

# Erosion Control Handbook II



2006

This handbook is the result of a cooperative effort between Mn/DOT's Erosion Control Unit and the Water and Natural Resources Group at Bonestroo Rosene Anderlik & Associates (Bonestroo)

The Erosion Control Unit is part of the Forestry and Erosion Control Section of Mn/DOT's Office of Environmental Services. The Erosion Control Unit provides technical expertise in the area of erosion and sediment control, soil bioengineering, NPDES requirements, vegetation establishment and management, and native plant/wetland community restoration.

Bonestroo is a multi-discipline engineering and science firm headquartered in St. Paul, MN; with offices in Rochester, St. Cloud, the Chicago, IL and Milwaukee, WI areas. The Water and Natural Resources Group provides practical solutions integrating science and engineering, covering all aspects of runoff management, wetland and watershed sciences, upland/natural community management, and GIS.



# Table of Contents

Preface

## Introduction To Volume II

### Part I - Stormwater Compliance

#### Regulatory Considerations

The New NPDES Permit

The Mn/DOT/MPCA MOU

Impaired/Special Waters

Spec/Permit Interaction

#### Achieving Compliance

The Stormwater Pollution Prevention Plan

Make It A Team Effort

Working With Agency Representatives

Good Habits

Tough Situations



???

#### FYI

Good Stewardship of Land, Water, and Environmentally Sensitive Resources During Road Construction Projects Will Result In Cleaner Water and a Better Quality of Life For All Minnesotans.

## **Part II - The Stormwater Pollution Prevention Plan (SWPPP)**

### **SWPPP Requirements**

Temporary ESC Plan

Permanent ESC Plan

Non-stormwater Pollutants

Permanent Stormwater Management

### **Tools For Contract Administration**

Stormwater Noncompliance Resolution

Specifications and Special Provisions

Project Chain of Command

Certification/Training

Contractor Requirements

Design/Build Projects

### **BMPs And How To Use Them**

Controlling Runoff

Minimizing Erosion

Managing Sediment

Vegetation Establishment

Other Considerations

## **Part III - BMPs and How To Use Them**

Interim Conditions

Site Inspection

Concurrent Critical Area Stabilization

Discharging From A Mn/DOT Site

Devil Is In The Details

Working In/Around Water

Maximizing Project Resources

Winter Work

What Happens When... (Expect the Unexpected)

Emergency Measures

Project Completion

### **Appendices**

Appendix A - Sources and Resources

Appendix B - Glossary, Index, & Credits

## Common Terms & Acronyms

ECB - Erosion Control Blanket

ESC - Erosion and Sediment Control

ESM - Erosion Stabilization Mat (also referred to as a TRM)

MPCA - Minnesota Pollution Control Agency



NOT - Notice of Termination

NTU - Nephelometric Turbidity Units

SOP - Standard Operating Procedure

SWPPP - Stormwater Pollution Prevention Plan

TMDL - Total Maximum Daily Load

TRM - Turf Reinforcement Mat

WCA - Wetland Conservation Act

WOS - Water-of-the-State

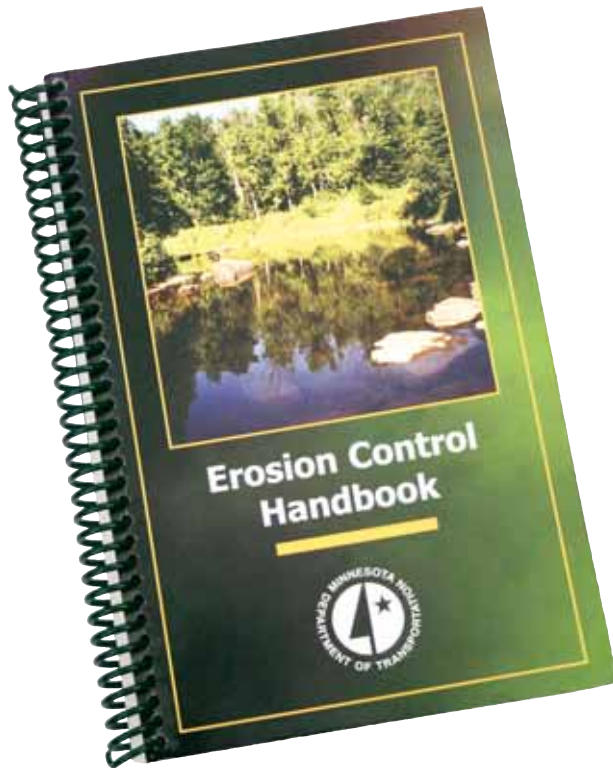
### Don't Forget

Projects within 2000 linear feet of special or impaired waters require additional BMPs



# Introduction To Volume II

It has been about five years since the original Mn/DOT Erosion Control Handbook (Volume I) was released, and much has changed. Many products and practices have been improved; some are no longer used. Awareness has increased dramatically among stormwater compliance practitioners. The NPDES Phase II General Stormwater Discharge Permit administered by the MPCA has been implemented and Mn/DOT has developed a new edition of Standard Specifications for Construction.



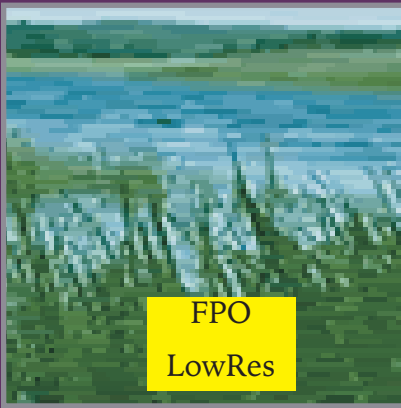
Due to these changes and many others, Volume II of the Erosion Control Handbook is being issued to coincide with the release of the new specifications and with the beginning of recertification training. We are confident the improved format and updated information will make the process of stormwater compliance easier for all involved.

## Did You Know?

According to the Phase II NPDES Permit, successfully developing a permanent stormwater management system is an important and required part of implementing the Stormwater Pollution Prevention Plan.

See Page **xx**.

To find the special/impaired waters closest to your site, visit [www.pca.state.mn.us/water/stormwater/stormwater-c.html](http://www.pca.state.mn.us/water/stormwater/stormwater-c.html)



Pristine waters risk invasion of invasive species, such as Reed Canary Grass, colonization due to sedimentation from construction sites.

This handbook provides insight for the larger Project Team, ESC Suppliers, Other Agencies, and to the General Public into the challenges faced by implementing the SWPPP during construction.

The basic concepts of who, what, where, when, why, and how will be developed for consideration by Mn/DOT Managers and Designers, and Contractors. This group will gain an understanding on the purpose and necessity of stormwater compliance efforts.

ESC Sub-contractors and the Contractor's field managers will get useful information that can assist them in supporting the ESC Supervisor in SWPPP implementation and in removing roadblocks to stormwater compliance.

And most importantly, SWPPP implementation and stormwater compliance will be easier for the ESC Supervisor when using the tools, methods, and information provided in this handbook. Refer to it on a regular basis to resolve a variety of challenges.



Sediment plumes like this resulting from construction activity, reduce recreational usage, degrade fish habitat, reduce oxygen levels, increase water temperatures, and reduce overall water quality.



## Where We Left Off in Volume I

Volume I of the Erosion Control Handbook covered a lot of material. Its handbook format (as compared to a manual) provided a handy reference for basic concepts of erosion and sediment control, standard BMPs in use at the time, and valuable information necessary for staying in compliance with permits and for protecting Minnesota's valuable resources.

Some of the concepts covered in Volume I still valid today include:

- **Erosion and Sediment Control (ESC) means 1) Controlling Runoff, 2) Minimizing Erosion, and 3) Managing Sediments.** Your experience over the past five years has probably shown that managing sediments is more challenging and more expensive than the first two components.
- There is a direct link between Mn/DOT specifications and provisions of the NPDES permit.
- Site conditions sometimes dictate that innovations be developed to match those conditions. Since Volume I, you may have had the chance to see that these innovations often turn out to be effective and practical BMPs.
- Record keeping is as important as any on the ground BMP.
- Project situations teach you that there is very little in the way of cookie cutter BMPs.

These concepts and others will be reviewed throughout Volume II. We encourage you to review Volume I again as a refresher. In case you do not have a copy of Volume I, a quick review of the basic ESC principles follows.

### Remember

Erosion and Sediment Control Means:

- Controlling the movement of runoff onto and across your site
- Minimizing the amount of erosion that occurs
- Managing the sediments that occur

## Principles of Erosion and Sediment Control

Following a few basic principles can help keep our waterways healthy and prevent sediment from depositing in a nearby wetland or farmer's soybean field.

