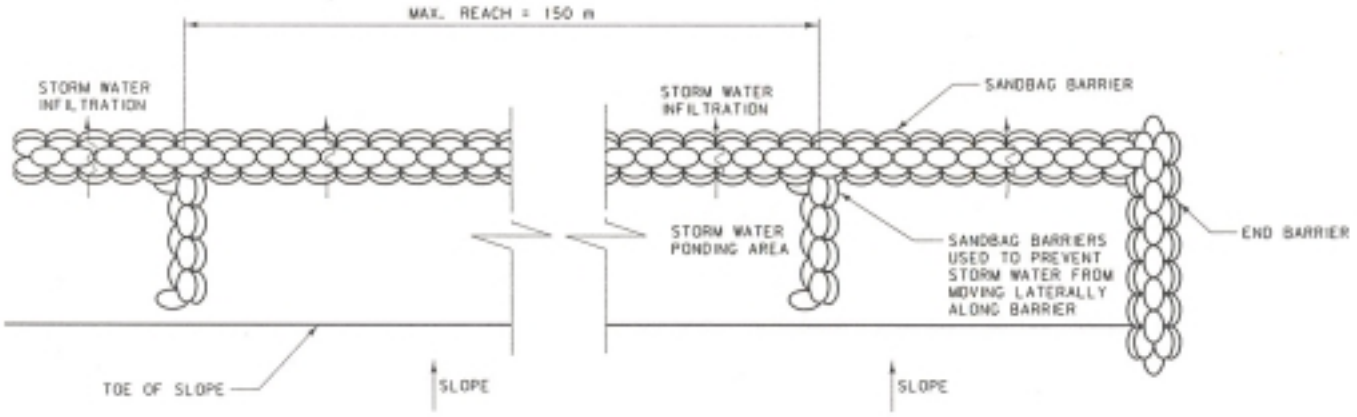
FILL SANDBAGS WITH SAND CONSISTING OF 100% PASSING THE 4.75 mm SCREEN, 50% PASSING THE 2.00 mm SIEVE, AND 20% MAXIMUM PASSING THE 0.075 mm SIEVE. FILL MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER.

WHEN INSTALLING SANDBAG BARRIERS AS LINEAR CONTROL, PLACE BAGS ALONG A LEVEL CONTOUR. UPON ENDING THE SANDBAG RUN, PLACE THE LAST BAGS TO ANGLE UP THE SLOPE SO THAT FLOWS DO NOT ESCAPE AROUND THE END.

WHEN SANDBAG BARRIERS ARE PLACED IN CONCENTRATED FLOWS, STACK SANDBAGS TO HEIGHT USING A PYRAMID APPROACH WITH THE UPPER SANDBAGS OVERLAPPING THE LOWER ROW. THIS APPLICATION MAY NOT BE USED WITHIN THE CLEAR ZONE UNLESS OVERALL HEIGHT IS 150 mm OR LESS.

ALL BAGS PLACED WITHIN THE CLEAR ZONE REQUIRE MEASURES TO PROTECT SAND FROM FREEZING. ALL FREEZE REDUCTION METHODS REQUIRE ENGINEERS APPROVAL PRIOR TO IMPLEMENTATION.



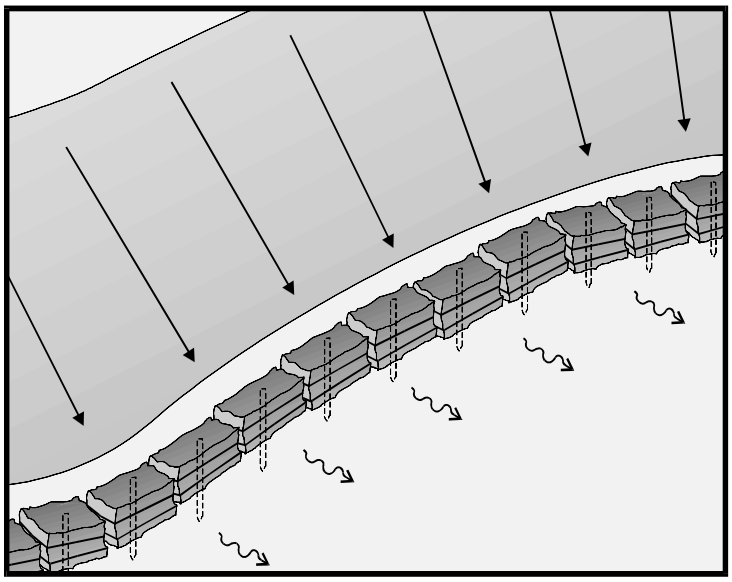


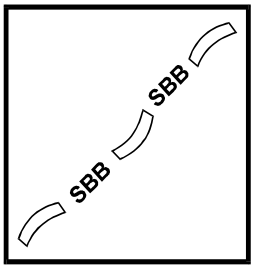
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
SAND BAG BARRIERS (SC-8)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Straw Bale Barriers SC-9





BMP Objectives
- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A straw bale barrier is a temporary linear sediment barrier consisting of straw bales, designed to intercept and slow sediment-laden sheet flow runoff. Straw bale barriers allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

- Along the perimeter of a site.
- Along streams and channels.
- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around stockpiles.
- Across minor swales or ditches with small catchments.
- Around above grade type temporary concrete washouts (See BMP WM-8, “Concrete Waste Management”).
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Don’t use in areas subjected to highly concentrated flows, such as channels or live streams.
- Installation can be labor intensive.

- Straw bale barriers are maintenance intensive.
- Degraded straw bales may fall apart when removed or left in place for extended periods.
- Can not be used on paved surfaces.
- Shall not be used on lined ditches.
- Shall not be used with clear zone limits unless approved by the Engineer.

Design Guidelines and Considerations

- Straw bale materials and size are shown in the Straw Bale Barriers (SC-9) Detail Drawing.
- Straw Bale Barrier installation is described in the Straw Bale Barriers (SC-9) Detail Drawing.
- Limit the drainage area upstream of the barrier to 0.3 ha/100 m (0.75 ac/325 ft) of barrier.
- Limit the slope length draining to the straw bale barrier to 30 m (100 ft).
- Slopes of 50:1 or flatter are preferred. If the slope exceeds 10:1 the length of slope upstream of the barrier must be less than 15 m (50 ft).
- Straw bales shall be installed with two offset lines of bales and embedded to prevent holes between bales and bridging due to undercutting.
- Construct straw bale barriers with a set-back of at least 1 m (3 ft) from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the straw bale barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

Maintenance, Inspection, and Removal

- Inspect straw bale barriers prior to forecasted storm events, as soon as possible after each storm event, and weekly throughout the rainy season.
- Inspect straw bale barriers for sediment accumulations and remove sediments when depth reaches 1/3 the barrier height. Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.
- Replace or repair damage bales as needed or as directed by the Engineer.
- Repair washouts or other damages as needed or as directed by the Engineer.
- Bales can be scattered when their function as a storm water barrier is completed. Accumulated sediment can be removed or seeded and stabilized.

SYMBOL: ——————— ——SBB——

STRAW BALE BARRIERS SC-9:

STRAW BALE BARRIERS ARE A SEDIMENT BARRIER CONSISTING OF ENTRENCHED, OVERLAPPING AND ANCHORED STRAW BALES THAT REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. DO NOT USE STRAW BALE BARRIERS INSIDE THE CLEAR ZONE. STRAW BALES MUST BE CERTIFIED WEED-FREE.

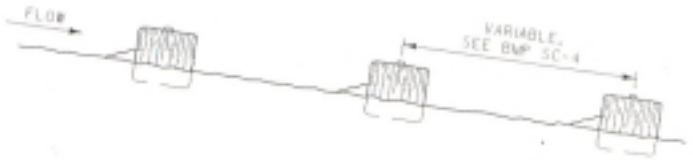
STRAW BALE BARRIERS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. DO NOT USE STRAW BALES IN HIGH FLOWS SUCH AS CHANNELS OR LIVE STREAMS. IN ADDITION, STRAW BALES CAN NOT BE USED ON SURFACE WHICH DO NOT ALLOW FOR ENTRENCHMENT.

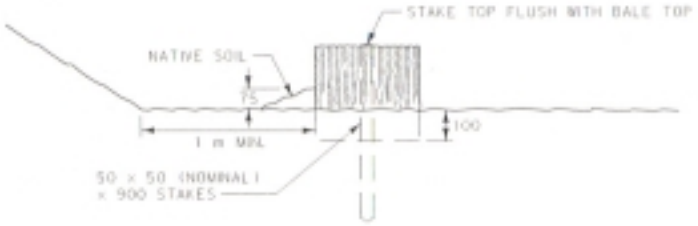
MINIMUM STRAW BALES SIZE REQUIREMENTS ARE A WIDTH OF 360 mm, HEIGHT OF 450 mm, LENGTH OF 900 mm AND A MASS OF 23 kg. USE STEEL WIRE (1.57 mm MIN. DIAMETER), NYLON OR POLYPROPYLENE STRING (2 mm MIN. DIAMETER) TO BIND BALES. MINIMUM BREAKING STRENGTH OF BINDING MATERIAL IS 360 N. USE 50 mm BY 50 mm (NOMINAL) BY 900 mm LONG WOODEN STAKES. DO NOT USE METAL STAKES.

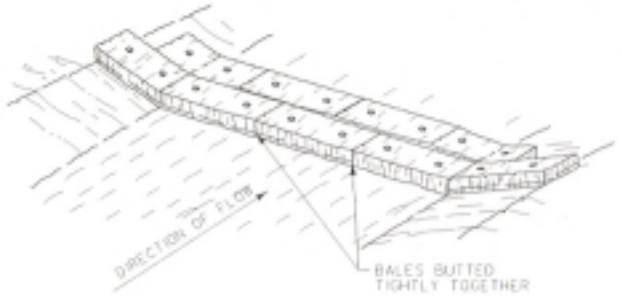
INSTALL STRAW BALES ALONG A LEVEL CONTOUR, WITH THE LAST BALE TURNED UP SLOPE. PLACE BALES IN A 100 mm DEEP TRENCH, TIGHTLY ABUT ADJACENT BALES, AND STAKE USING A MINIMUM OF TWO STAKES PER BALE. IF SLOPES EXCEED 10:1 THE LENGTH OF SLOPE UP STREAM OF THE BARRIER MUST BE LESS THAN 15 m. OFFSET BALES AT LEAST 1 m FROM THE TOE OF SLOPES. IF SITE CONDITIONS DO NOT ALLOW FOR OFFSET, BALES MAY BE PLACED AT TOE.

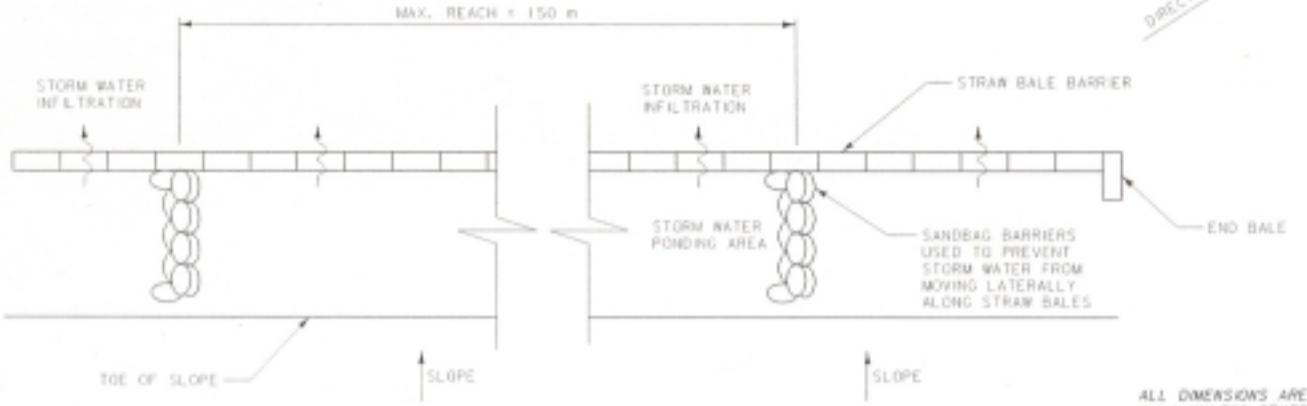
FOLLOW GUIDELINES IN BMP SC-4 IF BALES ARE USED AS CHECK DAMS.

REPAIR OR REPLACE DAMAGED, UNDER-CUT OR END RUN BALES. REMOVE SEDIMENT BUILDUP FROM BALES ONCE IT REACHES A HEIGHT OF 1/3 THE BALE HEIGHT.









ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

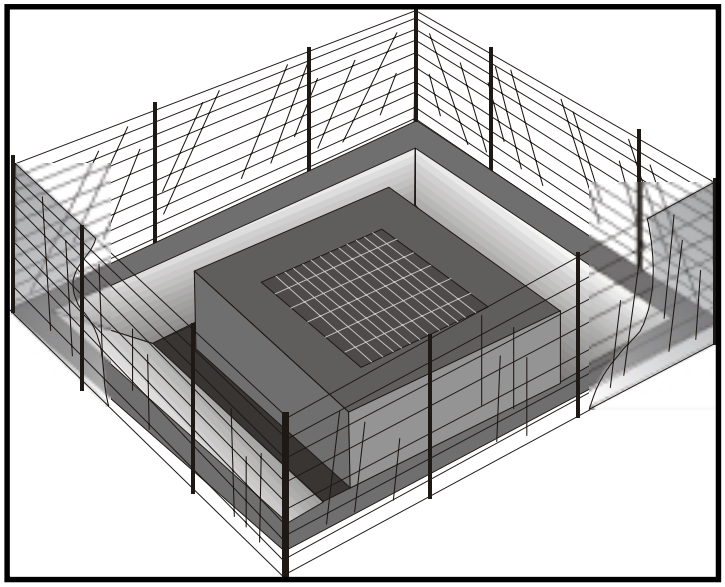
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22

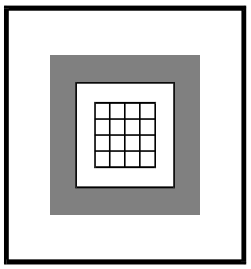
STRAW BALE BARRIERS (SC-9)

EFFECTIVE:

CDM Camp Dresser & McKee Inc.

Storm Drain Inlet Protection SC-10





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Storm Drain Inlet Protection is used at storm drain inlets that are subject to runoff from construction activities to detain and/or to filter sediment-laden runoff to allow sediment to settle and/or to filter sediment prior to discharge of storm water into storm water drainage systems or watercourses.

Appropriate Applications

- Where ponding will not encroach into highway traffic.
- Where sediment laden surface runoff may enter an inlet.
- Where disturbed drainage areas have not yet been permanently stabilized.
- Where the drainage area is 0.4 ha (1 acre) or less.
- Appropriate during wet and snow-melt seasons.

Limitations

- Use only when ponding will not encroach into highway traffic or onto erodible surfaces and slopes. If safety is a concern, use other methods of temporary protection to prevent sediment-laden storm water and non-storm water discharges to enter the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other on-site sediment trapping techniques in conjunction with inlet protection.
- Frequent maintenance is required.

- For drainage areas larger than 0.4 ha (1 acre), runoff shall be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, "Desilting Basin," and SC-3 "Sediment Traps."

- Filter fabric fence inlet protection appropriate in open areas is subject to sheet flow and for flows not exceeding 0.014 m^3/s (0.5 ft^3/s).

- Sandbag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m^3/s (0.5 ft^3/s), and it is necessary to allow for overtopping to prevent flooding.

- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

Design Guidelines and Considerations

- Identify existing and/or planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed, and which method to use.

- The Straw Bale Barrier method materials and installation are described in the Storm Drain Inlet Protection (SC-10) Detail Drawing.

- The Filter Fabric Fence method materials and installation are described in the Storm Drain Inlet Protection (SC-10) Detail Drawing.

- Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.

- Use Sandbag Barriers and Gravel Check Dams for high flows as described in the Storm Drain Inlet Protection (SC-10) Detail Drawing.

- The Sandbag Barrier materials and installation are described in the Storm Drain Inlet Protection (SC-10) Detail Drawing.

- Flow from a severe storm should not overtop the sandbags. In areas of high clay and silts, use filter fabric and gravel as additional filter media.

- The Gravel Check Dam method materials and installation are described in the Storm Drain Inlet Protection (SC-10) Detail Drawing.

Maintenance, Inspection, and Removal

General

- Inspect all inlet protection devices before predicted storm events, as soon as possible after storm events, and weekly during the construction season. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.

- Inspect the storm drain inlet after severe storms to check for bypassed material.

- Remove all inlet protection devices within thirty days after the site is stabilized, or when the inlet protection is no longer needed.

- Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.

- Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

Requirements by Method

Straw Bale Barriers

- Inspect straw bale barriers prior to forecasted storm events, as soon as possible after each storm event, and weekly throughout the rainy season.

- Inspect straw bale barriers for sediment accumulations and remove sediments when depth reaches 1/3 the barrier height. Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

- Replace or repair damage bales as needed or as directed by the Engineer.

- Repair washouts or other damages as needed or as directed by the Engineer.

- Bales can be scattered when their function as a storm water barrier is completed. Accumulated sediment can be removed or seeded and stabilized.

Filter Fabric Fence

- Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.

- Replace or clean the fabric when the fabric becomes clogged with sediment. Make sure the fabric does not have any holes or tears. Repair or replace fabric as needed or as directed by the Engineer.

- At a minimum, remove the sediment behind the fabric fence when accumulation reaches 1/3 the height of the fence or barrier height. Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

Sandbag Barrier

- Inspect bags for holes, gashes, and snags.

- Check sandbags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches 1/3 the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

Gravel Check Dam

- Inspect check dams after each storm event. Repair damage as needed or as required by the Engineer.

- Remove sediments when depth reaches 1/3 of the check dam height.

- Remove accumulated sediment prior to permanent seeding or soil stabilization or seed accumulated sediment to stabilize.

- Remove check dam and accumulated sediment when check dams are no longer needed or when required by the Engineer. Check dams can be left in place following construction activities and allowed to accumulate sediment and vegetation as approved by the Engineer.

- Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

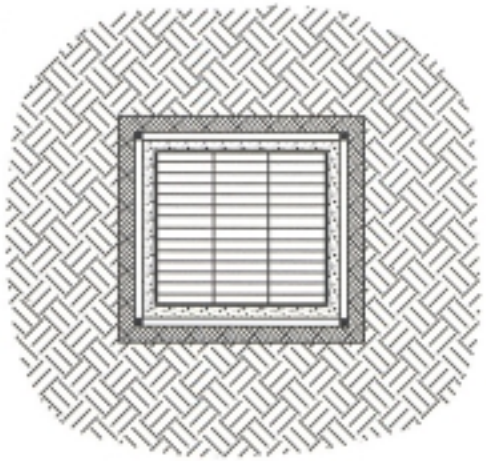
SYMBOL:

STORM DRAIN INLET PROTECTION SC-10:

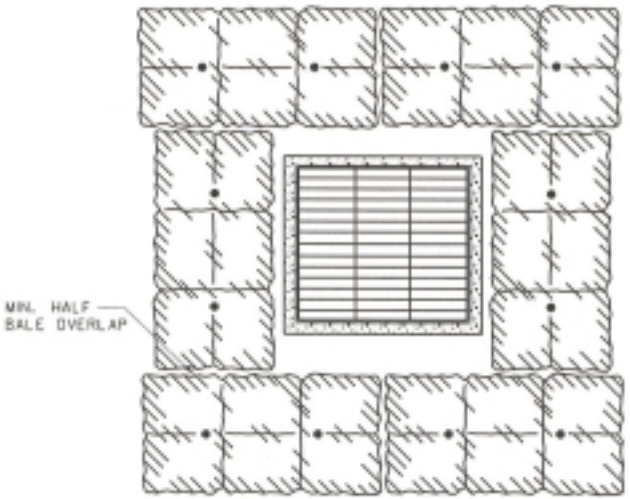
STORM DRAIN INLET PROTECTION IS USED AT STORM DRAIN INLETS THAT ARE SUBJECT TO RUNOFF FROM CONSTRUCTION ACTIVITIES. THESE DEVICES DRAIN AND/OR FILTER SEDIMENT-LADEN RUNOFF AND ALLOW SEDIMENT TO SETTLE PRIOR TO DISCHARGE OF STORM WATER INTO STORM WATER DRAINAGE SYSTEMS OR WATERCOURSES.

USE STORM DRAIN INLET PROTECTION WHEN PONDING WILL NOT ENCROACH INTO HIGHWAY AND FOR DRAINAGE AREAS OF 0.4 ha OR LESS. FOR FLOWS LESS THEN 0.014 m^3/s SILT FENCE OR STRAW BALES MAY BE USED. WHEN FLOWS EXCEED 0.014 m^3/s USE SANDBAG BARRIERS OR GRAVEL CHECK DAMS. FOLLOW SILT FENCE (SC-1), STRAW BALE BARRIERS (SC-9), SANDBAG BARRIERS (SC-8) AND CHECK DAMS (SC-4) FOR INSTALLATION REQUIREMENTS FOR EACH TYPE OF MATERIAL.

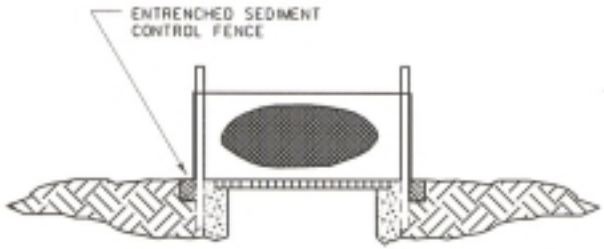
STRAW BALES, SAND BAGS, AND GRAVEL BERMS MAY BE USED WITHIN THE CLEAR ZONE UPON ENGINEERS APPROVAL. EXPEDIENTLY REMOVE ALL STRAW BALES, SAND BAGS, AND GRAVEL BERMS FROM THE CLEAR ZONE UPON COMPLETION OF CONSTRUCTION ACTIVITIES.



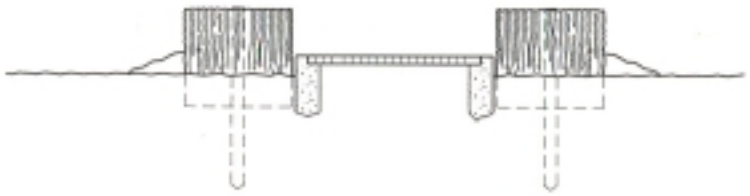
SILT FENCE - PLAN VIEW



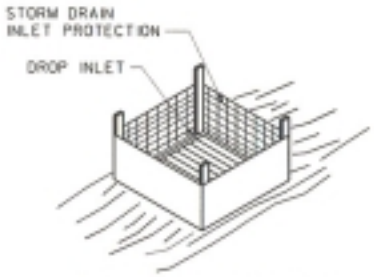
STRAW BALE BARRIER - PLAN VIEW



SILT FENCE - PROFILE VIEW



STRAW BALE BARRIER - PROFILE VIEW



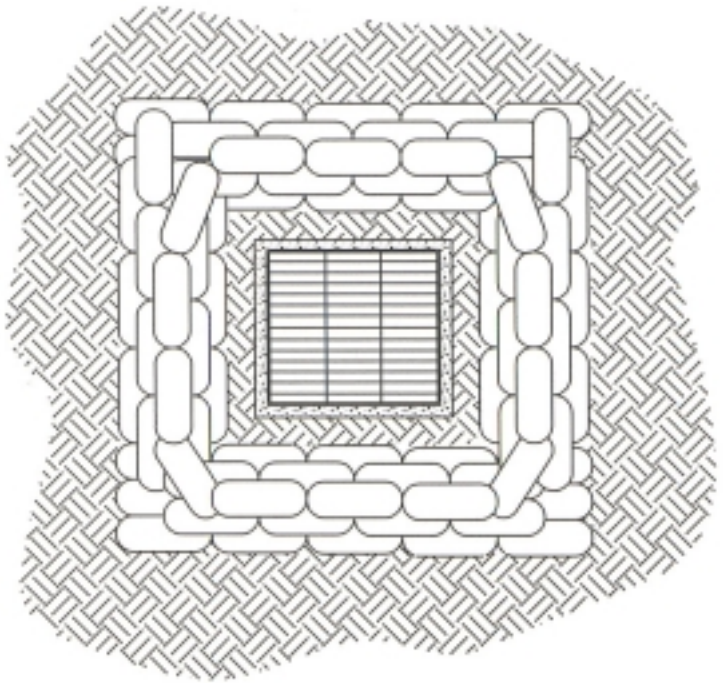
EXAMPLE ISOMETRIC VIEW

ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

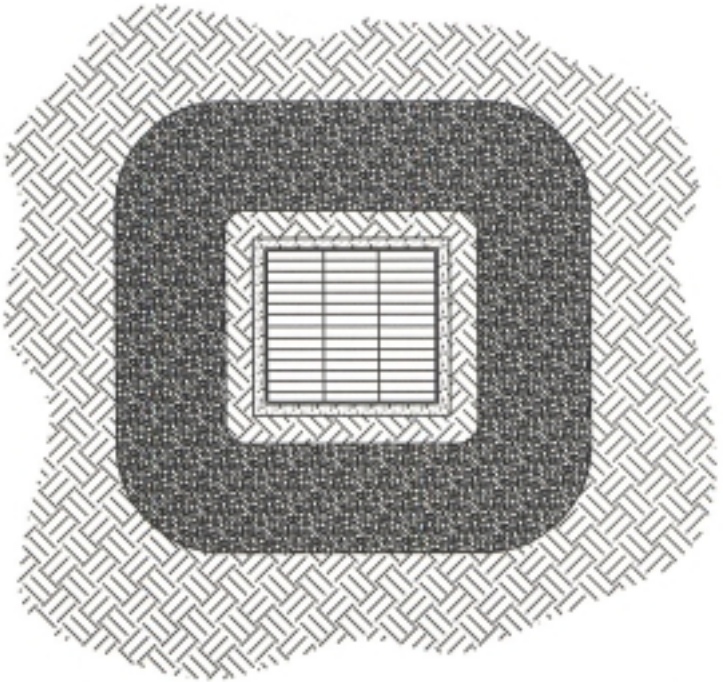
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
STORM DRAIN INLET PROTECTION (SC-10) (SHEET 1)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.



SANDBAG BARRIER - PLAN VIEW



GRAVEL CHECK DAM - PLAN VIEW

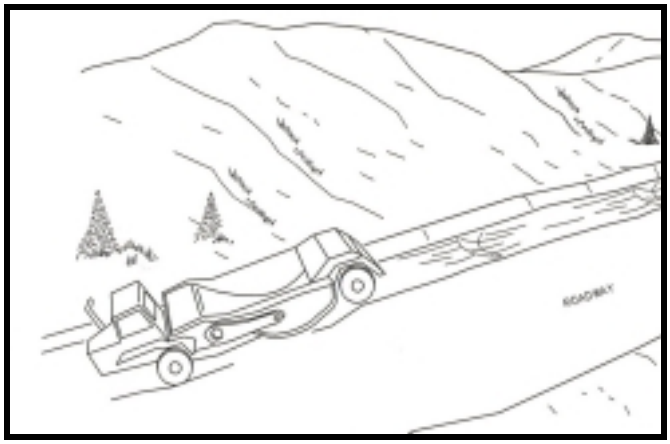
SANDBAG BARRIER - PROFILE VIEW

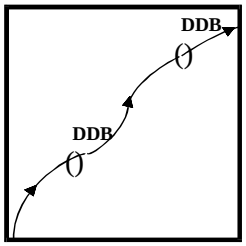
GRAVEL CHECK DAM - PROFILE VIEW

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-??
STORM DRAIN INLET PROTECTION (SC-10) (SHEET 2)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Dugout Ditch Basin SC-11





BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Dugout ditch basins consist of one or a series of small dugout basins located within a flow channel. Dugout ditch basins are used to reduce runoff velocity, promote sediment retention and allow settling within longitudinal roadside ditches in a cut section or as longitudinal sediment retention basins at the toe of fills.

Appropriate Applications

- Dugout ditch basins are used for longitudinal slope steepness (grade) sediment retention. Applications include ditch sediment traps, interceptor ditches, and toe of slope protection.
- The Designer determines the locations requiring ditch sediment traps and the proper placement intervals of the basins.

Limitations

- Not to be used in live streams.
- Not to be placed in channels which are already grass lined unless erosion is expected, as installation may damage vegetation.
- Require maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms.

Design Guidelines and Considerations

- Dugout ditch basins shall be placed at a depth that allows small pools to form in them.
- The maximum height for dugout ditch basins used inside the errant vehicle recovery area is 150 mm (6 in).
- The distance between dugout ditch basins is dependent on the length of ditch section relating to the grade that needs sediment retention. The interval is as follows:

Ditch Slope	Dugout Ditch Basin Spacing
2% to 3%	91 meters
3% to 4%	46 meters
4% +	15 meters

- The dugout ditch basin spacing values are empirical and are the maximal interval distances for a 2 year, 24-hour rain event. Intervals may be shortened at the discretion of the Engineer if soil conditions and/or precipitation indicate a need to do so.

- Dugout ditch basins can remain in place and be seeded during permanent seeding of the ditch.

Maintenance, Inspection, and Removal

- Inspect basins prior to predicted storm events and as soon as possible after each storm event. Repair damage as needed or as required by the Engineer.

- Remove sediments when required by the Engineer.

- Removed sediment shall be incorporated in the project at locations designated by the Engineer or disposed of outside the right-of-way as approved by the Engineer.

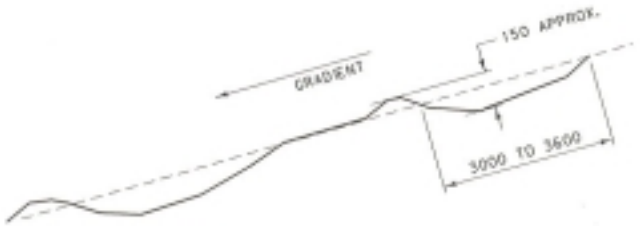
SYMBOL: ——————— ———DDB———

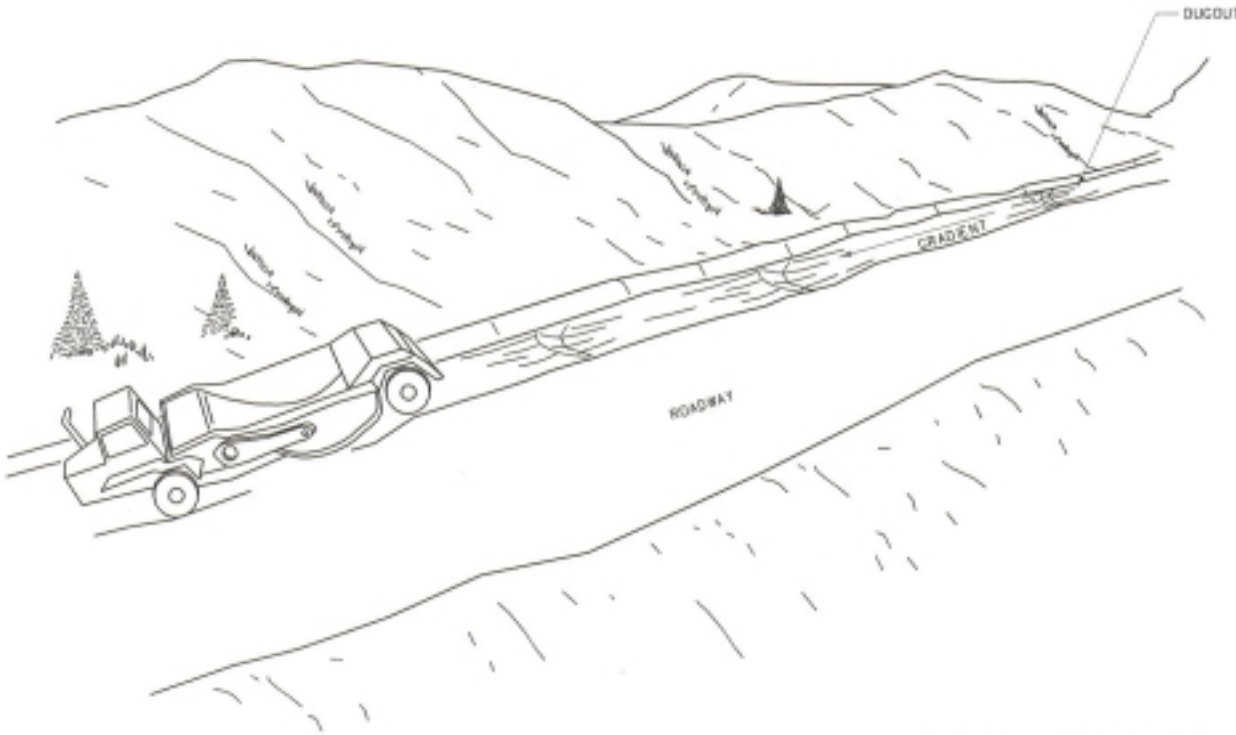
DUGOUT DITCH BASIN SC-111

DUGOUT DITCH BASINS CONSIST OF ONE OR A SERIES OF SMALL DUGOUT BASINS USED FOR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. THE MAXIMUM HEIGHT FOR DUGOUT DITCH BASINS USED INSIDE THE CLEAR ZONE IS 150 mm.

DUGOUT DITCH BASINS ARE USED FOR LONGITUDINAL SLOPE STEEPNESS (GRADE) SEDIMENT RETENTION. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INTERCEPTOR DITCHES AND TOE OF SLOPE PROTECTION. USE IS DEPENDENT ON SOIL TYPE. DISTANCES BETWEEN DUGOUT DITCH BASINS ARE AS FOLLOWS:
- FROM 2% TO 3% PLACE DUGOUT DITCH BASINS AT 90 METER SPACING
- FROM 3% TO 4% PLACE DUGOUT DITCH BASINS AT 45 METER SPACING
- FROM 4% + PLACE DUGOUT DITCH BASINS AT 15 METER SPACING

DUGOUT DITCH BASIN SPACING CAN BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS FOLLOWING ENGINEERS APPROVAL.





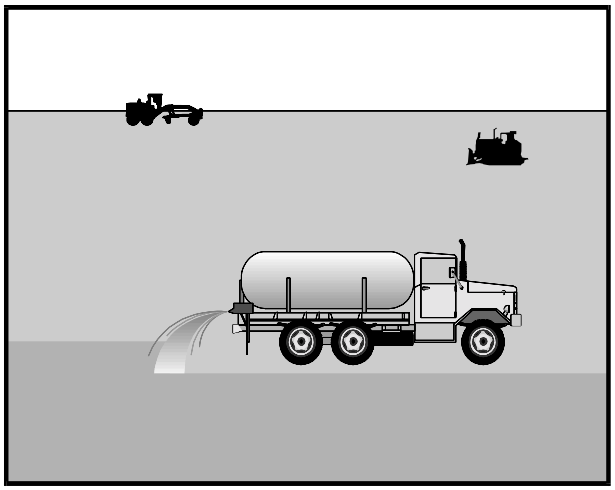
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
DUGOUT DITCH BASIN (SC-111)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Wind Erosion Control WE-1



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Wind erosion control consists of applying water or other dust suppressants as necessary to prevent soil erosion. Most BMPs described in Section 3.1 can also be applied to wind erosion. Several BMPs protect the soil surface like vegetative covers (SS-2, SS-4, and SS-15), buffer or mulch covers (SS-3, SS-6, and SS-8), as well as other control techniques that require periodic applications. These techniques include wet suppressions (i.e. watering, application of surfactants or other additives) and chemical stabilizers that change the physical and chemical characteristics of the surface. Other techniques are: surface roughening (SS-12) and wind barriers like board fences, wind fences, hay bales, crate walls, and similar materials. Stockpiles and other temporary soil structures shall also be protected from wind erosion. Stockpiles can be covered with plastic or fabric and materials can be stored in open ended buildings or storage silos. Work practices can be conducted to prevent soil erosion, like load-in and load-out operations, restricted pile activity, loading and unloading downwind, and minimizing spillage of material, and subsequent spreading of material. All dust controls shall be applied in accordance with MDT Standard Specification.

Appropriate Applications

Wind erosion should be considered for be all exposed soils subject to wind erosion.

Limitations

Effectiveness depends on soil, temperature, humidity, wind velocity, and wind direction.

Design Guidelines and Considerations

- Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution. In the winter months, the amount of water used for dust suppression shall be monitored not to saturated the soil and create other problems, like icing, excess runoff, and mud/dirt carry out.

- All distribution equipment shall be equipped with a positive means of shutoff.

- Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water or dust suppressants.

- If reclaimed wastewater is used, the sources and discharge must meet Montana DEQ water reclamation criteria. Non-potable water shall not be conveyed in tanks or drain pipes that will be used to convey potable water and there shall be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances shall be marked "NON-POTABLE WATER - DO NOT DRINK."

- Materials applied as temporary soil stabilizers and soil binders will also provide wind erosion control benefits. These materials shall be applied at manufacturer's specifications in accordance with all federal, state, local regulations.

Maintenance, Inspection, and Removal

- Check areas protected to ensure coverage.

- Implement requirements of MDT Standard Specifications as appropriate.

- Dust control measures require constant attention. Water may be dispersed on a regular basis depending on weather conditions.

- Special care shall be taken with the storage, handling, and disposal of chemical soil stabilizers, and soil binders. Section 3.7 describes BMPs related to Waste Management and Material Pollution Controls.

- Remove wind fencing and other non-degradable devices when soils are stabilized.

SYMBOL:

WIND EROSION CONTROL WE-1:

WIND EROSION CONTROL CONSISTS OF APPLYING WATER OR OTHER DUST SUPPRESSANTS, ROUGHENING SURFACES OR INSTALLING WIND BARRIERS TO PREVENT WIND EROSION BY PROTECTING SOIL SURFACES OR BY REDUCING WIND VELOCITIES.