- **Principle 1:** Minimize both the area and time of soil disturbance on your site throughout the project. This practice alone can significantly reduce erosion.
- **Principle 2:** Manage stormwater flowing across your construction site. Reducing runoff velocities and volumes will decrease impact to disturbed areas.
- **Principle 3:** Install erosion and sediment control measures early and keep them well maintained to proactively manage potential erosion.
- **Principle 4:** Manage sediments so deposition is limited to your site. You cannot eliminate runoff, but you can minimize sediment and manage it by keeping it within the project area and out of environmentally sensitive resources.
- **Principle 5:** Establishing vegetation by timely seeding is an efficient and economical way to reduce erosion by up to 90 percent.
- **Principle 6:** Successful plant establishment is maximized through:
  - Good planning and scheduling
  - Salvaging and replacing topsoil
  - Using appropriate seed for the site
  - Good seedbed preparation
  - Timely planting

### Important Tip

Adhering to these six principles and following the logic of first controlling runoff, then minimizing erosion, and finally managing sediments will make stormwater compliance easier.

## The Purpose of Volume II

Simply stated, the purpose of the Erosion Control Handbook, Volume II is to take the ease and efficiency of stormwater compliance to the next level. Along with recertification training, this handbook will guide everyone involved with stormwater compliance on a Mn/DOT project through and beyond the basics.

Volume II will look at ESC from these perspectives:

- **Stormwater Regulatory Compliance – Part 1** of the handbook addresses the current permit, applicable information and documents, and their ramifications.
- **Stormwater Pollution Prevention Plan (SWPPP) Implementation** – Using the information in the SWPPPs to stay in compliance will be covered in Part 2. BMPs and Mn/DOT specifications will be explained as they relate to SWPPP implementation.
- **BMPs and How to Use Them** - Part 3 describes how to cost-effectively minimize erosion.

Mike Isensee, Dakota County Soil and Water Conservation District



Meeting on site is the best way to resolve many erosion control concerns.

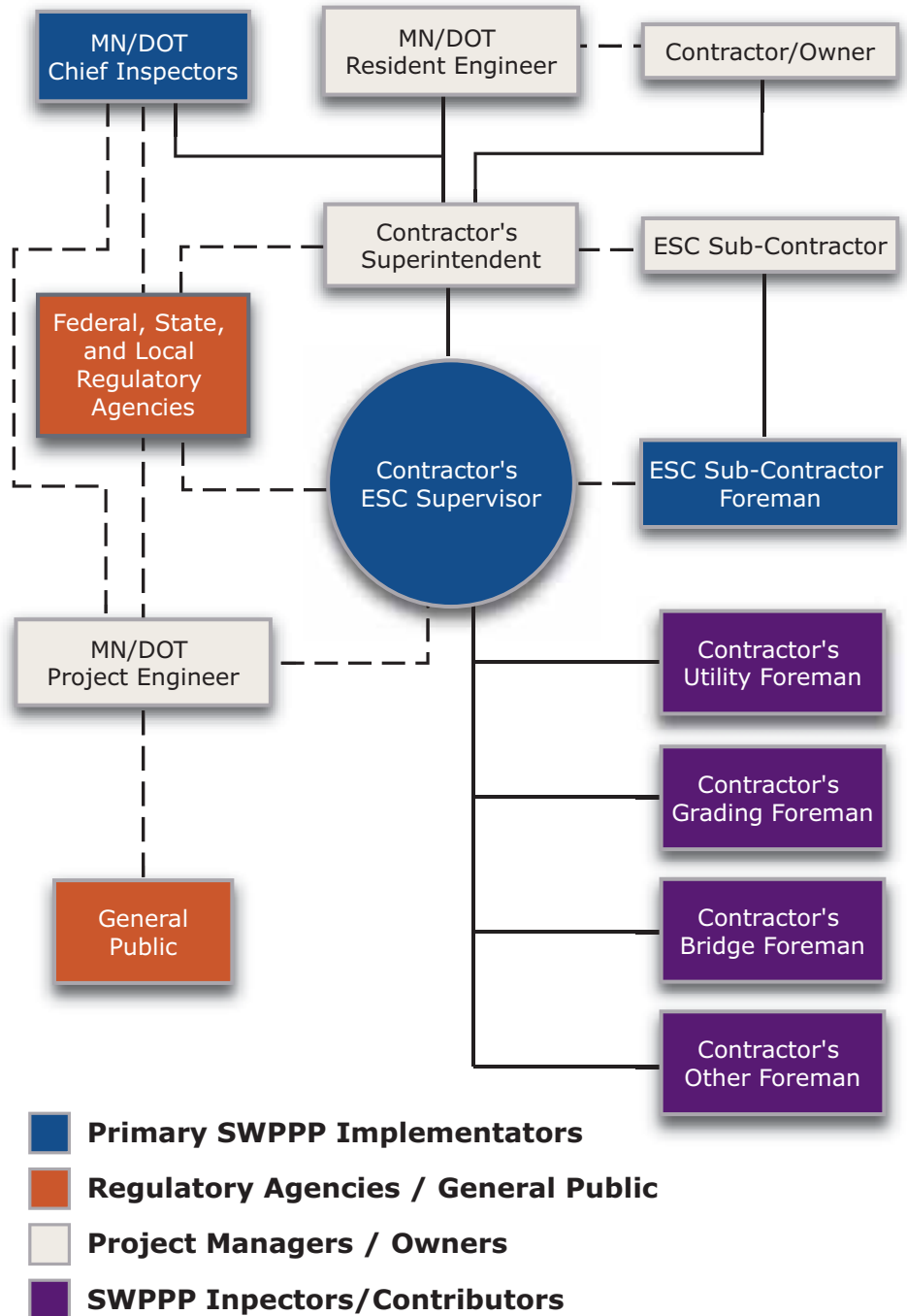
### Remember

Implementing a SWPPP falls into two broad categories:

- 1) Managing a site to minimize the effects of erosive forces.
- 2) Installing BMPs to mitigate the results of erosive forces.

## How To Use This Handbook

The Erosion Control Handbook, Volume II was developed to assist a broad spectrum of participants in understanding and achieving stormwater compliance. At the same time, it is focused on day-to-day, “in the trenches” implementation of the SWPPP. The flowchart on this page illustrates the focus of this handbook in terms of the concentration of project responsibility, and how all users of this handbook relate to each other.



Successful stormwater compliance depends on a host of participants.

- All parties shown play a role in SWPPP implementation.
- This handbook is written to benefit all project participants, but focuses on those that implement the SWPPP during construction. The Contractor's ESC Supervisor is at the center of stormwater compliance efforts.

## ESC Supervisor

The ESC supervisor must continually coordinate with Mn/DOT inspectors, their own superintendent, all sub-contractors on site, and especially the ESC sub-contractor. This handbook covers all aspects of the ESC duties and will help you:

- Meet Mn/DOT requirements for SWPPP implementation.
- Influence the sequence and method of construction activities by other foremen.
- Learn how to directly install and maintain BMPs to get the most out of your ESC budget.

## Mn/DOT Inspectors

Use this handbook as a quick reference for applicable Mn/DOT specs and other information. Photos and example BMPs will help you make suggestions in various situations.

## Contractor's Superintendent

The role of, and requirement for, the ESC Supervisor is a new requirement in managing construction sites. Use this book to understand what the ESC Supervisor is trying to accomplish and why. Find ways to achieve stormwater compliance without taking too much of a hit on your schedule or the project's bottom line.

## ESC Sub-Contractor

Like Mn/DOT inspectors, you will be able to quickly determine or verify the proper materials, methods, and requirements for installation and maintenance. Your experience on Mn/DOT sites combined with the ideas in this handbook will make stormwater compliance easier for the rest of the team

## Confused?

Not surprising. Stormwater compliance today is complex. It involves everyone associated with the project.



## FYI

ESC/Stormwater Compliance is as important as using the right materials and methods in paving, or making the workplace a safe and accident-free environment. On any project, day-to-day responsibility for this falls primarily on the ESC Supervisor.

### Mn/DOT Project Engineers

Gain a better understanding of the entire stormwater compliance process, from design to final stabilization to accepting the permanent stormwater management. When you get directly involved with ESC/stormwater compliance, decisions become easier and you can give direction from a solid base of knowledge.

### Design Engineers

There are design tips scattered throughout this handbook that will help you see ESC from a field perspective. By reading this handbook, the design engineer can turn an understanding of the challenges of SWPPP implementation into a more user friendly set of plan sheets.

### Mn/DOT Resident Engineers

As overall managers of Mn/Dot construction projects, Resident Engineers provide engineering guidance to the construction project team. Learn what BMPs and methods really work.

### Contract Owners

As contractor owners your company is responsible for implementing the SWPPP, good construction practices and complying with the permit requirements. Learn how to keep your project in compliance.

### Other Agencies

People involved in developing and constructing transportation projects at all levels may use the principles and practices contained in this handbook.


### Project Team, ESC Suppliers, General Public

In reviewing this handbook, use the right column to gain an understanding of the ESC supervisor's and other implementers' duties. When observing the project development or construction, your increased awareness of the process can spawn feedback that will enhance stormwater compliance.

## Scope and Limitations of Volume II

The scope of the Mn/DOT Erosion Control Handbook, Volume II covers the day-to-day implementation of the SWPPP. It is intended for projects that are linear in nature and subject to Mn/DOT specifications, special provisions, and contractual obligations. It will provide the following types of info:

- A summary of up to date, specific information on permits and published documents.
- A set of guidelines and suggestions to make ESC easier.
- Information and tools that will help avoid work stoppages and/or enforcement action.
- Sources of additional information and resources that can lend assistance to the stormwater compliance effort.
- Most of the information presented in Volume II can apply to many construction and erosion control settings.
- This handbook cannot provide comprehensive design or installation instruction.
- It is not intended for aerial type projects or projects not required to adhere to Mn/DOT specs.
- Its references to regulatory requirements are limited to the State of Minnesota.



Woodchips generated from site clearing have many uses and you can save money by using them. See page 109

### FYI

For a NOI (Notice of Intent), permit applications, other permit forms and information Go to [www.pca.state.mn.us/stormwater/stormwater-c.html](http://www.pca.state.mn.us/stormwater/stormwater-c.html)



Duane Stenlund, Mn/DOT

Rapid stabilization is required where work is occurring within 200 linear feet of water of the state. See Pages [xx-xx](#).

## Important Tip

The SWPPP, as required for all permitted projects consists of:

- A description of the project
- A discussion at the potential for discharge and mitigative measures
- List and description of any potential receiving waters
- A discussion of the timing and installation
- Dewatering and pollution prevention, and final stabilization methods.

See page [x](#) for more

## What's New Since Volume I?

Many factors affecting stormwater compliance have come on the scene or changed over the last five years. We'll outline those factors briefly here and then go over them in greater detail later in the handbook.

### Design-Build Contracts

The letting of "design-build" contracts presents non-typical challenges, including:

- Construction proceeds as the detail plans are developed.
- The contractor is identified as Owner and Co Permittee on the NPDES Permit. However, Mn/DOT is still the legal owner of the project and subject to any compliance action taken by the MPCA.
- The project must operate within a fixed budget environment.
- Mn/DOT involvement is defined as oversight.
- The Design/Build contractor must suspend the SWPPP concept plan if more than 50 acres/Special Water obtain approval from MPCA.

### 2005 Specifications

A new set of "Standard Specifications for Construction" has been issued. New seed mixes have been included, old "standards" have been dropped, section titles have been changed, etc. Compliance with Mn/DOT specs will require relearning several of these subjects.

See Pages [xx-xx](#).

### Rapid Stabilization Specifications

One of the most significant change to Mn/DOT specifications is that specifications have been added related to requirements for temporarily stabilizing "critical erosive prone areas" in accordance with the NPDES Permit.

See Pages [xx-xx](#).

## Technical Memoranda

Mn/DOT has issued Technical Memoranda pertaining to stormwater compliance recently. The subjects covered are:

- 1 Adhering to the Phase II NPDES Permit
- 2 Stormwater Pollution Prevention Plans (SWPPPs)
- 3 Certified ESC supervisor
- 4 Chain of Responsibility on Projects
- 5 Rapid Stabilization (along with new specifications)
- 6 Storm Drain Inlet Protection

See Pages **xx-xx**.

## Phase II Permit

Phase II of the NPDES/General Stormwater Discharge Permit became effective on August 1, 2003. With it, many changes ranging from distances from a water of the state to requirements for impaired waters are now effective. These changes affect design, implementation, and practices beyond project completion.

See Pages **xx-xx**.

## Mn/DOT/MPCA MOU

A Memorandum of Understanding (MOU) was developed by Mn/DOT and the MPCA to streamline the inspection project review process and working relationships between the two agencies.

See Pages **xx-xx**.

## FYI

SWPPP's are required to be kept on-site or in a project vehicle.

## FYI

Interim conditions may be the toughest challenge to stormwater compliance. The Temp ESC Plan cannot cover everything, and The Permanent ESC Plan comes in much later. Good site management and scheduling are the key to working through interim conditions.

### Training/Certification

Mn/DOT, in conjunction with the University of Minnesota, is providing training/certification for three levels of ESC practitioner: 1) Inspector/Installer, 2) Construction Site Manager, and 3) SWPPP Designer. Training is offered at several locations throughout the state and takes place during the winter months. Each certification is valid for three years.

See Pages **xx-xx**.

### ESC Supervisor

On all Mn/DOT projects requiring an NPDES Permit, a Certified ESC supervisor provided by the contractor is now mandatory. Knowledgeable persons who will oversee implementation of the SWPPP must attend training and meet certain qualifications to be considered “certified.”

See Pages **xx-xx**.

### Impaired/Special Waters

There are special requirements regarding the permitting process and construction in proximity to certain high quality or sensitive waters of the state. Impaired or Special Waters are defined, and other requirements are described on pages **xx-xx**. Updated and additional information can be found at the MPCA website ([www.pca.state.mn.us](http://www.pca.state.mn.us)).



# Part 1 - Stormwater Compliance

## 1.1 Regulatory Considerations

### 1.1.1 Regulatory Environment

The Phase II NPDES Permit became effective August 1, 2003. Please see pages **xx-xx** for a complete discussion on the Phase II permit.

The enforcement actions/process used by the MPCA is summarized below. More detailed info is provided in Volume I, Section 4.2. If you have any questions, please contact the Mn/DOT Turf Establishment Section or the MPCA. See Appendix **x** for contact info.

### FYI

Beginning in spring 2005, the MPCA entered into “Joint Partnership Agreements” (JPA) with several entities throughout the state. These JPAs have inspection authority similar to that of the MPCA inspector. If enforcement action is necessary, representatives of the MPCA are brought into the process. (Picture of the JPA Field Training Spring 2006)

## Enforcement Ramifications and Consequences

The Following is a Synopsis of Enforcement Actions Available to MPCA:

### 1. Letter of Warning (LOW)

Typically requires corrective action within 7-30 days

### 2. Notice of Violation (NOV)

MPCA gives more detail for corrective actions that may take longer than 30 days

### 3. Administrative Order (AO)

An enforceable document issued without consent/signature of contractor, Mn/DOT

Provides a list of requirements to resolve issue(s), may take longer than 30 days

Provides for appeals to be heard in the Court of Appeals



Discharges to waters of the state of sediment laden watery may result in an enforcement action.

## FYI

See page **XX** for information about basin draining, dewatering and/or site drying.



Discharges from dewatering/site drying must be treated with the appropriate BMPs prior to discharging from a project site.

#### 4. Administrative Order by Consent (AOC)

Basically the same as an AO, issued with the consent/signature

#### 5. Administrative Penalty Order (APO)

An enforceable document that includes a monetary penalty of up to \$10,000 (per occurrence)

Calls for corrective action to be completed in less than 30 days

Provides for appeals to be heard in District Court or by an Administrative Law Judge

#### 6. Stipulation Agreement

Is a negotiated agreement leading to a compliance schedule and penalties

May levy penalties up to \$10,000 per day, per violation

#### 7. Emergency Powers (no notice required)

May include immediate order to discontinue and/or clean-up pollution of a water of the state (including “cease and desist”)

Appeals are heard in the Court of Appeals

### Important Tip

Failure to bring the site into compliance with the final stabilization requirements in the fall will require the site to be monitored and inspected in accordance with Part IV.E of the NPDES Permit until final stabilization can be completed in the spring.



**US Army Corps  
of Engineers®**



## Remember

Inspection logs are critical. There have been cases of enforcement action by the MPCA where a penalty was levied not because of the discharge that brought attention to the site, but because there was a lack of proper documentation.

## Additional Permits

In addition to the NPDES Permit, these permits may be also required for land-disturbing activities:

- Minnesota Department of Natural Resources
- Protected Waters Permit
- Public Waters Work Permit
- License to Cross State Lands or Waters (for utilities)
- U.S. Army Corps of Engineers
- Wetland Permit (Section 404)
- Navigable Waters Permit (Section 10)
- Local Government Unit
- Wetlands Conservation Act (WCA)
- Grading Permit by local government or watershed district

## Record Keeping

In addition to inspections required by the permit, the Contractor should keep records that include the following information. A daily/weekly log that can be referenced, if necessary, in the future.