WATER SPRAYING:

APPLY BY MEANS OF PRESSURE-TYPE DISTRIBUTORS OR PIPELINES EQUIPPED WITH A SPRAY SYSTEM OR HOSES AND NOZZLES THAT MAY ENSURE EVEN DISTRIBUTION. DO NOT USE EXCESSIVE AMOUNTS OF WATER FOR DUST SUPPRESSION THAT MAY CAUSE SOILS TO BECOME SATURATED AND CREATE OTHER PROBLEMS SUCH AS EXCESS RUNOFF, MUD/DIRT TRACKING OR ICING IN THE WINTER MONTHS. EQUIP ALL DISTRIBUTION SYSTEM WITH A POSITIVE MEANS OF SHUTOFF. UNLESS WATER IS APPLIED BY MEANS OF PIPELINES, AT LEAST ONE MOBILE IS REQUIRED TO BE AVAILABLE AT ALL TIMES ON THE CONSTRUCTION SITE TO APPLY WATER OR DUST SUPPRESSANTS. IF RECLAIMED WASTEWATER IS USED, THE SOURCES AND DISCHARGE MUST MEET MONTANA DEQ WATER RECLAMATION CRITERIA. DO NOT USE NON-POTABLE WATER IN TANKS OR DRAIN PIPES THAT MAY BE USED TO CONVEY POTABLE WATER. DO NOT CONNECT BETWEEN POTABLE AND NON-POTABLE SUPPLIES. MARK ALL NON-POTABLE TANKS, PIPES AND OTHER CONVEYANCES AS "NON-POTABLE WATER - DO NOT DRINK".

DUST SUPPRESSANTS:

MATERIALS APPLIED AS TEMPORARY SOIL STABILIZERS AND SOIL BINDERS MAY ALSO PROVIDE WIND EROSION CONTROL BENEFITS. APPLY THESE MATERIALS PER MANUFACTURE'S SPECIFICATIONS IN ACCORDANCE WITH ALL FEDERAL, STATE, LOCAL REGULATIONS. SEE SS-5 SOIL BINDERS.

CALCIUM CHLORIDE OR OTHER DUST SUPPRESSANTS USED ON ROADWAYS THAT ARE NOT LISTED IN SS-5 MUST MEET MDT SPECIFICATIONS AND/OR BE APPROVED BY THE ENGINEER PRIOR TO USE.

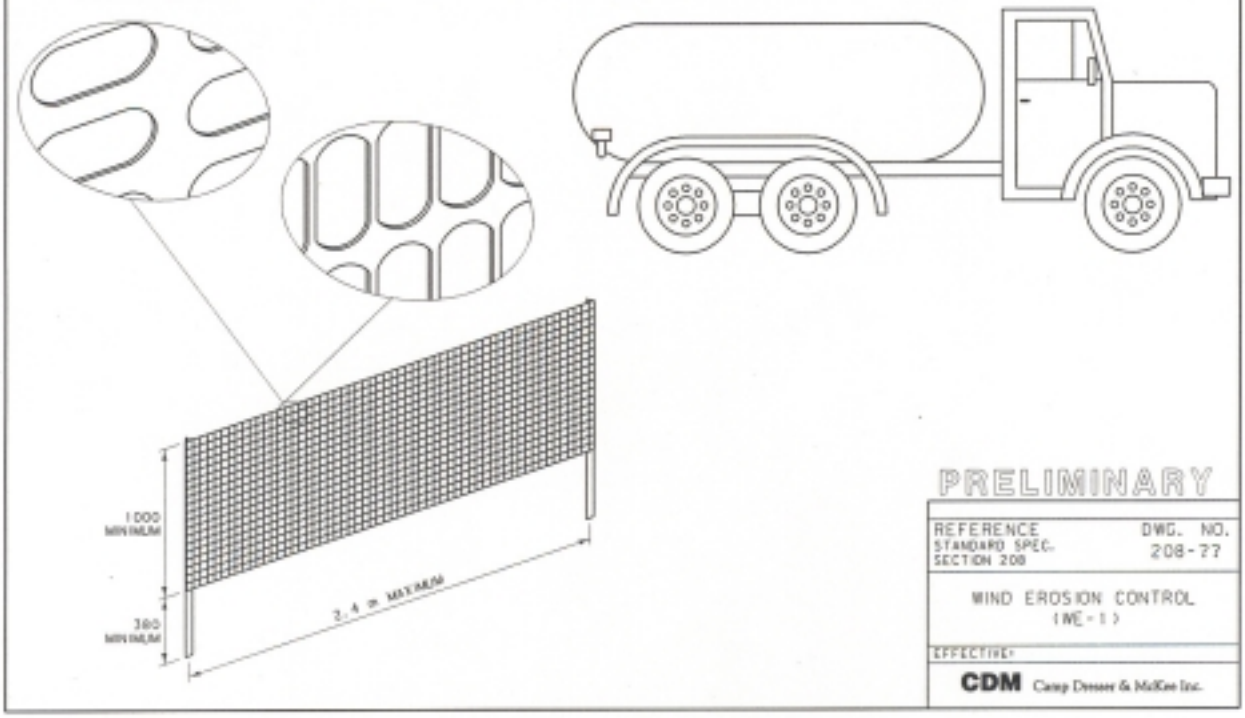
SLOPE ROUGHENING:

REFER TO SLOPE ROUGHENING TECHNIQUES DISCUSSED IN SS-12 SLOPE ROUGHENING.

WIND BARRIERS:

WIND BARRIERS PROVIDE AN AREA OF REDUCED WIND VELOCITY WHICH ALLOWS SETTLING OF LARGE SEDIMENT PARTICLES. MAXIMUM REDUCTION OF WIND VELOCITIES OCCUR IMMEDIATELY DOWNWIND OF THE WIND BARRIER, GRADUALLY DECREASING FURTHER DOWNWIND.

USE TEMPORARY WIND FENCING AS WIND BARRIERS ON CONSTRUCTION SITES. BOARD FENCING, EARTHEN BANKS, STRAW BOWS, ROCK WALLS, OR OTHER TEMPORARY WIND BARRIERS MAY BE UTILIZED AS APPROVED BY THE ENGINEER. WIND FENCING CAUSE WIND VELOCITY TO SLOW DOWN FOR APPROXIMATELY 40-50 TIMES THE FENCE HEIGHT, HOWEVER THE WIND FENCING IS ONLY EFFECTIVE FOR WIND BREAKING FOR APPROXIMATELY 10-25 TIMES THE HEIGHT OF THE FENCE. WIND FENCE IS REQUIRED TO BE A PREFABRICATED COMMERCIAL PRODUCT MADE OF WOVEN, POLYETHYLENE, AND ULTRAVIOLET RESISTANT MATERIAL WITH A POROSITY OF 50% MINIMUM. WIND FENCING IS MOST PROTECTIVE IN A DIRECTION THAT IS PERPENDICULAR TO THE WIND DIRECTION. FOR WIND PROTECTION OF STOCKPILES, PLACE WIND FENCING APPROXIMATELY 3 PILE HEIGHTS UPWIND OF THE STOCKPILE BASE.



PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
WIND EROSION CONTROL (WE-1)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Snow Management SN-1

BMP Objectives
- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Snow management involves the relocation of snow by transporting, plowing, dozing and/or blowing snow to locations where erosion impacts are less likely to occur during melting. This BMP can be used in conjunction with snow fences.

Appropriate Applications

This BMP is appropriate when construction projects extend through winter months and at locations (such as high mountain areas) where snow accumulation can be significant.

Limitation

This BMP may not be appropriate in areas with little snow accumulations and where access is limited.

Design Guidelines and Considerations

- Utilize snow blowers, snowplows, or other equipment to remove snow or move snow to less erosionally sensitive areas with proper drainage.
- Modify existing snowplow operations so snow is not piled in erosionally sensitive areas.
- Remove heavy snow accumulations from around temporary structures such as culverts to minimize ice jamming and structure failure during freeze-thaw cycles.
- Place snow in areas where soil/cover is stable and snowmelt will have a less significant impact.

Maintenance, Inspection, and Removal

- Remove or move snow as needed to reduce melt impacts.
- Inspect snow placement areas during the thaw cycle.

Snow Accumulation Management SN-2

BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

At construction sites, snow can accumulate on disturbed areas and in drainages prior to cover being established. The Snow Barrier BMP involves the installation of snow barriers to reduce the amount of erosion on disturbed areas. Temporary Snow Barriers are most commonly constructed from synthetic materials; however, boards, hay bales, rocks, and other similar materials can be used as well.

Appropriate Applications

In areas where snow drifts of 1.5 to 3 meters (5 to 10 feet) in depth can occur, snow fences can be installed to prevent snow from accumulating on sensitive areas. This practice will minimize erosive snowmelt runoff and ice blockages. Snow fencing can be used in conjunction with Preservation of Existing Vegetation (SS-2) and Wind Erosion Control (WE-1).

Limitation

Snow fences are difficult to install on steep slopes and rocky surfaces. Snow fences may not be cost effective when large areas need to be protected from snow accumulation. Removal at the end of the project is manpower intensive.

Design Guidelines and Considerations

- Install snow barriers adjacent to disturbed areas, perpendicular to the prevailing wind direction, and “upwind” of disturbance area.
- Fences in moderate snow areas should be 1.2 to 1.8 meters (4 to 6 ft) in height. Two or more parallel rows of snow fence may be used in areas of heavy snow accumulations.
- Synthetic fence density (the ratio of the solid area to the area of the fence) should be between 40% and 60%.
- Fences should be placed, if practical, at a distance of 15 to 20 times the fence height from the area to be protected.

Maintenance, Inspection, and Removal

- Inspect snow barrier materials and installation throughout the winter to make sure they are functioning properly.
- Remove snow barriers when the areas to be protected have been stabilized.

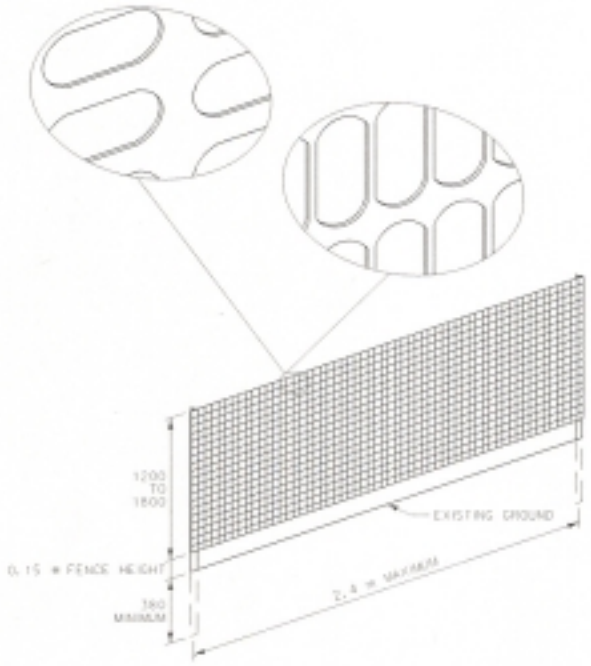
SYMBOLS

SNOW ACCUMULATION MANAGEMENT (SN-21)

SNOW ACCUMULATION BARRIERS PROVIDE AN AREA OF REDUCED WIND VELOCITY WHICH ALLOWS SETTLING OF SNOW. MAXIMUM REDUCTION OF WIND VELOCITIES OCCUR IMMEDIATELY DOWNWIND OF THE SNOW BARRIER, GRADUALLY DECREASING FURTHER DOWNWIND.

SNOW FENCING IS ONLY EFFECTIVE FOR DRIFT CONTROL FOR APPROXIMATELY 15-20 TIMES THE HEIGHT OF THE FENCE. SNOW FENCE IS REQUIRED TO BE A PREFABRICATED COMMERCIAL PRODUCT MADE OF WOVEN, POLYETHYLENE, AND ULTRAVIOLET RESISTANT MATERIAL WITH A POROSITY OF 40-60%. SNOW FENCING IS MOST PROTECTIVE IN A DIRECTION THAT IS PERPENDICULAR TO THE WIND DIRECTION. SEVERAL PARALLEL FENCES CAN BE USED IN AREAS OF HIGH SNOW ACCUMULATION OR HIGH WIND CONDITIONS. SECURE FENCING TO APPROVED POSTS WITH FOLLOWING MANUFACTURE RECOMMENDATIONS.

MAINTAIN SNOW FENCING AS NEED OR AS SPECIFIED BY THE ENGINEER. REMOVE SNOW ACCUMULATIONS FROM FENCING ONCE LEVELS HAVE REACHED THE BOTTOM OF THE FENCE.

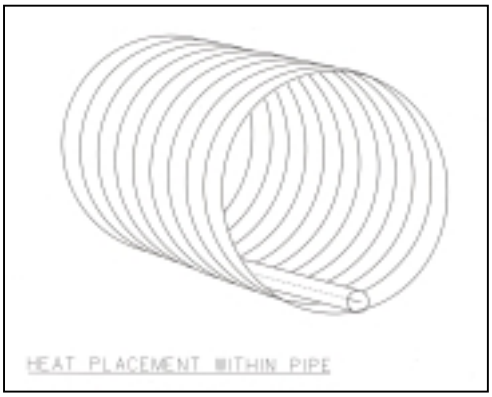


ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
SNOW ACCUMULATION MANAGEMENT (SN-21)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Freeze Reduction SN-3



BMP Objectives
- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Snow and ice accumulations in structures such as ditches and culverts can lead to plugging and subsequently to significant water flows across disturbed areas causing erosion. Frozen culverts can cause water to flow over roadways destabilizing them. Ice blockage in channels can increase water levels in the channels causing flooding and potentially resulting in significant damage. The freeze reduction BMP involves the use of oversized culverts, dual culverts, elevated culvert outlets, and heat trace to reduce the impacts of freezing weather on culvert effectiveness.

Appropriate Applications

Generally, ice blockage occurs during the winter months in Montana and proper slopes and proper installation of standard hydraulic structures reduce freezing. However, in areas where failure could cause significant damage, conservation methods such as the ones described in this BMP may be necessary.

Freeze reduction BMPs are appropriate in areas where heavy frost and snow may cause unacceptable failure, such as at or near environmentally hazardous sites, or in locations where failures could be a health hazard or cause unacceptable problems.

Limitation

Areas with limited access and space to install oversized and/or dual hydraulic structures. Elevated culvert outlets in streams should be avoided if fish migration is a concern. Heat trace may not be appropriate for remote areas with limited access to electricity.

Design Guidelines and Considerations

- Install oversized culverts to allow for some freezing.
- Install dual culverts with one culvert raised higher in elevation than the other culvert. This will allow water passage through the upper culvert if the lower culvert freezes.
- A vertical drop of approximately 0.6 meters (2 feet) at a culvert outlet may reduce water freezing within the culvert.

- Install channel freeze protective measures as shown in the Freeze Reduction (SN-3) Detail Drawing.

Maintenance, Inspection, and Removal

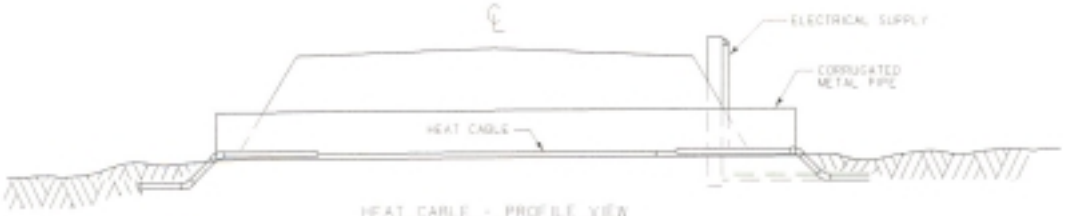
- Inspect temporary structures during freezing conditions and prior to spring thaw to assure that they are properly functioning.
- Disconnect and remove any electrical components when no longer required for freeze reduction.

SYMBOL: ————————

FREEZE REDUCTION SN-51

FREEZE REDUCTION BMPS ARE USED TO ENSURE THAT CRITICAL CULVERTS DO NOT FREEZE DURING THE WINTER MONTHS. USE HEAT TRACE IN CULVERTS TO PREVENT FREEZING. IN ENGINEER APPROVED CONDITIONS A DOUBLE CULVERT SYSTEM MAY BE USED. WITH THIS SYSTEM IF ONE CULVERT FREEZES A SECOND, HIGHER OR LOWER, CULVERT WILL CONTAIN RUNOFF.

ALL ELECTRICAL WORK TO BE COMPLETED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODES AND MDT STANDARD SPECIFICATIONS. HEAT CABLE IS INTENDED FOR CONTINUOUS OPERATION IN THE WINTER AND CAN NOT BE USED TO THAW FROZEN CULVERTS.



HEAT CABLE - PROFILE VIEW

HEAT CABLE - PLAN VIEW

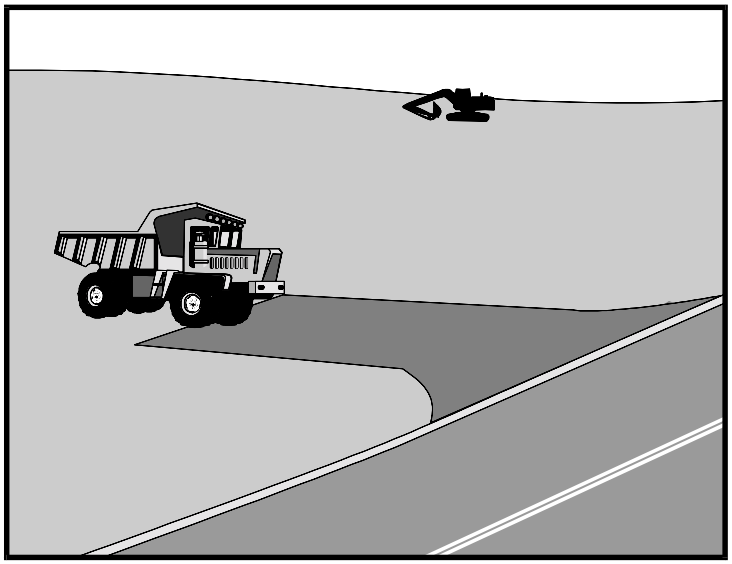
HEAT PLACEMENT WITHIN PIPE

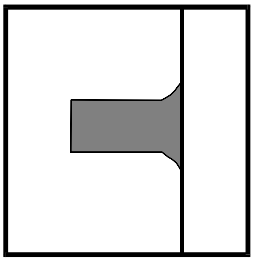
PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-22
FREEZE REDUCTION (SN-51)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Stabilized Construction Entrance/Exit TC-1





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ● Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A stabilized construction access is a defined point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Appropriate Applications

- Use at construction sites:
  - where dirt or mud is tracked onto public roads.
  - adjacent to water bodies.
  - where poor soils are encountered.
  - where dust is a problem during dry weather conditions.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Site conditions will dictate design and need.

Design Guidelines and Considerations

- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.

- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment-trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. The use of asphalt concrete (AC) grindings for stabilized construction access/roadway should be approved by the MDT Environmental Services Bureau.
- Use of constructed or constructed/manufactured steel plates with ribs for entrance/exit access is allowed with written approval of the Engineer.
- Designate combination or single purpose entrances and exits to the construction site. Require all employees, subcontractors and others to use them.

Maintenance, Inspection, and Removal

- Inspect routinely for damage and assess effectiveness of the BMP. Repair if access is clogged with sediment or as directed by the Engineer.
- Keep all temporary roadway ditches clear.

SYMBOL: —————— CELL SCEE

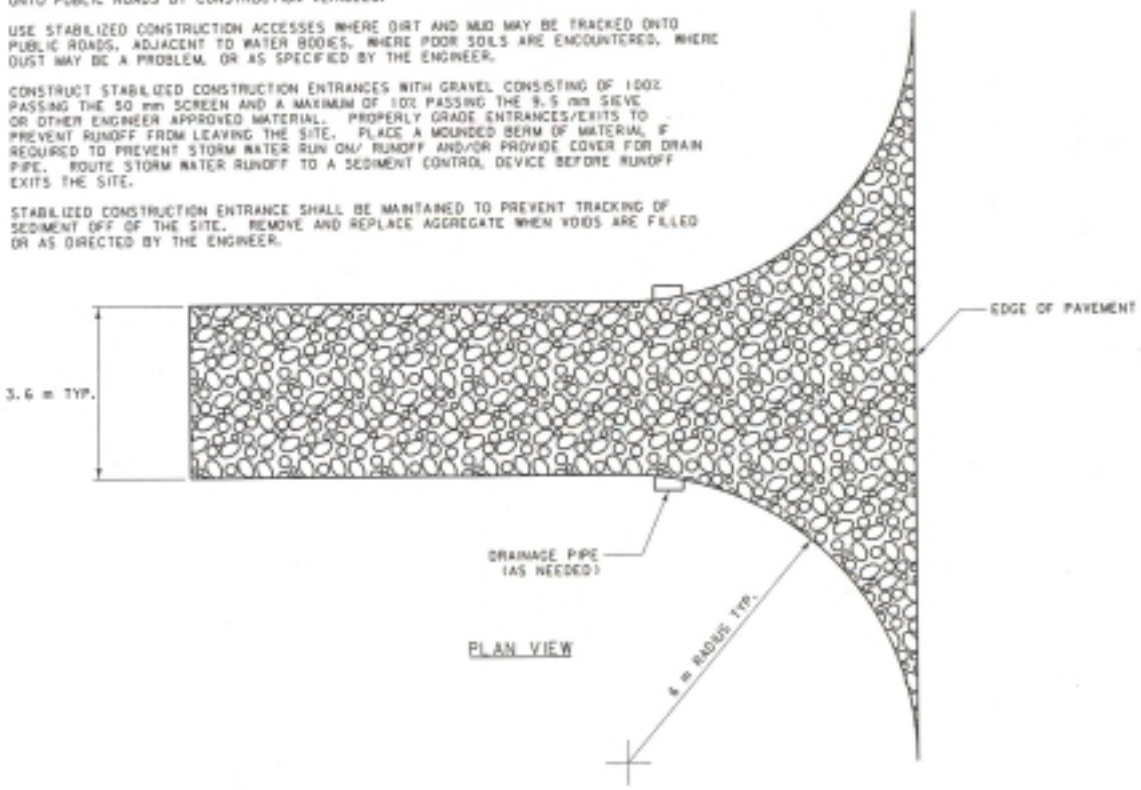
STABILIZED CONSTRUCTION ENTRANCE/EXIT TC-1:

A STABILIZED CONSTRUCTION ACCESS IS A DEFINED POINT OF ENTRANCE/EXIT TO A CONSTRUCTION SITE THAT IS STABILIZED TO REDUCE THE TRACKING OF MUD AND DIRT ONTO PUBLIC ROADS BY CONSTRUCTION VEHICLES.

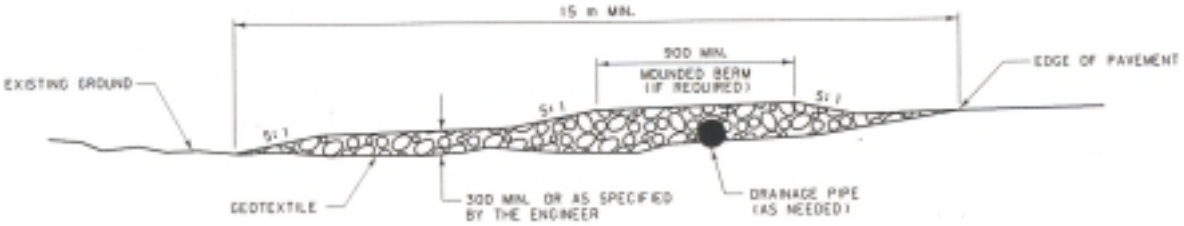
USE STABILIZED CONSTRUCTION ACCESSES WHERE DIRT AND MUD MAY BE TRACKED ONTO PUBLIC ROADS, ADJACENT TO WATER BODIES, WHERE POOR SOILS ARE ENCOUNTERED, WHERE DUST MAY BE A PROBLEM, OR AS SPECIFIED BY THE ENGINEER.

CONSTRUCT STABILIZED CONSTRUCTION ENTRANCES WITH GRAVEL CONSISTING OF 100% PASSING THE 50 mm SCREEN AND A MAXIMUM OF 10% PASSING THE 9.5 mm SIEVE OR OTHER ENGINEER APPROVED MATERIAL. PROPERLY GRADE ENTRANCES/EXITS TO PREVENT RUNOFF FROM LEAVING THE SITE. PLACE A MOUNDED BERM OF MATERIAL IF REQUIRED TO PREVENT STORM WATER RUN ON/ RUNOFF AND/OR PROVIDE COVER FOR DRAIN PIPE. ROUTE STORM WATER RUNOFF TO A SEDIMENT CONTROL DEVICE BEFORE RUNOFF EXITS THE SITE.

STABILIZED CONSTRUCTION ENTRANCE SHALL BE MAINTAINED TO PREVENT TRACKING OF SEDIMENT OFF OF THE SITE. REMOVE AND REPLACE AGGREGATE WHEN VOIDS ARE FILLED OR AS DIRECTED BY THE ENGINEER.



PLAN VIEW



PROFILE VIEW

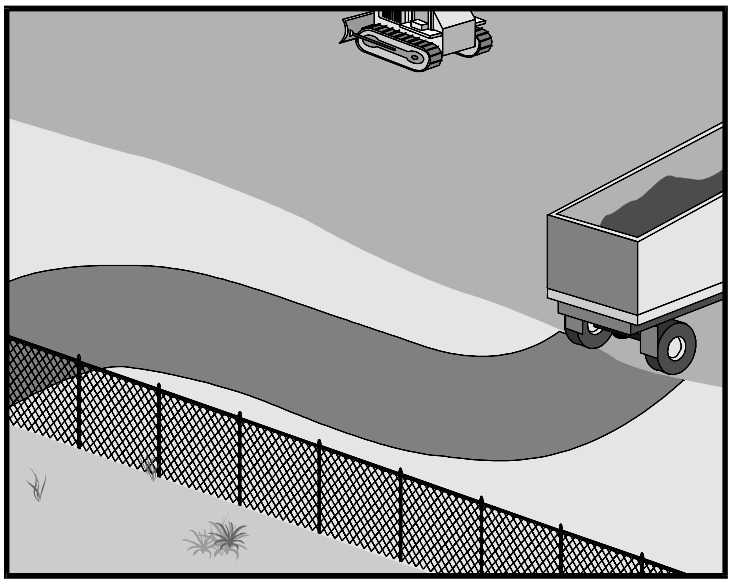
END VIEW

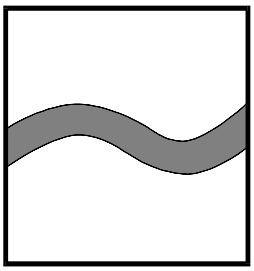
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED.

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-??
STABILIZED CONSTRUCTION ENTRANCE/EXIT (TC-1)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Stabilized Construction Roadway TC-2





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ● Tracking Control
- ● Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A stabilized construction roadway is a temporary access road connecting existing public roads to a remote construction area. It is designed for the control of dust and erosion created by vehicular tracking.

Appropriate Applications

- Construction roadways and short-term detour roads:
  - Where mud tracking is a problem during wet weather.
  - Where dust is a problem during dry weather.
  - Adjacent to water bodies.
  - Where poor soils are encountered.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Materials will likely need to be removed prior to final project grading and stabilization.
- Site conditions will dictate design and need.
- May not be applicable to very short duration projects.
- Limit speed of vehicles to control dust.

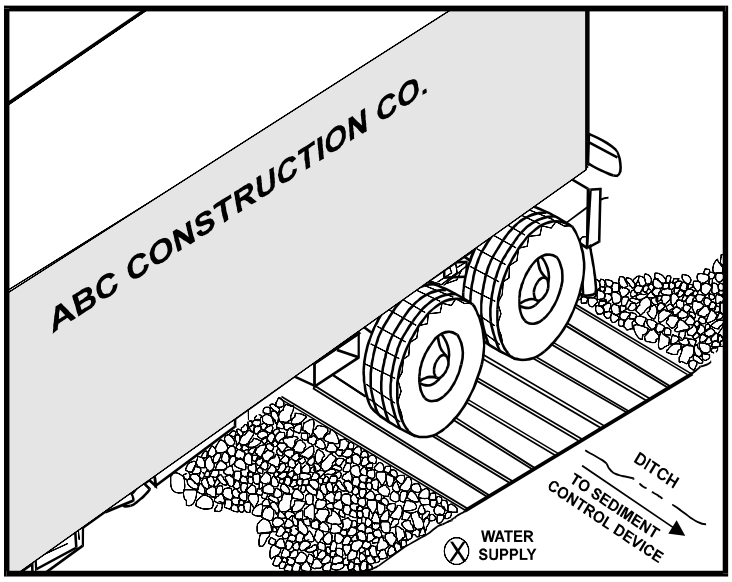
Design Guidelines and Considerations

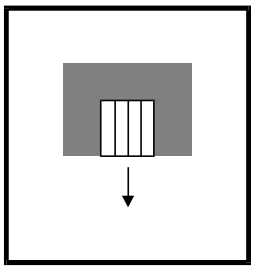
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.
- Stabilize roadway, using aggregate, AC, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or AC grindings for stabilized construction roadway should be approved by the MDT Environmental Services Bureau.
- Coordinate materials with those used for stabilized construction entrance/exit points.

Maintenance, Inspection, and Removal

- Inspect routinely for damage and repair as needed, or as directed by the Engineer.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

Entrance/Outlet Tire Wash TC-3





BMP Objectives
- ● Soil Stabilization
- ● Sediment Control
- ● Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriage, and to prevent sediment from being transported onto public roadways.

Appropriate Applications

- Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Engineer.

Limitations

- Requires a supply of wash water.
- Requires a turnout or doublewide exit in order to keep entering vehicles from having to drive through the wash area.

Design Guidelines and Considerations

- Incorporate with a stabilized construction entrance/exit. See BMP TC-1, "Stabilized Construction Entrance/Exit."
- Construct on level ground when possible, on a pad of coarse aggregate, greater than 75 mm (3 in) but smaller than 150 mm (6 in).
- Wash rack shall be designed and constructed/manufactured for anticipated traffic loads.

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment sump device. The drainage ditch shall be of sufficient grade, width, and depth to carry the wash runoff.

- Require that all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages use the wash facility.

- Constructed/Manufactured steel-ribbed plates may be used in lieu of rock.

Maintenance, Inspection, and Removal

- Remove accumulated sediment in wash rack and/or sediment sump to maintain system performance.

- Inspect routinely for damage and repair as needed.

SYMBOL: ———————— CELL EOTW

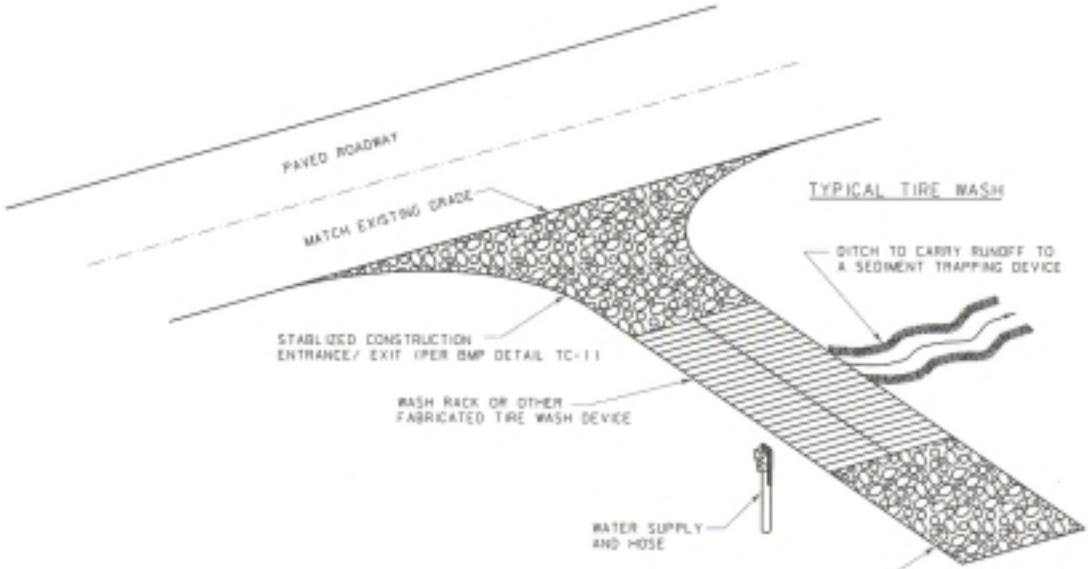
ENTRANCE/OUTLET TIRE WASH TC-3I

A TIRE WASH IS AN AREA LOCATED AT A STABILIZED CONSTRUCTION ACCESS POINT WHERE PRESSURIZED WATER IS USED TO REMOVE SEDIMENT FROM TIRES AND UNDERCARRIAGE, AND TO PREVENT SEDIMENT FROM BEING TRANSPORTED ONTO PUBLIC ROADWAYS.

TIRE WASHES ARE MEANT TO BE USED ON A PROJECT-BY-PROJECT BASIS AND REQUIRES APPROVAL BY THE ENGINEER. THESE DEVICES REQUIRE A SUPPLY OF WASH WATER AND MAY REQUIRE A TURNOUT OR DOUBLE WIDE ACCESS.

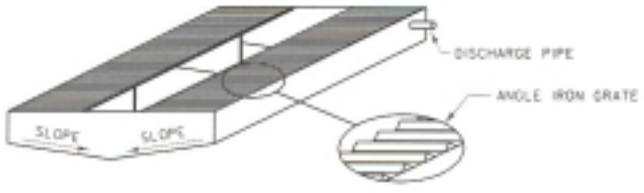
FOLLOW BMP TC-1 FOR STABILIZED CONSTRUCTION ENTRANCES/EXITS. PROVIDE WASH RACK SUITABLE FOR SUPPORTING TRAFFIC LOADS. DIRECT WASH WATER FROM THE RACK, THROUGH A DRAINAGE DITCH, TO A SEDIMENT TRAP DEVICE. ENGINEERS APPROVAL IS REQUIRED PRIOR TO CONSTRUCTION.

TIRE WASH DEVICES OTHER THEN THOSE SHOWN MAY BE USED AS APPROVED BY THE ENGINEER.



TYPICAL TIRE WASH

STEEL GRATE WASH RACK



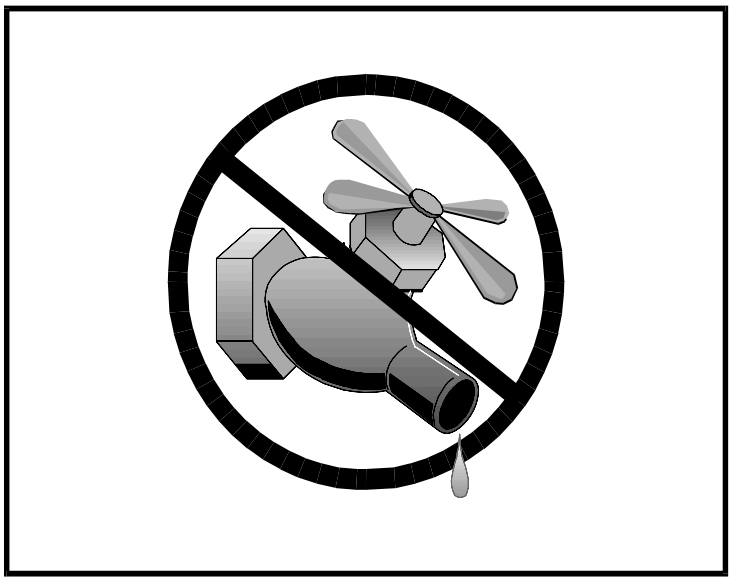
SELF-CONTAINED STEEL TIRE WASH

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
ENTRANCE/OUTLET TIRE WASH (TC-3)	
EFFECTIVE:	

CDM Camp Dresser & McKee Inc.

Water Conservation Practices NS-1



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and/or the transport of pollutants off site.

Appropriate Applications

- Water conservation practices are implemented wherever water is used.
- Applies to all construction projects.

Limitations

- None identified.

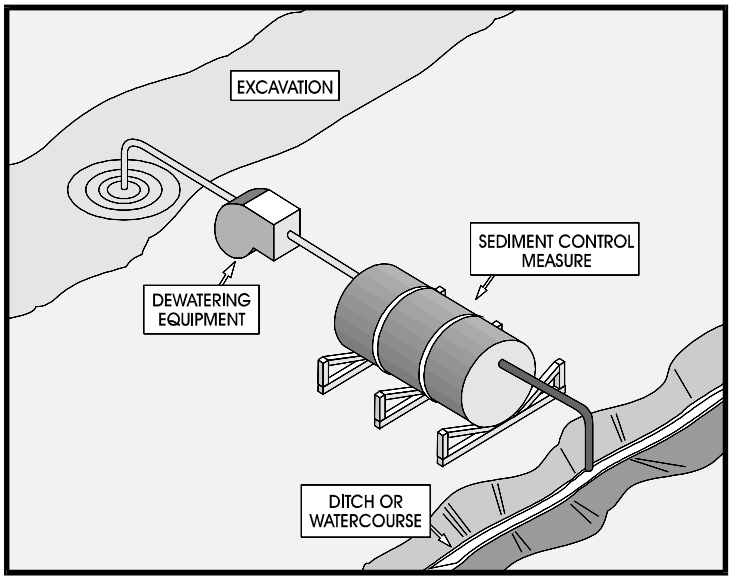
Design Guidelines and Considerations

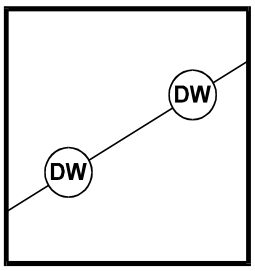
- Keep water equipment in good working condition.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. Paved areas shall be swept and vacuumed.
- Direct construction water runoff to areas where it can soak into the ground.
- Apply water for dust control in accordance with MDT Standard Specifications.