- Updated SWPPP or SWPPP with changes indicated
- Photo documentation (dated photos)
- Effectively functioning BMPs
- Records of rainfall and major storms
- Damaged BMPs, sedimentation
- Installation in progress
- Repaired or replaced BMPs
- Problems from discharge from adjacent area.
- Activities demonstrates your effort at stormwater compliance
- Daily activities by contractor crew or ESC Subcontractor
- Material/Installation records
- Project progress estimates
- Extent of sedimentation (if it occurs)

**ESC INSPECTION REPORT**

Report No. 1

DATE: 05-25-05 Observer: ESC Supervisor: General Contractor

Weather (precip, temp): 62° F Weekly ☐ Rain Event ☐ Amount

Check List	Comments / Action Taken
1. Have the ESC Areas been inspected and found to be properly installed and functioning? (reports required within 24 hours)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
2. Have temporary and permanent sediment basins been inspected and found to be functioning properly? (storage and removal of sediment required within 72 hours)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Have surface waters (including drainage ditches) been inspected and found to be free of sediment deposited by erosion? (removal of sediment required within 7 days)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Have the construction site vehicle exits been inspected and found to be free of silt? (removal required within 24 hours)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
5. Have all erosion prevention BMPs been inspected and found to be functioning properly? (Examples include: silt fence, silt fence, silt fence, or other approved or permanent cover)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
6. Have all sediment control BMPs been inspected and found to be functioning properly? (Examples include: storm drain inlet protection, sediment traps, or drainage inlets)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
7. Has sediment enclosed off-site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
8. Have siltation areas been inspected and found to be free of sediment and compacted due to construction activity?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
9. Have Reports needed for any of the above items?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
10. Other	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Maintenance and repair ongoing  
Continued inspection and re-inspection

Other information kept in a daily log that may be referenced in the future includes:

- Mn/DOT inspectors must conduct their own inspections and maintain an inspectors diary to properly administer the contract, represent the owner, maintain good ESC practices, and enforce Mn/DOT Specifications.

## Timing and Intent of Mn/DOT Inspections

On a daily basis, as necessary

Should also coincide with any MPCA inspection conducted

Note overall project conditions

Right after sediment controls are installed

After rain events

Just prior to seeding

Prior to temporarily shutting down for winter or project completion

Prior to shutting down for holidays and weekends

Mn/DOT inspectors should keep track of the following types of information:

Weather conditions/rainfall

- Dates and hours the ESC Subcontractor spends on the job
- What type of work they are doing
- Number, types of crews/people

Amount of disturbed area and with holdin for erodible soils (Spec .2105.5)

Plan changes and instructions given to the contractor

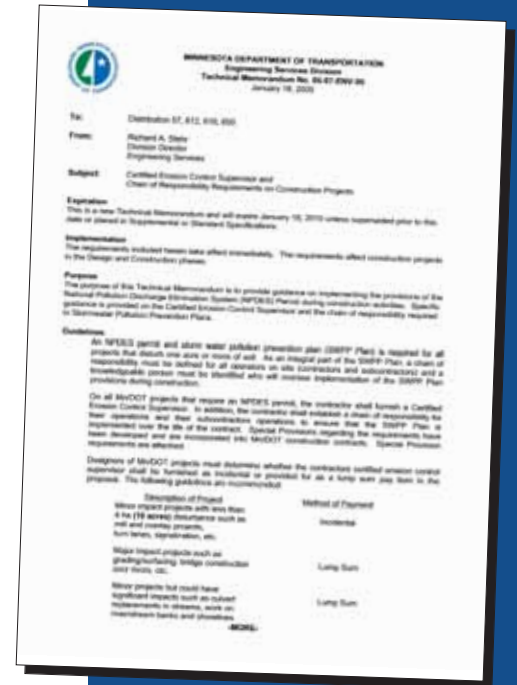
Comments on any unusual procedures or methods used

Explain any delays

Report contacts with the ESC Subcontractor and the reason for the contact

Inspection results and any subsequent discussion with the ESC Subcontractor

Photographs of any erosion or sedimentation and corrective actions taken



Mn/DOT specifications require that a certified ESC Supervisor be provided by the contractor to help achieve compliance with all Federal, State, and Local ordinances and regulations.

**FYI**

ESC Supervisor certification can be obtained by attending and passing the two-day erosion Site Management training course.



The goal of the National Pollutant Discharge Elimination System (NPDES) is minimizing impact to surface water resources during and after construction, by regulating discharges from construction sites to Water-of-the-State. The Phase II Permit, which went into effect in 2003, is administered [in Minnesota] by the MPCA. The permit requires that sites disturbing one or more acres obtain a permit and comply with permit requirements.

- The Owner including Mn/DOT, is responsible for compliance with all terms and conditions of the permit. (Part II.B.2)
- The general contractor, as the Operator (Co permittee) is responsible for Parts II.B, II.C, and IV (Part II.B.2) and must implement the SWPPP.
- The owner must develop a Stormwater Pollution Prevention Plan (SWPPP) prior to submitting the application and prior to any construction activity (Part III.A). On Mn/Dot projects, the SWPPP is included in the construction plans and specs.
- The SWPPP, inspections, and maintenance records must be kept on site. If requested by a Federal, State, or Local official, the records must be provided within 72 hours (Part V.B)
- The owner must maintain records on file for a period of three years after submitting the NOT (Part III.D).

[illegible]

## Erosion Prevention Practices (Part IV.B)

- Minimize amount of exposed soil; indicate on plan sheets and delineate areas to be preserved with flags (or the like) in the field (Part IV.B.1)
- Exposed soil areas within 200 linear feet of Water of the State must have temporary or permanent erosion protection year round as follows (Part IV.B.2):

Steeper than 3:1	within 7 days of being worked
1 to 10:1	within 14 days of being worked
Flatter than 10:1	within 21 days

- The normal wetted perimeter (NWP) of any ditch draining water from or around a construction site must be stabilized within 200 feet of the property edge or point of discharge within 24 hours (Part IV.B.3)
- Pipe outlets must have temporary or permanent energy dissipation within 24 hours of connecting to Water of the State (Part IV.B.4)
- No unbroken slope lengths greater than 75 feet for slopes with a grade of 3:1 or steeper (Part IV.C.1.c)
- Special Waters (Appendix A, paragraph C)

3:1 and steeper	within 3 days of being worked
Flatter than 3:1	within 7 days of being worked

Duane Stenlund, Mn/DOT



“Stabilized” means the exposed ground surface has been covered by appropriate materials such as mulch, staked sod, riprap, wood fiber blanket, or other material that prevents erosion from occurring. Grass seeding is not stabilization.

## Remember

Surface waters include curb and gutter storm inlets, stormwater ponds, and other stormwater conveyance systems.

## Sediment Control Practices (Part IV.C)

- Perimeter control such as a silt fence or other effective sediment control must be placed on all down gradient perimeters (IV.C.2)
- The timing of installation can be adjusted to accommodate short-term activities (e.g. clear and grub), provided that the short-term activity is completed quickly and sediment control is installed immediately. Sediment control must be installed prior to a rain event, even if the activity is not completed. (IV.C.3)
- All storm drain inlets must be protected with the appropriate BMPs (IV.C.4)
- Temporary soil stockpiles cannot be placed in Water of the State and must have down gradient perimeter control (IV.C.5)
- Vehicle tracking pads, wash racks or other means of removing soils from vehicle tires must be installed at the construction site exits, and street sweeping must be used to collect debris tracked into the street (Parts IV.C.6 and IV.E.4.d)
- Install temporary sediment basins in accordance with Part III.B (Part IV.C.7)

### Important

Secondary containment must equal the volume of fluid being stored. It cannot allow ANY seepage into or spillage onto the surrounding ground

## Dewatering and Basin Draining (Part IV.D)

- Sediment laden water from dewatering or basin draining must be discharged to a sediment basin or other effective BMP (Part IV.D.1)
- Dewatering and basin draining must not cause adverse impacts to receiving waters or downstream landowners and must be treated with the appropriate BMPs (Part IV.D.2)

## Pollution Prevention (Part IV.F)

- Solid waste must be collected and disposed of in accordance with MPCA disposal requirements (Part IV.F.1)
- Hazardous materials must be properly stored, have restricted access to prevent vandalism, and must be in compliance with the MPCA storage and disposal requirements (Part IV.F.2)
- External washing of trucks must be confined to a restricted area (Part IV.F.3)

Duane Stenlund, Mn/DOT



Secondary containment is required for the storage of petroleum products.

Duane Stenlund, Mn/DOT



Hazardous materials storage requires that they are under lock and key to prevent vandalism.





Duane Stenlund, Mn/DOT

Concrete washouts must be provided to collect concrete and associated materials generated at the project site.

#### (H4) Inspections (Part IVE)

- Inspections must be performed every 7 days and after every ½ inch rainfall event in 24 hours and shall include the following (Parts IVE.1 and IVE.2a f):
  - Date and time of inspections
  - Name of persons conducting inspections
- Corrective actions taken
  - Dates and amounts of rainfall
  - Documentation of changes made to the SWPPP as required by Part III.A.4
- On those sites, or portions of the site, where work has ceased slurry due to frozen ground conditions, the required inspections and maintenance must be performed as soon as the first runoff event occurs and prior to resuming construction. (Part IV.E.3)
- Inspections must be conducted to ensure functional effectiveness of BMPs. After maintenance, the BMPs must be inspected again for verification (Part IV.E.4)
- **Need Text for Winter work inspections**

#### Remember:

Proper storage of hazardous materials includes secondary containment equal to the volume of the original container.



## Maintenance (Part IV.E)

Maintenance must be performed according to the following table (Parts IV.E.4a-f and IV.E.5):

BMP/Site Impact	Maintenance Required (Degree of Failure)	Time Allowed for Maintenance
Silt fence	Nonfunctional or sediment reaches 1/3 the height	24 hours <sup>1</sup>
Temporary or permanent sediment basins	Sediment reaches ½ the design volume	72 hours <sup>1</sup>
Surface waters	All sediment or deltas	7 days <sup>1&amp;2</sup>
Vehicle tracking pads	Any tracked sediment onto paved surfaces	24 hours
Sediment escapes the construction Site	Any sediment*	Frequency Sufficient to minimize off-site impacts
All other BMPs	Storm events which would render the BMPs inoperable	Frequency sufficient to minimize off-site impacts
Infiltration areas	Prevent all sediment from reaching the infiltration areas	Immediately

<sup>1</sup> Sediment to be removed within the desired timeframe or as soon as the site is accessible.  
<sup>2</sup> Permittee is responsible to contact the appropriate Local, State or Federal Agency prior to doing any work.  
 \*Must be cleaned up in 7 days.

Bonestroo, Rosene, Anderlik and Associates



Maintaining inlet protection devices will include removing the collected sediment and disposing it appropriately.



???

## FYI

Establishing vegetation from native seed mixes can be more difficult than standard seed mixes.

See page 149 for helpful installation and maintenance guidelines

Bypassing or pumping are two ways to control runoff onto or across your site. See page 127

## Did You Know?

Failure to comply with permit requirements as stated above may result in an enforcement action by the MPCA.

## Final Stabilization and Close-out (Part IV.G)

Final stabilization shall be completed the 30 days prior to submitting the Notice of Termination (NOT) or before another owner/operator has assumed control of the site and can be achieved by:

- Stabilizing all areas/repair washouts
- Providing 70 percent vegetative cover on all exposed soil areas
- Removing all temporary and structural erosion prevention and sediment control BMPs
- Cleaning out sediment from conveyances and from sediment basins to be used for permanent stormwater management
- Any retrieved sediment must be stabilized or contained
- Notice of Termination
  - The ESC Supervisor should monitor final stabilization so the Notice of Termination (NOT) can be submitted in accordance with Part II.B.5

Minnesota Pollution Control Agency  
National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS)  
General Stormwater Permit for Construction Activity (MN R100001)

### Notice of Termination

**PLEASE SUBMIT TO:**  
Minnesota Pollution Control Agency  
Construction Stormwater Permit Program  
520 Lafayette Road North, St. Paul, MN 55155-4104

**NO FEE**

This Notice of Termination form should be used to terminate permit coverage of the original project permit number or the subdivision registration permit number.

Refer to the NPDES/SDS General Stormwater Permit for Construction Activity (MN R100001) and the original owner's coverage notification letter as you complete this form. Breakers [ ] are references to the General Stormwater Permit.

Call the MPCA Customer Assistance Center at (612) 297-2274 or toll-free (in Minnesota) at (800) 848-4247 for assistance.

**I want to terminate my NPDES/SDS General Stormwater Permit:**

1. My Stormwater Permit Identification Number is SDN R100001-0300. [ ]
2. The project name (as listed on the initial permit) is: [ ]
3. If the site was subdivided—I certify that all subdivisions have been properly terminated. ☐ Yes

**I want to terminate my NPDES/SDS Subdivision Permit:**

1. My Subdivision Permit Identification Number is SCB 00. [ ]
2. The lot identification number (For example: "Tract Address" or "Block 1, Lot 1") is: [ ]
3. The ENTIRE site has been cleared for termination because EITHER:
  - ☐ Final stabilization has been achieved on all portions of the site for which I am responsible. [Part II.C.2.a and Part IV.G.] or
  - ☐ For residential construction only—I have provided temporary erosion control and down gradient perimeter control, transferred ownership, and furnished the MPCA Sediment and Erosion Control for New Homeowners list sheet to the homeowners. [Part II.C.2.a.]

**This form will not be accepted if the owner and contractor contact information sections, on the next page, are BOTH not completed and signed. If the owner is also the contractor, the owner must also fill out the contractor information section and sign again.**

### 1.1.3 The Memorandum of Understanding

A Memorandum of Understanding (MOU) was developed by Mn/DOT and the MPCA to streamline the compliance process, develop a common interpretation of the rules and improve communications before, during and after MPCA field inspections.



## Details

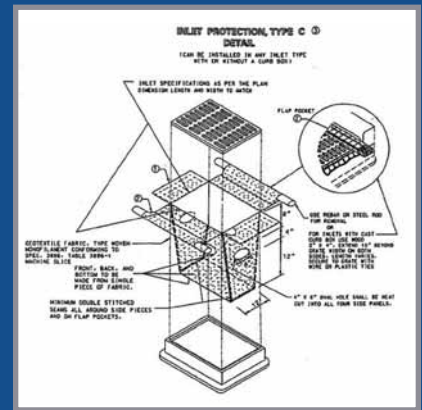
The MOU between MPCA and Mn/Dot contains five main parts. For the purposes of this handbook, we will only focus on the parts related to construction:

- Permit requirements and SWPPPs for Highway Construction Projects
- Permit inspections, communication, and follow up
- Issue resolution
- Review and approval of alternative BMPs for stormwater
- Stakeholder training programs
- During construction, the Project Engineer is responsible for administering provisions of the temporary erosion control plan and the SWPPP, as well as enforcement of the specifications and compliance with the Mn/DOT's permit obligations
- For design build projects, the D/B contractor takes primary responsibility for meeting all the requirements of the NPDES construction permit as they pertain to the project

## Technical Issues of the MOU

BMP requirements for the designer and the ESC supervisor:

- Storm sewer inlet protection may be modified to allow an overflow for public safety.
- Dewatering of sediment laden water will be treated with the appropriate BMPs.
  - Flocculent can be used in dewatering or site drying, provided that:
  - Discharge is directed to a temporary or permanent basin with a closed outlet
  - Adequate time is allowed to settle sediment prior to discharge
  - Stormwater is monitored for treatment effectiveness
  - Flocculants are not applied directly to a natural surface water body
  - The application rate, pH and temperature range are within range of the manufacturer's specifications
- Slopes greater than 75 feet in length shall be stabilized in increments. Each increment must be stabilized prior to constructing the next phase.
- Temporary sediment basins will be constructed concurrently with the start of soil disturbance, and at a minimum shall be temporarily constructed.



All inlet protection has safety overflow.

Duane Sterlund, Mn/DOT



This slope was stabilized in segments. Silt fence also works to slow down water flows.

## Don't Forget

According to Mn/Dot specification 2575.A1, the contractor shall provide a certified ESC Supervisor to maintain compliance with all Federal, State, and Local ordinances and regulations.





Mike Isensee, Dakota County Soil and Water Conservation District

Inspector will look at compliance with all aspects of the Phase II permit.!


## Permit Compliance Inspections

According to the MOU, the MPCA inspector will make a reasonable attempt to contact the Mn/DOT Project Engineer or Chief Inspector prior to conducting a field inspection. The inspection process and procedures are outlined below. The MPCA inspector should be, in most cases, be accompanied by a Mn/DOT representative during the inspection to:

- improve coordination and communication
- understand the project's schedule for erosion control installations
- be aware of methods for conducting work in critical areas
- be able to address site specific concerns

The MPCA inspector will do an overview of the site inspection report prior to leaving the site to answer any questions and will provide a time schedule to bring issues into compliance.