Maintenance, Inspection and Removal

- Inspect water equipment at least weekly.

Dewatering Operations NS-2





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Dewatering operations are practices that manage the discharge of pollutants from groundwater and accumulated precipitation dewatering operations. All appropriate State and Federal permits are required. Permits to be completed by the MDT Environmental Services Bureau.

Appropriate Applications

These practices are implemented where groundwater or accumulated precipitation will be discharged from a construction site. Controlling sediment from dewatering operations is required on all projects that pump sediment-laden water from work areas and plan to discharge the pumped water into a conveyance system or water body. Dewatering discharges include but are not limited to:

- Removal of uncontaminated groundwater.
- Removal of accumulated rainwater from work areas.
- Removing water from cofferdams or diversions.

Limitations

- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this BMP address sediment only. If the presence of polluted water is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water to be removed by dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Engineer and comply with MDT Standard Specifications.

- The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Dewatering operations will require, and must comply with, applicable local permits.
- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.

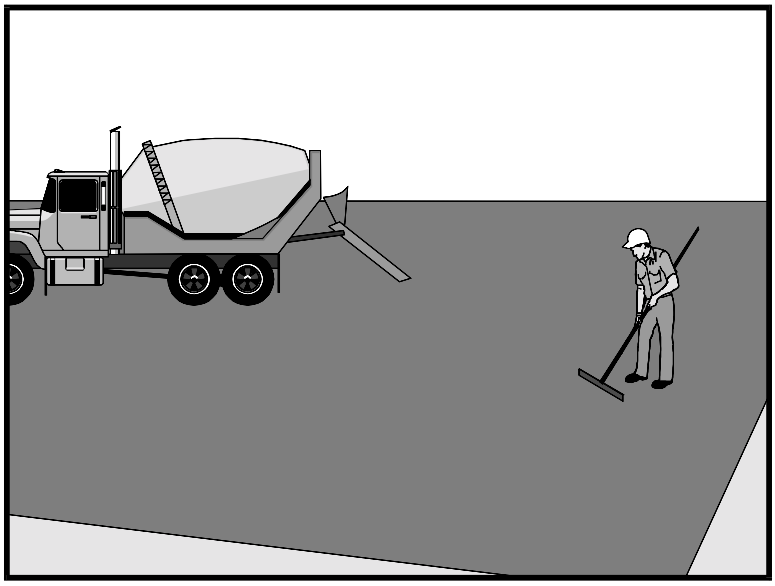
Design Guidelines and Considerations

- Contractor shall notify the Engineer of planned discharges.
- The Engineer will coordinate monitoring and permit compliance.
- Discharges must comply with regional and watershed-specific discharge requirements.
- Ensure that dewatering discharges do not cause erosion at the discharge point.
- Sediment Control Treatment: Dewatering effluent (groundwater and accumulated precipitation) that is laden with suspended solids shall be treated by a device designed to remove soil particles down to 0.02 mm (0.0008 in) in size. Desilting basins (see BMP SC-2) and sediment traps (see BMP SC-3) are examples of temporary treatment devices; these devices shall be designed according to the respective BMPs.
- A filtration device may be substituted for a desilting basin or sediment trap if the Contractor can demonstrate, to the Engineer's satisfaction, that the filtration device provides equivalent or greater removal of suspended solids than the basin.
- Filter bags may be used for small-scale dewatering operations.

Maintenance, Inspection, and Removal

- Prior to completion of permit application, notify MDT's Environmental Services Bureau to perform testing requirements and complete necessary paper work for the permit.
- Inspect filtering device frequently and repair or replace once the sediment build-up prevents the structure from functioning as designed.
- Accumulated suspended solids removed from a dewatering device shall be spread on the project site and stabilized at locations designated by the Engineer, or shall be disposed of outside the right-of-way in conformance with the MDT Standard Specifications.

Paving and Grinding Operations NS-3



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Procedures that minimize pollution of storm water runoff during paving operations, including new paving and preparation of existing paved surfaces for overlays.

Appropriate Applications

These procedures are implemented where paving, surfacing, resurfacing, or saw cutting, may pollute storm water runoff or discharge to the storm drain system or watercourses.

Limitations

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Design Guidelines and Considerations

- Substances used to coat asphalt transport trucks and asphalt trucks and asphalt spreading equipment shall not contain soap and shall be non-foaming and non-toxic.
- Place drip pans or absorbent materials under paving equipment while not in use, to catch and/or contain drips and leaks. See also BMP WM-10, “Liquid Waste Management”.
- When paving involves asphaltic concrete (AC), the following steps shall be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - Minimize the washing of sand or gravel from new asphalt into storm drains, streets, and creeks by sweeping where practical.
  - Old or spilled asphalt must be disposed as approved by the Engineer.

- AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drains or watercourses. Apply temporary perimeter controls until structure is stabilized or permanent controls are in place. Examples of temporary perimeter controls can be found in the following BMPs: SS-10, "Earth Dikes/Drainage Swales & Ditches"; SC-1, "Silt Fence"; or SC-5, "Fiber Rolls".

- Collect and remove all broken asphalt and recycle when practical; otherwise, dispose in accordance with MDT Standard Specification.

- Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 0.3 m (1 ft) of material.

- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.

- Drainage inlet structures and manholes shall be covered with filter fabric during application of seal coat, tack coat, slurry seal, and/or fog seal.

- Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall is predicted to occur during the application or curing period.

- Clean asphalt coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in BMP WM-5, "Solid Waste Management". Any cleaning on site shall follow BMP NS-8, "Vehicle and Equipment Cleaning".

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile, or dispose of properly.

- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in BMP WM-08, "Concrete Waste Management", or pump the water to the sanitary sewer if allowed by the local wastewater authority.

- Do not allow saw-cut Portland Concrete Cement Pavement (PCCP) slurry to enter storm drains or watercourses. Residue from grinding operations shall be picked up by means of a vacuum attachment to the grinding machine, shall not be allowed to flow across the pavement, and shall not be left on the surface of the pavement. See also BMP WM-8, "Concrete Waste Management" and BMP WM-10, "Liquid Waste Management".

Pavement Grinding and Removal

- Collect material that was excavated by mechanical or manual methods. This material may be recycled if approved by the Engineer for use as shoulder backing or base material at locations approved by the Engineer.

- If digout material cannot be recycled, transport the material back to a maintenance facility or approved storage site.

- Digout activities shall not be conducted in the rain.

- When approved by the Engineer, stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses.

- Disposal of PCCP and AC waste shall be in conformance with MDT Standard Specifications. See also BMP WM-8, "Concrete Waste Management".

Thermoplastic Striping

- All thermoplastic striper and pre-heater equipment shutoff valves shall be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the storm water drainage system, or watercourses.

- The pre-heater shall be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave 150 mm (6 in) of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.

- Contractor shall not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.

- Clean truck beds daily of loose debris and melted thermoplastic. When possible recycle thermoplastic material. Thermoplastic waste shall be disposed of in accordance with MDT Standard Specifications.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the storm water drainage system or watercourses.

- Melting tanks shall be loaded with care and not filled to beyond 150 mm (6 in) from the top to leave room for splashing when vehicle is deadheaded.

- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.

- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

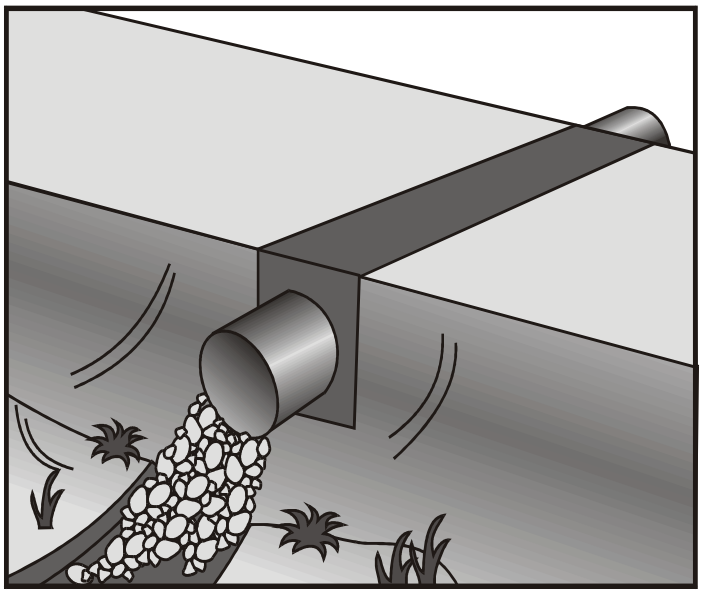
- Waste shall be disposed of in accordance with MDT Standard Specifications.

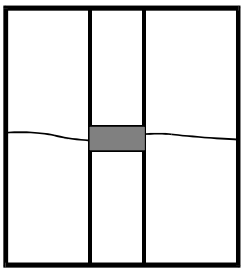
Maintenance, Inspection, and Removal

- Inspect and maintain machinery regularly to minimize leaks and drips.

- Ensure that employees and subcontractors are implementing appropriate measures during paving operations.

Temporary Stream Crossing NS-4





BMP Objectives

- ● Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A temporary stream crossing is a structure placed across a waterway, which allows vehicles to cross the waterway during construction without entering the water, eliminating erosion and downstream sedimentation caused by the vehicles. All appropriate State and Federal permits are required. Permits to be completed by the MDT Environmental Services Bureau.

Appropriate Applications

Temporary stream crossings are installed at sites:

- Where appropriate permits have been secured.
- Where construction equipment or vehicles need to frequently cross a waterway.
- When alternate access routes impose significant constraints.
- When crossing perennial streams or waterways causes significant erosion.
- Where construction activities will not last longer than one year.

Limitations

- Will usually disturb the waterway during installation and removal.
- Requires appropriate State and Federal permits. Permits to be completed by the MDT Environmental Services Bureau.
- Installation may require dewatering or temporary diversion of the stream. See BMP NS-2, “Dewatering Operations”.

- May become a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.

Design Guidelines and Considerations

General Considerations

Location of the temporary stream crossing shall address:

- Site selection where erosion potential is low.
- Areas where the side slopes from highway runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings shall be considered:

- Culverts - Used on perennial and intermittent streams.
- Fords - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams. Avoid use on perennial streams.
- Bridges - Appropriate for streams with high flow velocities, steep gradients and/or where temporary restrictions in the channel are not allowed.

Design and installation requires knowledge of stream flows and soil strength. Designs shall be prepared under direction of, and approved by, a registered civil and/or structural engineer. Both hydraulic and construction loading requirements shall be considered with the following:

- Comply with the requirements for culvert and bridge crossings, as contained in the MDT Hydraulics, Bridge and Road Design Manuals, particularly if the temporary stream crossing will remain through the rainy season.
- Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor shall be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.
- Install sediment traps immediately downstream of crossings to capture sediments. See BMP SC-3, “Sediment Trap”.
- Avoid oil or other potentially hazardous waste materials for surface treatment.

Construction Considerations

- Stabilize construction roadways, adjacent work area and stream bottom against erosion.
- Construct during dry periods to minimize stream disturbance and reduce costs.
- Construct at or near the natural elevation of the streambed to prevent potential flooding upstream of the crossing.

- Vehicles and equipment shall not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed, except as authorized by the Engineer, as necessary to complete the work.

- Temporary water body crossings and encroachments shall be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments shall be clean, rounded river cobble.

- The exterior of vehicles and equipment that will encroach on the water body within the project shall be power washed to remove residues.

- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.

- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.

- Any temporary artificial obstruction placed within flowing water shall only be built from material, such as clean gravel or sandbags, which will cause little or no siltation.

- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Conceptual temporary stream crossings are shown in the Detailed Drawings.

Specific Considerations

- Culverts are relatively easy to construct and able to support heavy equipment loads.

- Fords are the least expensive of the crossings, with maximum load limits.

- Temporary fords are not appropriate if construction will continue through rainy season, if thunderstorms are likely, or if the stream is perennial.

- Bridges are generally more expensive to design and construct, but provides the least disturbance of the streambed and constriction of the waterway flows.

Maintenance, Inspection, and Removal

Maintenance provisions shall include:

- Periodic removal of silt behind fords, in culverts, and under bridges.

- Replacement of lost aggregate from inlets and outlets of culverts.

- Removal of temporary crossing promptly when it is no longer needed.

Inspection shall, at a minimum, occur weekly and after each significant rainfall, and include:

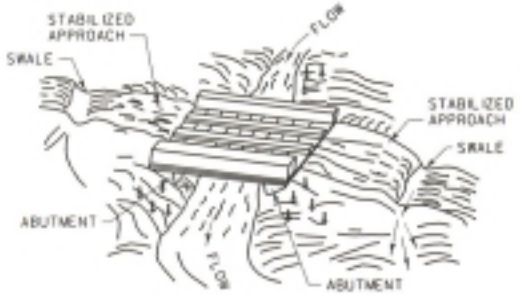
- Checking for blockage in the channel, sediment buildup in culverts or behind fords, or trapped debris.
- Checking for erosion of abutments, channel scour, riprap displacement, or piping in the soil.
- Checking for structural weakening of the temporary crossing, such as cracks, and undermining of foundations and abutments.

SYMBOL:

TEMPORARY STREAM CROSSINGS NS-4:

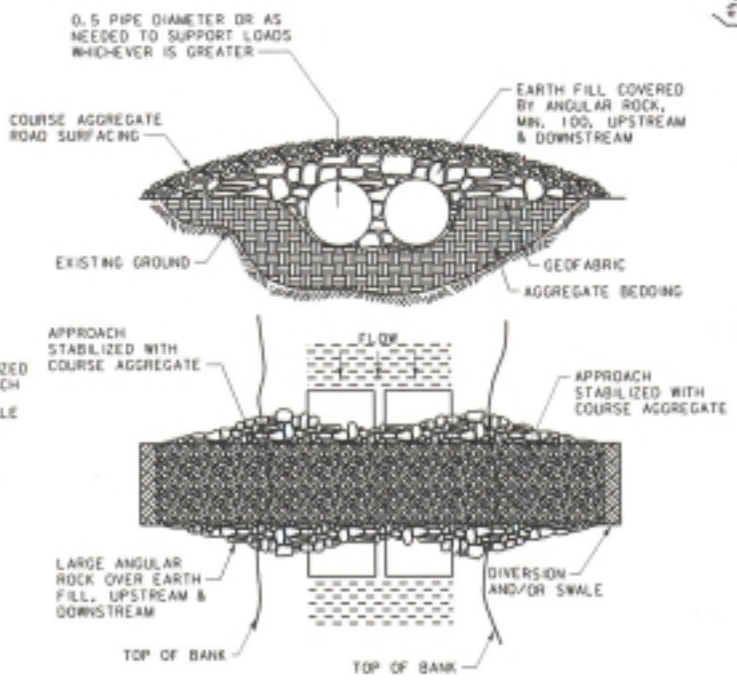
A TEMPORARY STREAM CROSSING IS A STRUCTURE PLACED ACROSS A WATERWAY THAT ALLOWS VEHICLES AND/OR HEAVY EQUIPMENT TO CROSS THE WATERWAY DURING CONSTRUCTION. THE STREAM CROSSINGS PROTECT THE STREAM BANKS AND CHANNELS FROM DAMAGE CAUSED BY VEHICLE MOVEMENT WHICH RELEASES SEDIMENT.

TEMPORARY STREAM CROSSINGS CAN CONSIST OF BRIDGES, CULVERTS OR FORDS. FOLLOW STREAM CROSSING GUIDELINES PROVIDED IN THE MDT/FWP TASK FORCE RECOMMENDATIONS REPORT. TEMPORARY STREAM CROSSINGS REQUIRE THE ACQUISITION OF SPECIAL PERMITS.

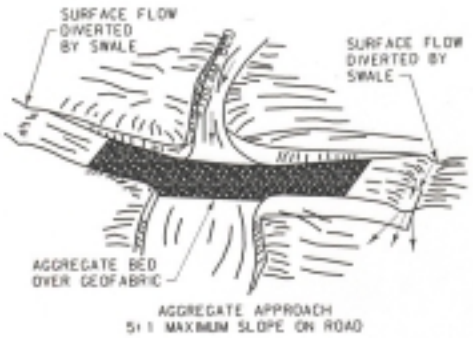


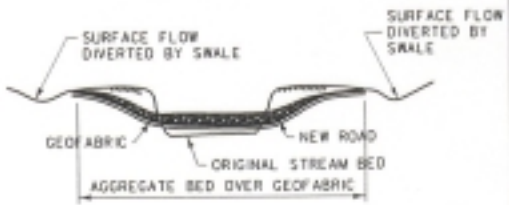
NOTE:
SURFACE FLOW OF ROAD DIVERTED BY SWALE AND/OR DIKE

TYPICAL BRIDGE CROSSING



TYPICAL CULVERT CROSSING



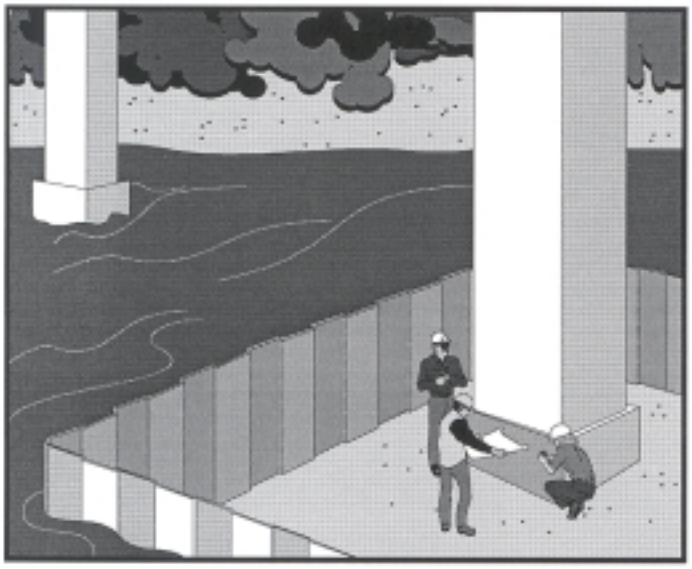


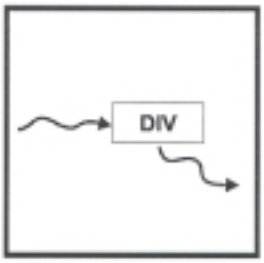
TYPICAL FORD CROSSING

PRELIMINARY

REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-77
TEMPORARY STREAM CROSSINGS (NS-4)	
EFFECTIVE:	
CDM Camp Dresser & McKee Inc.	

Clear Water Diversion NS-5





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project site, transport it around the site, and discharge it downstream with minimal water quality degradation for either the project construction operations or the construction of the diversion. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, drainage, and interceptor swales.

Appropriate Applications

Implemented where appropriate permits have been secured and work must be performed in a running stream or water body.

Limitations

- Diversion/encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Specific permit requirements or mitigation measures, such as the U.S. Army Corps of Engineers, Montana Department of Fish and Game, Federal Emergency Management Agency (FEMA), DEQ, etc. may be included in contract documents because of clear water diversion/encroachment activities.
- Diversion/encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts.

Design Guidelines and Considerations

General

- Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams shall be held to a minimum.

- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.

- Heavy equipment driven in wet portions of a water body to accomplish work shall be completely clean of petroleum residue, and water levels are below the gear boxes of the equipment in use, or lubricants and fuels are sealed such that inundation by water shall not result in leaks.

- Mechanical equipment operated in the water shall not be submerged to a point above any axle of said mechanical equipment.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of an excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe shall not enter water covered portions of a water body, except as necessary to cross the stream to access the work site.

- Stationary equipment, such as motors and pumps, located within or adjacent to a water body shall be positioned over drip pans.

- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water shall, at all times, be allowed to pass downstream to maintain aquatic life downstream.

- The exterior of vehicles and equipment that will encroach on a water body within the project shall be power washed to remove residues.

- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.

- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.

- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Where possible, avoid or minimize diversion/encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. See also the project special provisions for scheduling requirements. Scheduling shall also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil. If sandbags are used, they shall be filled with clean materials free of silt, clay, and organic substances.

Temporary Diversions/Encroachments

- Construct diversion channels in accordance with BMP SS-9, "Earth Dikes/Drainage Swales, and Ditches".

- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with BMP SS-7, "Geotextiles, Mats/Plastic Covers and Erosion Control Blankets", or, use rock slope protection, as described in MDT Standard Specifications

- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment/slope protection, or other temporary soil stabilization methods.

- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also BMP SS-10, "Outlet Protection/Velocity Dissipation Devices".

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment settling device, such as a portable tank or settling basin, before returning water to the water body. See also BMP NS-2, "Dewatering Operations".

- If the presence of polluted water or sediment is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water or sediment to be removed while dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Engineer and comply with MDT Standard Specifications.

- Any substance used to assemble or maintain diversion structures, such as form oil, shall be non-toxic and non-hazardous.

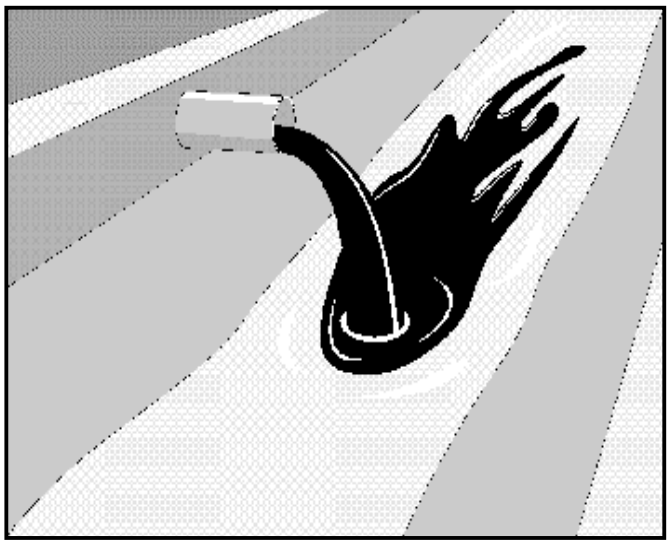
- Any material used to minimize seepage underneath diversion structures, such as grout, shall be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Maintenance, Inspection, and Removal

- Inspect diversion/encroachment structures before and after significant storms, and at least once per week while in service.

- Inspect embankments and diversion channels before and after significant storms, and at least once per week while in service for damage to the linings, accumulating debris, sediment buildup, and weakening of the slope protection. Remove debris and repair linings and slope protection as required.

Illicit Connection/Illegal Discharge Detection and Reporting NS-6



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents to the Engineer.

Appropriate Applications

- Illicit connection/illegal discharge detection and reporting is applicable anytime an illicit discharge is discovered or illegally dumped material is found on the construction site.
- This BMP applies to all construction projects.

Limitations

- Unlabeled or non-identifiable material shall be assumed to be hazardous.
- Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor.
- Procedures and practices presented in this BMP are general. Contractor shall use extreme caution, immediately notify the Engineer when illicit connections or illegal dumping or discharges are discovered, and take no further action unless directed by the Engineer.
- If pre existing hazardous materials or wastes are known to exist on site, the contractor's responsibility will be detailed in separate special provisions.

Design Guidelines and Considerations

Planning

- Inspect site before beginning the job for evidence of illicit connections or illegal dumping or discharges.

- Inspect site regularly during project execution for evidence of illicit connections or illegal dumping or discharges.

- Observe site perimeter for evidence or potential of illicitly discharged or illegally dumped material, which may enter the job site.

- Identification of illicit connections and illegal dumping or discharges.

- Solids - Look for debris or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

- Liquids - signs of illegal liquid dumping or discharge can include:

    - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils.

    - Pungent odors coming from the drainage systems.

    - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.

    - Abnormal water flow during the dry weather season.

- Urban Areas - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

    - Abnormal water flow during the dry weather season.

    - Unusual flows in sub drain systems used for dewatering.

    - Pungent odors coming from the drainage systems.

    - Discoloration or oily substances in the water or stains and residues detained within ditches, channels, or drain boxes.

    - Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.

- Rural Areas - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

    - Abnormal water flow during the dry weather season.

- Non-standard junction structures.

- Broken concrete or other disturbances at or near junction structures.

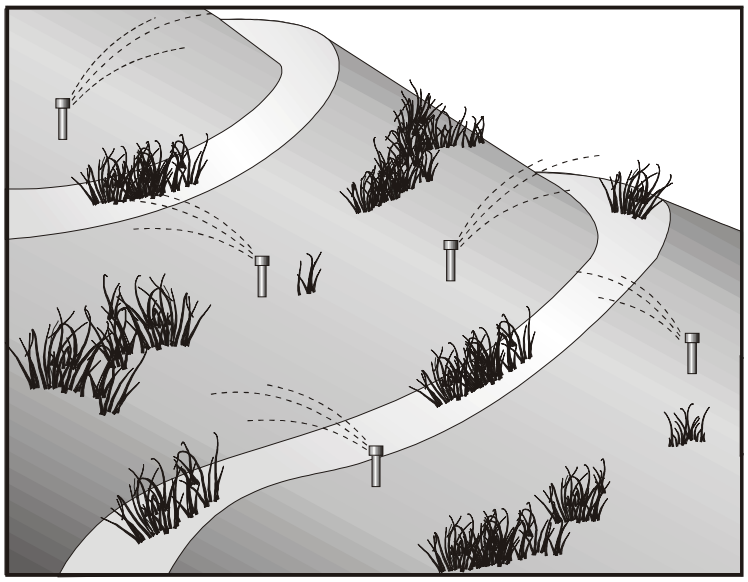
Reporting

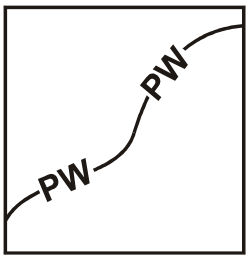
- Notify the Engineer of any illicit connections and illegal dumping or discharge incidents at the time of discovery. The Engineer will notify MDT Environmental Services Bureau for reporting.

Cleanup and Removal

- The contractor is not responsible for investigation and clean up of illicit or illegal dumping or discharges not generated by the Contractor. MDT may direct Contractor to clean up non-hazardous dumped or discharged material on the construction site.

Potable Water/Irrigation NS-7





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Potable Water/Irrigation consists of practices and procedures to reduce the possibility for the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Appropriate Applications

Implement this BMP whenever the above activities or discharges occur at or enter a construction site.

Limitations

None identified.

Design Guidelines and Considerations

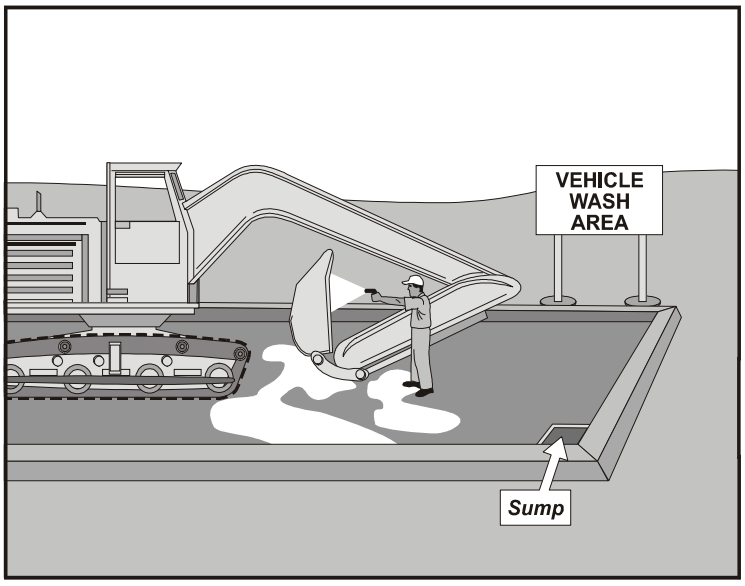
- Where possible, direct water from off-site sources around or through a construction site in a way that minimizes contact with the construction site.
- When possible, discharges from water line flushing shall be reused for landscaping purposes.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream storm water drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to

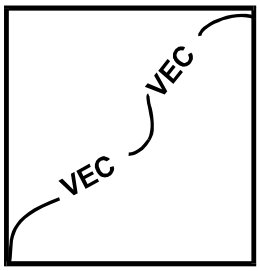
minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Maintenance, Inspection, and Removal

- Repair broken water lines as soon as possible or as directed by the Engineer.

Vehicle and Equipment Cleaning NS-8





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Procedures and practices used to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain system or to watercourses.

Appropriate Applications

These procedures are applied on all construction sites where vehicle and equipment cleaning is performed.

Limitations

None.

Design Guidelines and Considerations

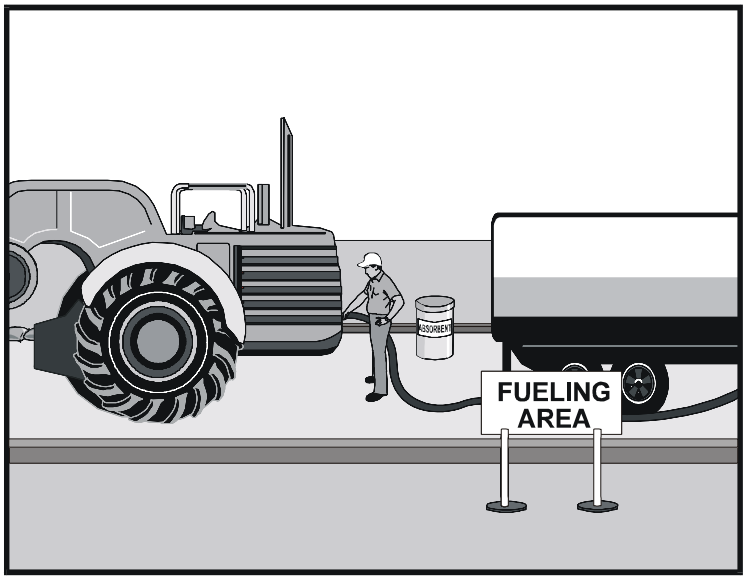
- On-site vehicle and equipment washing is discouraged.
- Cleaning of vehicles and equipment with soap, solvents, or steam shall not occur on the project site unless the Engineer has been notified in advance and the resulting wastes are fully contained and disposed of outside the right-of-way in conformance with the provisions in MDT Standard Specifications. Resulting wastes shall not be discharged or buried within the right-of-way.
- Vehicle and equipment wash water shall be contained for percolation or evaporative drying away from storm drain inlets or watercourses and shall not be discharged within the right-of-way.
- All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.

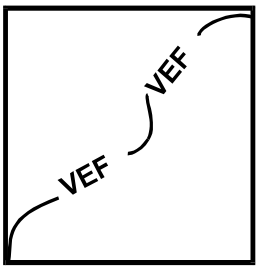
- When vehicle/equipment washing/cleaning must occur on-site and the operation can be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the following characteristics, and shall be arranged with the construction storm water coordinator:
    - Located away from storm drain inlets, drainage facilities, or watercourses.
    - Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff.
    - Configured with a sump to allow collection and disposal of wash water.
    - Wash waters shall not be discharged to storm drains or watercourses.
    - Used only when necessary.
- When cleaning vehicles/equipment with water:
    - Use as little water as possible. High-pressure sprayers may use less water than a hose, and shall be considered.
    - Use positive shutoff valve to minimize water usage.

Maintenance, Inspection, and Removal

- The control measure shall be inspected at a minimum of once a week.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed or as directed by the Engineer.

Vehicle and Equipment Fueling NS-9





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of fuel spills and leaks into the storm drain system or to watercourses.

Appropriate Applications

These procedures are applied on all construction sites where vehicle and equipment fueling takes place.

Limitations

- On-site vehicle and equipment fueling shall only be used where it's impractical to send vehicles and equipment off-site for fueling.

Design Guidelines and Considerations

- When fueling must occur on-site, the contractor shall select and designate an area to be used, subject to approval of the Engineer.
- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
- Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.

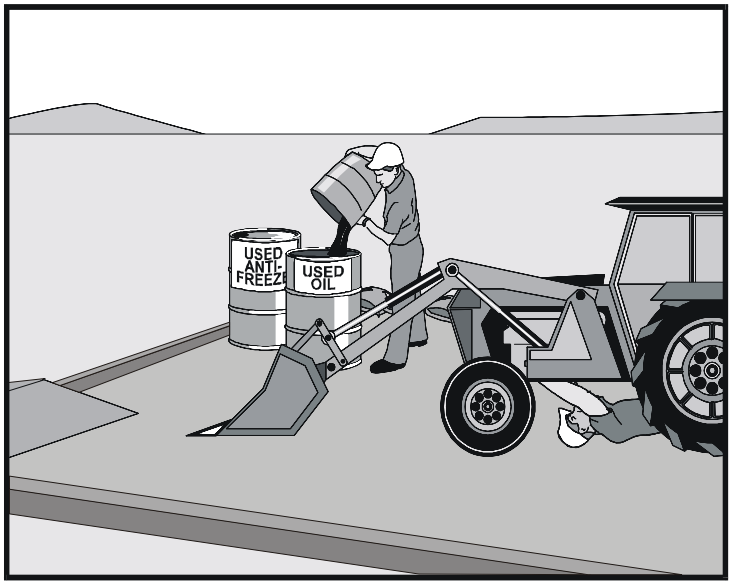
- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.
- Fuel tanks shall not be "topped-off."
- Vehicles and equipment shall be inspected each day of use for leaks. Leaks shall be repaired immediately, or problem vehicles or equipment shall be removed from the project site.
- Absorbent materials shall be used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks.
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.

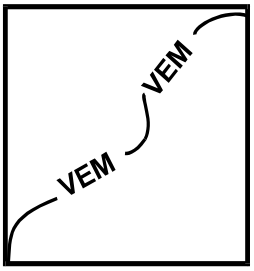
Maintenance, Inspection, and Removal

- Fueling areas and storage tanks shall be inspected on a regular basis.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

Vehicle and Equipment Maintenance

NS-10





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of pollutants to the storm drain system or to watercourses from vehicle and equipment maintenance procedures.

Appropriate Applications

These procedures are applied on all construction projects where an on-site yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

None identified.

Design Guidelines and Considerations

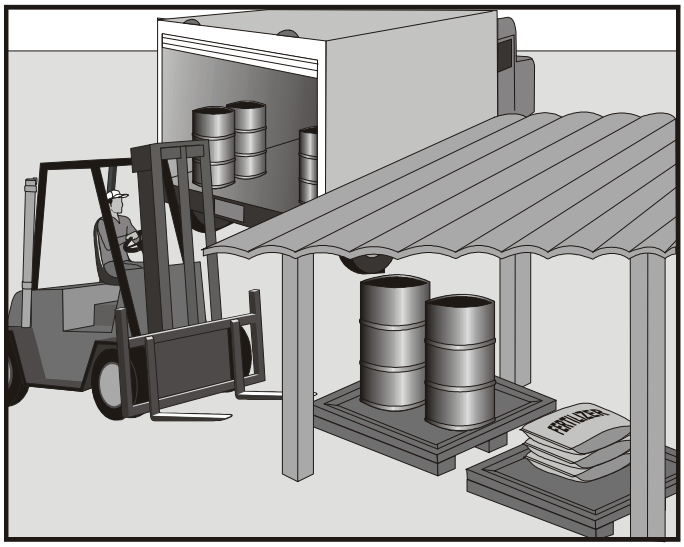
- Drip pans or absorbent pads shall be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Dedicated maintenance areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses.
- Drip Pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use. Substances used to coat asphalt transport trucks and asphalt-spreading equipment shall be non-toxic. Drainage inlet structures and manholes shall be covered with filter fabric when seal coat, tack coat, slurry seal, or fog seal is applied to adjacent surfaces. Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall or thunderstorms are predicted to occur during the application or curing period.
- Use off-site maintenance facilities whenever practical.
- For long-term projects, consider using portable tents or covers over maintenance areas.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.
- Repair leaks of fluids and oil immediately.
- Provide spill containment dikes or secondary containment around stored oil and chemical drums.

Maintenance, Inspection, and Removal

- Maintain waste fluid containers in leak proof condition.
- Vehicle and equipment maintenance areas shall be inspected regularly.
- Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately or the problem vehicle(s) or equipment shall be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

Material Delivery and Storage WM-1



MS

BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

Procedures and practices for the proper handling and storage of materials in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

Appropriate Applications

These procedures are implemented at all construction sites with delivery and storage of the following:

- Soil
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds must meet building and fire code requirements.

Design Guidelines and Considerations

General

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage area shall be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) shall be supplied to the Engineer for all materials stored.

Material Storage Areas and Practices

Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be handled in conformance with the following provisions:

- Storage, preparation, and mixing shall be accomplished in temporary containment facilities. Each temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers therein and shall be impervious to the materials contained therein for a minimum contact time of 72 hours.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- To provide protection from wind and rain, throughout the rainy season, temporary containment facilities shall be covered during non working days and prior to rain events.
- Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
- Liquid materials, petroleum products, and substances listed in 40 CFR Parts 110, 117 or 302 shall be stored in approved containers and drums shall not be overfilled. Containers shall be placed in temporary containment facilities for storage.
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.
- Stockpiles shall be protected in accordance with BMP WM-3, “Stockpile Management”.

- Minimize the material inventory stored on-site (e.g., only a few days supply).
- Store materials indoors within existing structures or sheds when available.
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, under cover in secondary containment.
- Keep hazardous chemicals well labeled and in their original containers.
- Keep ample supply of appropriate spill clean up material near storage areas.
- Also see BMP WM-6, "Hazardous Waste Management", for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored on-site.
- Employees trained in emergency spill clean-up procedures shall be present when dangerous materials or liquid chemicals are unloaded.