Stormwater Permit Program for Construction Activity

 Minnesota Pollution Control Agency Stormwater Inspection

Project Name: Environmental Compliance Highway  
 Location: 800 Stormwater Drive  
 Compliance MII, MII 18333  
 Site Identification: C0001333\_2005\_11\_06\_18\_02

Inspection Date: 11/06/2005 Weather Conditions: Partly Cloudy Site Conditions: Semi-Saturated

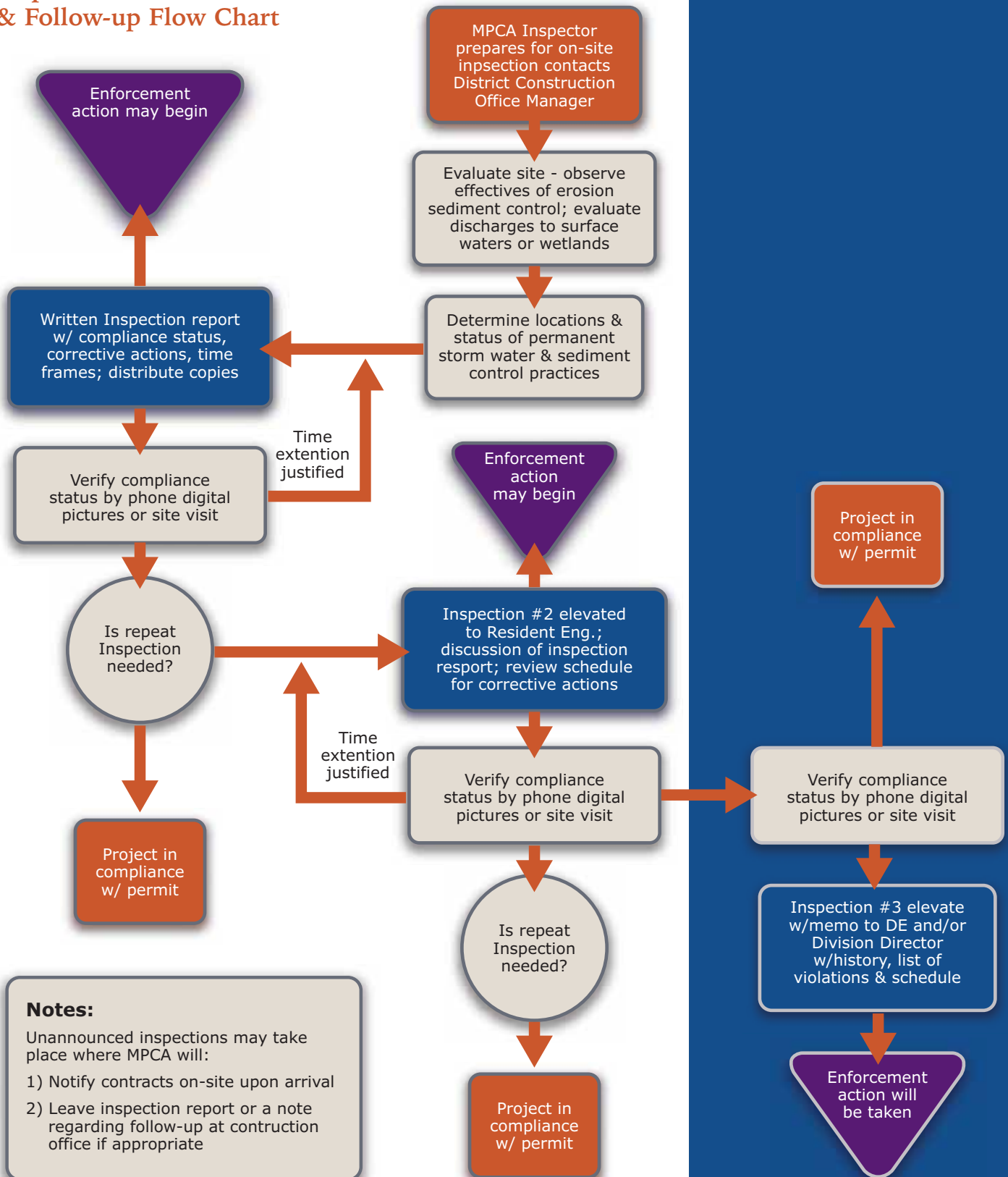
Requirement	Inspection Results	Status
MPCA Rule 7000.2010, sub 3, Permit section 10 B.2 Erosion Control Practices During Construction: Road side slopes have required temporary protection or permanent cover within 20' of surface water.	Compliant	Not Inspected
MPCA Rule 7000.2010, sub 3, Permit section 10 B.3 Erosion Control Practices During Construction: Normal-sloped perimeter of temporary or permanent (connected) ditch that drains water is installed within 24 hours (20' back from surface water).	Compliant	Compliant
MPCA Rule 7000.2010, sub 3, Permit section 10 B.2 Erosion Control Practices During Construction: Other exposed, erodible soils with positive slopes have stabilization (SIS) that are installed appropriately and functional.	Compliant	Compliant
MPCA Rule 7000.2010, sub 3, Permit section 10 B.3 Erosion Control Practices During Construction: Temporary or permanent energy dissipation present at outlets connected to surface water within 24 hours.	Compliant	Compliant
MPCA Rule 7000.2010, sub 3, Permit section 10 C.1 Sediment Control: Adequate control for minimization of sediment discharge (no additional or gradient controls required).	Compliant	Compliant
MPCA Rule 7000.2010, sub 3, Permit section 10 C.2 Sediment Control: Sediment deposits in ditches or surface waters removed.	Non-Compliant	Non-Compliant

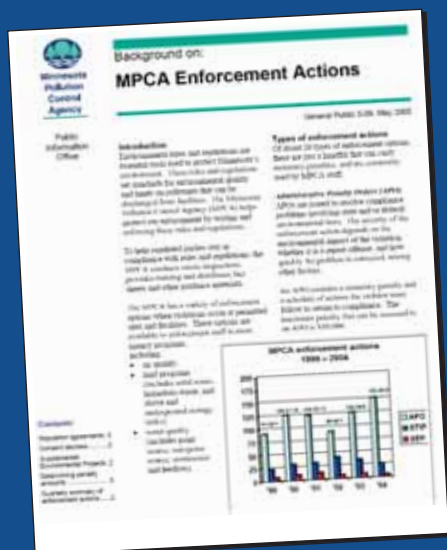
The entire drainage ditch that is behind and parallel to noise wall # 10 has received significant quantities of sediment from the steep slope on the west side of the wall.

All accumulations of deposited sediment for the entire length of the drainage ditch between the point (located at SW corner of Environmental Highway and 5th Trunk Road) and the nearest up-gradient culvert must be removed. Within Contractor indicated that this corrective action should be done by December 15, 2005. A follow-up inspection will be done to ensure compliance with this corrective action.



## Inspection Results & Follow-up Flow Chart





Summons of MPCA enforcement actions

## The Enforcement Process

The MPCA will initiate an enforcement action at any point in the inspection process if the amount or severity of noncompliance warrants it. In the event of an enforcement action the MPCA will consider the following parameters in the determination of extent of the violation:

- Degree of deviation from compliance
- Degree of environmental harm
- Quality and speed of response and corrective action
- History of non-compliance
- History of Mn/DOT staff, contractor, and contractor performance management

It is essential for the ESC Supervisor to fulfill the requirements of the quality control program as stated in Spec 1717.C (see page **XXX**). The enforcement process, if initiated, will require that the appropriate Mn/DOT staff prepare responses (MOU Appendix A, Part II, Table 4).

## Issue Resolution

The Mn/DOT staff and MPCA inspector need to work as a team to effectively resolve any stormwater noncompliance issues before further environmental harm results. They will need to take time during an inspection and discuss the problem areas.

The MPCA inspector and Mn/DOT staff willingness to communicate will most often result in immediate repair and resolution of the problems and will not require elevating the concerns to a higher level. However there are instances where this may not be a viable option. Reasonable attempts must be made to resolve the stormwater noncompliance issues and bring the project back into compliance.

## Remember

Check the SWPPP to see if there are any special waters near your site. If so, additional or different BMPs may be required. If not addressed in the SWPPP, ASK – don't assume.

### 1.1.4 Impaired and Special Waters

Impaired and special waters receiving discharge from a construction site greater than 50 acres and within 2000 feet of the site will require additional time, the use of additional BMPs, and/or meeting the goals of a TMDL implementation plan.

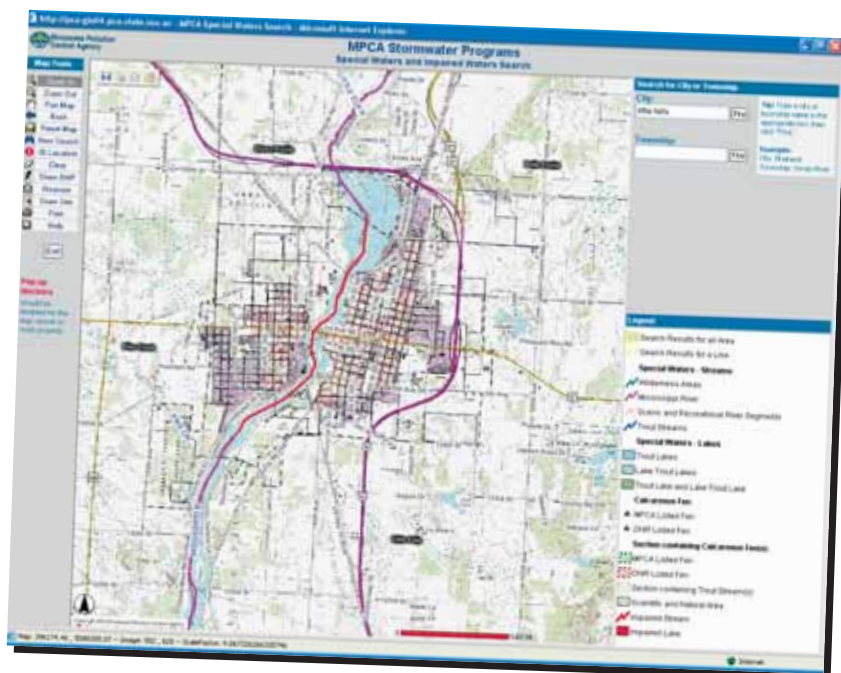
#### (H4) Impaired/Special Waters Requirements

The ESC supervisor will need to review the SWPPP to determine if there are any impaired or special waters adjacent to the construction site. If so, the ESC supervisor will, at a minimum, need to comply with the following requirements:

- Temporary erosion protection or permanent cover must be provided where an area is no longer being worked for slopes having a continuous positive slope to surface waters within 3 days for slopes 3:1 or greater, and within 7 days for slopes less than 3:1.
- Temporary sediment basins must be used when 5 acres or more discharge to a common location.
- Buffer zones a minimum of 100 linear feet must be maintained from the surface water.
- Incorporate BMPs that will meet the requirements of the TMDL implementation plan sufficient for the project site.