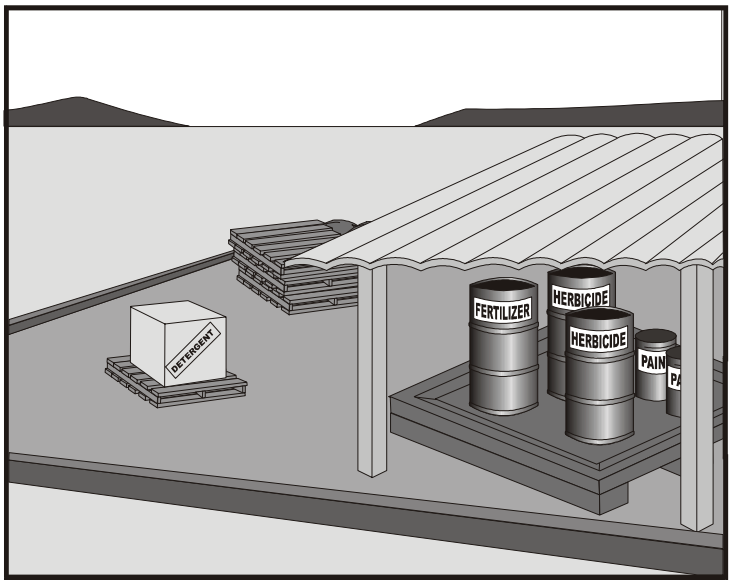
Spill Clean-up

- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

Maintenance, Inspection, and Removal

- Storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Inspect storage areas before and after rainfall events, and at least weekly during other times.

Material Use WM-2



MU

BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices for use of construction material in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

Appropriate Applications

This BMP applies to all construction projects. These procedures apply when the following materials are used or prepared on site:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Safer alternative building and construction products may not be available or suitable in every instance.

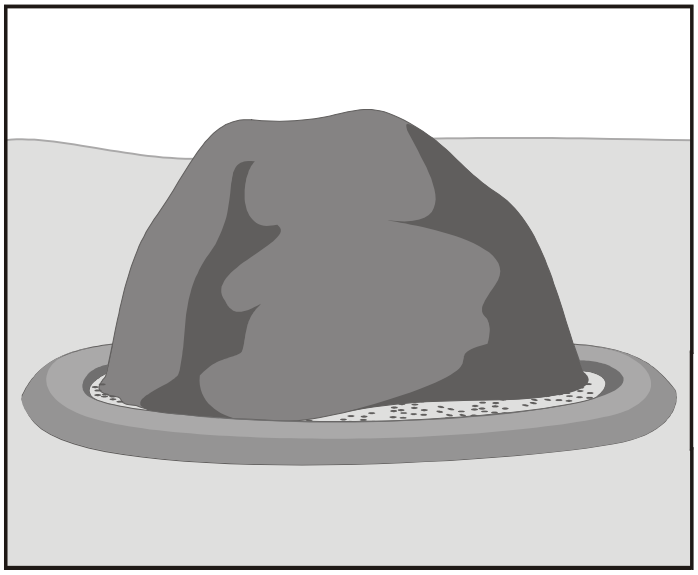
Design Guidelines and Considerations

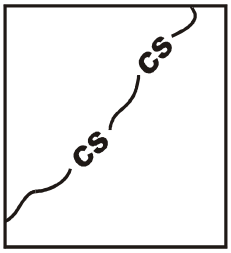
- MSDS shall be supplied to the Engineer for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry, and are no longer hazardous and may be disposed of with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled as hazardous waste.
- For water based paint, clean brushes to the extent practical and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practical, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
- Do not over-apply fertilizers and pesticides. Prepare only the amount needed. Strictly follow the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to large applications, to allow time for it to work in and to avoid excess materials being carried off-site by runoff.
- Application of herbicides and pesticides shall be performed by a licensed applicator.
- Contractors are required to complete the “Report of Chemical Spray Forms” when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Maintenance, Inspection, and Removal

- Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.

Stockpile Management WM-3





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

Procedures and practices to reduce or eliminate pollution of storm water from stockpiles of soil and paving materials such as PCCP rubble, AC, asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, and asphalt minder (so called “cold mix” asphalt).

Appropriate Applications

Implemented in all projects that stockpile soil and paving materials.

Limitations

None identified.

Design Guidelines and Considerations

- Protection of stockpiles is a year-round requirement.
- Locate stockpiles away from concentrated flows of storm water, drainage courses, and inlets.
- Protect all stockpiles from storm water run-on using a temporary perimeter sediment barrier such as berms, dikes, silt fences, or sandbag barriers.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see BMP WE-1, “Wind Erosion Control.”
- Stockpiles of contaminated soil shall be managed in accordance with BMP WM-7 “Contaminated Soil Management”.
- Bagged materials should be placed on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials shall be protected further as follows:

- Stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.

Protection of Active Stockpiles

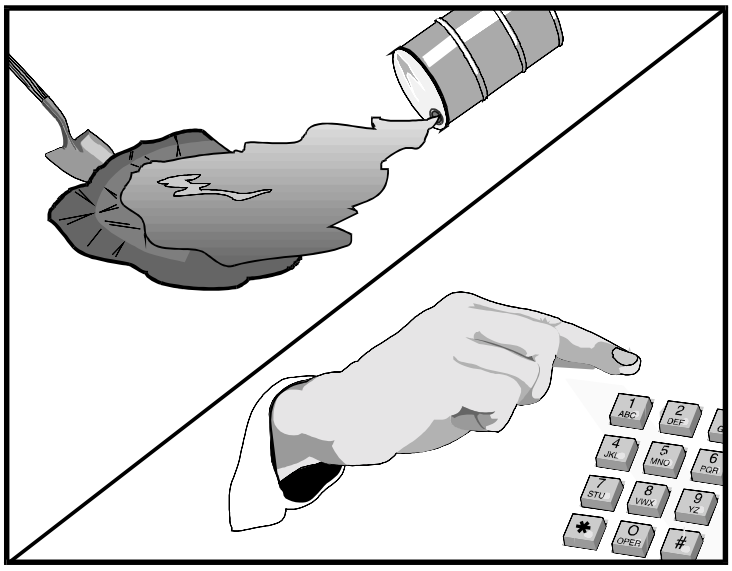
Active stockpiles of the identified materials shall be protected further as follows:

- All stockpiles shall be protected with a temporary linear sediment barrier prior to the onset of precipitation.

Maintenance, Inspection, and Removal

- Repair and/or replace perimeter controls and covers as needed, or as directed by the Engineer to keep them functioning properly.

Spill Prevention and Control WM-4



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

Appropriate Application

This BMP applies to all construction projects. Spill control procedures are implemented anytime chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

- Soil stabilizers/binders
- Dust Palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals
- Fuels
- Lubricants
- Other petroleum distillates

To the extent that the work can be accomplished safely, spills of oil, petroleum products, and substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

Limitations

- This BMP only applies to spills caused by the contractor.
- Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site.

Design Guidelines and Considerations

- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from storm water run-on during rainfall.
- Spills shall not be buried or washed with water.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and disposed of in conformance with the provisions in these special provisions.
- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses, and shall be collected and disposed of in accordance with BMP WM-10, "Liquid Waste Management".
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up, and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

Education

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper spill prevention and control measures.

Clean up and Storage Procedures

- Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.

- Use absorbent materials on small spills rather than hosing down or burying the spill.

- Remove the absorbent materials promptly and dispose of properly.

- The practice commonly followed for a minor spill is:

    1. Contain the spread of the spill.

    2. Recover spilled materials.

    3. Clean the contaminated area and/or properly dispose of contaminated materials.

■ Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Clean up spills immediately:

    1. Notify the project foreman immediately. The foreman shall notify the Engineer.

    2. Contain spread of the spill.

    3. If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter, and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.

    4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.

    5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

■ Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:

    1. Notify the Engineer immediately and follow up with a written report.

    2. Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.

3. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.

4. Notification shall first be made by telephone and followed up with a written report.

5. The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up until the appropriate and qualified staff have arrived at the job site.

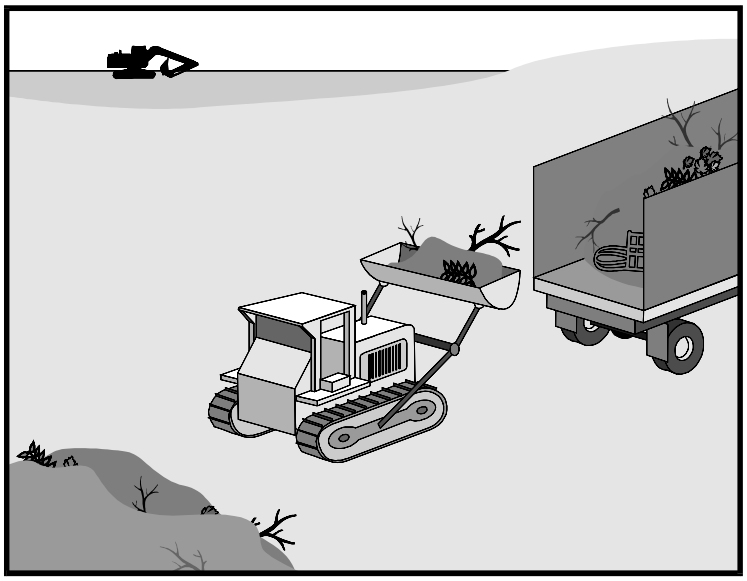
6. Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, OSHA, etc.

Maintenance, Inspection, and Removal

- Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas.

- Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals on site.

Solid Waste Management WM-5



SWM

BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, and removal of construction site wastes.

Appropriate Applications

Solid waste management practices are implemented on all construction projects that generate solid wastes.

Solid wastes include, but are not limited to:

- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, and other materials used to transport and package construction materials.
- Highway planting wastes, including vegetative material, plant containers, and packaging materials.
- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, and smoking materials, including litter generated by the public.

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Design Guidelines and Considerations

Education

- Any Storage, transport, or disposal of hazardous or deleterious materials shall be coordinated through the appropriate MDT and DEQ Environmental Departments.

- The Contractor's WPCM shall oversee and enforce proper solid waste procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.

Collection, Storage, and Disposal

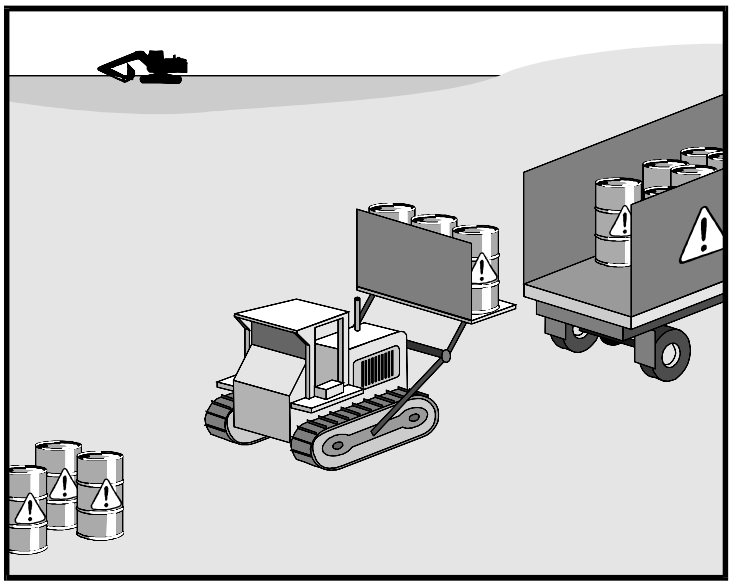
- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site shall be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems, or watercourses.
- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the right-of-way in conformance with the provisions in MDT Standard Specifications.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Materials that are disposed of or temporarily stockpiled outside the right-of-way, but are visible from the roadway, shall be in a neat and orderly fashion to the satisfaction of the Engineer.
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures, or through the use of measures to elevate waste form site surfaces.

- Solid waste storage areas shall be located at least 15 m (50 ft) from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be protected from wind and rain by securely covering the waste with tarps or plastic sheeting, or protected in conformance with the applicable Disturbed Soil Area protection.
- Dumpster washout on the project site is not allowed.
- Notify trash-hauling contractors that only watertight dumpsters are acceptable for use on-site.
- Plan for additional containers during the demolition phase of construction.
- Plan for more frequent pickup during the demolition phase of construction.
- Designate on-site waste storage areas and obtain approval of the Engineer.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Dispose of non-hazardous waste in accordance with MDT Standard Specifications.
- For disposal of hazardous waste, see BMP WM-6, “Hazardous Waste Management”. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging, and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Maintenance, Inspection, and Removal

- The WPCM shall monitor on site solid waste storage and disposal procedures.
- Police site for litter and debris.

Hazardous Waste Management WM-6



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharge of pollutants from construction site hazardous waste to the storm drain system or to watercourses.

Appropriate Applications

- This BMP applies to all construction projects.
- Hazardous waste management practices are implemented on construction projects that generate waste from the use of:
  - Petroleum Products
  - Asphalt Products
  - Concrete Curing Compounds
  - Pesticides
  - Palliatives
  - Acids
  - Septic Wastes
  - Paints
  - Stains
  - Solvents

- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste 40 CFR Parts 110, 117, 261, or 302.

Limitations

- Nothing in this BMP relieves the Contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes. Any storage, handling, transportation, and disposal of hazardous or deleterious materials shall be coordinated through the appropriate MDT and DEQ Environmental Departments.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to BMP WM-7, "Contaminated Soil Management", and the project Special Provisions.

Design Guidelines and Considerations

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The Contractor's WPCM shall oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

Storage Procedures

- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by 49 CFR Parts 172,173, 178, and 179.
- All hazardous waste shall be stored, transported, and disposed as required in 49 CFR 261-263.
- Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:
  - Temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers.

- Temporary containment facility shall be impervious to the materials contained for a minimum contact time of 72 hours.
- Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities shall be covered during non-working days, prior to rain events.

- Drums shall not be overfilled and wastes shall not be mixed.
- Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.
- Ensure that adequate hazardous waste storage volume is available.
- Ensure that hazardous waste collection containers are conveniently located.
- Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
- Minimize production or generation of hazardous materials and hazardous waste on the job site.
- Use containment berms in fueling and maintenance areas, and where the potential for spills is high.
- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Unless watertight, containers of dry waste shall be stored on pallets.

- Do not mix wastes.

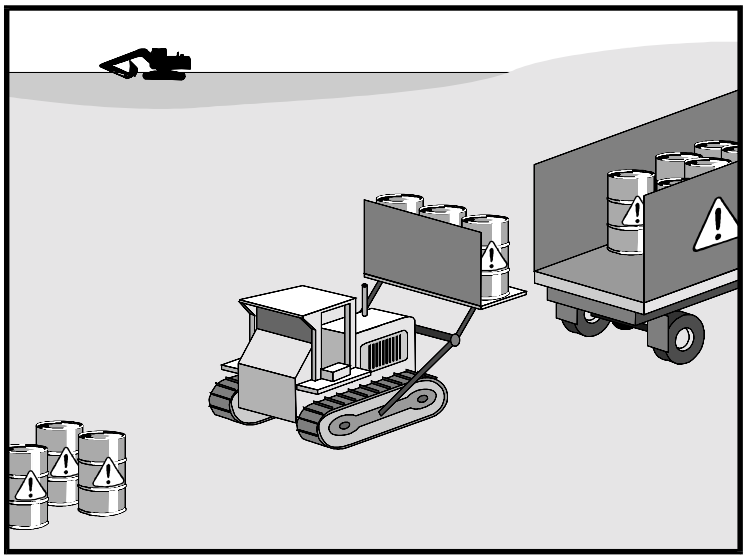
Disposal Procedures

- Waste shall be disposed of outside the highway right of way within 90 days of being generated, or as directed by the Engineer.
- To minimize on-site storage, full containers of waste shall be disposed of outside the right-of-way at least weekly.
- Waste shall be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility, or recycling facility utilizing properly completed Uniform Waste Manifest forms.
- A MDT certified laboratory shall sample waste to determine the appropriate disposal facility.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste. Recycle any useful material such as used oil or water-based paint when practical.

Maintenance, Inspection, and Removal

- The WPCM shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in the contract documents.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Hazardous spills shall be cleaned up and reported in conformance with the applicable MSDS and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- Copy of Bill of Laden and disposal receipts shall be provided to the Engineer.

Contaminated Soil Management WM-7



BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharges of pollutants to the drainage system or to watercourses from contaminated soil.

Appropriate Applications

- Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, and leaks from underground storage tanks.

- It may also apply to highway widening projects in older areas where median and shoulder soils may have been contaminated by ADL.

Limitations

- The procedures and practices presented in this BMP are general. The contractor shall identify appropriate practices and procedures for the specific contaminants known to exist or discovered on site.

Design Guidelines and Considerations

Identifying Contaminated Areas

- Contaminated soils are often identified during project planning and development with known locations identified in the plans and specifications. The contractor shall review applicable reports and investigate appropriate call-outs in the plans and specifications.

- The contractor may further identify contaminated soils by investigating:

  - Past site uses and activities.

  - Detected or undetected spills and leaks.

- Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements.

- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris. Test suspected soils at a certified laboratory.

Education

- Prior to performing any excavation work at the locations containing material classified as hazardous, employees and subcontractors shall complete a safety training program which meets 29 CFR 1910.120 and covering the potential hazards as identified.

- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with ADL

- Materials from areas designated as containing ADL may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.

- Excavation, transportation, and placement operations shall result in no visible dust.

- Use caution to prevent spillage of lead containing material during transport.

- Monitor the air quality during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Test suspected soils at a MDT approved certified laboratory.

- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.

- Avoid temporary stockpiling of contaminated soils or hazardous material.

- If temporary stockpiling is necessary:

  - Cover the stockpile with plastic sheeting or tarps.

  - Install a berm around the stockpile to prevent runoff from leaving the area.

  - Do not stockpile in or near storm drains or watercourses.

- Contaminated material and hazardous material on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.

- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.

- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.

- Collect water from decontamination procedures and treat, and/or dispose of it at an appropriate disposal site.

- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.

- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.

- Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):

    - United States Department of Transportation (USDOT),

    - EPA,

    - DEQ,

    - Occupation Safety and Health Administration (OSHA), and

    - Local regulatory agencies.

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies, which have jurisdiction over such work.

- Arrange to have tested, as directed by the Engineer, any liquid or sludge found in the underground tank prior to its removal to determine if it contains hazardous substances.

- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).

- The underground storage tank, any liquid and/or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal shall be transported to disposal facilities permitted to accept such waste.

Water Control

- Take all necessary precautions and preventive measures to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to: berms,

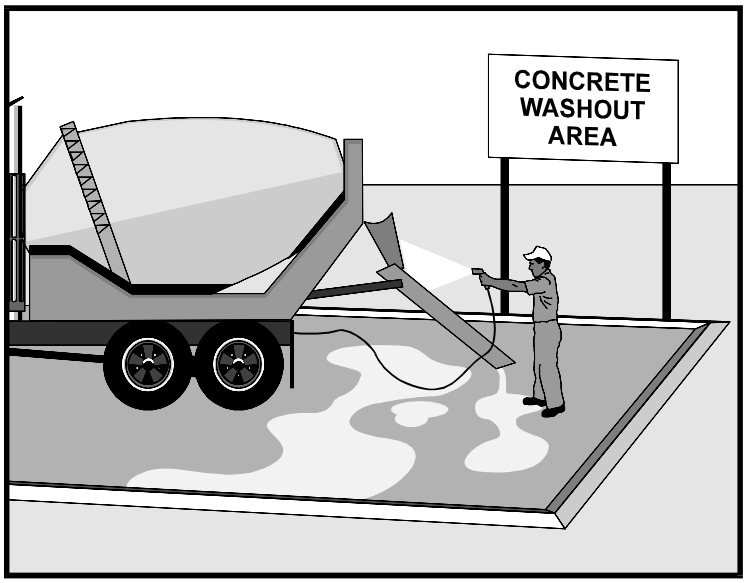
cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.

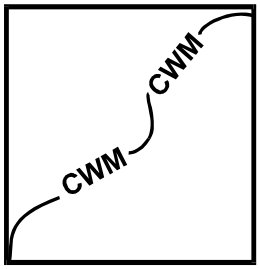
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, shall be discharged to clean, closed top, watertight holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Maintenance, Inspection, and Removal

- The Contractor's Water Pollution Control Manager and/or construction supervisor shall monitor on-site contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.
- Inspect hazardous waste receptacles and areas regularly.

Concrete Waste Management WM-8





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

These are procedures and practices that are implemented to minimize or eliminate the discharge of concrete waste materials to the storm drain system or to watercourses.

Appropriate Applications

- Concrete waste management practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result form demolition activities.
- Where slurries containing PCCP or AC are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Engineer. See also NS-8, "Vehicle and Equipment Cleaning."
- Where mortar-mixing stations exist.

Limitations

None identified.

Design Guidelines and Considerations

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- The Contractor's WPCM shall oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCCP and AC waste shall not be allowed to enter storm drains or watercourses.

- PCCP and AC waste shall be collected and disposed of outside the right-of-way in conformance with MDT Standard Specifications or placed in a temporary concrete washout facility.

- Disposal of hardened PCCP and AC waste shall be in conformance with MDT Standard Specifications.

- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.

- Do not allow slurry residue from wet coring or saw-cutting AC or PCCP to enter storm drains or receiving waters by:

    - Placing temporary berms or sandbags around coring or saw-cutting locations to capture and contain slurry runoff.

    - Placing straw bales, sandbags, or gravel dams around inlets to prevent slurry from entering storm drains.

- Vacuum slurry residue and dispose in a temporary pit (as described in On-Site Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allow slurry to dry. Dispose of dry slurry residue in accordance with BMP WM-5, "Solid Waste Management", or, for on-site disposal, in accordance with MDT Standard Specifications.

Collect residue from grooving and grinding operations in accordance with MDT Standard Specifications.

On-site Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses, unless determined unfeasible by the Engineer. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be installed as shown on the plans and in conformance with the provisions in MDT Standard Specifications.

- Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

- Perform washout of concrete trucks in designated areas only.

- Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per BMP WM-5, "Solid Waste Management", and in conformance with the provisions in MDT Standard Specifications. Dispose of hardened concrete on a regular basis.

- Temporary Concrete Washout Facility (Type Above Grade)

  - Temporary concrete washout facility (type above grade) shall be constructed as shown on the plans, with a recommended minimum length and minimum width of 3 m (10 ft), but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer.

  - Straw bales, wood stakes, and sandbag materials shall conform to the provisions in BMP SC-9, "Straw Bale Barrier".

  - Plastic lining material shall be a minimum of 60 mil polyethylene sheeting and shall be free of holes, tears, or other defects that compromise the impermeability of the material.

  - Portable delineators shall conform to the provisions in MDT Standard Specifications. The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement in MDT Standard Specifications. Portable delineators shall be applied only to a clean, dry surface.

- Temporary Concrete Washout Facility (Type Below Grade)

  - Temporary concrete washout facility (type below grade) shall be constructed as shown on the plans, with a recommended minimum length and minimum width of 3 m (10 ft). The quantity and volume shall be sufficient to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the Engineer. Lath and flagging shall be commercial type.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete shall be removed and disposed of in conformance with the provisions in MDT Standard Specifications. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the right-of-way in conformance with the provisions in MDT Standard Specifications.

- Holes, depressions, or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in MDT Standard Specifications.

Maintenance, Inspection, and Removal

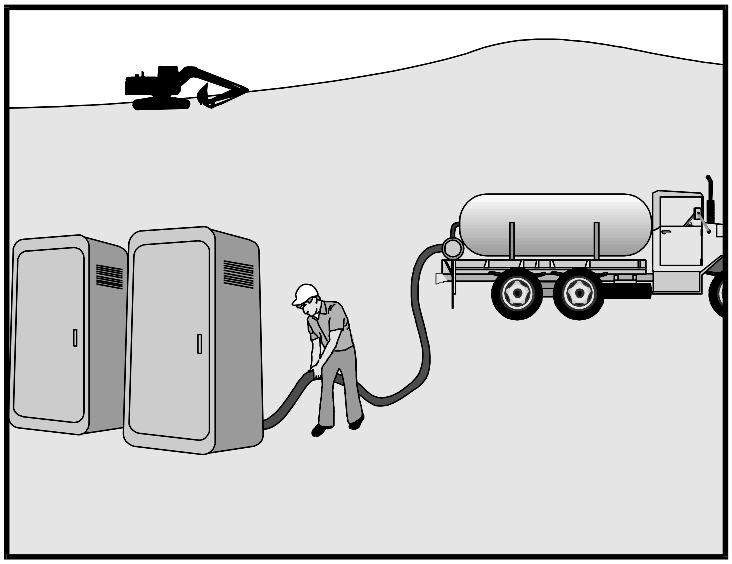
- The Contractor's WPCM shall monitor on site concrete waste storage and disposal procedures at least weekly.

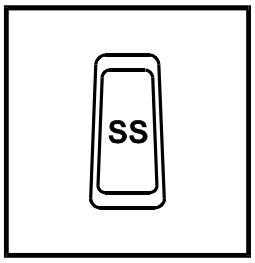
- The WPCM shall monitor concrete working tasks, such as saw cutting, coring, grinding, and grooving at least weekly to ensure proper methods are employed.

- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 in) for above grade facilities and 300 mm (12 in) for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete, and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in MDT Standard Specifications.

- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

Sanitary/Septic Waste Management WM-9





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

Appropriate Applications

Sanitary/septic waste management practices are implemented on all construction sites that use temporary or portable sanitary/septic waste systems.

Limitations

Not applicable.

Design Guidelines and Considerations

Education

- Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary/septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Storage and Disposal Procedures

- Temporary sanitary facilities shall be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, as

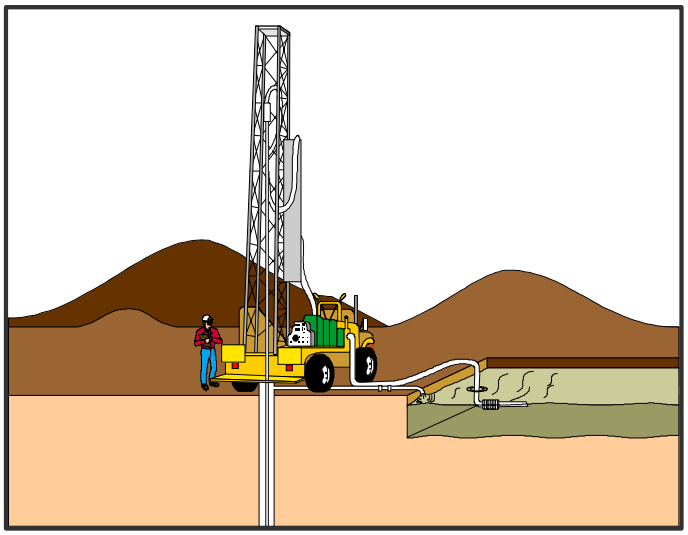
determined by the Engineer, temporary sanitary facilities shall be secured to prevent overturning.

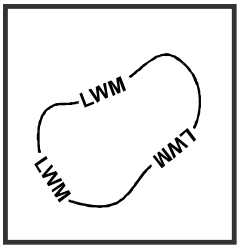
- Wastewater shall not be discharged or buried within the right-of-way.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.
- If using an on site disposal system, such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure that sanitary/septic facilities are maintained in good working order by a licensed service.
- Use only reputable, licensed sanitary/septic waste haulers.

Maintenance, Inspection, and Removal

- The Contractor's WPCM shall monitor on site sanitary/septic waste storage and disposal procedures at least weekly.

Liquid Waste Management WM-10





BMP Objectives

- ○ Soil Stabilization
- ○ Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ● Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

Procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes. All appropriate State and Federal permits are required.

Appropriate Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous byproducts, residuals, or wastes, such as:

- Drilling slurries and drilling fluids.
- Grease-free and oil-free wastewater and rinse water.
- Dredgings.
- Other non-storm water liquid discharges not permitted by separate permits.

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations, or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, etc.).
- Does not apply to dewatering operations (see BMP NS-2, “Dewatering Operations”), solid waste management (see BMP WM-5, “Solid Waste Management”), hazardous wastes (see BMP WM-6, “Hazardous Waste Management”), or concrete slurry residue (see BMP WM-8, “Concrete Waste Management”).
- Does not apply to non-storm water discharges permitted by any NPDES permit held by the pertinent MDT District, unless the discharge is determined by MDT to be a source of pollutants. Typical permitted non-storm water discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped

ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and, discharges or flows from emergency fire fighting activities.

Design Guidelines and Considerations

General Practices

- The Contractor's WPCM shall oversee and enforce proper liquid waste management procedures and practices.
- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities, and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-storm water discharges are permitted by the MDT Statewide NPDES permit; different regions might have different requirements not outlined in this permit. Some listed discharges may be prohibited if MDT determines the discharge to be a source of pollutants.
- Apply the "Vehicle and Equipment Cleaning" BMP for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids shall not be allowed to enter storm drains and watercourses and shall be disposed of outside the right-of-way in conformance with the provisions in MDT Standard Specifications.
- If an appropriate location is available, as determined by the Engineer, drilling residue and drilling fluids may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in BMP WM-08, "Concrete Waste Management".
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, shall be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.

- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Take precautions to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in BMP WM-4, "Spill Prevention and Control".

- Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety, or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes running off a surface, which has the potential to affect the storm drainage system, such as wash water and rinse water from cleaning walls or pavement.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- If the liquid waste is sediment laden, use a sediment trap (see BMP SC-3, "Sediment Trap") for capturing and treating the liquid waste stream, or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- Typical method is to dewater the contained liquid waste, using procedures such as described in BMP NS-2, "Dewatering Operations", and BMP SC-2, "Desilting Basin"; and dispose of resulting solids per BMP WM-5, "Solid Waste Management", or per MDT Standard Specifications, for off site disposal.

- Method of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, local agency discharge permits, etc., and may be defined elsewhere in the Special Provisions.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see BMP WM-6, "Hazardous Waste Management".

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Maintenance, Inspection, and Removal

- Spot check employees and subcontractors at least monthly throughout the job to ensure appropriate practices are being employed.

- Remove deposited solids in containment areas and capturing devices as needed, and at the completion of the task. Dispose of any solids as described in BMP WM-5, "Solid Waste Management".

- Inspect containment areas and capturing devices frequently for damage, and repair as needed.

Section 4
Erosion and Sediment Control Design Process

4.1 Overview of Erosion and Sediment Control Design

Erosion and sediment control has come to the forefront of roadway design and construction. Section 4 illustrates the design process to be used for erosion and sediment control plan sheets and the creation of the NOI package, including a SWPPP, in accordance with State and Federal regulations.

The first portion of section 4 describes the design activities associated with erosion and sediment control and how each of these activities are incorporated into the overall project design process. Following the description of the design activities, erosion and sediment control tools are listed to aid in the selection of BMPs.

4.2 Erosion and Sediment Control Design Activities

The MDT Project Management System (PMS) is used by the MDT to schedule, monitor, and coordinate project development and project pre-construction manpower needs. New erosion and sediment control activities have been developed to be incorporated into PMS and are listed below.

4.2.1 Preliminary Field Review (Activity 200)

In the preliminary field review activity (Activity 200) in PMS, the Erosion and Sediment Control personnel should be included in all preliminary field reviews in order to assess project's impact to receiving waters and to begin the data gathering required in the NOI package.

4.2.2 Preliminary Erosion and Sediment Control Design (New Activity)

Definition

Prepare preliminary erosion and sediment control design. The preliminary design should include the following items:

- Vicinity map,
- Delineation of potential erosion and sedimentation areas,
- Preliminary soils investigation,
- Review drainage information,
- Generate erosion and sediment control schedule,
- Identification of existing control practices, and

- Prepare preliminary NOI package, which includes a NOI form, and a SWPPP.

Output Provided

Preliminary erosion and sediment control design report summarizing the tasks listed below.

Tasks

Develop a preliminary erosion and sediment control design report for all projects where the existing conditions are disturbed. The preliminary erosion and sediment control design report should include as a minimum the following:

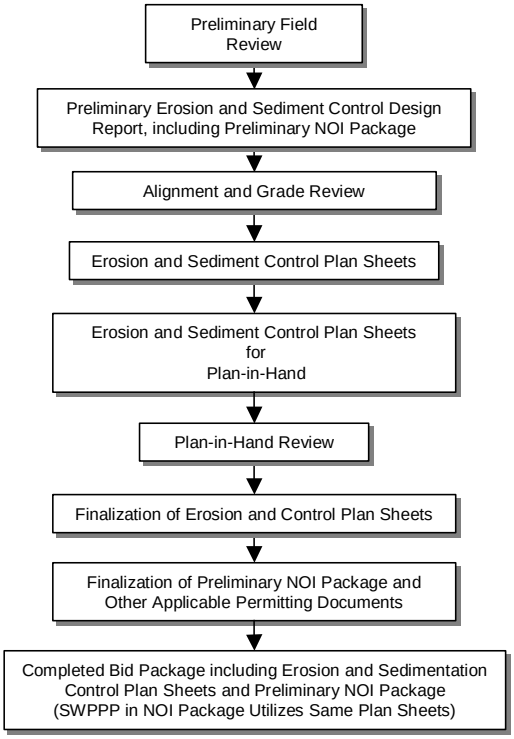
- An 8½" x 11" color copy or larger vicinity map of the project area using a USGS map or equivalent. The map shall extend approximately 0.4 km (1/2 mile) beyond the property boundaries of the construction site. Included in the vicinity map shall be the following:
  - Outline of site perimeter,
  - Clear identification of major roadways,
  - Geographic features or landmarks,
  - Water bodies within, adjacent or downstream of the construction limits,
  - Disturbance area within construction site,
  - Known wells,
  - Outline of the offsite drainage areas that discharge into the construction site,
  - Identification of anticipated construction site storm water discharge locations to a municipal storm sewer system or other water bodies,
  - Other geographic features surrounding the site, and
  - General topography.
- Delineation of potential erosion and sedimentation areas, listing all construction materials that may be used during construction activities that may have the potential to contribute to the discharge of pollutants into storm water. In addition, a list of all construction activities that may have the potential to contribute to erosion and sedimentation.
- Request for geotechnical information including a preliminary soil characterization and soil inventory. Within the characterization area, the conditions of the fill material and the soils at the construction site shall be described. Additionally, show and/or describe existing features that, as a result of known past usage, may contribute to pollution of storm water. Also, list known contaminants based on a review of the contract documents and associated environmental documents.
- Identification of existing permanent control measures. Existing permanent control measures may include any measures used to reduce erosion, sediment, or other pollutants into storm

water discharges. Existing permanent control measures may include, but not be limited to; detention basins, infiltration basins, sediment basins, oil water separators, bridge slope protections, rock slope protection, existing erosion control, existing landscaping, lined ditches, energy dissipaters, etc.

- Preliminary NOI package including NOI form and SWPPP as described in Section 4.5 – NOI Package Tools, of this manual. Incorporate all known information into the preliminary SWPPP.

Start Dependencies

Preliminary Field Review.



Distribution and Use

Distribute preliminary erosion and sediment control design report to Environmental Services Bureau, Road Design Section, Bridge Bureau, and Construction Bureau.

4.2.3 Alignment and Grade Review (Activity 216)

Incorporate the preliminary erosion and sediment control design into the alignment and grade review.

4.2.4 Erosion and Sediment Control Plan Sheets for Plan-in-Hand (New Activity)

Definition

Following the alignment and grade review, the Erosion and Sediment Control Section will prepare erosion and sediment control plan sheets for plan-in-hand review by incorporating the following tasks.

Output Provided

Complete erosion and sediment control package for plan-in-hand review, including preliminary erosion and sediment control plan sheets and preliminary NOI package.

Tasks

The Erosion and Sediment Control Section is responsible for the following tasks:

Revise and develop an erosion and sediment control package for the plan-in-hand review for all projects that will disturb existing conditions. The preliminary erosion and sediment control package should include the preliminary erosion and control plans and preliminary NOI package. For the preliminary erosion and sediment control package, as a minimum, the following task should be completed:

- Use Section 3.0 "Best Management Practices" and Section 4.4 - Erosion and Sediment Control Design Tools of this manual to select the BMPs that best apply to the reduction of erosion and sedimentation of the previously identified sources.
- Integrate geotechnical information into the preliminary erosion and sediment control plan sheets.
- Identify existing storm water control measures.
- Revise preliminary erosion and sediment control design to incorporate all modifications since alignment and grade and integrate the revisions into the erosion and sediment control plan sheets.
- Revise preliminary NOI package, including the SWPPP following Section 4.5 - NOI Package Tools of this manual. Incorporate new information since submittal of preliminary NOI package.
- Prepare any additional applicable storm water permitting documents.
- Prepare a preliminary erosion and sediment control schedule to be used during the project construction. Assumed excavation boundaries to select preliminary BMP and placement. Outline BMPs in chronological order: preconstruction, construction, and post-construction.

Start Dependencies

Alignment and grade approval.

Distribution and Use

Distribute one set of erosion and sediment control plan sheets to all Preconstruction Sections prior to plan-in-hand review. Provide Environmental Services Bureau one copy of the preliminary NOI package including the preliminary SWPPP and one copy of any other applicable preliminary storm water permitting documents.

4.2.5 Plan-in-Hand Review (Activity 220)

Incorporate erosion and sediment control plan sheets into the plan-in-hand review process. Review all erosion and sediment control plan sheets, preliminary NOI package, and any other applicable storm water permitting documents.

4.2.6 Finalize Erosion and Sediment Control Plan Sheets (New Activity)

Definition

Following plan-in-hand, revise, and finalize the erosion and sediment control plan sheets.

Output Provided

Finalized erosion and sediment control plan sheets.

Tasks

The Erosion and Sediment Control Section is responsible for the following task:

- Finalize all erosion and sediment control plan sheets to incorporate any changes based on the plan-in-hand review.

Start Dependencies

Finalization of plan-in-hand report.

Distribution and Use

Distribute one copy of erosion and sediment control plan sheets to all Preconstruction sections.

4.2.7 Finalize Preliminary NOI Package and Other Applicable Permitting Documents (New Activity)

Definition

Following plan-in-hand, revise NOI package and any other applicable permitting document.

Output Provided

Finalized NOI package including NOI form and SWPPP and any other applicable permitting documents.

Tasks

The Erosion and Sediment Control Section is responsible for the following task:

- Finalize the preliminary NOI package including the NOI form and the SWPPP, and any other applicable permitting documents to incorporate any changes based upon the plan-in hand review.

Start Dependencies

Finalization of plan-in-hand report, preliminary NOI package, and any other applicable permitting documents.

Distribution and Use

Distribute one copy of the finalized NOI package and the any other permitting documents to the Environmental Services Bureau.

4.3 Erosion and Sediment Control Reference Literature

This section provides information and references that the erosion and sediment control designer can use to create erosion and sediment control plan sheets, NOI packages, and any other applicable storm water permitting documents. The reference literature listed below can be used to assist the designer in the erosion and sediment control design process. Sections 4.3.1 through 4.3.5 provide an overview of some of the available references. These references are subject to change; therefore, the designer should review updated versions prior to beginning the design process.

4.3.1 MDT Hydraulics Manual

The MDT Hydraulics Manual is a modified version of the AASHTO Drainage Manual. This manual contains guidelines for hydrology, culverts, bridges, and storm drain systems. Within this reference there are several example problems for each section including rainfall intensity tables, design requirements, and rainfall curves. This reference should be used whenever the designer is evaluating rainfall intensities and their effects on flow throughout Montana.

4.3.2 MDT Road Design Manual

The MDT Road Design Manual is an integral part of the MDT road design process. This manual should be referenced to determine adequate cut and fill slopes for different geometric design variables. In addition, this manual contains information on basic design controls, horizontal alignments, vertical alignments, cross section, at-grade intersections, roadway safety, temporary traffic control, drainage/irrigation, and special design elements.

4.3.3 MDT Detail Drawings

The MDT Detail Drawings includes English and metric versions of detail drawings of construction designs. These drawings should be referenced to ensure that all designs meet the Departments standards. The Detail Drawings coincide with the MDT Standard Specifications for Roads and Bridges. The Detail Drawings provide the designer with dimensions and materials to be used for a multitude of different designs and procedures.

4.3.4 MDT Standard Specifications for Roads and Bridges

The MDT Standard Specifications for Roads and Bridges is a compilation of construction standards used on MDT projects. The Standard Specifications should be referenced to ensure that BMPs are specified correctly and that they are integrated into the design following the correct guidelines. Special provisions may need to be written to address specific applications if the standard specifications do not outline the desired approach.

4.3.5 Federal Regulations

The specific requirements for storm water controls on construction activities will be defined by the NPDES permitting authority. For construction sites not located on Tribal lands the NPDES authority is the DEQ. For construction sites located on Tribal land, the permitting authority is the EPA. In the state of Montana, a MPDES permit will be required. For construction sites located on Tribal lands, an NPDES permit will be required. Application processes in both cases are similar. Section 4.5 included contract information and ways to access a blank form.

4.3.5.1 MPDES Storm Water Discharge General Permit

The basic principle of the General Permit under NPDES/MPDES is to identify areas or activities that may contribute pollutants to surface waters and to consider practical methods to reduce such pollutants from entering the surface water discharges. A General Permit must be obtained from regulatory authority if storm water associated with construction activity will discharge to surface water.

4.3.5.2 Notice of Intent Package

If a construction activity requires a General Permit, a NOI package including a NOI form and a SWPPP must be completed and submitted to DEQ or EPA (for Tribal lands). To be compliant with the regulations, a complete NOI package must be received and approved by the regulatory agency prior to construction. If the NOI package has not been completed or is considered not complete by the regulatory agency, storm water discharge associated with construction activity will not be in compliance with the law. Refer to Section 4.5 for NOI packages for the DEQ and EPA.

4.3.6 Soil Survey Information

Each county throughout Montana has a published survey of soils classifications. The county soil classification survey contains a large amount of information that is useful in any land planning program. Of prime importance are the predictions of soil behavior for selected land uses. Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may also be shallow to bedrock. With this information, the designer will be able to select the BMP for the appropriate soil type.

The MDT Hydraulics Manual lists soils surveys that have been completed by the U.S Department of Agriculture, National Resource Conservation Service. The list of surveys can be found in Appendix C of Section 7 of the MDT Hydraulics Manual.

Soil surveys are being completed and published on a continuing schedule. For information on areas not listed and for ordering or obtaining information on reference copies, contact:

State Conservationist
Federal Building, Room 443
10 East Babcock Street
Bozeman, MT 59715-4704

Phone: 406-587-6813
FAX: 406-587-6761

4.3.7 Erosion and Sediment Control Cost Estimating

Erosion and sediment control BMP cost estimates can be found in MDT's Erosion and Sediment Control BMP Unit Cost Rate Schedule. This schedule will be updated periodically as the unit costs are refined and to account for inflation. An example BMP Unit Cost Rate Schedule is provided in Appendix A.

4.3.8 Erosion and Sediment Control CADD Standards

In an attempt to standardize plan preparation, MDT has created CADD Standards that are followed on all design projects. The following erosion and sediment control CADD standards will be incorporated into the MDT CADD Standards Manual.

4.3.8.1 File Naming

Reserved

4.3.8.2 Levels

Reserved

4.3.8.3 Reference Files

Reserved

4.3.8.4 Symbols

Reserved

4.3.8.5 Cells

Reserved

4.3.8.6 Custom Line Styles

Reserved

4.3.8.7 Macros

Reserved

4.4 Erosion and Sediment Control Design Tools

The following are design tools that should be used when creating erosion and sediment control plan sheets. The tools consist of BMP selection guidelines and rules of thumb.

4.4.1 BMP Selection Guidelines

As previously described, BMPs are tools used to reduce the amount of erosion and subsequent sediment discharge from construction sites. To most effectively prevent the erosion and sedimentation processes, the designer should first identify if erosion is likely to occur, the areas of potential erosion, and the type of erosion and sedimentation that could occur on the construction site. Once these items are identified, the designer should select the best BMP for the conditions. As an example, mulching reduces the detachment of soil particles from raindrop impact. Therefore, mulching would be used in disturbed bare areas where rainfall

could cause significant erosion. Mulching should not be used to reduce erosion in a channel or ditch where the primary erosion mechanism is the concentrated flow of water.

Assess if Erosion is Likely to Occur at the Site

The main mechanisms of erosion are water and wind. In order for the designer to determine if erosion will occur on a particular site due to water, the designer can correlate the soil type with the erodibility potential for different slopes or use the Revised Universal Soil Loss Equation (RUSLE) to calculate the average annual soil loss. To determine if a site has the potential for wind erosion, the designer can use the wind erodibility equation listed in this section.

Erosion by Water

Several states highway departments, like Alaska, developed charts to easily determine the level of erodibility of construction sites. The table below illustrates the relationship between the erodibility of the different soil types and the slope dimensions (Alaska Highway Drainage Manual, 2001).

CLASSIFICATION		ERODIBILITY				
GEOLOGICAL DESCRIPTION	USCS CLASSIFICATION (ASTM D-2487)	GENERAL	SLOPE ANGLE < 45 degrees (1:1 slope)	SLOPE ANGLE > 45 degrees (1:1 slope)	SLOPE LENGTH < 30 feet	SLOPE LENGTH > 30 feet
ALLUVIAL						
High Energy	GW, GP,GM	Low	Low-Med	Med	Low-Med	Med
Low Energy		Med-High	Med-High	High	Med-High	High
COLLUVIAL	Various	Low-High	Low-High	Low-High	Low-High	Low-High
EOLIAN						
Dune Sand	SP	High	High	Very High	High	Very High
Loess	ML, SM	High- Very High	High- Very High	Very High	High-Very High	Very High
GLACIAL						
Till	GM, SM ,ML	Low-Med	Low-Med	Low-Med	Low-Med	Med
Outwash	GW, GP, GM, SW, SP,SM	Low-Med	Low-Med	Med	Low-Med	Med
Glaciolacustrine	ML, SM, SP	Med-High	Med	High	Med	High
LACUSTRIAN	ML, SM, MH, OL, CL, CH, OH, PT	High	High	High-Very High	High	High-Very High

Another method to predict the level of erodibility is to use the RUSLE. RUSLE provides numerical empirical estimates of the average annual soil loss. RUSLE calculates the soil loss from slopes due to raindrops and overland flow (interrill erosion), or rill erosion. The RUSLE does not describe other types of erosion, like gully or stream bank erosion.

The RUSLE is defined as:

$$A=RKLSCP$$

Where:

A - Average annual soil loss.

R - Rainfall-runoff erosivity factor – Rainfall intensity and duration, and snow accumulation and melting are directly related to erosion. As intensity of rainfall increases, erosion increases. As duration increases (assuming the same intensity), erosion increases.

K - Soil erodibility factor – This is the propensity for soil particles to become detached by actions of water or wind. Silty soils are typically the most erodable soils.

L, S - Slope factors – The length of the flow path and the slope angle have a direct effect on erosion.

Length (L): Top of slope to closest waterway, diversion, or design point.

Slope (S): The ratio of the horizontal to vertical distance of travel.

C - Cover-management factor – The rate of erosion is directly proportional to the amount of permanent or temporary cover over the soil surface. Cover can reduce rainfall impact, reduce surface water velocities, enhance infiltration, trap sediment, and promote permanent vegetation establishment. Cover can have the most significant impact on the amount of erosion.

P - Support practice factor – Conservation practices are our man made attempts to reduce erosion when soils have been disturbed by construction or other practices.

The numerical values for these factors can be found in Agriculture Handbook Number 703 of the United States Department of Agriculture- Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE) or by contacting Publishing Editor Joe Galetovic for a copy of the complete guidelines and the public domain RUSLE software:

Joe R. Galetovic, Technical Coordinator
The Office of Technology Transfer
Western Region Coordination Center
Office of Surface Mining
1999 Broadway, Suite 3320
Denver, CO 80202-5733

Voice: (303) 844-1448
Fax: (303) 844-1546
E-mail: jgaletov@osmre.gov

The designer should also consider if the potential for other types of erosion exist. Rill or gully erosion is mainly caused by factors like flow concentrations on bare soils like swales, slope breaks, and steep slopes. Channel erosion is usually caused by disturbances at or adjacent to stream banks, while snowmelt erosion can be caused by snow that accumulated on disturbed areas and as it melts detaches and transports sediments.

Erosion by Wind

Wind erosion is a function of soil cohesiveness, particle density, and regional wind speeds. The wind erosion increases as soil cohesiveness lessens, the smaller the particle size and the higher the wind speeds. Also, soils low in clay, but high in sand content tend to detach easier and be transported longer distances. The amount of erosion associated with wind can be calculated by the potential wind erodibility equation which is expressed by:

$$E = f(I, K, C, L, V)$$

Where:

E - Total erosion loss.
F - Indicates function of the variables in the parenthesis.
I - Soil erodibility index that is based on the texture and aggregation of the particles.
K - Surface roughness.
C - Climate factor dependant on the windspeed and effective soil moisture.
L - Effect of field length.
V - Equivalent quantity of vegetation cover.

The numerical values can be found in several text books including Soils – An Introduction to Soils and Plant Growth (Donahue, 1985).

Based on the calculations and charts, the designer can determine if significant amounts of sediments will be transported off site, or if the amount of soil detachment are negligible.

Identify the Areas of Potential Erosion and the Type of Erosion and/or Sedimentation that Could Occur at the Identified Areas on the Construction Site.

From the topographic maps, field observation, and the Erosion and Sediment Control Design reports, the designer should determine which areas could potentially be impacted by erosion. Based on the erosion type descriptions in Section 2.1.1, the designer can determine which types of erosion could potentially be present at the construction site.

Select Appropriate BMPs for the Construction Site

BMPs should be implemented when construction activities disturb native soils exposing bare surfaces receptive to water and wind erosion. The BMPs should be installed as close as possible to the original source of sediments. Refer back to Section 3 of this manual to help identify all the BMPs appropriate for the reduction of erosion and sedimentation. The EPA stresses the use of a management system approach, which utilized a combination of BMPs at each construction site to maximize the overall effectiveness of the BMPs.

The presence of vegetation prevents soils from being eroded by creating a natural cover and holding soils together. If possible, vegetation should not be disturbed during construction activities or only remove when construction activities begin at a particular area of the site. Designers should consider phasing the activities and only removing vegetation when necessary avoiding bare soils during long periods of time. The use of designated haul routes, temporary fencing and other measures that minimize the disturbance of natural vegetation should also be considered when planning construction activities.

Table 4.4.1-1 summarizes BMPs and their best application to reduce and control specific erosion processes. Note that some measures are designed to prevent erosion while other are designed to repair damage occurred due to erosion. For example, silt fences are installed to reduce velocities and protect the soils against channel erosion, as well as to collect sediment

before they discharge into surface waters. Silt fences are not designed to reduce erosion occurring upgradient the silt fence but to prevent sediments from migrating offsite.

Table 4.4.1-1 BMP Selection Guidelines

ID	BMP Name	Primary Purpose	Erosion Processes
SS-1	Scheduling	Sequencing of BMPs	All
SS-2	Preservation of Existing Vegetation	Protection of desirable vegetation by limiting soil detachment	All
SS-3	Hydraulic Mulch	Protection of disturbed soil with mulch by limiting soil detachment	Splash, Sheet, Rill/Gully, Wind, and Snow Melt.
SS-4	Temporary Seeding	Provide soil protection through new plant growth	All
SS-5	Soil Binders	Soil stabilization to prevent wind and water induced erosion	Splash, Sheet, Wind, and Snow Melt.
SS-6	Straw Mulch	Protect disturbed soil with straw mulch by limiting soil detachment	Splash, sheet, Rill/Gully, Wind, and Snow Melt.
SS-7	Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats	Protect disturbed soil or slopes	All
SS-8	Wood Mulching	Protect disturbed soil with wood mulch	Splash, Sheet, Rill/Gully, Wind, and Snow Melt.
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	Intercept, divert, and convey surface run-on	Stream Bank, Sheet, Rill/Gully, and Snow Melt.
SS-10	Outlet Protection/Velocity Dissipation Devices	Prevent scour of exiting storm water flows	Stream Bank, Snow Melt, and Shoreline.
SS-11	Slope Drains	Route overland flow into a pipe to protect slope	Rill/Gully, Sheet, and Snow Melt.
SS-12	Slope Roughening	Reduce runoff velocity, increase infiltration, trap sediments, and create microenvironment for seeding	Rill/Gully, Sheet, Splash, Wind, and Snow Melt.
SS-13	Terraced Slope	Reduce velocity and allow upland deposition	Rill/Gully, Sheet, Wind, and Snow Melt.
SS-14	Vegetated Buffer	Prevent soil erosion and catch sediment	Stream Bank, Sheet, Wind, Snow, and Shoreline.
SS-15	Erosion Seeding	Erosion control on steep slopes	All
SC-1	Silt Fence	Slow and filter runoff to retain sediment	Stream Bank, Wind, Snow, and Shoreline.
SC-2	Desilting Basin	Large pond with controlled outflow which allows sediment to settle out of runoff	Stream Bank and Snow Melt.
SC-3	Sediment Trap	Reducing sediment before it enters live water bodies	Stream Bank and Snow Melt.
SC-4	Check Dam	Provides minor detention and retention of sediment for small swales and concentrated flows	Stream Bank and Snow Melt.
SC-5	Fiber Rolls	Intercept runoff and remove sediment	Rill/Gully, Sheet, Stream Bank, and Snow Melt.

ID	BMP Name	Primary Purpose	Erosion Processes
SC-6	Gravel Bag Berm	Intercept runoff and remove sediment	Rill/Gully, Sheet, Stream Bank, Shoreline and Snow Melt.
SC-7	Street Sweeping and Vacuuming	Prevent sediment from entering waterway	Stream Bank and Wind.
SC-8	Sandbag Barrier	Intercept runoff and remove sediment	Rill/Gully, Sheet, Stream Bank, Shoreline and Snow Melt.
SC-9	Straw Bale Barrier	Intercept runoff and remove sediment	Rill/Gully, Sheet, Stream Bank, Shoreline and Snow Melt.
SC-10	Storm Drain Inlet Protection	Intercept sediment at curb and field inlets. Should be used in conjunction with other on-site techniques.	Stream Bank and Snow Melt.
SC-11	Dugout Ditch Basin	Provides minor detention and retention of sediment for small swales and concentrated flows	Stream Bank and Snow Melt.
WE-1	Wind Erosion Controls	Prevent or alleviate dust nuisance	Wind
SN-1	* Snow Management	Reduce the volume of runoff in disturbed areas	Rill/Gully, Sheet, Stream Bank, and Snow Melt.
SN-2	* Snow Accumulation	Reduce the volume of runoff in disturbed areas	Rill/Gully, Sheet, Stream Bank, and Snow Melt.
SN-3	Freeze Reduction	Increase effectiveness of structures and BMPs	Rill/Gully, Sheet, Stream Bank, and Snow Melt.
TC-1	Stabilized Construction Entrance/Exit	Reduces offsite sediment tracking from trucks and construction equipment	Special
TC-2	Stabilized Construction Roadway	Control of dust and erosion created by vehicular traffic	Special
TC-3	Entrance/Outlet Tire Wash	Reduces offsite sediment tracking from trucks and construction equipment	Special
NS-1	Water Conservation Practices	Conserving water on construction sites	Special
NS-2	Dewatering Operations	Manage pollutants from dewatering operations	Special
NS-3	Paving and Grinding Operations	Minimize pollution of storm water during paving operations	Other Pollutants
NS-4	Temporary Stream Crossing	Minimize pollution at waterway crossings	Stream Bank
NS-5	Clear Water Diversion	Intercepts clear surface water runoff upstream of a project site	Rill/Gully, Stream Bank, and Snow Melt.
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	Recognize illicit connections or illegally dumped or discharged materials	Other Pollutants
NS-7	Potable Water/Irrigation	Reduce potential pollutants during discharge of water lines.	Other Pollutants
NS-8	Vehicle and Equipment Cleaning	Procedures to minimize or eliminate discharge of pollutants from cleaning operations	Other Pollutants
NS-9	Vehicle and Equipment Fueling	Procedures to eliminate the discharge of fuel spills into waterways	Other Pollutants

ID	BMP Name	Primary Purpose	Erosion Processes
NS-10	Vehicle and Equipment Maintenance	Procedures to eliminate the discharge of pollutants into waterways from maintenance activities	Other Pollutants
WM-1	Material Delivery and Storage	Proper handling and storage of materials	Other Pollutants
WM-2	Material Use	Procedures for eliminating or reducing the discharge of materials to waterways	Other Pollutants
WM-3	Stockpile Management	Procedures for eliminating or reducing pollution of storm water from stockpiles	Splash, Sheet, Rill/Gully, Stream Bank, Wind, and Snow Melt.
WM-4	Spill Prevention and Control	Prevent and control spills	Other Pollutants
WM-5	Solid Waste Management	Management of packaging, building materials, etc.	Other Pollutants
WM-6	Hazardous Waste Management	Management of paints, chemicals, fertilizer, pesticides, oil and grease, etc.	Other Pollutants
WM-7	Contaminated Soil Management	Procedures for eliminating or reducing pollution of storm water from contaminated soils	Other Pollutants
WM-8	Concrete Waste Management	Procedures for eliminating or reducing pollution of storm water from concrete wastes	Other Pollutants
WM-9	Sanitary/Septic Waste Management	Procedures for eliminating or reducing pollution of storm water from concrete wastes	Other Pollutants
WM-10	Liquid Waste Management	Reduce liquid waste pollution	Other Pollutants

* BMP functions best primarily in western region.

4.4.2 Rules of Thumb

Rules of thumb consist of a variety of different tools to aid in the design and construction process. Within the rules of thumb are erosion and sediment control planning and design checklists, slope measurement tables, slope inclination conversion tables, and seeding application rate tables.

4.4.2.1 Slope Measurement Tables

Slope measurement tables, like the one listed below, are a useful tool during the design and construction of a variety of earthwork projects. Typically, plan sheets show the run to rise ratio. The table below shows the commonly used slopes with the correspondingly multiplication factor. The Pythagorean Theorem (A2 + B2 = C2) describes the relationship between the run, rise, and slope length.

- **Run** is the horizontal change of the slope (A).
- **Rise** is the vertical change of the slope (B).

- **Slope length** at run length is the length of the slope using the rise and run factors (C).

- **Multiplication factor** is multiplied by the run to calculate the slope length.

4.4.2.1-1 Slope Measurement

Run	Rise	Slope Length	Multiplication Factor
20	1	20.025	1.00125
10	1	10.050	1.005
9	1	9.055	1.006
8	1	8.062	1.0078
7	1	7.071	1.0102
6	1	6.083	1.0138
5	1	5.099	1.0198
4	1	4.123	1.0308
3	1	3.162	1.0541
2	1	2.236	1.118
1.5	1	1.803	1.2018
1.25	1	1.601	1.2806
1	1	1.414	1.414
0.75	1	1.250	1.667
0.50	1	1.118	2.2361
0.25	1	1.031	4.1231

4.4.2.2 Slope Inclination Conversion Tables

Slope inclination conversion tables like the one listed below are another useful tool for design and construction of earthwork projects. They allow for the designer to gain another perspective of the slope and its correlation to erosion and sediment control. Three of these perspectives are the run/rise ratio, percent slope and degree slope.

- **Run** is the horizontal distance used to measure slopes.

- **Rise** is the vertical distance used to measure slopes. This distance is usually set at a unit of one and the run is adjusted accordingly.

- **Run to rise ratio** is simply the run to rise correlation, i.e. 20:1 is 20 unit of run for every unit of rise.

- **Percent slope** is the percentage difference between the run and the rise, i.e. a 20:1 slope would be 1 divided by 20, then multiplied by 100, to equal 5.0.

- **Degree slope** is the angle at the toe of the slope formed by the run and the rise. Since Tan θ equals rise over run, the slope in degrees can be calculated by taking the Tan^{-1} of the rise over the run.

Slope Inclination Conversion Worksheet

Run	Rise	Ratio	Percent	Degree
20	1	20:1	5.0	2.86
10	1	10:1	10.0	5.71
9	1	9:1	11.1	6.34
8	1	8:1	12.5	7.12
7	1	7:1	14.3	8.13
6	1	6:1	16.7	9.46
5	1	5:1	20.0	11.31
4	1	4:1	25.0	14.04
3	1	3:1	33.3	18.43
2	1	2:1	50.0	26.57
1.5	1	1.5:1	66.7	33.69
1.25	1	1.25:1	80.0	38.66
1	1	1:1	100.0	45.00
0.75	1	0.75:1	133.3	53.13
0.50	1	0.50:1	200.0	63.43
0.25	1	0.25:1	400.0	75.96

4.4.2.3 Seed Application Rate Tables

Seeding application rate tables can be found in the Temporary Seeding (SS-4) and the Erosion Seeding (SS-15) Detailed Drawings included in Section 3, Best Management Practices.

4.5 NOI Package Tools

The NOI package, which includes the NOI form and the SWPPP must be completed and submitted to the permitting authority. For Tribal lands, the EPA is the permitting authority, while for all other lands in the state of Montana, the DEQ is the permitting authority. The NOI form must be filled out and signed by the appropriate parties. The SWPPP is a document that addresses water pollution control during construction activities. The General Permit requires that all storm water discharges associated with construction activity must comply with the provisions of a NPDES permit. A copy of the General Permit is included in Appendix B.

4.5.1 NOI Form

Before completing the NOI form, the operator shall read the General Permit for Surface Water Associated with Construction Activities. NOI forms are included in Appendices C and D. The forms can be downloaded from http://cfpub.epa.gov/npdes/ for construction sites on Tribal land, EPA permitting authority and from http://www.deq.state.mt.us/wqinfo/MPDES/Index.asp for non-Tribal lands.

4.5.2 SWPPP

The SWPPP must be completed for submittal to the appropriate regulatory agency prior to commencement of construction activities. A copy of a blank SWPPP and an example of a SWPPP are included in Appendices E and F respectively, or can be downloaded from http://www.deq.state.mt.us./

4.5.3 NOT Form

At the completion of the construction activities, the operator must complete a NOT form and submitted it to the regulatory agency. Blank NOT forms are included in Appendices G and H or can be downloaded from http://www.deq.state.mt.us.

Section 5
Erosion and Sediment Control Construction Phase Process

5.1 Overview of Erosion and Sediment Control Construction Process

The goal of the erosion and sediment control plan sheets and the SWPPP is to incorporate erosion and sediment control devices into the construction stage of transportation projects in order to prevent excessive erosion and sedimentation; thereby, protecting Montana's surface waters. This section identifies the required activities and individual's responsibilities to ensure that the project has the necessary erosion and sediment control measures in place during construction activities. Key MDT personnel, Contractors, and Regulatory Agencies are required in the construction stage of the project to properly integrate erosion and sediment control devices into the project. Following MDT chain-of-command procedures with all correspondence flowing through the project engineer is important to the success of erosion and sediment control during construction. The three major areas of responsibility for construction of erosion and sediment control BMPs are the Engineer/Inspector, Contractor, and the Regulatory Agencies.

5.1.1 MDT Responsibilities

MDT employees who oversee the construction phase of MDT projects hold the title of Engineer and/or Inspector. This manual will use "Engineer" for the project overseer (project engineer). Under some circumstances the Engineer may be a contracted third party brought in to aid MDT in construction oversight. The third party is not allowed to have an affiliation with the Contractor in order to avoid conflicts of interest.

The following are some key areas that the Engineer is responsible for during the construction phase of MDT projects. Other project specific responsibilities may be included depending on the overall project requirements.

- The Engineer shall coordinate all communications between MDT and the Contractor in a precise and timely manner.
- The Engineer shall oversee project construction and communicate any discrepancies and omissions to the Contractor and MDT in a precise, timely manner.
- The Engineer shall perform, collect, and/or observe all tests as required by the standard specifications and special provisions.
- The Engineer shall generate all documentation required, including field notes, photos, testing information, submittal processing, field changes, etc. The Engineer shall also compile information submitted by the Contractor.

As a part of the general requirements listed above, the Engineer is responsible for ensuring that the Contractor constructs all erosion and sediment control BMPs as specified on the

construction plans and in accordance with the SWPPP. In addition, the Engineer is responsible for monitoring the timeliness of the installation of each BMP following the construction timeline. BMPs shall be inspected at minimum once every fourteen calendar days (unless otherwise specified) and within 24 hours after any storm event of 0.5 inches or greater. The Engineer will notify the Contractor of any repairs, additions, or maintenance that are deemed necessary.

5.1.2 Contractor Responsibilities

The Contractor is the individual or legal entity contracted to perform the prescribed work. For purposes of consistency, the Contractor will encompass the prime contractor and any and/or all subcontractors used to complete the project.

Overall, the Contractor is responsible for ensuring that the project is constructed to the plans and specifications. The following are some general responsibilities required of the Contractor:

- The Contractor shall construct the project to meet or exceed the plans and specifications using safe and proven techniques.
- The Contractor shall communicate all discrepancies and/or omissions to the Engineer in a precise and timely fashion.
- The Contractor shall perform, collect, and/or observe all tests as required by the standard specifications and special provisions under the supervision of the Engineer.
- The Contractor shall generate all documentation required, including field notes, photos, testing information, submittals, field changes, etc. This information shall be provided to the Engineer.

As a part of the above tasks, the Contractor is responsible for installation and maintenance (and possibly the removal of) temporary BMPs on the construction site during the contract period. The Contactor shall work with the Engineer to ensure that all erosion and sediment control devices are working correctly. The Contractor shall inspect all BMPs at a minimum once every fourteen calendar days (unless otherwise specified) and within 24 hours after any storm event of 0.5 inches or greater. Upon routine maintenance, the Contractor shall adjust any BMPs that are not functioning correctly or install additional temporary BMPs as required to prevent erosion and contain sediment. Devices that are beyond adjustment shall be removed and replaced. Details of Contractor's responsibilities are provided in Section 5.2 - Erosion and Sediment Control Construction Process.

5.1.3 Regulatory Agencies Responsibilities

The primary regulatory agency that will be involved during the construction phase process is DEQ for non-Tribal lands and EPA for Tribal lands. DEQ/EPA is responsible for ensuring that all construction activities are in compliance with the General Permit. The following activities will be performed by DEQ/EPA:

- Check records that must be kept under the condition of the General Permit.

- Inspect any facilities, equipment, measures, or operations regulated or required under the General Permit.
- Sample or monitor any substances or parameters at any location within the construction activity area to assure permit compliance.

The operator shall allow DEQ/EPA to enter upon the construction site at reasonable times to perform the activities described above. Questions regarding DEQ's role during the construction phase process may be directed to:

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

Questions regarding EPA's role and permitting obligations should be directed to:

EPA – Notice of Intent Processing Center
Storm Water Notice of Intent (4203M)
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
(866) 352-7755

5.2 Erosion and Sediment Control Construction Process

Many critical activities are required throughout the project construction process to ensure that the SWPPP is properly implemented and adjusted as necessary in the field to meet the goal of minimizing erosion and sediment loss from the construction site. Several of these activities are completed before the contractor mobilizes equipment and begins construction of the project. Figure 5.2-1 outlines the major construction activities required in order to implement the SWPPP.

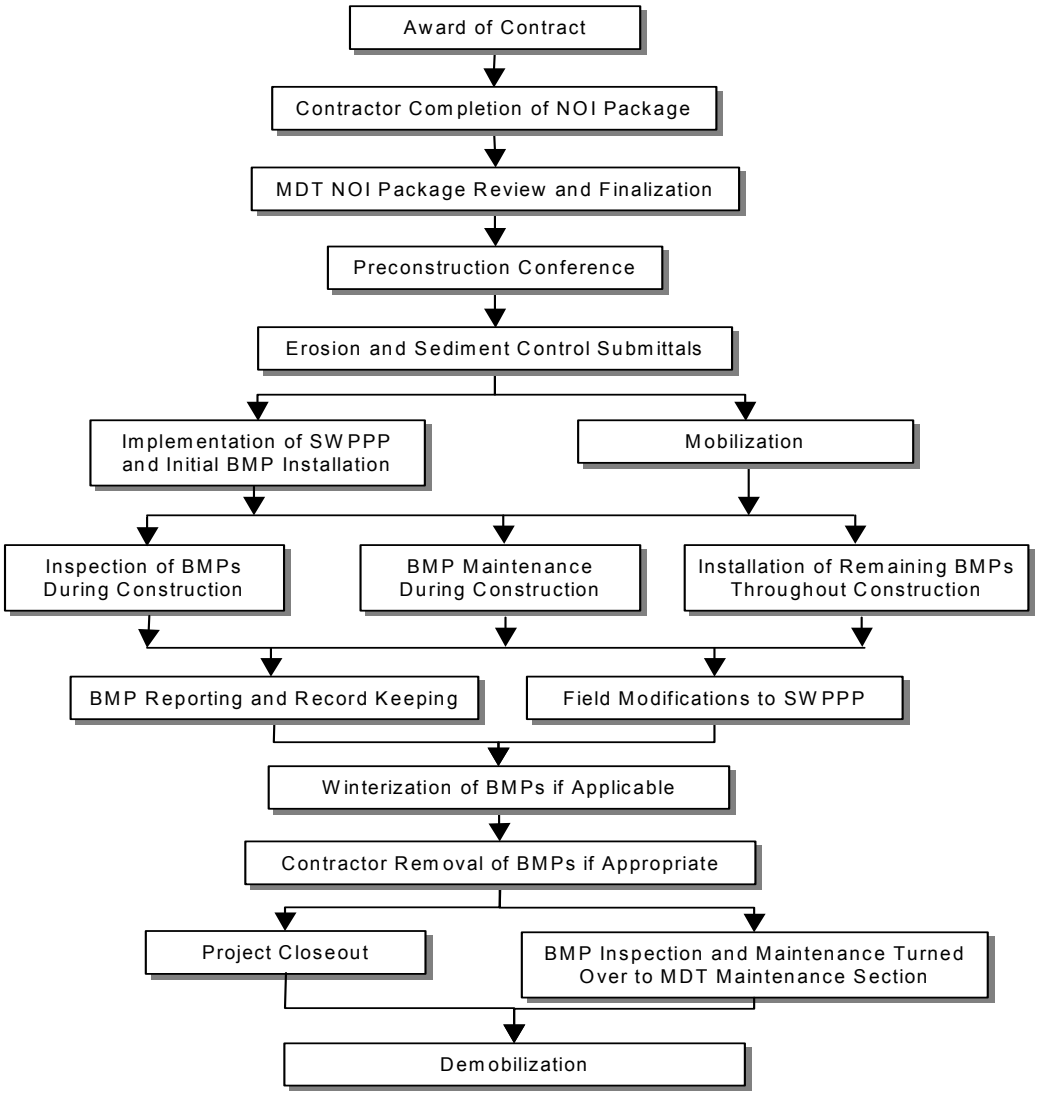
5.2.1 Contractor Completion of Draft NOI Package

A draft NOI form and preliminary SWPPP are prepared by MDT prior to bid letting for a project. The preliminary SWPPP will provide direction and convey specific BMP expectations to the Contractor. However, it shall not be considered a final SWPPP since the preliminary SWPPP is prepared assuming standard construction practices and may not reflect the Contractor's actual methods of construction. The Contractor shall use the preliminary SWPPP from MDT as a guide and reference tool to develop and submit the final SWPPP to MDT. MDT and the Contractor are co-permittees on the General Permit.

It is required that the Contractor implements the final SWPPP in order to minimize or eliminate sediment and pollutants from reaching surface waters. The SWPPP must be prepared in accordance with the format set forth in this manual and Part IV of the General Permit for Storm Water Discharges Associated with Construction Activity, which is regulated

by DEQ for Non Tribal lands. If the construction site is located on Tribal lands, the regulatory agency is the EPA.

Figure 5.2-1 Erosion and Sediment Control Construction Process



Section 4.5.2 provides detailed instructions and a template that Contractors shall use to finalize the preliminary SWPPP prepared by MDT. The Contractor shall complete the preliminary SWPPP and submit it to MDT for review and approval prior to final submittal to the appropriate regulatory agency. If revisions are required, the Contractor shall revise the SWPPP as noted. No construction activity having the potential to cause water pollution shall be performed until the SWPPP has been approved and the corresponding BMPs are in place.

5.2.2 MDT NOI Package Review and Finalization

The Contractor shall submit the revised preliminary SWPPP to MDT. MDT shall review the SWPPP and submit the Final SWPPP to regulatory agency. The SWPPP shall be submitted to regulatory agency at the same time as the NOI form. It is the responsibility of MDT and the Contractor to ensure that the SWPPP complies with the requirements stated in the General Permit. Incomplete SWPPPs are a violation of the General Permit and could result in fines.

If, through site inspections and reviews of the SWPPP of construction sites not on Tribal land, DEQ determines that the SWPPP is deficient, MDT and the Contractor will be notified and shall make changes to the SWPPP. MDT will submit a written certification to DEQ indicating that the necessary changes have been made. Unless otherwise provided by DEQ, MDT and the Contractor shall have seven calendar days after such notification to make the necessary changes to the SWPPP and to submit the revisions to DEQ.

Whenever there is a change in design, construction, operation, or maintenance during the construction activities, which has significant effect on the potential for the discharge of pollutants to surface waters, or if the SWPPP proves to be ineffective in achieving the general objectives of controlling pollutants in a storm water discharge associated with construction activity, the Contractor shall amend the SWPPP and submit the amendments to MDT. MDT shall then review the amendments and submit the revisions to DEQ.

5.2.3 Regulatory Agency Permit and Coordination

For non-Tribal lands the DEQ is the primary regulatory agency from which a permit will be required. MDT will be required to obtain a General Permit and for each construction activity thereafter the following shall be provided:

- NOI Package, including NOI form and SWPPP, and
- NOT Package.

The NOI form and SWPPP must be submitted prior to the commencement of any construction activity which could potentially cause pollutants to discharge to surface water in order to be in compliance with the General Permit. Timely submittal of the complete NOI package should ensure efficient processing by DEQ, prevent delay of construction activity, and minimize potential storm water discharge compliance problems.

5.2.4 Pre-Construction Conference

All MDT construction projects are kicked off with a pre-construction conference. This conference will focus on design components, erosion and sediment control issues, environmental issues, and other features of the design that warrant close interaction between the Contractor and MDT.

This meeting is intended as an open discussion of the project to discuss critical issues posed by either MDT or the Contractor. The attendees for this meeting should include personnel from the following:

- MDT Construction Bureau,

- MDT District Construction,
- MDT District Maintenance,
- MDT Environmental Services Bureau,
- MDT Erosion and Sediment Control Section,
- MDT Pre-Construction (If unique items or special requirements are present in the design),
- Contractor,
- Sub-Contractors, and
- MDT's Consultants (If project is designed through Consultant Design).

The conference attendees shall review the construction project phases, the design drawings and specifications, and the SWPPP and/or other erosion and sediment control documents. A detailed schedule for accomplishing all required erosion and sediment control work shall be submitted by the Contractor for discussion at this pre-construction conference.