Impaired waters may require additional BMPs to comply with the requirements of a TMDL implementation plan.



Please view [www.pca.state.mn.us/stormwater/stormwater-c.html](http://www.pca.state.mn.us/stormwater/stormwater-c.html) for Special/Impaired waters search engine.



Special waters will require additional BMPs.

These are the basic categories in the permit under which special waters are defined and identified:

- Wilderness Areas
- Mississippi River
- Scenic or Recreational River Segments
- Lake Superior
- Scientific and Natural Areas
- Trout Streams
- Trout Lakes

The ESC supervisor may need to do a special or impaired waterbody search if they feel they were not identified in the SWPPP. The ESC supervisor can do the search at [www.pca.state.mn.us/water/stormwater/stormwater-c.html](http://www.pca.state.mn.us/water/stormwater/stormwater-c.html). Special and impaired waters are located throughout the state and one should never assume that their project is not located near special or impaired waters.

### 1.1.5 Permit/Specification Interaction

For the most part, Mn/DOT Specifications, special provisions, and technical memorandums will provide most of the necessary direction to comply with the NPDES Permit. Cross referencing of permit provisions with Mn/DOT specs is provided throughout the handbook.

Under certain circumstances Mn/DOT documents may require a more stringent standard than the NPDES Permit. If so, the Mn/DOT requirements must be met for the project.

### Design Tips:

Construction in proximity to special or impaired waters or wetlands must include design requirements that are not discussed in this handbook. Refer to the NPDES Permit, Appendix A when developing a SWPPP.

## 1.2 Achieving Compliance

The primary objective in implementing the SWPPP on job sites is to protect and preserve Minnesota's natural water resources for future generations. Achieving stormwater compliance is more than just installing BMPs as required by the permit. It is not easy and cannot be approached casually. It requires attention to detail and actively managing your site for stormwater compliance. This section discusses five tools and techniques that make stormwater compliance less difficult. A dedicated approach, integrating these five will make the difference between success and struggle.

- **SWPPP Implementation**
- **Working as a team**
- **What Agency Representatives Like to See**
- **Good Habits or Beneficial Standard Operating Procedures**
- **Avoiding or Working Through Tough Situations**

### 1.2.1 SWPPP Implementation

#### When is a SWPPP Required?

If the project disturbs an acre or more of soil, or less than an acre but is part of a larger common plan of development, a Stormwater Pollution Prevention Plan (SWPPP) must be completed. According to the NPDES Permit, the owner of the project is responsible for developing the SWPPP and the Contractor is responsible for implementing it. The SWPPP is an enforceable part of the permit and must be implemented accordingly.

#### Remember

Good site management is critical to maintain stormwater compliance. See page [x](#).





Duane Stenlund, Mn/DOT

Mn/Dot plans contain a SWPPP index sheet for ease of reference within the construction plan set.

## Important Tip

The SWPPP should not only be looked at as an enforceable part of the permit binding document, but also as an effective tool to reduce the amount of soil lost and efficiently minimize potential of a nuisance discharge from a construction site.

## Tool for Compliance

In order to make the SWPPP an enforceable part of the contract. Mn/DOT incorporates the SWPPP into the project plans. It is important to review all the contents before starting construction. In most circumstances, the SWPPP allows innovation to address difficult situations. For instance, some Mn/DOT projects require the contractor to submit a construction site plan for stream crossings. In some cases, the SWPPP must be amended, in other cases a notation in the ESC Supervisor's log or on the weekly inspection would be sufficient.

Look for and use the following information, found in a SWPPP, as a tool to help you efficiently manage your site for stormwater compliance. For detailed information on SWPPP requirements and implementation, see Part II - The Stormwater Pollution Prevention Plan.

- **Documentation** - Track inspections, corrective actions, and amendments to predict upcoming challenges and to demonstrate to agency representatives that that site is being actively managed
- **Receiving water locations** - know where they are and how the site discharges to them
- **Temp and Permanent ESC Plans** - Indicates the types of BMPs that should be used
- **Special site considerations**
- **Pollution prevention management requirements**
- **Rapid stabilization measures** - Communicate this information to foremen and other supervisors, so that they can plan
- **Contact Lists** - Know whom to call on the project team and which agency representatives to contact if needed



Receiving waters location map.



## 1.2.2 Working As A Team

Stormwater compliance is not the responsibility of one person. Achieving site compliance will take cooperation between all implementers of the SWPPP (the project team). The primary implementers are the Contractor's Superintendent, ESC Subcontractor, Mn/Dot Project Engineer, Mn/DOT Chief Inspector, and the Contractor's ESC Supervisor.

### Who Makes Up the Team

The team is comprised of the members mentioned in the handbook's Stormwater Compliance Organization Chart on pages **14-16**. The organization chart defines the members that will be involved in the SWPPP implementation process and how outside entities or the general public may weigh in on erosion and sediment control.

### Team Leadership

The ESC Supervisor will serve as the team leader for all of the contractor's operations. The ESC supervisor will have valid certification and must be able to coordinate contractor and subcontractor(s) operations to help achieve compliance. This person must have the authority to carry out the duties defined in Mn/DOT specification 2573.A1. The project team must respect the ESC Supervisor role and look to the ESC Supervisor as the point person on all matters of erosion and sediment control over the entire project site. Specific job duties of the ESC Supervisor are on page **XX**.

Duane Stenlund, Mn/DOT



The project team may need to get together to resolve any outstanding erosion concerns or when work is conducted in a critical area.

### Don't Forget

The SWPPP is not a list of suggestions or general ideas. The Contractor is contractually obligated to implement the SWPPP and to follow all provisions of the NPDES Permit relating to the SWPPP.

## Team Members

The SWPPP implementation process will not only require that a project have a team leader with the necessary authority, but a team that is willing to cooperate. The goal is to work toward a smooth transition from site clearing through grading, utility installation, road/bridge construction, and the permanent stabilization phase.



Team members

Each phase must be timed to minimize the amount of open soils and also minimize the amount of time needed before the soil is stabilized either temporarily or permanently. In critical areas, all factors should be taken into consideration such as weather, flow rates, and high water. The work will be completed during times that will minimize the potential for erosion and loss of soils from the site.

## Important

Mn/DOT spec 2573.A1 defines the duties required of the contractor's ESC Supervisor

## Coordination and Communication

The ESC Supervisor will be the responsible person to implement the SWPPP and conduct the contractor's erosion and sediment quality control program, (Mn/DOT specification 2573.3.A1). The ESC Supervisor will need to coordinate a schedule for erosion control items with the contractor, and will also need to coordinate with Federal, State, and Local agencies to follow up on all erosion and sediment control concerns.

### Weekly Meetings

There must be weekly meetings held to discuss the erosion and sediment control measures used at the project site. The meetings will include the ESC Supervisor, Contractor Supervisor, Project Engineer, Project Inspector, and representatives from regulatory agencies may be invited. The following topics will be discussed with a proposed schedule to accomplish the work:

- Proposed erosion control installations
- Areas ready for permanent establishment
- Grading operations and how erosion control will be incorporated in the work
- Repair or maintenance required on any erosion control installations
- Proposed erosion control measures in areas not being actively worked ordering suspension of the work

W34-05	<b>TH 62 NE</b> Put some rock or hay bales in front of large gap between concrete barriers. 05-26-05 Completed.	05-12-05	5/19	Closed
W36-01	<b>Sta. 509-518L</b> Non-conformance. Exposed soil and little runoff control result in persistent discharge WOS with runoff.	05-26-05	6/1	Open
W36-02	<b>Sta. 451-466L</b> Re-establish by grading, runoff control to utilize temporary down drain at 451+50.	05-26-05	5/27	Open
W36-03	<b>Sta. 462L</b> Discharge of sediment onto SB driving surface.	05-26-05	-	Noted

ESC Supervisor inspection reports need to provide a weekly schedule.