The responsibilities of the Erosion and Sediment Control Supervisor (ESCS) that was listed in the SWPPP shall be reviewed during the pre-construction conference. The ESCS, who is experienced in all aspects of construction and shall be present at the job site as needed, has the following responsibilities:

- Be aware of, and ensure compliance with the General Permit including the SWPPP during the construction activities.
- Directly supervise the installation, construction, and maintenance of all erosion control measures specified in the contract and coordinate the construction of erosion control measures with all other construction operations.
- Direct the implementation of suitable temporary erosion and sediment control features as necessary to correct unforeseen conditions or emergencies. Direct the dismantling of those features when their purpose has been fulfilled unless the Engineer directs that the features be left in place. If removed, the area in which these features were constructed shall be returned to a condition reasonably similar to that which existed prior to its disturbance.
- Inspect all erosion and sediment control and waste management features implemented for the project on a bi-weekly basis (unless otherwise specified) and within 24 hours after any storm event of 0.5 inches or greater. A report shall be submitted to the Engineer after every inspection and shall become part of the project records.
- Attend all project scheduling meetings.
- Upon the Engineer's request, direct the implementation of necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.

- Make immediately available, upon the Engineer's request, all labor, material, and equipment judged appropriate by the Engineer to maintain suitable erosion and sediment control features. These actions requested by the Engineer take precedence over all other aspects of project construction that have need of the same labor, material, and equipment, except those aspects required to prevent loss of life, personal injury, or significant property damage.

Upon completion of the pre-construction meeting, the Contractor will submit a formal letter to MDT stating the relevant information discussed during the pre-construction conference. This letter will discuss all changes made during the pre-construction meeting and the impacts to cost, design, and overall project success. In addition, this letter will state any options presented that were not viable and the reason why they were not viable. Finally, this letter will have attached to it any additional information required by MDT to clarify cost, schedule, or other items that may be affected due to the decisions made during the pre-construction conference.

5.2.5 Erosion and Sediment Control Submittals

Submittals are essential for quality control on construction projects. Erosion and sediment control submittals have been created to adhere to quality standards listed in the Standard Specifications for Roads and Bridges and the Detailed Drawings. Additional submittal standards may be found on a project-by-project basis in the Special Provisions. The Contractor shall supply the Engineer with the submittals listed below.

Quality Products List

A submittal shall be provided to MDT prior to placement of any material, stating the quality of products to be used during construction activities. The submittal shall follow the standard specification, and special provisions were applicable, and shall verify that all products used on the project meet or exceed specified minimums. No materials shall be accepted by the Engineer without an approved quality products list submittal.

Certified Seed Tags

A submittal shall be provided to MDT prior to seeding for any seed mix that will be required on the project. The submittal shall follow the standard specification, and special provisions where applicable, and shall verify that the seeds have the specified germination rate and appropriate seed percentage. No seeding shall be accepted by the Engineer without an approved certified seed tag submittal.

Weed Free Straw/Straw Bales

A submittal shall be provided to MDT prior to placement for any straw that will be required on the project. The submittal shall follow the standard specification and special provisions where applicable, and shall verify that the straw is weed free. No straw shall be accepted by the Engineer without an approved weed free straw submittal.

5.2.6 Mobilization

Following the pre-construction conference, the Contractor can begin to mobilize equipment and staff in preparation of construction activities. Prior to the start of construction activities, the Contractor must have all the required permits and a finalized NOI form and finalized

SWPPP in place. The Contractor is required to follow the erosion and sediment control plans and must place BMPs prior to any disturbance on the construction site.

5.2.7 Implementation of SWPPP

Erosion and sediment control BMPs are often implemented prior to mobilization of equipment onto the construction site. Depending on the project, the erosion and sedimentation plans might require that the existing vegetation be protected, streams, or other sensitive areas be fenced prior to competition of mobilization activities. Once the BMPs are properly installed and construction activities begin, modifications to the SWPPP and/or the BMPs may be required due to unforeseen field conditions or observed failure of the designed BMPs. It is the Contractor's responsibility to protect the environment from excess erosion and the associated sedimentation from the construction activities, regardless of the approved SWPPP and construction plans, specifications, and special provisions. If the specified BMPs are not effective, the Contractor can make minor modifications in the field without prior MDT notification but approval of the Engineer. Major revisions to the SWPPP or BMPs must be approved by following the proper submittal procedures. All changes must be documented and must prove effective in controlling erosion and sedimentation.

5.2.8 Field Modifications to SWPPP

If the Contractor believes that the SWPPP should be modified for portions of the construction site, the Contractor shall suggest modifications to the SWPPP, which need to be approved by the Engineer. The SWPPP should be modified if the specified BMPs are not stabilizing soils to prevent erosion or are not preventing sediment from leaving the site.

The Contractor's revised SWPPP will be reviewed and stamped by a Professional Engineer (P.E.) licensed in Montana and a P.E. employed by MDT. On sensitive sites, MDT can specify that the Contractor's revised SWPPP be reviewed and stamped by a Certified Professional in Erosion and Sediment Control (CPESC) at no additional cost to MDT. All revised plans shall be submitted to MDT for review and approval prior to construction of the BMPs. No construction activities shall be performed that will impact the area(s) under review by MDT until approval has been given and the proper BMPs have been placed. The Contractor may make minor modifications to BMPs in the field and can add or modify BMPs as needed in emergency situations such as prior to, during, or immediately after storm events in order to prevent erosion and sedimentation.

Notification of any modifications to the SWPPP made after the pre-construction conference and prior to construction shall be submitted in writing to MDT prior to the installation of any erosion and sediment control devices. The written modification proposal shall include the following minimum information:

- Reasons for changing the erosion control measures.
- Diagrams showing details and locations of all proposed changes.
- List of appropriate pay items indicating new and revised quantities.
- Effects on schedules for accomplishing all erosion and sediment control work.

- Effects on permits or certifications caused by the proposed changes.

If applicable, MDT will review the written proposal and may suggest additional control measures. The Contractor shall be responsible to address any amendment to the SWPPP.

5.2.9 Site BMP Monitoring

During construction, the Contractor will inspect all BMPs on a minimum on a bi-weekly basis and within 24 hours after any storm event of 0.5 inches or greater. The Contractor's ESCS shall notify the Engineer prior to weekly or storm related inspections. The ESCS should be readily accessible to the Engineer at all times. The inspections prior to forecasted storm events and after storm events may have to be conducted during non-regular working hours, which may require the Contractor and/or Engineer to be available for such cases. In addition, the Contractor is required to visually monitor the BMP effectiveness and make necessary modifications if required.

The inspections are used to determine the effectiveness of the erosion and sediment control system and its proper installation and maintenance. Documentation of all inspections shall be submitted to the Engineer and remain onsite or at a nearby location at all times for review by the Engineer, other MDT personnel, or local, State or Federal government inspectors.

The Engineer and the Contractor shall complete the BMP Monitoring/Maintenance checklist attached in Section 5.3.4.1 during monitoring of all BMPs installed on site. In addition, Section 3 should be consulted for specific inspection criteria for each BMP. A copy of all BMP Monitoring checklists shall be sent to the Erosion and Sediment Control Section to be incorporated into a BMP database.

All BMPs that fail inspection must be repaired in accordance to Section 5.2.10 - BMP Maintenance During Construction. Following any BMP maintenance or repair, the Engineer and/or the Contractor shall re-inspect the BMP and record the type of failure, the performed repairs and/or modifications, and the effectiveness of the repairs and/or modifications.

5.2.10 BMP Maintenance During Construction

For proper operation of the installed BMPs, BMP maintenance is critical. With the implementation of a monitoring and maintenance program non-compliance issues can usually be avoided. The bi-weekly monitoring and storm event inspections are designed to reveal those BMPs that may require maintenance and/or replacement before they may become a compliance issue.

BMPs that fail inspections should be evaluated by the Engineer and the Contractor to determine if the BMP should be repaired or replaced with a different BMP. For new and/or replacement of BMPs, refer to Section 4.4.1 - BMP Selection Guidelines, and the BMP fact sheets in Section 3. Unless otherwise specified, the Contractor shall correct minor maintenance problems during or before daily construction activities. When possible, major maintenance issues shall be corrected within 24-hours of detection or immediately if pending storm conditions are apparent.

The Engineer and/or the Contractor shall record any maintenance procedures conducted on BMPs on a BMP monitoring report. The monitoring report will be beneficial to determine future maintenance procedures as well as to track BMP maintenance performance.

5.2.11 Non-Compliance Mitigation

Reserved

5.2.11.1 Illegal Actions

Reserved

5.2.11.2 Notice of Non-Compliance

Reserved

5.2.11.3 Remedial Action

Reserved

5.2.11.4 Agency Notification

Reserved

5.2.11.5 Reporting, Certifications, and Record Keeping

During construction activities, any spills and releases shall be reported as required by the General Permit. The following language is from the General Permit.

Reporting

- **Spill/Release Notification** – Written notification to the DEQ Storm Water Program shall be mailed within two business days of the detection of any unregulated significant spill or release in any area(s), which has the potential to introduce pollutants into storm water runoff other than sediment. This notification must provide: the Notice of Intent number; the name of the construction activity project; the operator(s) as identified on the Notice of Intent form; a description of the time and duration of the spill/release; the specific location and contaminant fate of the spill/release; a description of the quantity and type of material spilled/released; measures being taken to investigate and/or remediate the spill/release; any known or potential impacts to storm water discharges due to the spill/release; and any BMPs to be implemented to minimize and/or prevent similar spills/releases in the future.

- **Noncompliance Reporting** – If, for any reason, the operator(s) does not comply with, or will be unable to comply with, any condition specified in the General Permit, the operator(s) shall notify DEQ as soon as possible by phone and provide DEQ with the following information, in writing, within five calendar days of becoming aware of such condition:

  - A description of the discharge or other cause of noncompliance;

  - The period of noncompliance, including exact dates and times or, if not identified, the anticipated time the noncompliance is expected to continue; and,

  - Additional measures being taken to reduce, eliminate, and prevent recurrences of the non-complying discharge or other cause of noncompliance.

- All reports, notification, and inquiries regarding the conditions of the General Permit must be provided to DEQ at:

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

Record Keeping

- **Permit Retention Requirements** – The operator shall retain a copy of the General Permit, a copy of the completed and signed Notice of Intent form, a DEQ's Confirmation Letter for receipt of the Notice on Intent package, and a completed and signed SWPPP at the construction activity project site at all times during the active coverage period provided under the General Permit. If no permanent offices/buildings are located at the facility site, copies of these documents must be retained at the office of the operator's contact person identified on the Notice of Intent form and at the office of the primary operator(s) responsible for the implementation of the SWPPP and must be brought to the site at all times with these identified operator(s). If the person(s) designated as responsible contact/individual is replaced during the active coverage period provided under the General Permit, the operator(s) shall ensure measures are in place to transfer and familiarize replacement personnel with the requirements pertaining to these documents.

- **Inspection and Uncontrolled Release Records** – The operator(s) shall keep a record of inspection, the date and time inspected, and the name of the person performing the inspection. Uncontrolled releases of mud or muddy water or "significant sediment" found off the site or entering into surface waters must be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measured taken to clean up the sediment that has left the site. This inspection record must be made available to DEQ upon request.

- **Required Period of Record Retention** – All records and information resulting from the monitoring activities required by the General Permit, a copy of the completed and signed NOI form, a DEQ NOI Package Receipt Confirmation Letter, and completed and signed SWPPP shall be retained by the operator(s) for a minimum of three (3) years from the date the site is finally stabilized, or longer if requested by DEQ.

5.2.12 Winterization

Winterization activities are critical to projects that carry over more than one construction season. In some areas, winterization can even be needed on projects of one season or less in length, due to adverse weather conditions.

Prior to seasonal shutdown or downtime of one month or longer, place winterization devices or other applicable BMPs to prevent or minimize site disturbance. See Section 3 - Best Management Practices and more specifically Section 3.4 - Snow Accumulation and Snowmelt BMPs for devices to prevent or minimize disturbances during seasonal shutdown.

Winterization BMPs shall be placed prior to season or extended shutdowns. The Engineer and Contractor shall inspect all winterization BMPs prior to approval. Any BMPs that do not meet requirements shall be removed and replaced with adequate BMPs. Following shutdown, the Contractor will inspect BMPs on a weekly or monthly basis as specified the Engineer. Any BMPs not passing inspection shall be maintained in accordance to Section 5.2.10 - BMP Maintenance During Construction.

5.2.13 Demobilization

During project completion or project winterization, equipment should be demobilized from the site. During equipment demobilization, make sure that all BMPs are in place and functioning correctly. Ensure that all waste management BMPs are used during the demobilization activities. The contractor shall coordinate all demobilization activities with the Engineer.

5.2.14 Project Close-Out

The project close-out is intended to wrap up construction activities on the site. During project close-out, the Contractor shall demobilize all equipment, including any temporary products brought on site that are not part of the final design, remove all construction BMPs, install any post-construction BMPs, and ensure that the site meets MDT's requirements.

As part of the project close-out, MDT may require a project close-out conference. The project close-out conference shall discuss issues involving overall project success and determine if completed construction meets MDT standards. The project should be reviewed to make sure that the project was constructed as designed and that all post-construction items be in place, as required by the Engineer. Personnel from the following areas shall attend the project closeout meeting:

- MDT Construction Bureau,
- MDT District Construction,
- MDT District Maintenance,
- MDT Environmental Services Bureau,
- MDT Erosion and Sediment Control Section,
- MDT Preconstruction Bureau,
- Contractor, and
- Sub-Contractors.

5.2.14.1 Engineers Responsibilities

The Engineer is responsible for ensuring that the Contractor has completed all tasks required within the project design. The project design includes design drawings, specifications, change orders, and other contractual items signed between the Contractor and MDT. At project close-out the Engineer shall have documentation stating that the completed project was build as

designed or have documentation of changes made to during construction that were authorized by MDT.

In addition to the overall project responsibilities of the Engineer addressed at close-out, the Engineer is also responsible for bringing specialized MDT personnel together at the project close-out conference to verify that 100% of the project has been constructed.

5.2.14.2 Maintenance Review

MDT's Maintenance Division is solely responsible for the project following project close-out and thus their review is critical. At least one individual from the Maintenance Division shall be at the project close-out conference to ensure that the project meets their standards and maintenance requirements before the Contractor is released of construction responsibilities.

Maintenance will look to make sure that the following areas are completed with regards to erosion and sediment control:

- All post-construction BMPs are inspected for proper implementation. On some projects, MDT may place post-construction BMPs and thus the Contractor will not be responsible for this task.
- All earthen surfaces have appropriate final seeding/fertilizer/mulching mixture for maximum reestablishment.
- All channels have appropriate protection (i.e. riprap and concrete spillways).

If the Maintenance Division does not feel that the final construction meets their requirements as specified in the contract, they may require the Contractor to perform additional work.

5.2.14.3 Environmental Review

The Environmental Services Bureau shall inspect the site prior to project close-out to ensure that the Contractor has fulfilled all of the permit requirements. If the Contractor has not fulfilled all of its responsibilities to meet environmental standards, the Environmental Services Bureau may require the Contractor to perform additional work.

5.2.14.4 Record Retention

Erosion and sediment control records will be kept in accordance with guidelines established by MDT.

5.3 Erosion and Sediment Control Construction Phase Tools

This section of the manual is designed to provide information and references that the Contractor and Engineer can use to construct the erosion and sediment control devices and implement the SWPPP.

5.3.1 Reference Literature

The reference literature listed below can be used to assist the Contractor and Engineer in erosion and sediment control construction. The attempt of this section is to give an overview of each of the reference instead of laying out the information within each reference. These references are ever changing and in an attempt to provide the construction staff with the most current information; each reference should be reviewed prior to beginning the construction process.

5.3.1.1 MDT Detail Drawings

The MDT Detail Drawings consist of an English and Metric version. These drawings should be referenced to ensure that all construction activities are completed within the Department's standards. The Detail Drawings coincide with the MDT Standard Specifications for Roads and Bridges. The Detail Drawings provide the construction staff with dimensions and materials to be used for a multitude of different items and procedures.

5.3.1.2 MDT Standard Specifications for Roads and Bridges

The MDT Standard Specifications for Roads and Bridges is a compilation of construction standards used on MDT projects. The standard specifications should be referenced to ensure that BMPs are integrated into the design following the correct guidelines. Special provisions should also be followed where required.

5.3.1.3 AASHTO Highway Drainage Guidelines

With its Final Rule, the FHWA committed to ensuring that all highway construction projects are located, designed, constructed, and maintained according to standards that will minimize erosion and control associated sedimentation. Volume III of the AASHTO Highway Drainage Guidelines provides excellent guidance concerning these factors.

5.3.2 SWPPP Tools

Section 4.3.3 of this manual contains instructions and forms that shall be used during the development and preparation of the SWPPP.

5.3.3 Construction Permitting Tools

Permitting tools can be found in Section 4.3.4.

5.3.4 Erosion and Sediment Control Construction Tools

The following are construction tools that should be used when constructing the erosion and sediment control plans.

5.3.4.1 BMP Monitoring/Maintenance Checklist

On-site monitoring is necessary to assure the proper functioning of soil erosion, sedimentation, and storm water control measures. To meet the General Permit requirements, all erosion and sediment control measures must be monitored at least once every fourteen calendar days and within 24 hours after any storm event of 13 mm (0.5 inches) or greater. MDT requires monitoring of BMPs once a week, prior to forecasted storm events, and after storm events.

The Contractor and Engineer may want to use the following example inspection form to inspect the site.

BMP Monitoring / Maintenance Checklist

Yes	No	
		Are BMPs accessible for monitoring and maintenance activities?
		Is there evidence of excessive sediment loss or pollution from site?
		Are slope stabilization BMPs effective in preventing excess erosion?
		Are rills/gullies present on reclaimed slopes?
		Do slope stabilization BMPs require maintenance to remove sediment?
		Are additional or different BMPs required for slope stabilization?
		Are sediment control BMPs effective in preventing excessive soil loss from site?
		Is sediment laden water undercutting or bypassing BMPs?
		Do sediment control BMPs require maintenance to remove sediment?
		Are any off-site conditions or activities negatively affecting on-site BMPs?
		Is winterization of BMPs required?
		Are wind control BMPs effective in reducing off-site dust?
		Are there BMPs that can be removed?
		Do sediment traps and desilting basins require sediment removal?
		Have BMP monitoring report and maintenance forms been completed for each BMP?
		Have maintenance follow-up action items been recorded?

5.3.4.2 BMP Installation and Monitoring Scheduling Form

Project ____

Location ______________________________________

BMP Installation and Monitoring During Construction

BMP#	BMP Description	Phase of Project Being Protected by BMP	Anticipated Installation Date	Monitoring Frequency	Anticipated Removal Date

5.3.4.3 Winterization Checklist

BMP Winterization Checklist

Limit fall–time disturbance of surface area to only that which can be properly protected for snowmelt runoff?

Schedule temporary or erosion seeding prior to ground freezing?

Determine applicability of snow management BMPs and apply as appropriate?

Evaluate wintertime access to maintain BMPs?

Make sure all BMPs are in place and able to withstand spring thawing and snow melt conditions?

5.3.4.4 Project Close-out Checklist

Project closeout is the culmination of the construction activities. As construction ends, the Contractor and MDT work together to ensure that the project is constructed as designed. The activities listed below will assist the Contractor and the Engineer in assessing the completion of the project.

Are all temporary BMPs in place that are scheduled to remain after construction completion?

Are BMPs in proper working order and constructed in accordance to the plans, specifications details?

Are BMPs free of sediment accumulation?

Have BMPs that are no longer necessary been removed?

Is proper access provided to all BMPs requiring post-construction maintenance?

Have all outstanding items from the last BMP monitoring been corrected?

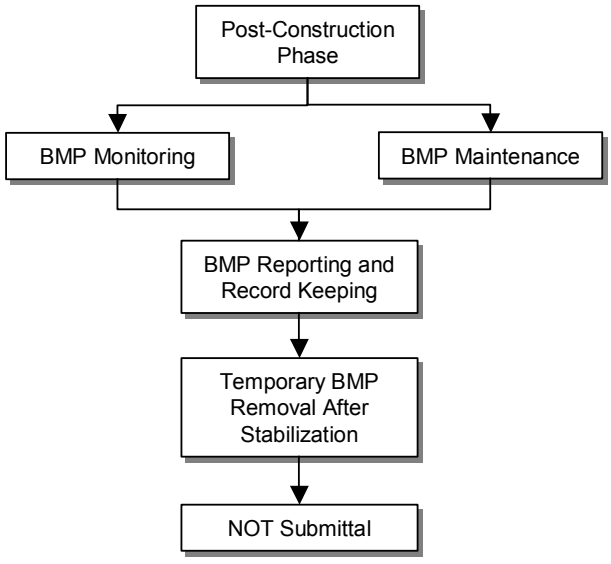
Is a representative of the MDT Maintenance Division present for close-out inspection?

Section 6
Erosion and Sediment Control Post-Construction Phase Process

6.1 Overview of Erosion and Sediment Control Post-Construction

The post-construction phase of a project addresses monitoring, maintenance, and removal of temporary erosion and sediment control BMPs after construction activities are completed. During the post-construction phase of a project, the long-term maintenance of BMPs is performed and corrective measures are taken to ensure that the BMPs perform their intended objective of preventing erosion and sedimentation in areas disturbed during construction activities. Post-construction activities include, but are not limited to, monitoring BMP effectiveness, removal of excess sediment trapped by BMPs, monitoring and maintenance of revegetation areas, repair and replacement of damaged BMPs, and removal of BMPs that are no longer required. Failure to properly address the long-term reclamation and erosion and sediment controls of a disturbed site can result in years of environmental damage both on the site and downgradient of the site. Figure 6.1-1 provides a brief overview of the post-construction phase processes as it relates to erosion and sediment control.

Figure 6.1-1 Erosion and Sediment Control Post-Construction Process



6.1.1 MDT Responsibilities

Following construction close-out, MDT becomes solely responsible for the project, unless maintenance agreements were made with Contractors or other outside organizations. At the project close-out, the project responsibilities are transferred from the Construction Bureau to the Maintenance Division. The Maintenance Division is now responsible for ensuring that all

post-construction BMPs are functioning properly, and that permanent and temporary BMPs are monitored and maintained to control erosion and sedimentation. The Maintenance Division is also required to submit a Notice of Termination (NOT) to the regulatory agency.

6.1.2 Contractor Responsibilities

Once MDT has approved the project close-out, the Contractor has minimal, if any, responsibility for post-construction. The Contractor may be required by MDT to complete some tasks that were not completed during the project close-out. Additionally, the Contractor or another agency may be brought in to perform routine maintenance on post-construction BMPs. It is important that the Maintenance Division be involved with the final Contractor close-out inspections to ensure that all the repairs were completed prior to responsibility transfer to the Maintenance Division.

6.1.3 Regulatory Agencies Responsibilities

DEQ is the primary regulatory agency involved with the post-construction phase monitoring of BMPs and the protection of surface waters from sedimentation and other pollution related to construction activities for sites not located on Tribal land. DEQ issues a NOT when a site is stabilized. Final stabilization of the site will be achieved when all soil disturbing activities at the site have been completed, and a vegetative cover has been established with a density of at least 70 percent of the pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. DEQ is responsible to provide site inspections during and after construction activities.

6.2 Erosion and Sediment Control Post-Construction Process

The erosion and sediment control post-construction process consists of monitoring, maintenance, and removal of temporary post-construction BMPs. BMP monitoring and maintenance is a critical step in ensuring that activities completed during construction are not damaged or destroyed. This section of the manual will discuss the process of post-construction with regards to monitoring, maintenance, and removal of temporary BMPs.

6.2.1 BMP Monitoring

Various methods can be utilized to monitor the effectiveness of temporary BMPs. Two common methods include water quality monitoring and hydraulic evaluation. In urban settings, where the likelihood of pollutants associated with sediment is higher than in non-urban areas, water quality sampling can be used to compare pollution loads. Influent pollutant concentrations can be compared with BMP effluent concentrations to determine if the BMP is being effective in the removal of contaminants. If pollutant concentrations are not reduced satisfactorily, a treatment BMP may need to be considered. Mining wastes may be encountered during construction activities in both urban and rural settings in Montana. These sites should be considered for water quality monitoring. Construction in areas containing petroleum or other contaminated soils must also be monitored carefully to ensure that pollutants are not exacerbated by the construction activities.

All BMPs should be evaluated for hydraulic performance. This evaluation should compare the intent of the BMP with how the BMP is performing in the field. For example, if a BMP is

designed to reduce velocity during a storm event, the evaluation should determine if the BMP has proven to be effective as constructed to intercept storm flows and reduce the velocity of the flow. A determination of the current status of this BMP also needs to be made. If the BMP was effective in reducing storm water velocities, an evaluation needs to be made to determine if the BMP is in proper working order to continue in this function during the next storm event, or to determine if maintenance is required to keep the BMP functional. Because the ultimate goal of the temporary BMPs is to protect the surface waters of Montana, an evaluation of the drainages, streams, wetlands, lakes, or other water bodies downstream of the construction site should be evaluated to determine if the BMPs are being effective at minimizing impacts to the downstream areas. This evaluation should include an assessment of any damage associated with an increase in velocity or volume of water downstream that was caused by the construction activities.

The MDT Maintenance Division shall perform BMP monitoring monthly and within 24 hours after storm event of 0.5 inches or greater. During the springtime, runoff site monitoring may need to be adjusted to daily on sites that have very low site vegetation reestablishment.

All monitoring results should be copied and sent to the Erosion and Sediment Control Section so that long-term evaluations of each BMP can be entered into the Department's database. This information will assist MDT personnel in determining which BMPs are most effective in different areas of the state.

During the monitoring phase, if a BMP is found to not to be functioning correctly, the Maintenance Division, or a Contractor, will be required to correct the problem as specified in Section 6.2.2 - BMP Maintenance.

6.2.2 BMP Maintenance

The Maintenance Division or a Contractor shall perform BMP maintenance. The maintenance staff should correct minor maintenance issues encountered during the monitoring so that the BMP can immediately regain functionality. On larger maintenance issues, the Maintenance Division shall rectify the problem as soon as possible.

The AASHTO Highway Drainage Guidelines (AASHTO, 1999) include two basic BMP maintenance requirements:

- Frequent and periodic cleanout of accumulated sediment and;
- Replacement of deteriorated BMP materials.

As a guide, any temporary BMP (silt fences, sediment basins, and check dams) should be cleaned out when its accumulation capacity is approximately 50 percent filled. This judgment should be made considering the erodible nature of soil, velocity, and quantity of flow expected and history of accumulation of sediment (AASHTO, 1999).

BMP materials should be checked for deterioration. Silt fencing that has been in place for an extended period of time can be weakened and lose its ability to hold back sediment. Similarly, straw bails can deteriorate or become dislodged by animals or vehicles and may need replacement. If a BMP is consistently being replaced due to damage, an assessment should be

made as to whether a different BMP should be installed in its place or if additional upgradient measures need to be taken to reduce erosion from the site.

Access to BMPs needs to be maintained in order to properly maintain these structures. Special provisions may need to be made to provide wintertime access to temporary BMPs. Maintaining BMPs during the winter months in Montana can be a nuisance and viewed as a costly measure; however, the overall control of snow melt events at a construction site can minimize or eliminate damage to downgradient areas and can save money in the long run as well as be more protective of the environment.

The maintenance guidance found for each temporary BMP in Section 3 is intended to help identify the measures required to properly maintain temporary BMPs and protect surface waters from erosion and sedimentation caused by construction activities.

6.2.3 Removal of Temporary BMPs

The removal of temporary BMPs is driven by the evaluation of whether sufficient reestablishment of vegetation and other measures used to minimize erosion and sedimentation have been met on a construction site. Temporary BMPs may require removal in stages depending on their intended use. For example, silt fencing is designed to trap sediment caused by erosion within the construction area. Once a site is revegetated, the silt fencing should be considered for removal. If removals of BMPs are not planned, they tend to be forgotten or ignored. Once access to construction areas is lost, removing BMPs after they have been in place for a long period can cause additional damage. If long-term sediment control is desired on a construction site, silt fencing should be considered for removal during the monitoring and maintenance period and replaced with BMPs that are designed for the smaller sediment loads expected after the site is revegetated and can be left in place. For example, small check dams can be installed during silt fence removals that will continue to serve as sediment protection and will eventually become revegetated as they fill with sediment. Silt fencing left around inlet structures for a long period may actually divert water away from the drainage structure and cause flooding or erosion problems. If excessive sediment still exists for an extended time after construction activities are completed requiring silt fencing to remain, the upgradient erosion problem should be readdressed and remediated.

6.3 Erosion and Sediment Control Post-Construction Phase Tools

This remaining portion of Section 6 provides checklists and reporting forms that the maintenance staff can use to monitor, maintain, and remove post-construction erosion and sediment BMPs.

6.3.1 Post-Construction Monitoring Schedule

Project ____

Location____

BMP Post-Construction Monitoring Schedule

BMP#	BMP Description	Monitoring Frequency	Special Conditions

6.3.2 Monitoring/Maintenance Checklist

Yes	No	
		Are BMPs accessible for monitoring and maintenance activities?
		Is there evidence of excessive sediment loss or pollution from site?
		Are slope stabilization BMPs effective in preventing excess erosion?
		Are rills/gullies present on reclaimed slopes?
		Do slope stabilization BMPs require maintenance to remove sediment?
		Are additional or different BMPs required for slope stabilization?
		Are sediment control BMPs effective in preventing excessive soil loss from site?
		Is sediment laden water undercutting or bypassing BMPs?
		Do sediment control BMPs require maintenance to remove sediment?
		Are BMP materials in sufficient condition to work as designed?
		Are any off-site conditions or activities negatively affecting on-site BMPs?
		Is winterization of BMPs required?
		Are wind control BMPs effective in reducing off-site dust?
		Are there BMPs that can be removed?
		Do sediment traps and desilting basins require sediment removal?
		Have BMP monitoring report and maintenance forms been completed for each BMP?
		Have maintenance follow-up action items been recorded?

6.3.3 Monitoring Report Form

Project ______________________________

Location ____________________________

BMP Monitoring Report Form

BMP#	Status of BMP	Repair/Maintenance Required	Date Monitored	Initial

6.3.4 BMP Maintenance Record

Project ______________________________

Location ____________________________

BMP Maintenance Report Form

BMP#	Repair/Maintenance Performed	Follow-up Required	Date	Initials

6.3.5 BMP Removal Checklist

Yes	No	
		Is site vegetation of adequate species and density (as specified by MDT Agronomist) to maintain soil stabilization?
		Have any rills or gullies formed on reclaimed slopes since last monitoring event?
		Is sediment still accumulating behind BMPs?
		Are permanent BMPs (if any) functioning properly?
		Can BMPs that are designed to collect small volumes of sediment be used in replacement of larger, more intrusive BMPs (e.g. replace silt fence with check dam)?

Section 7
References

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http://www.dot.state.ak.us/stwddes/dcs/pop_hwydrainageman.html

American Association of State Highway and Transportation Officials (ASHTO). 1999. Highway Drainage Guidelines. http://fhwa.dot.gov

Caltrans, 2000. Caltrans Storm Water Quality Handbooks, Construction Site Best Management Practices Manual. November.

Donahue, 1985. Soils – An Introduction to Soils and Plant Growth.

EPA, 2002. Contaminated Sediment.
http://www.epa.gov/OST/cs/aboutcs/overview.html

EPA, 2002. National Menu of Best Management Practices for NPDES Storm Water Phase II Downloadable Files. August 15.
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/bmp_files.cfm

Montana Department of Environmental Quality. Web Site.
http://www.deq.state.mt.us

United States Environmental Protection Agency. National Pollution Discharge Elimination System. Web Site.
http://www.epa.gov/npdes

APPENDIX A

Erosion and Sediment Control BMP Unit Cost Rate Schedule

Example of an Erosion Control BMP Rate Schedule
(Use Rate Schedule from Contract Document)

Group No.	Erosion Control Device	Value in Units for Each
SS-1 Scheduling		
	Scheduling	42/each/hour
SS-2 Preservation of Existing Vegetation		
	Preservation of Existing Vegetation 10 m (33 ft)	43/each
SS-3 Hydraulic Mulch		
	Hydraulic Mulch 100 m^2 (1076 ft^2)	17/each
SS-4 Temporary Seeding		
	Temporary Seeding100 m^2 (1076 ft^2)	846/each
SS-5 Soil Binder		
	Soil Binder 100 m^2 (1076 ft^2)	840/each
SS-6 Straw Mulch		
	Straw Mulch 100 m^2 (1076 ft^2)	67/each
SS-7 Geotextiles, Plastic Covers & Erosion Control Blankets/Mats		
	Geotextiles 100 m^2 (1076 ft^2)	263/each
	Plastic Cover 100 m^2 (1076 ft^2)	160/each
	Erosion Control Blankets/Mats 100 m^2 (1076 ft^2)	3283/each
SS-8 Wood Mulch		
	Wood Mulch 100 m^2 (1076 ft^2)	407/each
SS-9 Earth Dikes/Drainage Swales & Lined Ditches		
	Earth Dikes 10 m (33 ft)	250/each
	Earth Drainage Swales 10 m (33 ft)	250/each
	Lined Trapezoidal Ditch 10 m (33 ft)	2157/each
SS-10 Outlet Protection/Velocity Dissipation Devices		
	Outlet Protection/Velocity Dissipation Devices	557/each
SS-11 Slope Drains		
	Pipe Slope Drains	1377/each
	Riprap Slope Drains	997/each
	Ditch Lined Slope Drain	1247/each

Group No.	Erosion Control Device	Value in Units for Each
SS-12 Slope Roughening		
	Slope Roughening 100 m^2 (1076 ft^2)	228/each
SS-13 Graded Terraces		
	Graded Terraces 10 m (33 ft)	150/each
SS-14 Vegetated Buffer		
	Vegetated Buffer 10 m (33 ft)	43/each
SS-15 Erosion Seeding		
	Erosion Seeding 100 m^2 (1076 ft^2)	264/each
SC-1 Silt Fence		
	Silt Fence 10 m (33 ft)	81/each
SC-2 Desilting Basin		
	Desilting Basin – Outlet Type 1	6674/each
	Desilting Basin – Outlet Type 2	6411/each
	Desilting Basin – Outlet Type 3	6674/each
SC-3 Sediment Trap		
	Sediment Trap w/ Spillway Type Outfall	3200/each
	Sediment Trap w/ Riser Pipe Type Outfall	3911/each
SC-4 Check Dams		
	Check Dams 4 m^3 (5 yd^3)	596/each
SC-5 Fiber Rolls		
	Fiber Rolls 10 m (33 ft)	102/each
SC-6 Gravel Bag Berms		
	Gravel Bag Berm 100 bags	490/each
SC-7 Street Sweeping and Vacuuming		
	Street Sweeping and Vacuuming	104/each/hour
SC-8 Sandbag Barrier		
	Sandbag Barrier 100 bags	490/each
SC-9 Straw Bale Barriers		
	Straw bale Barriers 10 m (33 ft)	242/each

Group No.	Erosion Control Device	Value in Units for Each
SC-10 Storm Drain Inlet Protection		
	Silt Fence Barrier	566/each
	Straw Bale Barrier	643/each
	Sandbag Barrier	1139/each
	Gravel Check Dam Barrier	1147/each
SC-11 Dugout Ditch Basin		
	Dugout Ditch Basin 10 m (33 ft)	169/each
SN-1 Snow Management		
	Snow Management	182/each/hour
SN-2 Snow Accumulation Management		
	Snow Accumulation Management 10 m (33 ft)	122/each
SN-3 Freeze Reduction		
	Freeze Reduction	767/each
TC-1 Stabilized Construction Entrance		
	Stabilized Construction Entrance	2209/each
TC-2 Stabilized Construction Roadway		
	Stabilized Construction Roadway	1014/each
TC-3 Entrance/Outlet Tire Wash		
	Entrance/Outlet Tire Wash	3676/each
NS-1 Water Conservation Practices		
	Water Conservation Practices	35/each/hour
NS-2 Dewatering Operations		
	Dewatering Operations	4971/each
NS-3 Pavement and Grinding Operations		
	Pavement and Grinding Operations	35/each/hour
NS-4 Temporary Stream Crossing		
	Bridge Crossing	48655/each
	Culvert Crossing	18818/each
	Ford Crossing	14038/each
NS-5 Clear Water Diversion		
	Clear Water Diversion	35/each/hour

Group No.	Erosion Control Device	Value in Units for Each
NS-6 Illicit Connection/Illicit Discharge Detection and Reporting		
	Illicit Connection/Illicit Discharge Detection & Reporting	35/each/hour
NS-7 Potable Water/Irrigation		
	Potable Water/Irrigation	35/each/hour
NS-8 Vehicle and Equipment Cleaning		
	Vehicle and Equipment Cleaning	35/each/hour
NS-9 Vehicle and Equipment Fueling		
	Vehicle and Equipment Fueling	35/each/hour
NS-10 Vehicle and Equipment Maintenance		
	Vehicle and Equipment Maintenance	35/each/hour
WE-1 Wind Erosion Control		
	Wind Erosion Control	70/each/hour
WM-1 Material Delivery and Storage		
	Material Delivery and Storage	35/each/hour
WM-2 Material Use		
	Material Use	88/each/hour
WM-3 Stockpile Management		
	Stockpile Management	35/each/hour
WM-4 Spill Protection and Control		
	Spill Protection and Control	35/each/hour
WM-5 Solid Waste Management		
	Solid Waste Management	35/each/hour
WM-6 Hazardous Waste Management		
	Hazardous Waste Management	35/ each/hour
WM-7 Contaminated Soil Management		
	Contaminated Soils Management	35/each/hour
WM-8 Concrete Waste Management		
	Concrete Waste Management	35/each/hour

Group No.	Erosion Control Device	Value in Units for Each
WM-9 Sanitary/Septic Waste Management		
	Sanitary/Septic Waste Management	35/each/hour
WM-10 Liquid Waste Management		
	Liquid Waste Management	35/each/hour

APPENDIX B

GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER
THE MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

In compliance with Montana Code Annotated (MCA) 75-5-101 et seq., the Administrative Rules of Montana (ARM) 17.30.1301 et seq., and ARM 17.30.601 et seq., operators who submit a complete Notice of Intent package for a storm water discharge associated with construction activity under this General Permit for Storm Water Discharges Associated with Construction Activity are authorized to discharge storm water from construction activities to surface waters in accordance with the conditions set forth in Parts I, II, III, IV, and V of this General Permit.

This General Permit shall become effective June 8, 2002.

This General Permit shall expire at midnight, December 31, 2006.

FOR THE MONTANA DEPARTMENT
OF ENVIRONMENTAL QUALITY

_____
Thomas D. Reid, Supervisor
Water Quality Discharge Permit Section
Water Protection Bureau
Permitting and Compliance Division

Dated this _____ day of _____, 2002

PREAMBLE

The purpose of this Preamble is to provide the operators who submit a Notice of Intent package for a storm water discharge associated with construction activity under the General Permit for Storm Water Discharges Associated with Construction Activity a summary of the requirements for compliance with this General Permit.

The basic principle of the General Permit is to identify areas or activities that may contribute pollutants to surface waters and to consider practical methods to reduce such pollutants from your operation. The degree of pollution control necessary will vary depending on the site and the situation. For example, if you are constructing a road on perfectly flat ground where there are no surface waters in close proximity to your activities, the potential to cause pollution of surface waters is minimal, and only minimal erosion and sediment controls would be expected. On the other hand, if you are constructing a highway and there are several stream drainages, etc. in close proximity to your project, very comprehensive and complete pollution controls would be expected.

The major pollutant that could be a potential problem for construction sites will be sediment discharges from increased erosion. If the project will impact a waterbody, you must ensure that minimal sediment reaches surface waters by using appropriate erosion and sediment control measures. The discharge of turbid water may cause a violation of this General Permit. Adequate erosion and sediment control measures must also be used to prevent sediment discharges to riparian areas and ephemeral streams.

Other pollutants likely to be a problem at construction sites are fuels, lubricating oils, construction materials, fertilizers, and pesticides. Managing these materials properly (such as keeping them as far away as possible from surface waters or preventing spills of these materials) is a primary factor in ensuring pollutants do not reach surface waters through storm water runoff.

In order to help characterize the construction activity, potential sources of pollutants, and BMPs to help ensure pollutants do not reach surface waters, operators are required to develop and implement a SWPPP. The basic requirements of the SWPPP are provided in Part IV. of this General Permit.

PART I. COVERAGE UNDER THIS GENERAL PERMIT

A. General Permit Area

The General Permit applies to all areas of the State of Montana.

B. Sources Covered Under this General Permit

This General Permit covers all projects or activities which meet the definition of "storm water discharge associated with construction activity" as defined in Part V.T.15. of this General Permit. For determining whether coverage under this General Permit is required, the total land area of disturbance that is part of a larger common plan of development or sale must be used. Determination of the acreage of disturbance does not typically include disturbance for routine maintenance activities on existing roads where the line and grade of the road is not being altered, nor does it include the paving of existing roads.

The General Permit may also cover storm water discharges from support activities related to a construction site (e.g. concrete or asphalt batch plants, equipment staging yards, material storage areas, etc.). This is provided that:

1. The support activity is not a commercial operation serving multiple unrelated construction projects and does not operate beyond the completion of the construction activity.

2. Appropriate controls and measures are identified in the Storm Water Pollution Prevention Plan (SWPPP) for the discharge from the support activity.

All discharges must be in accordance with the submitted SWPPP and the provisions of this General Permit. Any other direct discharge and/or wastewater discharge to surface waters is prohibited unless covered by another MPDES permit.

This General Permit does not relieve the operator(s) from responsibility for compliance with any other applicable federal, state, or local law, rule, standard, ordinance, order, judgment, or decree.

Permittees who have an active permit authorization under the 1997-2002 General Discharge Permit for Storm Water Associated with Construction Activity (issued prior to the effective date of this 2002-2006 General Permit) shall refer to Part I.C.5. of this reissued General Permit for requirements on continued General Permit coverage for their storm water discharge associated with construction activity.

C. Notice of Intent (NOI) Submittal Procedures

1. Notice of Intent Package

Any person who is the operator of a storm water discharge associated with construction activity which requires coverage under the General Permit as stated in Part I.B. of this General Permit shall submit a complete Notice of Intent (NOI) package to the Department.* The complete NOI package consists of:

a. An NOI completed on a standard NOI form developed by the Department, which provides all of the required information stated in Part I.C.2. of this General Permit, and signed by the operator(s) based on the signatory requirements stated in Part V.G. and H. of this General Permit.

b. A separate SWPPP (document and related plans) which has been completed in accordance with the requirements identified in Part IV. of this General Permit and signed by the operator(s) based on the signatory requirements stated in Part V.G. and H. of this General Permit.

c. The application fee and first year annual fee, as required by ARM 17.30.201. (Note: New fee rules including fee amounts are effective as of February 2002.)

* For a storm water discharge associated with construction activity with construction-related disturbance under 5 acres of total land area, an NOI package is not required until the Department formally incorporates EPA Phase II requirements into the Administrative Rules of Montana.

2. NOI Form

The NOI form requires, at a minimum, the following information:

a. Name and address of all construction activity operator(s) as defined in Part V.T.8. of this General Permit.

b. Contact person and telephone number for all construction activity operator(s).

c. Construction project/site name, address, and county (for MDT projects, also provide project number and designation).

d. Project site latitude and longitude for the center of the construction activity's disturbance, or the endpoints for lineal projects (in degrees, minutes, and seconds).

e. Name of receiving surface waters. Indicate the nearest perennial surface water body receiving the storm water discharge and include a description of the flow path(s) for the storm water discharges to these receiving surface waters and the approximate distances as necessary (such as through ditches, coulees, other ephemeral streams, and/or intermittent streams). Indicate whether storm water will be discharging to a municipally owned storm sewer system; if so, indicate the receiving surface waters and a description of the flow path(s) as is pertinent.

f. Estimated construction start date and completion date through site final stabilization.

g. A USGS topographic map indicating the location of the project and nearby surface waters.

h. An estimate of the area (in acres) to be disturbed due to construction-related activity.

i. A brief description of the purpose and nature of the construction activity.

j. An indication of the type of construction activity fee submitted based on Part V.S. of this General Permit. This must be either a "commercial or public" construction activity, or a "residential (single family dwelling)" construction activity. If residential (single family dwelling)

is indicated, a description of the scope of the overall construction project supporting this fee type category must also be indicated.

k. If multiple operators are identified, an indication of which operator(s) is responsible for the submittal of fees to the Department (such as future annual fees).

l. If multiple operators are identified, an indication of which operator is responsible for the submittal of the Notice of Termination form. This must include an indication of which operator has primary responsibility, and what those responsibilities are, during major construction phases, particularly after earthwork is completed and through final stabilization. If only one operator is identified as the responsible party for final stabilization and, consequently, the submittal of the Notice of Termination form, then this operator shall also be the responsible party for fees identified in Part I.C.2.k. above.

3. NOI Package Submittal

A signed and complete NOI form, a signed and complete SWPPP, and the required application and annual fees must be submitted to the following address:

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901

4. NOI Package Receipt Confirmation Letter

The Department will provide all identified operator(s) on the NOI form with a Confirmation Letter acknowledging the receipt of the complete Notice of Intent package.

Receipt by the Department of the complete NOI package by the construction start date where construction-related disturbance will initiate shall provide coverage to discharge storm water under the General Permit. If any of the required items in the NOI package are not complete or are not submitted to the Department, coverage for storm water discharge associated with construction activity under the General Permit will not initiate until the required items are received by the Department.

Receipt by the Department of the complete NOI package constitutes a full agreement by the operator(s) to meet and comply with all requirements stated in this General Permit.

The operator(s) should submit complete NOI packages, with all components submitted at the same time, to ensure efficient NOI processing by the Department, to prevent delay of construction activity, and to minimize potential storm water discharge compliance problems.

5. NOI Submittal Requirements for Permittees Authorized under the Preceding 1997-2002 General Discharge Permit for Storm Water Associated with Construction Activity

The operator(s) of ongoing construction projects as of the effective date of this General Permit, which have an active permit authorization under the 1997-2002 General Discharge Permit for Storm Water Associated with Construction Activity, shall:

a. Submit an NOI package according to Part I.C.1., 2., and 3. of this General Permit within 90 days of the effective date of this General Permit. If the operator(s) is eligible to submit a Notice of Termination under Part V.R. of this General Permit (e.g., construction is finished and final stabilization has been achieved) before the 90th day, an NOI package is not required to be submitted.

b. For the first 90 days from the effective date of this General Permit, comply with the terms and conditions of the 1997-2002 General Discharge Permit for Storm Water Associated with Construction Activity, except that, for Notice of Terminations, the requirements of Part V.R. in this 2002-2006 General Permit shall apply.

c. Update their SWPPP to comply with the requirements of Part IV. of this General Permit within 90 days after the effective date of this General Permit.

d. If a Notice of Termination is not to be submitted before the 90th day after the effective date of this General Permit (e.g., construction is not finished and/or final stabilization has not been achieved by this date), submit an NOI fee according to ARM 17.30.201 with the NOI form. This fee will be waived if the original permit application for authorization under the 1997-2002 General Permit was stamp-received by the Department between January 1, 2002 and the effective date of this 2002-2006 General Permit.

PART II. EFFLUENT LIMITATIONS AND SPECIAL CONDITIONS

Effective immediately upon the submittal of a complete Notice of Intent package for coverage under this General Permit and lasting through the expiration date, the following effluent limitations apply.

A. There must be no discharge of process wastewater pollutants to surface waters. Discharges to surface waters of material other than storm water must be in compliance with a Montana Pollutant Discharge Elimination System (MPDES) permit other than this General Permit.

B. All discharges to surface waters covered by this General Permit must be composed entirely of storm water. Discharges must consist of water generated only through rainfall precipitation and snowmelt.

C. A discharge of storm water associated with construction activity must not cause or contribute to a violation of water quality standards.

D. The operator(s) shall develop and maintain all BMPs and storm water management controls in accordance with the SWPPP required in Part IV. Of this General Permit.

PART III. MONITORING, REPORTING, AND RECORDS RETENTION REQUIREMENTS

A. Monitoring Requirements

1. The operator(s) shall implement and maintain Best Management Practices (BMPs) to minimize potential pollutants in storm water discharges, as identified in the SWPPP.

2. Storm water discharges associated with construction activity must be monitored by the operator(s) as specified in this section to evaluate the adequacy and effectiveness of the erosion and sediment control measures and BMPs.

3. All erosion and sediment control measures must be inspected and maintained by or under the direction of the operator(s) at least once every fourteen calendar days and within 24 hours after any storm event of 0.5 inches or greater.

4. The frequency of the inspections required in Part III.A.3. may be reduced to monthly, as follows:

a. After the operator(s) has completed earthwork and construction activities at the construction site and has installed the SWPPP erosion and sediment control measures and other BMPs necessary to establish final stabilization at a later date, or

b. Between December 1 and March 1.

In either case, all sediment and erosion control measures and other BMPs must be in place as identified in the SWPPP. This change in inspection frequency and its schedule for implementation must be indicated in the SWPPP.

5. All inspections and monitoring performed above under Part III.A.3. and 4. of this General Permit must be documented and kept in accordance with Part III.C.2. and 3. of this General Permit.

6. The operator(s) of a storm water discharge associated with construction activity with construction-related disturbance of 5 acres or more of total land area, which has had active General Permit coverage for 1 year or more, shall perform an annual inspection of the site by the 1 year anniversary date of the submittal of the NOI package or the initiation of active permit coverage. The annual inspection must:

a. Identify areas contributing to the storm water discharge associated with construction activity and evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly implemented in accordance with the requirements in this General Permit or whether additional controls are needed.

b. Be summarized in a report that includes a certification of compliance with the SWPPP and General Permit and any incidents of non-compliance. Such report and certification must be signed in accordance with the signatory requirements of Part V.G. and H. of this General Permit. This inspection record, report, and certification must be maintained in accordance with Part III.C.2. and C.3. of this General Permit.

B. Reporting Requirements

1. Notification of Facility Contact Changes

The operator(s) shall notify the Department in writing of any change of the designated contact person, mailing address, and/or telephone number (as originally identified in the Notice of Intent) within 15 calendar days of this change.

2. Spill/Release Notification

The operator(s) shall submit written notification to the Department Storm Water Program (mailing address is stated in Part I.C.3. of this General Permit) within two business days of the detection of any unregulated significant spill or release in any area(s) which has the potential to introduce pollutants into storm water runoff other than sediment. This notification must provide: the Notice of Intent number; the name of the construction activity project; the operator(s) as identified on the Notice of Intent form; a description of the time and duration of the spill/release; the specific location and contaminant fate of the spill/release; a description of the quantity and type of material spilled/released; measures being taken to investigate and/or remediate the spill/release; any known or potential impacts to storm water discharges due to the spill/release; and any BMPs to be implemented to minimize and/or prevent similar spills/releases in the future.

3. Noncompliance Reporting

If, for any reason, the operator(s) does not comply with or will be unable to comply with any condition specified in this General Permit, the operator(s) shall notify the Department as soon as possible by phone and provide the Department with the following information, in writing, within five calendar days of becoming aware of such condition:

a. A description of the discharge or other cause of noncompliance;

b. The period of noncompliance, including exact dates and times; or, if not identified, the anticipated time the noncompliance is expected to continue; and,

c. Additional measures being taken to reduce, eliminate, and prevent recurrences of the non-complying discharge or other cause of noncompliance.

4. All reports, notifications, and inquiries regarding the conditions of this General Permit must be provided to the Department at:

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

C. Records Retention

1. Permit Retention Requirements

The operator shall retain a copy of this General Permit, a copy of the completed and signed Notice of Intent form, a copy of the Department's Confirmation Letter for receipt of the Notice of Intent package, and a copy of the completed and signed Storm Water Pollution Prevention Plan (SWPPP) at the construction activity project site at all times during the active coverage period provided under this General Permit. If no permanent offices/buildings are located at the facility site, copies of these documents must be retained at the office of the operator's contact person identified on the Notice of Intent form and at the office of the primary operator(s) responsible for the implementation of the SWPPP and must be brought to the site at all times with these identified operator(s). If the person(s) designated as responsible contact/individual is replaced during the active coverage period provided under this General Permit, the operator(s) shall ensure measures are in place to transfer and familiarize replacement personnel with the requirements pertaining to these documents.

2. Inspection and Uncontrolled Release Records

The operator(s) shall keep a record of inspections, the date and time inspected, and the name of the person performing the inspection. Uncontrolled releases of mud or muddy water or "significant sediment" (as defined in Part V.T.13. of this General Permit) found off the site or entering into surface waters must be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the site. This inspection record must be made available to the Department upon request. Any occurrence of noncompliance must be reported according to Part III.B.3. of this General Permit.

3. Required Period of Record Retention

All records and information resulting from the monitoring activities required by this General Permit, a copy of the completed and signed NOI form, a copy of the DEQ NOI Package Receipt Confirmation Letter, and a copy of the completed and signed SWPPP shall be retained by the operator(s) for a minimum of 3 years from the date the site is finally stabilized, or longer if requested by the Department.

PART IV. STORM WATER POLLUTION PREVENTION PLAN

A. The operator(s) shall develop a Storm Water Pollution Prevention Plan (SWPPP) and submit a copy of the SWPPP at the same time as the Notice of Intent form. This operator shall implement the SWPPP at the time construction activity commences. The objective of the SWPPP is to minimize the erosion of disturbed land during construction and post-construction activities and to minimize pollutants, such as sediment, fuels, oil, grease, fertilizer, pesticides, concrete truck washout, etc., from discharging to surface waters. It is the responsibility of the operator(s) to ensure the SWPPP requirements stated in this General Permit are complied with. Incomplete SWPPPs are a violation of this General Permit. The Department may take (or initiate) enforcement action if an operator is found to have prepared an incomplete SWPPP.

The SWPPP must:

1. Be signed in accordance with the signatory requirements in Part V.G. and H. of this General Permit,

2. Be maintained at the construction site in accordance with Part III.C. of this General Permit, and

3. Provide for compliance with the terms and schedule of the SWPPP and be updated as necessary.

B. The SWPPP must be implemented for the entire duration of the project, beginning with disturbance related to construction activity and lasting through establishment of site final stabilization of disturbed areas.

C. The Department may notify the operator(s), that the SWPPP is not in compliance with this General Permit. This determination of SWPPP deficiency may be derived through site inspection or through a review of the SWPPP. After such notification from the Department, the operator(s) shall make changes to the SWPPP and submit a written certification to the Department indicating the necessary changes have been made. Unless otherwise provided by the Department, the operator(s) shall have seven calendar days after such notification to make the necessary changes to the SWPPP. When the Department makes such notification, the operator(s) shall provide the Department with a copy of revisions to the SWPPP.

D. The operator(s) shall amend the SWPPP whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters, or if the SWPPP proves to be ineffective in achieving the general objectives of controlling pollutants in a storm water discharge associated with construction activity. When such revisions are made to the SWPPP based upon this General Permit condition, the operator(s) shall provide the Department with a copy of revisions to the SWPPP.

E. The SWPPP may include any erosion and sediment control measures or Best Management Practices (BMPs), including but not limited to the use of sediment basins, berms, barriers, filter strips, covers, diversion structures, seeding, and sodding.

F. Any SWPPP that is prepared for a construction activity which includes 20 acres or more in total disturbance related to construction activity, must be reviewed and stamped by a professional engineer licensed in the State of Montana.

G. The SWPPP must include at least the following items:

1. Site Description: Each plan must at a minimum, provide a description of the following:

a. The nature of the construction activity, including a proposed implementation schedule for major activities;

b. Estimates of the total area of the site, and all other sites if a phased development project, and the area of the site that is expected to undergo disturbance related to construction activity;

c. Site map(s) indicating:

• Areas of total development and, at a minimum, areas of "disturbance" related to construction activity (including support activities related to a construction site concrete or asphalt batch plants, equipment staging yards, material storage areas, material borrow areas, etc.);

• Drainage patterns;

• Approximate slopes anticipated after major grading activities;

• Areas used for the storage of soils or wastes;

• Areas used for the storage of fuel(s);

• Location of all erosion and sediment control measures or structures;

• Areas where vegetative measures are to be implemented;

• The location of impervious structures (including buildings, roads, parking lots, outdoor storage areas, etc.) after construction is completed;

• The location of all surface waters on or near to the construction activity site (including perennial and intermittent water bodies, ephemeral streams, springs, wetlands with standing water, etc.),

• The boundary of the 100-year floodplain, if determined; and

• A north arrow and map scale;

d. The character and erodibility of sediment and other earth material to be disturbed at the project site, including cut/fill material to be used;

e. For a storm water discharge associated with construction activity with construction-related disturbance of 5 acres or more of total land area, an estimate of the runoff coefficient of the site and the increase in impervious area after the construction addressed in the NOI is completed;

f. The names of receiving surface waters and a description of the size, type, and location of each point source discharge or outfall. If there is no distinguishable point source discharge or outfall to the receiving surface waters, a description of storm water runoff flow and drainage patterns into the receiving surface waters must be provided. If the discharge is to a municipal separate storm sewer, the location of any storm sewer discharge into receiving surface waters; and

g. A description of storm water discharges from support activities related to a construction site (e.g. concrete or asphalt batch plants, equipment staging yards, material storage areas, etc.).

2. BMPs and Storm Water Management Controls

Each operator(s) covered by this General Permit shall develop, as part of the SWPPP, a description of BMPs and storm water management controls appropriate for the site, including a brief description of applicable local erosion and sediment control requirements. The following

minimum components must be addressed, including a schedule for implementation, unless otherwise authorized in writing by the Department.

a. A description of stabilization measures which must, to the degree practicable, preserve existing vegetation and re-vegetate areas of construction-related disturbance as soon as possible after grading or construction. In developing vegetative measures, the operator(s) shall consider: temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer/filter strips, grassed waterways, erosion control blankets, and tree and shrub planting.

b. A description of structural measures which indicates how, to the degree practicable, the operator(s) will divert storm water flows from exposed soil, store these flows, or otherwise limit runoff from exposed areas of the site. In developing structural measures, the operator(s) shall consider: straw bale dikes, silt fences, earth dikes, brush barriers, drainage swales, check dams, subsurface drains, pipe slope drains, rock outlet protection, drain inlet and outlet protection, temporary drain diversions, sediment traps, temporary sediment basins, infiltration trenches or basins, and retaining walls. The operator(s) should also consider the proximity of structural measures with respect to floodplains, and if there are other alternatives, avoid the placement of structural BMPs within the floodplain.

c. None of the temporary control structures, including silt fences and straw bale dikes, shall be removed until permanent vegetation and site stabilization has taken place. The only exception to this would be where temporary control structures need to be moved or removed in order to allow continuing construction activities to occur, in which case equivalent measures must be implemented to ensure the same level of protection in minimizing potential pollutant discharges.

d. Off-site vehicle tracking of sediments from the construction site must be controlled or minimized, particularly onto paved road surfaces, in order to minimize the potential impairment of storm water quality.

e. When trucking saturated soils from the site, either tight leak-proof trucks must be used or loads must be required to drain until drippage has been reduced to less than 1 gallon per hour before leaving the site.

H. BMPs must minimize or prevent "significant sediment" (as defined in Part V.T.13. of this General Permit) from leaving the construction site.

I. If "significant sediment" (as defined in Part V.T.13. of this General Permit) results from the failure of erosion or sediment control measures, the operator(s) shall evaluate the effectiveness of such measures or other BMPs and incorporate improvements to minimize the potential for "significant sediment".

J. If "significant sediment" (as defined in Part V.T.13. of this General Permit) results from the failure of erosion or sediment control measures, the material must be cleaned up and placed back on the site or disposed of in an acceptable manner. The material must not be washed into the storm sewer(s), drainageway(s), or receiving surface waters. This does not waive any obligations for the operator(s) to obtain other permits or permissions to clean up the "significant sediment."

K. A description of measures to control pollutants in storm water discharges that will occur after construction operations have been completed must be addressed in the SWPPP, including a brief description of applicable local erosion and sediment control requirements. Such measures may include: storm water detention structures (including wet ponds), storm water retention structures, flow attenuation by use of open vegetated swales and natural depressions, and infiltration of runoff on-site.

PART V. STANDARD CONDITIONS

A. Duty to Comply

The operator(s) shall comply with all conditions of this General Permit. Any General Permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, for termination of coverage under the General Permit, revocation and reissuance, modification of coverage under the General Permit, or for denial of General Permit coverage renewal. The operator(s) shall give the Department advance notice of any planned changes at the permitted activity that may result in permit noncompliance.

The Montana Water Quality Act (75-5-631, MCA) and the federal Clean Water Act (Section 309) provide significant penalties for any person who violates a General Permit condition. Any person who violates any condition of this General Permit is subject to a civil penalty not to exceed $25,000 per day per violation, or an administrative penalty not to exceed $10,000 per day per violation, as well as any other appropriate sanction provided by Section 309 of the Clean Water Act.

B. Continuation of the Expired General Permit

An expired General Permit remains in full force and effect until the General Permit is reissued. Those operator(s) who submitted Notices of Intent prior to the expiration date or who were granted coverage under the General Permit before it expired, are covered by the expired permit until the General Permit is reissued.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for an operator(s) in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D Duty to Mitigate

The operator(s) shall take all reasonable steps to minimize or prevent any discharge in violation of this General Permit that has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to Provide Information

The operator(s) shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating coverage under this General Permit, or to determine compliance with this General Permit. The operator(s) shall also furnish to the Department, upon request, copies of records required to be maintained under this General Permit.

F. Other Information

When the operator(s) becomes aware that he failed to submit any relevant facts or submitted incorrect information in a Notice of Intent package or any report to the Department, he shall promptly submit such facts or information.

G. Signatory Requirements

All Notices of Intent, SWPPPs, Notices of Termination, and reports or information, must be signed and certified.

1. All Notices of Intent, SWPPPs, Notices of Termination, and reports required by this General Permit must be signed by the following persons or by a duly authorized representative of these persons as provided in Part V.G.2. of this General Permit:

a. For a corporation, by a responsible corporate officer;

b. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively;

c. For a municipality, state, federal, or other public agency, by either a principal executive officer or ranking elected official.

2. A person is a duly authorized representative of the person stated above in Part V.G.1. of this General Permit only if:

a. The authorization is made in writing by the person stated in Part V.G.1. of this General Permit and submitted to the Department, and

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company (A duly authorized representative may thus be either a named individual or any individual occupying a named position).

3. Changes to authorization. If an authorization under Part V.G.2. of this General Permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility or activity, a new authorization satisfying the requirements of Part V.G.2. of this General Permit must be submitted to the Department prior to, or together with, any SWPPP revisions, reports, or other information requiring the signature of a duly authorized representative.

H. Certification

Any person signing a document required under this General Permit shall make the following certification:

"I certify under penalty of the 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 gather and evaluate 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."

I. Penalties for False Statements and Falsifying Monitoring

Under Section 75-5-633, MCA, the Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any Notice of Intent, record, report, plan, or other document filed or required to be maintained under this General Permit or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this General Permit shall upon conviction be punished by a fine of not more than $25,000 or by imprisonment for not more than 6 months or both.

J. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the operator(s) from any responsibilities, liabilities, or penalties to which the operator(s) is or may be subject under Section 311 of the Clean Water Act.

K. Property Rights

The issuance of this General Permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property, nor any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

L. Severability

The provisions of this General Permit are severable, and if any provision of this General Permit, or the application of any provision of this General Permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

M. Transfers

A Notice of Intent cannot be transferred to a new operator(s). A new operator of a facility must submit a new Notice of Intent package according to the procedures in Part I.C. of this Permit prior to taking responsibility for the construction activity. If the new operator(s) chooses to develop a new SWPPP, the new operator(s) shall be expected to implement the old SWPPP until the new plan is developed, implemented, and submitted to the DEQ.

N. Proper Operation and Maintenance

The operator(s) shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the operator(s) to achieve compliance with the conditions of this General Permit and with the requirements of Storm Water Pollution Prevention Plans. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance require the operation of backup or auxiliary facilities or similar systems, installed by an operator(s) only when necessary to achieve compliance with the conditions of the General Permit.

O. Inspection and Entry

The operator(s) shall allow the Department or the Regional Administrator, or authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:

1. At reasonable times, enter upon the operator(s)'s premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this General Permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), measures, or operations regulated or required under this General Permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

P. Permit Actions

Coverage under this General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the operator(s) for a modification, revocation and reissuance, or termination, or notification of planned changes or anticipated noncompliance, does not stay any General Permit condition.

Q. Reopener Provision

If there is evidence indicating an exceedance of a water quality standard due to any storm water discharge associated with construction activity that is covered by this General Permit, the operator(s) may be required to develop and implement a corrective action plan, which may include additional BMPs or the need to apply for and obtain coverage under an individual MPDES permit.

R. Notice of Termination (NOT)

1. Where a site has been finally stabilized or where the operator(s) at a site changes, the operator(s) shall submit a standard DEQ Notice of Termination (NOT) form that has been signed in accordance with Part V.G. and H. of this General Permit. The standard DEQ Notice of Termination form that is used must be the 2002 updated version (or a subsequent revision) and must include the following information:

a. The mailing address of the construction activity site. Where a mailing address for the site is not available, the location of the site must be described by the latitude and longitude for the center of the construction activity disturbance, or the endpoints for lineal projects (in degrees, minutes, and seconds);

b. The name, address, and telephone number of the operator(s) as identified in the Notice of Intent;

c. The MPDES Notice of Intent number as stated in the NOI Package Receipt Confirmation Letter described in Part I.C.4. of this General Permit;

d. Certification indicating the site has achieved final stabilization, or the operator(s) of the project has changed; and

e. The Notice of Termination form must be signed in accordance with Part V.G. and include the signature certification in accordance with Part V.H. of this General Permit. The Notice of Termination must be sent to the following address:

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
1520 East Sixth Avenue
PO Box 200901
Helena, MT 59620-0901

Failure to submit a Notice of Termination shall result in additional annual permit fee accumulation until notification has been received.

2. For the operator(s) identified on the Notice of Intent form submitted to the Department, only one Notice of Termination form shall be submitted when final stabilization of disturbed areas associated with the construction activity has been satisfactorily accomplished.

3. If more than one operator is stated on the Notice of Intent form and an operator(s) desires to be relieved of responsibility for a particular portion and/or period of the General Permit coverage period, then the operator(s)shall so indicate on the Notice of Intent form when it is submitted. Consequently, the Notice of Intent form must specify which operator is responsible for the submittal of the Notice of Termination. This would typically pertain to situations where a hired contractor has completed earthwork activities and the owner elects to accept sole responsibility for compliance with the General Permit (including annual fees) from the cessation of earthwork activities through final stabilization of the site and the formal submittal of the Notice of Termination form.

S. Fees

1. The operator(s) is required to submit payment of an annual fee as set forth in ARM 17.30.201. (Note: New fee rules (including fee amounts) are effective as of February 2002.) When there is more than one operator specified on the Notice of Intent form, there shall be an indication of which operator is responsible for payment of the annual fees. If the operator(s) fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

a. Impose an additional assessment consisting of 15 percent of the fee, plus interest, on the required fee computed at the rate established under 15-31-510(3), MCA; or

b. Suspend the effective date of the Notice of Intent for General Permit coverage or, if the nonpayment involves an annual permit fee, suspend the coverage under the General Permit for which the fee is required. The Department may lift suspension at any time up to 1 year after the

suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments, and interest imposed under this sub-section. Suspensions are limited to 1 year, after which the coverage under the General Permit through the Notice of Intent will be terminated.

2. Fees submitted for storm water discharges associated with construction activity are divided into two categories based on the following:

a. A "residential (single family dwelling)" construction activity is the construction of any building, structure, access, utility, or related disturbance utilized for single family occupancy on a distinct and individual lot or parcel of land and that is not combined with or a part of construction activity related to other lots, parcels of land, or single family dwellings; and

b. A "commercial or public" construction activity is a construction activity that does not meet the above criteria as a "residential (single family dwelling)" construction activity and that includes the development of subdivisions and other projects, which are part of a common plan for development or sale.

An indication of which of these two categories a construction activity meets must be provided on the NOI form as required in Part I.C.2.j. of this General Permit.

T. Definitions

1. The "Act" means the Federal Clean Water Act.

2. "Best Management Practices" ("BMPs") means schedule of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of state waters. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

3. The "Department" means the Montana Department of Environmental Quality.

4. "Disturbance" related to construction activity means areas that are subject to clearing, excavating, grading, stockpiling earth materials, and placement/removal of earth material performed during construction projects.

5. "Ephemeral stream" means a stream or part of a stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and whose channel bottom is always above the local water table.

6. "Final stabilization" means all soil disturbing activities at the site have been completed, and a vegetative cover has been established with a density of at least 70 percent of the pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. Final stabilization using vegetation shall be accomplished using seeding mixtures or forbs, grasses, and shrubs, which are adapted to the conditions of the site. Establishment of a vegetative cover capable of providing erosion control equivalent to pre-existing conditions at the site will be considered final stabilization.

7. "Larger common plan of development or sale" means a contiguous area where multiple separate and distinct construction activities are planned to occur at different times on different schedules under one plan. These separate and distinct construction activities which form a larger common plan of development or sale may have areas of disturbance which are not physically connected.

8. "Operator" for the purpose of permitting "storm water discharge associated with construction activity" means any "owner or operator" as defined in ARM 17.30.1304 associated with a construction project, who is a person designated as an eligible signatory pursuant to Part V.G. of this General Permit, and who meets either of the following two criteria:

a. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

b. The party has day-to-day operational control of those activities at a project, which are necessary to ensure compliance with a Storm Water Pollution Prevention Plan for the site or other General Permit conditions (e.g., is authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

If multiple operators are identified on the Notice of Intent form, a particular operator may be an "operator" for a particular segment or phase of the construction activity and/or "storm water discharge associated with construction activity". An example is if contracted help is used for earthwork, but not through to final stabilization of the site.

An "operator" is not a person(s) at the construction project site employed by the designated eligible signatory pursuant to Part V.G. of this General Permit (such as construction equipment users).

An "operator" shall be considered to have operational control over all their subcontractors.

9. "Point source" means any discernible, confined, or 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 storm water runoff.

10. "Receiving surface waters" is the river, stream, lake, etc., which receives the discharge from the site.

11. "Regional administrator" means the administrator of Region VIII of the Environmental Protection Agency, which has jurisdiction over federal water pollution control activities in the state of Montana.

12. "Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

13. "Significant sediment" means mud, dirt, sediment, or similar material exceeding 1.0 cubic foot in volume which is deposited in any area of 100 square feet or less on public or private streets or property adjacent to the construction site. "Deposited" includes direct deposit, dropping, discharge, or placement as a result of erosion.

14. "Storm water" means storm water runoff, snowmelt runoff, and surface runoff and drainage.

15. "Storm water discharge associated with construction activity" means a discharge from construction activity due to disturbance from clearing, grading and excavation, except operations that result in the disturbance of less than 1 acre of total land area. Construction activity also includes the disturbance of less than 1 acre of total land area that is a part of a larger common plan of development or sale if the larger common plan will ultimately disturb 1 acre or more. Irregardless of the acreage of disturbance for a construction activity, this definition includes any other construction activity designated by the Department based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to surface waters. For storm water discharge associated with a construction activity, which has disturbance less than 5 acres, the acreage of disturbance does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

16. "SWPPP" or "Storm Water Pollution Prevention Plan" means a document developed to help identify sources of pollution potentially affecting the quality of storm water discharges associated with a facility or activity and to ensure implementation of measures to minimize and control pollutants in storm water discharges associated with a facility or activity. The Department determines specific requirements and information to be included in a SWPPP based on the type and characteristics of a facility or an activity and on the respective MPDES permit requirements.

17. "Surface waters" means any waters on the earth's surface including, but not limited to, streams, lakes, ponds, and reservoirs and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir or other surface water. Water bodies used solely for treating, transporting, or impounding pollutants shall not be considered surface water.

APPENDIX C

DEQ Notice of Intent (NOI) Form

NOI NUMBER (DEQ Will Assign):_____

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER PROTECTION BUREAU / STORM WATER PROGRAM
PO Box 200901 / Helena, MT / 59620-0901

NOTICE OF INTENT (NOI) FORM
GENERAL PERMIT FOR STORM WATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITY

IMPORTANT: Before completing this form, all parties need to read the General Permit. For coverage to be valid upon receipt by the Department, all required items on the form must be completed. Responses must be self-explanatory and must not refer exclusively to attached maps, plans, or documents. The Storm Water Pollution Prevention Plan (SWPPP) and appropriate fees must accompany the NOI Form. Do not submit these items separately. Mail this NOI Form to the DEQ address above. The 2002-2006 General Permit, 2002 Fee Schedule, and related forms are available from the Storm Water Program at (406) 444-3080 or http://www.deq.state.mt.us/wqinfo/MPDES/Storm waterConstruction.asp.

I. OPERATOR INFORMATION

List each party participating in the construction activity—from initiation of construction through final stabilization—that will be an operator as defined in Part V.T.8. of the General Permit. (Examples: primary contractor, project owner, site/land owners, consultants, or other contractors, such as the "final stabilization" contractor). For each operator, briefly describe responsibilities (what, when, where) for ensuring compliance with General Permit requirements.

OPERATOR #1

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____
Operator #1 Responsibilities: _____
_____
_____
_____
_____
_____

OPERATOR #2

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____
Operator #2 Responsibilities: _____
_____
_____
_____
_____
_____

OPERATOR #3

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____
Operator #3 Responsibilities: _____
_____
_____
_____
_____
_____

II. INDICATE WHICH OPERATOR IS RESPONSIBLE FOR:

A) Achieving "final stabilization" of the site: _____
B) Submitting the "Notice of Termination" (Specify one operator only): _____
C) Payment of any subsequent annual fees (Specify one operator only): _____

III. CONSTRUCTION ACTIVITY INFORMATION (see General Permit for clarification)

A) Construction Activity Name: _____
B) Construction Activity Address (or location if no address): _____
_____
C) Construction Activity County: _____
D) MDT Project Number/Designation (if applicable): _____
E) Construction Activity Latitude and Longitude (See Part I.C.2.d. of General Permit): _____
_____
F) Number and Names of Receiving Surface Waters (See Part I.C.2.e. of General Permit. Describe clearly. The number of named or perennial receiving surface waters must be determined for you to calculate the fee in item "H" below. Attach
USGS topographic map showing project location and surface waters as required in Part I.C.2.g. of the General Permit): _____
_____
_____
_____
G) Type of Construction Activity Fee (see Part I.C.2.j. of General Permit): _____
H) Indicate the Application and First Year Annual Fee Amounts Attached:
Application Fee Amount: _____ Annual Fee Amount: _____ Check No.: _____
I) Brief Description of Purpose and Nature of Construction Activity: _____
_____
_____
_____
_____
J) Estimated Construction Activity Start Date: _____
K) Estimated Construction Activity Completion Date: _____
L) Estimated Final Stabilization Completion Date: _____
M) Estimate of Total Acreage of Construction-related Disturbance: _____
N) Has a Storm Water Pollution Prevention Plan been developed according to Part IV of the General Permit and submitted with this Notice of Intent? YES _____ NO _____

IV. CERTIFICATION

"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 gather and evaluate 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 or imprisonment for knowing violations."

_____ _____

Print Name of Operator #1 or Authorized Representative Title

_____ _____

Signature of Operator # 1 (Name must match that above) Date

_____ _____

Print Name of Operator #2 or Authorized Representative Title

_____ _____

Signature of Operator #2 (Name must match that above) Date

_____ _____

Print Name of Operator #3 or Authorized Representative Title

_____ _____

Signature of Operator #3 (Name must match that above) Date

APPENDIX D

EPA Notice of Intent (NOI) Form

THIS FORM REPLACES PREVIOUS FORM 3510-6 (8-98)
See Reverse for Instructions

Form Approved. OMB No. 2040-0188

NPDES FORM

United States Environmental Protection Agency
Washington, DC 20460

Notice of Intent (NOI) for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY Under a NPDES General Permit

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a NPDES permit issued for storm water discharges associated with construction activity in the State/Indian Country Land identified in Section II of this form. Submission of this Notice of Intent also constitutes notice that the party identified in Section I of this form meets the eligibility requirements in Part I.B. of the general permit (including those related to protection of endangered species determined through the procedures in Addendum A of the general permit), understands that continued authorization to discharge is contingent on maintaining permit eligibility, and that implementation of the Storm Water Pollution Prevention Plan required under Part IV of the general permit will begin at the time the permittee commences work on the construction project identified in Secion II below. IN ORDER TO OBTAIN AUTHORIZATION, ALL INFORMATION REQUESTED MUST BE INCLUDED ON THIS FORM. SEE INSTRUCTIONS ON BACK OF FORM.

I. Owner/Operator (Applicant) Information

Name: Phone:

Address: Status of Owner/Operator: ☐

City: State: Zip Code: –

II. Project/Site Information

Is the facility located on Indian Country Lands? Yes ☐ No ☐

Project Name:

Project Address/Location:

City: State: Zip Code: –

Latitude: Longitude: County:

Has the Storm Water Pollution Prevention Plan (SWPPP) been prepared? Yes ☐ No ☐

Optional: Address of location of SWPPP for viewing ☐ Address in Section I above ☐ Address in Section II above ☐ Other address (if known) below:

SWPPP Address: Phone:

City: State: Zip Code: –

Name of Receiving Water:

Month Day Year
Estimated Construction Start Date

Month Day Year
Estimated Completion Date

Estimate of area to be disturbed (to nearest acre):

Estimate of Likelihood of Discharge (choose only one):

1. ☐ Unlikely
2. ☐ Once per month
3. ☐ Once per week
4. ☐ Once per day
5. ☐ Continual

Based on instruction provided in Addendum A of the permit, are there any listed endangered or threatened species, or designated critical habitat in the project area?

Yes ☐ No ☐

I have satisfied permit eligibility with regard to protection of endangered species through the indicated section of Part I.B.3.e.(2) of the permit (check one or more boxes):

(a) ☐ (b) ☐ (c) ☐ (d) ☐

III. Certification

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 gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this 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.

Print Name: Date:

Signature: _____

EPA Form 3510-9 replaced 3510-6 (8-98)

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity to be Covered Under a NPDES Permit

Form Approved. OMB No. 2040-0188

Who Must File a Notice of Intent Form

Under the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et.seq.; the Act), except as provided by Part I.B.3 the permit, Federal law prohibits discharges of pollutants in storm water from construction activities without a National Pollutant Discharge Elimination System Permit. Operator(s) of construction sites where 5 or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least 5 acres, or any site designated by the Director, must submit an NOI to obtain coverage under an NPDES Storm Water Construction General Permit. If you have questions about whether you need a permit under the NPDES Storm Water program, or if you need information as to whether a particular program is administered by EPA or a State agency, write to or telephone the Notice of Intent Processing Center at (866) 352-7755.

Where to File NOI Form

NOIs sent regular mail:

Storm Water Notice of Intent (4203M)
USEPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

NOIs sent overnight/express:

Storm Water Notice of Intent
US EPA East Building, Rm. 7329
1201 Constitution Avenue, NW
Washington, D.C. 20004

Storm Water Pollution Prevention Plans (SWPPPs) should not be sent in with the NOI -- they should remain on-site. For overnight/express delivery of NOIs, add the phone number (202) 564-9537. Please submit original document with signature in ink—DO NOT send copies.

When to File

This form must be filed at least 48 hours before construction begins.

Completing the Form

OBTAIN AND READ A COPY OF THE APPROPRIATE EPA STORM WATER CONSTRUCTION GENERAL PERMIT FOR YOUR AREA. To complete this form, type or print, using uppercase letters, in the appropriate areas only. Please place each character between the marks (abbreviate if necessary to stay within the number of characters allowed for each item). Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions on this form, call the Notice of Intent Processing Center at (866) 352-7755.

Section I. Facility Owner/Operator (Applicant) Information

Provide the legal name, mailing address, and telephone number of the person, firm, public organization, or any other entity that meet either of the following two criteria: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have the day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions. Each person that meets either of these criteria must file this form. Do not use a colloquial name. Correspondence for the permit will be sent to this address.

Enter the appropriate letter to indicate the legal status of the owner/operator of the project: F = Federal; S = State; M = Public (other than federal or state); P = Private.

Section II. Project/Site Information

Enter the official or legal name and complete street address, including city, county, state, zip code, and phone number of the project or site. If it lacks a street address, indicate with a general statement the location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit coverage to be granted.

The applicant must also provide the latitude and longitude of the facility in degrees, minutes, and seconds to the nearest 15 seconds. The latitude and longitude of your facility can be located on USGS quadrangle maps. Quadrangle maps can be obtained by calling 1-800 USA MAPS. Longitude and latitude may also be obtained at the Census Bureau Internet site: http://www.census.gov/cgi-bin/gazetteer.

Latitude and longitude for a facility in decimal form must be converted to degrees, minutes and seconds for proper entry on the NOI form. To convert decimal latitude or longitude to degrees, minutes, and seconds, follow the steps in the following example.

Convert decimal latitude 45.1234567 to degrees, minutes, and seconds.

1) The numbers to the left of the decimal point are degrees.
2) To obtain minutes, multiply the first four numbers to the right of the decimal point by 0.006. 1234 x .006 = 7.404.
3) The numbers to the left of the decimal point in the result obtained in step 2 are the minutes: 7'.
4) To obtain seconds, multiply the remaining three numbers to the right of the decimal from the result in step 2 by 0.06: 404 x 0.06 = 24.24. Since the numbers to the right of the decimal point are not used, the result is 24".
5) The conversion for 45.1234 = 45° 7' 24".

Indicate whether the project is on Indian Country Lands.

Indicate if the Storm Water Pollution Prevention Plan (SWPPP) has been developed. Refer to Part IV of the general permit for information on SWPPPs. To be eligible for coverage, a SWPPP must have been prepared.

Optional: Provide the address and phone number where the SWPPP can be viewed if different from addresses previously given. Check appropriate box.

Enter the name of the closest water body which receives the project's construction storm water discharge.

Enter the estimated construction start and completion dates using four digits for the year (i.e. 05/27/1998).

Enter the estimated area to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest acre; if less than 1 acre, enter "1." Note: 1 acre = 43,560 sq. ft.

Indicate your best estimate of the likelihood of storm water discharges from the project. EPA recognizes that actual discharges may differ from this estimate due to unforeseen or chance circumstances.

Indicate if there are any listed endangered or threatened species, or designated critical habitat in the project area.

Indicate which Part of the permit that the applicant is eligible with regard to protection of endangered or threatened species, or designated critical habitat.

Section III. Certification

Federal Statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner of the proprietor, or

For a municipality, state, federal, or other public facility: by either a principal executive or ranking elected official. An unsigned or undated NOI form will not be granted permit coverage.

Paperwork Reduction Act Notice

Public reporting burden for this application is estimated to average 3.7 hours. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form, including any suggestions which may increase or reduce this burden to: Director, OPPE Regulatory Information Division (2137), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB control number on any correspondence. Do not send the completed form to this address.

APPENDIX E
DEQ SWPPP Form

Montana Department of Environmental Quality
Water Protection Bureau
Storm Water Program
PO Box 200901
Helena, MT 59620-0901

SWPPP Form
General Permit For Storm Water Discharge Associated with Construction Activity

IMPORTANT (READ THIS BEFORE COMPLETING FORM):
Before completing this form all parties need to read the General Permit, particularly Part IV on SWPPPs. This SWPPP Form is intended to assist operators in developing a SWPPP, which complies with Part IV. of the General Permit. The SWPPP is a document which is developed to direct and assist operators in identifying sources of potential pollutants at the construction activity site, and BMPs to be used to help ensure such pollutants do not impact receiving surface waters through storm water runoff. It is the operator's responsibility to ensure all required items in the General Permit are adequately addressed, and that the SWPPP is developed, implemented, and maintained. Additional narrative information may need to supplement this SWPPP Form in order to meet these requirements. A copy of the SWPPP must be maintained at the construction activity site as required in Part III.C. of the General Permit. Items I through III on this SWPPP Form must state information exactly the same as that indicated on the NOI Form. Attach additional pages as necessary with the item number on this form indicated. For coverage under the General Permit to be valid upon the submittal of a NOI Package, this package must include a complete NOI Form, SWPPP, and fee. Do not submit these items separately. Mail the NOI Package to the DEQ address above. The 2002-2006 General Permit, 2002 Fee Schedule, and related forms are available from the Storm Water Program at (406) 444-3080 or http://www.deq.state.mt.us/wqinfo/MPDES/Storm waterConstruction.asp.

NOI NUMBER (DEQ will assign when this form (NOI Package) is submitted): **MTR10 _ _ _**

I. OPERATOR INFORMATION

List each party participating in the construction activity—from initiation of construction through final stabilization—that will be an operator as defined in Part V.T.8. of the General Permit. (Examples: primary contractor, project owner, site/land owners, consultants, or other contractors, such as the "final stabilization" contractor). For each operator, briefly describe responsibilities (what, when, where) for ensuring compliance with General Permit requirements.

OPERATOR #1
Name:_____ Phone:_____
Mailing Address:_____ State:_____ Zip Code:_____
Contact Person:_____ Phone (if different from above):_____
Operator #1 Responsibilities:_____
_____
_____
_____
_____

OPERATOR #2

Name:_____ Phone:_____
Mailing Address:_____ State:_____ Zip Code:_____
Contact Person:_____ Phone (if different from above):_____
Operator #2 Responsibilities:_____
_____
_____
_____
_____

OPERATOR #3

Name:_____ Phone:_____
Mailing Address:_____ State:_____ Zip Code:_____
Contact Person:_____ Phone (if different from above):_____
Operator #3 Responsibilities:_____
_____
_____
_____
_____

II. INDICATE WHICH OPERATOR IS RESPONSIBLE FOR:

A) Achieving "final stabilization" of the site:_____
B) Submitting the "Notice of Termination" (Specify one operator only):_____

III. CONSTRUCTION ACTIVITY INFORMATION (see General Permit for clarification)

A) Construction Activity Name:_____
B) Construction Activity Address (or location if no address):_____
_____
C) Construction Activity County:_____
D) MDT Project Number/Designation (if applicable):_____
E) Construction Activity Latitude and Longitude (Refer to Part I.C.2.d. of General Permit):___
_____
F) Estimated Construction Activity Start Date:_____
G) Estimated Construction Activity Completion Date:_____
H) Estimated Final Stabilization Completion Date:_____

IV. GENERAL SWPPP REQUIREMENTS

A) If the construction activity includes 20 acres or more in total disturbance related to construction activity, indicate the name, affiliation, and Montana License Number for the registered professional engineer, which reviewed and stamped the SWPPP.

Name:_____Affiliation:_____
_____MT License No.:_____

B) Brief Description of Purpose and Nature of Construction Activity:_____
_____
_____
_____
_____

C) Proposed Implementation Schedule for Major Activities (indicate which operators are responsible for each activity):_____
_____
_____
_____
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_____

D) Estimate of Total Area of the Site (and all other sites if a phased development project):____
_____

E) Estimate of Total Area of the Site Expected to Undergo Disturbance Related to Construction Activity:_____

F) Check to confirm a site map has been developed and included with this SWPPP which indicates all required information stated in Part IV.G.1.c. of the General Permit: YES_____

G) Are sand & gravel excavation, other borrow areas, and/or crushing operations associated with project? Yes_____ No_____

Are temporary asphalt batch plant operations associated with this project?
Yes_____ No_____

If yes, be sure to include the requested information about these areas on the site map, or a similar separate map, as stated in Part IV.G.1.c. of the General Permit.

H) Describe the character and erodibility of sediment and other earth material to be disturbed at the project site, including cut/fill material to be used:_____
_____
_____
_____
_____

_____
_____
_____
_____
_____
_____

I) Estimate of Runoff Coefficient and Increase In Impervious Area (refer to Part IV.G.1.e. of the General Permit - only applies if total construction-related disturbance is 5 acres or more):_
_____
_____

J) Indicate Names of Receiving Waters and Describe the Size, Type, and Location of each Point Source Discharge or Outfall (refer to Part IV.G.1.f. of General Permit):_____
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K) Describe Storm Water Discharges From Support Activities (refer to Part IV.G.1.g. of General Permit):_____
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V. SWPPP BEST MANAGEMENT PRACTICES (BMPs) AND STORM WATER MANAGEMENT CONTROLS

A) Describe Applicable Local Erosion and Sediment Control Requirements:_____
_____
_____
_____

____
____
____

B) Describe in detail, temporary BMPs and storm water management controls which will be used for erosion and/or sediment control during construction-related earthwork activities. Indicate the location of these measures on the site map required above, or a similar separate map, as much as practicable. Include a schedule for implementation for each of these measures. Attached details and specifications may be used to supplement this description. Refer to Parts IV.G.2.a., b., c., of the General Permit. Examples of temporary measures could include but are not limited to: slope roughening; vegetative buffer strips; silt fences; straw bale dikes; erosion control blankets/mats; temporary drain diversions; minimizing clearing; temporary sediment basins/traps; mulching; temporary seeding; brush barriers; up-slope runoff diversions/controls; inlet/outlet protection; disturbance area runoff diversions/controls; waterway protection; and, ditch runoff flow dispersers (e.g. level spreaders)/flow inhibitors.__

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C) Describe in detail, permanent and structural BMPs and storm water management controls which will be used for erosion and/or sediment control during and after construction-related earthwork activities. These would include measures to achieve final stabilization (as defined in Part V.T.6. of the General Permit). Indicate the location of these measures on the site map required above, or a similar separate map, as much as practicable. Attached details and specifications may be used to supplement this description. Refer to Parts IV.G.2.a.,b. of the

General Permit. Examples of permanent measures could include but are not limited to: permanent seeding; check dams; retaining walls; drain inlet protection; rock outlet protection; drainage swales; sediment basin & traps; earth dikes; manmade erosion control structures; grassed waterways; sod stabilization; infiltration trenches or basins; subsurface drains; level spreader; terraced slopes; tree or shrub planting; pipe slope drains; vegetative buffer strips; detention ponds; and, containment ponds._____

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D) Describe what products or wastes may be stored or utilized at the construction activity site, indicate on the site map as required above, and indicate what BMPs will be used to minimize potential pollutants from these materials coming into contact with storm water runoff. Examples of products or wastes could include but is not limited to: fuels; concrete; masonry blocks; solvents; detergents; steel; roofing shingles; fertilizers; paints; tar; pesticides; lumber; other petroleum-based materials; other hazardous materials (including wastes); solid waste; and, concrete truck wastewater disposal._____

_____
_____
_____
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_____

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_____

E) Describe any measures that will be used to prevent vehicle tracking of sediment from the construction site onto roads (examples include a graveled access entrance and exit drives and parking areas, and a tire wash pad at exit drive):_____
_____
_____
_____
_____
_____
_____

F) When trucking saturated soils from the site, either tight leak-proof trucks must be used or loads must be required to drain until drippage has been reduced to less than 1 gallon per hour before leaving the site.

Will saturated soils be trucked from the site? Yes_____ No_____

G) Describe man-made and natural measures to control pollutants in storm water discharges after construction operations have been completed. Refer to Part IV.K. of the General Permit. Examples include: vegetative waterways and natural landscape; infiltration trenches or basins; storm water detention structures; wet ponds or man-made wetlands; and, storm water containment structures._____
_____
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H) BMPs must minimize or prevent "significant sediment" (as defined in Part V.T.13. of this General Permit) from leaving the construction site. If "significant sediment" results from the failure of erosion or sediment control measures, the operator(s) shall evaluate the effectiveness of such measures or other BMPs and incorporate improvements to minimize the potential for "significant sediment". Additionally, if "significant sediment" results from the failure of erosion or sediment control measures, the material must be cleaned up and placed back on the site or disposed of in an acceptable manner. The material must not be washed into the storm sewer(s), drainageway(s), or receiving surface waters. There may be obligations for the operator(s) to obtain other permits or permissions to clean up the "significant sediment."

VI. CERTIFICATION

"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 gather and evaluate 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 or imprisonment for knowing violations."

_____	_____
Print Name of Operator #1 or Authorized Representative	Title
_____	_____
Signature of Operator # 1 (Name must match that above)	Date
_____	_____
Print Name of Operator #2 or Authorized Representative	Title
_____	_____
Signature of Operator #2 (Name must match that above)	Date
_____	_____
Print Name of Operator #3 or Authorized Representative	Title
_____	_____
Signature of Operator #3 (Name must match that above)	Date

APPENDIX F

Example SWPPP

HOMERVILLE APARTMENTS
CONSTRUCTION POLLUTION PREVENTION PLAN

SITE DESCRIPTION			
Project Name and Location: (Latitude, Longitude, or Address)	Homerville Apartments 21 Broadview Avenue Center City, ANY STATE 00000	Owner Name and Address:	Quality Associates 11 Main Street Center City, ANY STATE 00000
Description: (Purpose and Types of Soil Disturbing Activities)			

This project will consist of three low-rise, attached apartment buildings with adjacent parking facilities.

Soil disturbing activities will include: clearing and grubbing; installing a stabilized construction entrance, perimeter, and other erosion and sediment controls; grading; excavation for the sedimentation pond, storm sewer, utilities, and building foundations; construction of curb and gutter, road, and parking areas; and preparation for final planting and seeding.

Runoff Coefficient:	The final coefficient of runoff for the site will be c = 0.5.
Site Area:	The site is approximately 11.0 acres of which 9.8 acres will be disturbed by construction activities.

Sequence of Major Activities

The order of activities will be as follows:

1. Install stabilized construction entrance
2. Clear and grub for earth dike and sediment basin
3. Install earth dike
4. Construct sedimentation basin
5. Continue clearing and grading
6. Pile topsoil
7. Stabilize denuded areas and stockpiles within 14 days of last construction activity in that area
8. Install utilities, storm sewer, curb and gutter
9. Apply stone to parking area and road
10. Construct apartment buildings
11. Complete grading and install permanent seeding and plantings
12. Complete final paving
13. Remove accumulated sediment from basin.
14. When all construction activity is complete and the site is stabilized, remove earth dike and reseed any areas disturbed by their removal.

Name of Receiving Waters:	The entire site will drain into Rocky Creek which is approximately one hundred yards from the site.

CONTROLS

Erosion and Sediment Controls

Stabilization Practices

Temporary Stabilization - Top soil stock piles and disturbed portions of the site where construction activity temporarily ceases for at least 21 days will be stabilized with temporary seed and mulch no later than 14 days from the last construction activity in that area. The temporary seed shall be Rye (grain) applied at the rate of 120 pounds per acre. Prior to seeding, 2,000 pounds of ground agricultural limestone and 1,000 pounds of 10-10-10 fertilizer shall be applied to each acre to be stabilized. After seeding, each area shall be mulched with 4,000 pounds per acre of straw. The straw mulch is to be tacked into place by a disk with blades set nearly straight. Areas of the site which are to be paved will be temporarily stabilized by applying geotextile and stone sub-base until bituminous pavement can be applied.

Permanent Stabilization - Disturbed portions of the site where construction activities permanently ceases shall be stabilized with permanent seed no later than 14 days after the last construction activity. The permanent seed mix shall consist of 80 lbs/acre tall fescue, and 40 lbs/acre kobe lespedeza. Prior to seeding, 4,000 pounds of ground agricultural limestone and 2,000 pounds of 10-10-10 fertilizer shall be applied to each acre to be stabilized. After seeding, each area shall be mulched with 4,000 pounds per acre of straw. The straw mulch is to be tacked into place by a disk with blades set nearly straight.

CONTROLS (Continued)

Structural Practices

Earth Dike - will be constructed along the uphill perimeter (north) of the site. A portion of the dike will divert runon around the construction site. The remaining portion of the dike will collect runoff from the disturbed area and direct the runoff to the sediment basin.

Sediment Basin - will be constructed at the common drainage location on the south side of the construction site. The basin will be formed by constructing an embankment across an existing gully and excavating a storage pond with a volume of 36,000 cubic feet (0.82) acre feet. The basin will drain through a corrugated metal riser and outlet pipe to a rip rap outlet apron. Once construction activities are nearly complete, the accumulated sediment will be removed from the basin.

Storm Water Management

Storm water drainage will be provided by curb and gutter, storm sewer and catch basin, for the developed areas. The areas which are not developed will be graded at less that 0.5:1 and have permanent seeding or plantings. Two acres of the site will remain untouched and in its natural state. When construction is complete the entire site will drain to a wet detention basin. The wet detention basin will be in the location of the temporary sediment basin. When upslope areas are stabilized, the accumulated sediment will be removed from the sediment basin, and the areas on the sides of the basin will be planted with vegetation. The wet detention pond is designed with a permanent pool volume of 0.82 (acre-feet). This is equivalent to one inch of runoff for the entire drainage area. It is expected that this wet detention pond design will result in an 80 percent removal of total suspended solids from the site's storm water runoff. The pond has been designed by a professional engineer to keep peak flow rates from the two and ten year/24 hour storms at their pre-development rates. The outlet of the detention basin will be stabilized by a riprap apron.

OTHER CONTROLS

Waste Disposal:

Waste Materials

All waste materials will be collected and stored in a securely lidded metal dumpster rented from the ADF Waste Management Company, which is a licensed solid waste management company in Center City. The dumpster will meet all local Center City and any State solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to the Center City Dump. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and Mr. Doe, the individual who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste

All hazardous waste materials will be disposed of in the manner specified by local or State regulation or by the manufacturer. Site personnel will be instructed in these practices and Mr. Doe, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be collected from the portable units a minimum of three times per week by the TIDEE Company, a licensed Center City sanitary waste management contractor, as required by local regulation.

Offsite Vehicle Tracking:

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments. The paved street adjacent to the site entrance will be swept daily to remove any excess mud, dirt or rock tracked from the site. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

TIMING OF CONTROLS/MEASURES

As indicated in the Sequence of Major Activities, the earth dike, stabilized construction entrance and sediment basin will be constructed prior to clearing or grading of any other portions of the site. Areas where construction activity temporarily ceases for more than 21 days will be stabilized with a temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized with permanent seed and mulch. After the entire site is stabilized, the accumulated sediment will be removed from the trap and the earth dike will be removed.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The storm water pollution prevention plan reflects Center City requirements for storm water management and erosion and sediment control, as established in Center City ordinance 5-188. To ensure compliance, this plan was prepared in accordance with the Center City Storm Water Management, Erosion and Sediment Control Handbook, published by the Center City Department of Planning, Storm Water Management Section. There are no other applicable State or Federal requirements for sediment and erosion site plans (or permits), or storm water management site plans (or permits).

MAINTENANCE/INSPECTION PROCEDURES

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls.

- Less than one half of the site will be denuded at one time.
- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
- Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
- Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
- The sediment basin will be inspected for depth of sediment, and built up sediment will be removed when it reaches 10 percent of the design capacity or at the end of the job.
- Diversion dike will be inspected and any breaches promptly repaired.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.
- Mr. Doe, site superintendent, will select three individuals who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance report.
- Personnel selected for inspection and maintenance responsibilities will receive training from Mr. Doe. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

MAINTENANCE/INSPECTION PROCEDURES (Continued)
Non-Storm Water Discharges
It is expected that the following non-storm water discharges will occur from the site during the construction period: • Water from water line flushings. • Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred). • Uncontaminated groundwater (from dewatering excavation). All non-storm water discharges will be directed to the sediment basin prior to discharge.

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

- Concrete
- Detergents
- Paints (enamel and latex)
- Metal Studs
- Concrete
- Tar
- Fertilizers
- Petroleum Based Products
- Cleaning Solvents
- Wood
- Masonry Block
- Roofing Shingles.

SPILL PREVENTION

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough product required to do the job
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure
- Products will be kept in their original containers with the original manufacturer's label
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturers' recommendations for proper use and disposal will be followed
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data will be retained; they contain important product information
- If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal will be followed.

SPILL PREVENTION (Continued)

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products:

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturers' instructions or State and local regulations.

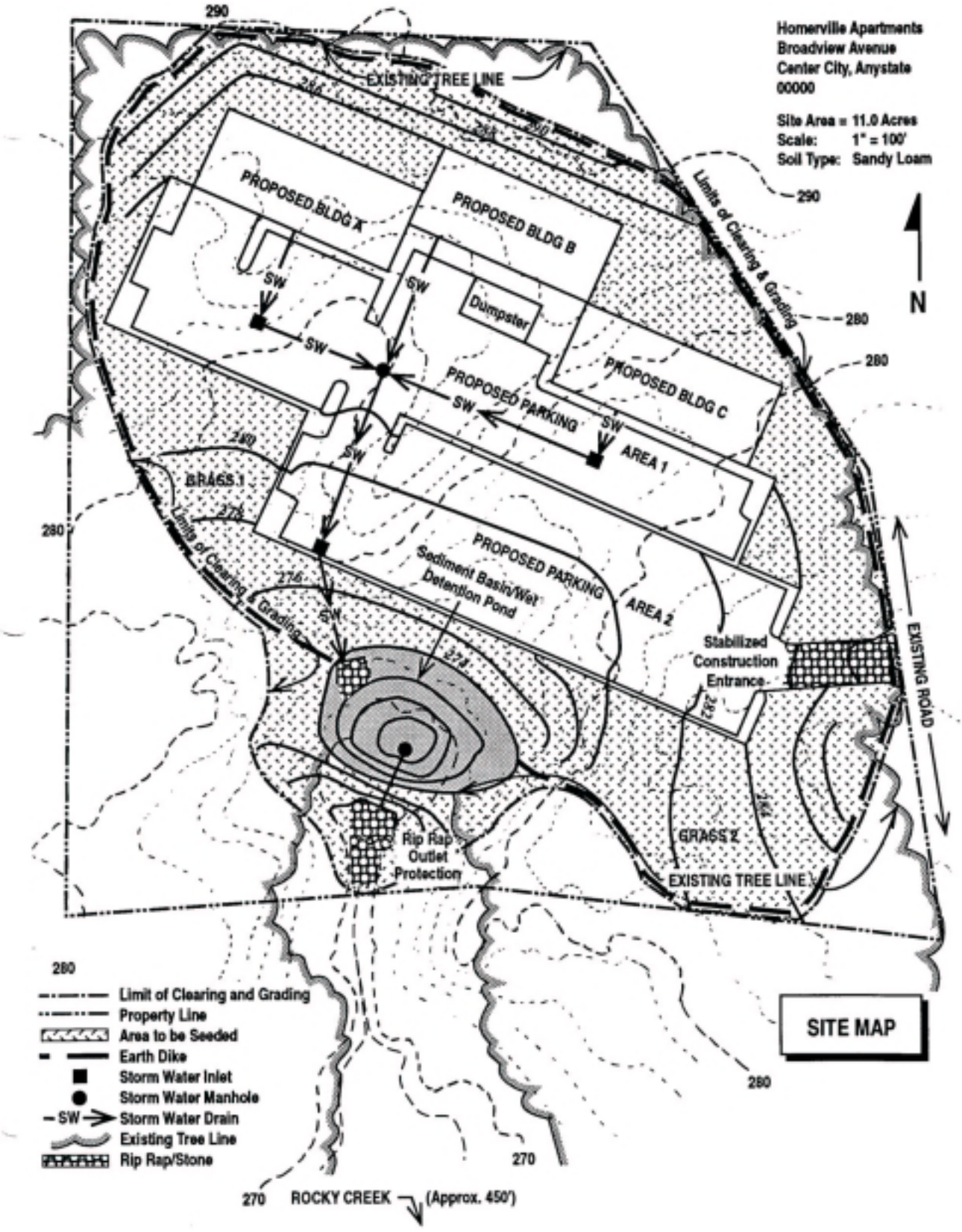
Concrete Trucks:

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- Mr. Doe, the site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.


Homerville Apartments
Broadview Avenue
Center City, Anystate
00000
Site Area = 11.0 Acres
Scale: 1" = 100'
Soil Type: Sandy Loam
N
EXISTING TREE LINE
PROPOSED BLDG A
PROPOSED BLDG B
PROPOSED BLDG C
Dumpster
PROPOSED PARKING
AREA 1
AREA 2
GRASS 1
GRASS 2
Limits of Clearing & Grading
Sediment Basin/Wet Detention Pond
Stabilized Construction Entrance
EXISTING ROAD
Rip Rap Outlet Protection
SW
290
280
270
ROCKY CREEK
(Approx. 450')
Limit of Clearing and Grading
Property Line
Area to be Seeded
Earth Dike
Storm Water Inlet
Storm Water Manhole
Storm Water Drain
Existing Tree Line
Rip Rap/Stone
SITE MAP

POLLUTION PREVENTION PLAN CERTIFICATION

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.

Signed:_____
John R. Quality,
President
Quality Associates

Date:_____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signature	For	Responsible for
_____ Joseph Contractor, President Date:_____	Center City Const., Inc. 21 Elm Street Center City, Any State 00000 (123) 399-8765	General Contractor
_____ John Planter Vice President of Construction Date:_____	Green Grass, Inc. 4233 Center Road Outerville, Any State 00001 (123) 823-5678	Temporary and Permanent Stabilization
_____ Jim Kay, President Date:_____	Dirt Movers, Inc. 523 Lincoln Ave. Outerville, Any State 00001 (123) 823-8921	Stabilized Construction Entrance, Earth Dikes, Sediment Basin

HOMERVILLE APARTMENTS

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT FORM

STRUCTURAL CONTROLS

DATE: _____

EARTH DIKE:

FROM	TO	IS DIKE STABILIZED?	IS THERE EVIDENCE OF WASHOUT OR OVER-TOPPING?
BUILDING B	STABILIZED CONSTRUCTION ENTRANCE		
STABILIZED CONSTRUCTION ENTRANCE	SEDIMENT BASIN		
BUILDING B	SEDIMENT BASIN		

MAINTENANCE REQUIRED FOR EARTH DIKE:

_____

_____

_____

_____

TO BE PERFORMED BY: _____ ON OR BEFORE: _____

HOMERVILLE APARTMENTS

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT FORM

SEDIMENT BASIN:

DEPTH OF SEDIMENT IN BASIN	CONDITION OF BASIN SIDE SLOPES	ANY EVIDENCE OF OVERTOPPING OF THE EMBANKMENT?	CONDITION OF OUTFALL FROM SEDIMENT BASIN

MAINTENANCE REQUIRED FOR SEDIMENT BASIN:

_____

_____

_____

_____

TO BE PERFORMED BY: _____ ON OR BEFORE: _____

OTHER CONTROLS

STABILIZED CONSTRUCTION ENTRANCE:

DOES MUCH SEDIMENT GET TRACKED ON TO ROAD?	IS THE GRAVEL CLEAN OR IS IT FILLED WITH SEDIMENT?	DOES ALL TRAFFIC USE THE STABILIZED ENTRANCE TO LEAVE THE SITE?	IS THE CULVERT BENEATH THE ENTRANCE WORKING?

MAINTENANCE REQUIRED FOR STABILIZED CONSTRUCTION ENTRANCE:

_____

_____

_____

_____

TO BE PERFORMED BY: _____ ON OR BEFORE: _____

HOMERVILLE APARTMENTS

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT FORM

CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN:

_____

_____

_____

_____

REASONS FOR 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.

SIGNATURE:_____ DATE:_____

APPENDIX G

DEQ Notice Of Termination (NOT) Form

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER PROTECTION BUREAU / STORM WATER PROGRAM
PO Box 200901 / Helena, MT / 59620-0901

NOTICE OF TERMINATION (NOT) FORM

GENERAL PERMIT FOR STORM WATER DISCHARGE
ASSOCIATED WITH CONSTRUCTION ACTIVITY

IMPORTANT: Before completing this form, all parties need to read the General Permit and the Notice of Intent (NOI) Form that was submitted. For termination to be valid upon receipt by the Department, all required items on the form must be completed. Responses must be self-explanatory and must not refer exclusively to attached maps, plans, or documents. The submittal of this NOT Form does not relieve the permittees of liability for annual fees that accrued during the period of active General Permit coverage. Only one NOT Form may be submitted for a respective NOI. Mail this NOT Form to the DEQ address above. The 2002-2006 General Permit, 2002 Fee Schedule, and related forms are available from the Storm Water Program at (406) 444-3080 or http://www.deq.state.mt.us/wqinfo/MPDES/Storm waterConstruction.asp.

I. INDICATE NOI NUMBER: MTR10 _ _ _ _

(Note: This number is indicated on the Confirmation Letter sent to operators upon receipt by the Department of a complete NOI package)

II. OPERATOR INFORMATION

List each operator that was provided on the Notice of Intent originally submitted. The Notice of Intent Form specified which operator is responsible for submitting the Notice of Termination. This operator should complete and sign this NOT Form, unless Reason For Termination "B" is checked below. Parties permitted under the 1997-2002 General Permit must list the "contractor" as Operator #1, and the "owner" as Operator #2 as stated on the Application form originally submitted.

OPERATOR #1

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____

OPERATOR #2

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____

OPERATOR #3

Name: _____ Phone: _____
Mailing Address: _____ State: _____ Zip Code: _____
Contact Person: _____ Phone (if different from above): _____

III. CONSTRUCTION ACTIVITY INFORMATION

A) Construction Activity Name: _____

B) Construction Activity Address (or location if no address): _____

_____

_____

C) Construction Activity County: _____

D) Construction Activity Latitude and Longitude (See Part I.C.2.d. of General Permit): _____

_____

E) Brief Description of Purpose and Nature of Construction Activity: _____

_____

_____

_____

_____

IV. REASON FOR TERMINATION

Indicate the reason this Notice of Termination is being submitted by checking one of the following:

A)_____ Site has achieved "final stabilization" as defined in Part V.T.6. of the General Permit; or

B)_____ Operators identified on original NOI Form have changed.

IMPORTANT: The General Permit, and the corresponding NOI Form, are designed to provide coverage for all parties designated an "operator" at any time during the construction activity. The NOI Form and the SWPPP delineate who has what responsibilities, and during what portion of the project. Each NOI Form for a construction activity is designed to have only one corresponding NOT Form submitted for it, by the single operator identified as having this responsibility on the NOI Form. Reason for Termination "B" is not to be checked, and this NOT Form is not to be submitted, when a particular "operator" identified on the NOI Form is no longer active based on their identified responsibilities on the NOI Form. Reason for Termination "B" is only to be checked when an owner, contractor, etc. has been replaced (new owner – property sold, new contractor - contractor fired, etc.) based on operators identified on the original NOI Form. In this case, a new NOI Form will need to be submitted with all valid operators listed for the remainder of the construction project.

If Reason For Termination "A" is checked above, describe final site stabilization: _____

_____

_____

_____

_____

_____

_____

V. CERTIFICATION

"I certify under penalty of law that if I checked Reason For Termination "A" above, by the date of my signature below the permitted construction activity site has achieved "final stabilization" as defined in Part V.T.6. of the General Permit. 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 gather and evaluate 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 or imprisonment for knowing violations."

_____	_____
Print Name of Operator or Authorized Representative	Title
_____	_____
Signature of Operator (Name must match that above)	Date

APPENDIX H

EPA Notice Of Termination Form

THIS FORM REPLACES PREVIOUS FORM 3510-7 (8-92)

Please See Instructions Before Completing This Form

Form Approved. OMB No. 2040-0086
Approval expires: 9-31-98

NPDES FORM

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notice of Termination (NOT) of Coverage Under a NPDES General Permit for Storm Water Discharges Associated with Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the NPDES program. ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.

I. Permit Information

NPDES Storm Water General Permit Number: _____

Check Here if You are No Longer the Operator of the Facility: ☐

Check Here if the Storm Water Discharge is Being Terminated: ☐

II. Facility Operator Information

Name: _____ Phone: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

III. Facility/Site Location Information

Name: _____

Address: _____

City: _____ State: _____ ZIP Code: _____

Latitude: _____ Longitude: _____ Quarter: _____ Section: _____ Township: _____ Range: _____

IV. Certification

I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a NPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

Print Name: _____ Date: _____

Signature: _____

Instructions for Completing Notice of Termination (NOT) Form

Who May File a Notice of Termination (NOT) Form

Permittees who are presently covered under an EPA-issued National Pollutant Discharge Elimination System (NPDES) General Permit (including the 1995 Multi-Sector Permit) for Storm Water Dicharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26(b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with industrial activity from the construction site that are authorized by a NPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the 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.

Where to File NOT Form

NOTs sent regular mail:
Stormwater Notice of Termination (4203M)
USEPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

NOTs sent overnight/express:
Stormwater Notice of Termination
US EPA East building, Rm. 7329
1201 Constitution Avenue, NW
Washington, D.C. 20004
(202) 564-9537

Completing the Form

Type or print, using upper-case letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use only one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions about this form, telephone or write the Notice of Intent Processing Center at (866) 352-7755

Please submit original document with signature in ink—DO NOT send copies.

EPA Form 3510-7 (8-98)

Instructions - EPA Form 3510-7
Notice of Termination (NOT) of Coverage Under The NPDES General Permit
for Storm Water Discharges Associated With Industrial Activity

Section I Permit Information

Enter the existing NPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, telephone or write your EPA Regional storm water contact person.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II Facility Operator Information

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III Facility/Site Location Information

Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quarter, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV Certification

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor, or

For a municipality, State, Federal, or other public facility: by either a principal executive officer or ranking elected official.

Paperwork Reduction Act Notice

Public reporting burden for this application is estimated to average 0.5 hours per application, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form, including any suggestions which may increase or reduce this burden to: Chief, Information Policy Branch, 2136, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, or Director, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.