### Important Tip

One of the key ways to achieve environmental compliance at a project site is to gain the trust of regulating parties and illustrate a willingness to communicate.

## Working with Representatives from Regulatory Agencies

Effective coordination and communication with Federal, State, and Local Regulating parties on a frequent basis will be important in developing a positive and trusting relationship among regulating parties. A willingness to perform erosion and sediment control inspections and repairs in a timely/proficient manner will help gain the trust of the regulating parties and permitting agencies.

### Key Points

- Contractor shall prepare and submit a weekly schedule of proposed erosion control activities for the engineer's approval
- The engineer may require the contractor to submit a site plan detailing proposed ESC measures for work occurring in water bodies and/or adjacent to water of the state with a schedule for the completion of the work
- If the contractor fails to install erosion or sediment control measures ordered by the engineer, the engineer may withhold payment from related work until the control measures are undertaken by the contractor
- The contractor is required to designate an ESC Supervisor with the appropriate training according to the Mn/DOT Specifications

Attendee	Initials	Attend (Y or N)	Organization	Phone	E-mail
Marty Kortmark	MK		Mn/DOT	651 634 2077	Marty.kortmark@dot.state.mn.us
Sanna Straumann	SS		Mn/DOT	651 294 3788	sanna.straumann@dot.state.mn.us
Peter Leete	PL		Mn/DOT	651 296 6509	Peter.leete@dot.state.mn.us
Deayne Sterkund	DS		Mn/DOT	651 284 3797	Deayne.sterkund@dot.state.mn.us
Peter Wasko	PRW		Mn/DOT	651 582 1293	Peter.wasko@dot.state.mn.us
Mark Darling	MRD		Mn/DOT oversight	651 765 2953	mderling@ustfsc.com
Tim Anderson	TA		FRWA	651 291 6114	Timothy.anderson@frwa.dot.gov
Todd Smith	TS		MPCA	651 215 8008	todd.smith@mpca.state.mn.us
Brian Timerson	BT		MPCA	651 296 7899	brian.timerson@mpca.state.mn.us
Joseph Yanta	JJY		USACE	651 290 5362	joseph.j.yanta@usace.army.mil
Jim Konrad	JK		DNR	612 476 8736	Jim.konrad@dnr.state.mn.us
Wayne Bantard	WB		DNR	651 772 7941	wayne.bantard@dnr.state.mn.us
Doug Norris	DN		DNR	651 296 6779	doug.norris@dnr.state.mn.us
Julie Ekman	JE		DNR	651 772 7910	Julie.ekman@dnr.state.mn.us
Brad Wozney	BW		BWSR	651 290 8008	brad.wozney@dnr.state.mn.us
Thomas Mings	TM		BWSR	651 284 4153	Thomas.mings@dnr.state.mn.us
Stacy Puranen	SP		HCCD		stacy.puranen@hennepin.mn.us
Terry Jeffery	TJ		HCCD	952 546 7601	terry.jeffery@hennepin.mn.us
Joel Sefties	JS		Hennepin County	612 586 1171	joel.sefties@hennepin.mn.us
Len Krenier	LK		Bassett Creek WMO	652 832 2781	lkrenier@bassett.com
Ranae Clark	RC		MCWD	952 471 0590	rlclark@mcwdhacreek.org
Bob Obermeyer	BO		MACWD, RPB/CWD	952 832 2657	bob.obermeyer@barr.com
Shane Messaighs	SM		City of Plymouth	763 569 5527	shane.messaighs@plymouth.mn.us
Leslie Stoving	LS		City of Eden Prairie	952 949 8326	lstoving@edensprings.org
Nathan Campau	NOC		Barr Engineering	952 832 2654	ncampau@barr.com

Agency representative contents

### 1.2.3 What Agency Representatives Like To See

The first time a regulator visits the site should not be because of noncompliance or a sediment discharge from the project site. Efforts must be made early in construction to gain regulator trust by working cooperatively. Failure to attempt to work cooperatively with the agency representatives prior to this type of event will often result in an enforcement action.

Send agency representatives positive signals by:

- Keeping them informed of the project's progress
- Providing documentation of the weekly or post-event rainfall inspections
- Inviting them to come review the site and/or attend the weekly meetings
- Providing proof that repairs or corrective actions have been made
  - do this with a follow-up site visit, phone calls, and/or digital pictures



SWPPP site plan amendments can be completed on the fly while in the field!

EROSION & SEDIMENT CONTROL BMP MAINTENANCE LOG				
Project Name: <u>Environmental Highway</u>				
Project Number: <u>0001</u>				
DATE	MAINTENANCE ACTION TAKEN	DATE COMPLETED	CREW MEMBERS	PHOTOS TAKEN?
6/14/06	Repaired silt fence at STA. 601	6/13/06	Mr. BMP Mr. Maintenance	<input checked="" type="radio"/> YES <input type="radio"/> NO
6/26/06	Removed Sediment from Sed. Pond	6/28/06	Joe	YES <input checked="" type="radio"/> <input type="radio"/> NO
7/12/06	Interior Erosion maintenance performed at STA 212	7/13/06	Ralph	<input checked="" type="radio"/> YES <input type="radio"/> NO
7/19/06	Repaired silt fence at STA 616 - 623	7/21/06	Mr. Erosion	<input checked="" type="radio"/> YES <input type="radio"/> NO
				YES <input type="radio"/> NO <input type="radio"/>

ESC Subcontractors BMP maintenance log

### Don't Forget

Inspections are required weekly, or within 24 hours of a 0.5 inch rainfall event or greater.



## 1.2.4 Good Habits

Often times, unforeseen weather, soil, or personnel conditions require quick thinking to minimize erosion and manage sediment. The following section outlines good habits and beneficial standard operating procedures that help achieve compliance with MPCA rules and Mn/DOT expectations.

### Scheduling and Timing

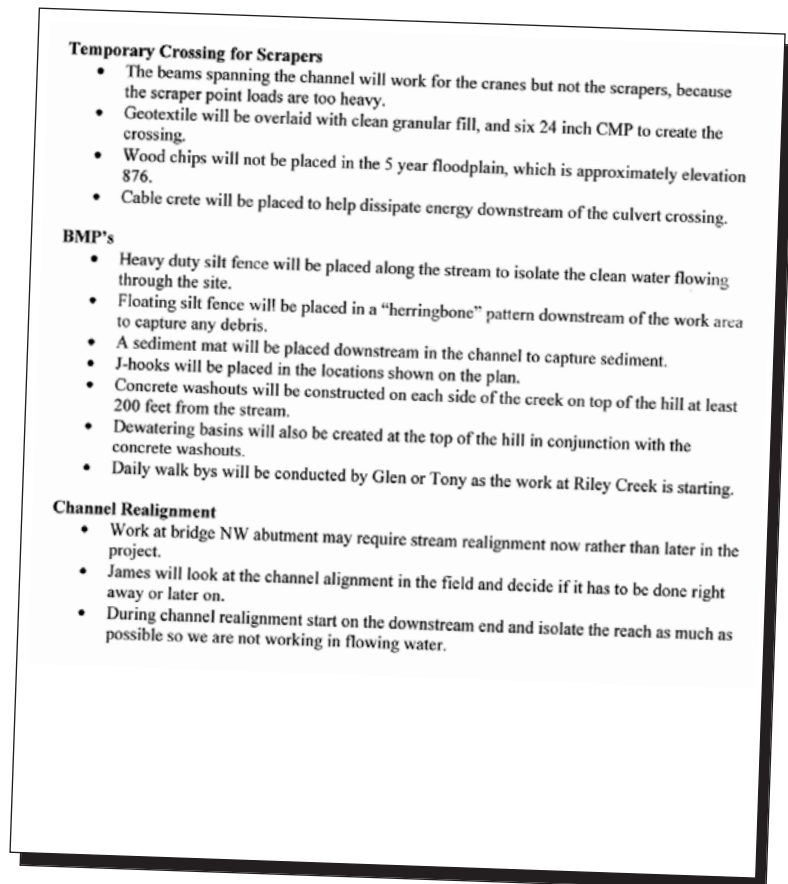
The primary objective of scheduling and timing grading activities is to minimize erosion by limiting the area disturbed before adequate ESC measures can be put into place. This reduces the amount of soil exposed to the forces of erosion. Proper scheduling and timing are essential in minimizing erosion.

It is not easy to integrate effective scheduling and timing with all the other responsibilities of a project. Remember that permit compliance is not intended to holdup grading activities, or to cause hardship to any parties, but is meant to protect the environmentally sensitive resources along your project corridor.

### Important Tip

All exposed soil with a positive slope within 200 linear feet of a surface water must have temporary erosion protection or permanent cover for the exposed soil areas year-round, according to the following table of slopes and time frames:

Type of Slope	Time
Steeper than 3:1	7 days
10:1 to 3:1	14 days
Flatter than 10:1	21 days



Critical area site plan notes



## QA/QC

Providing QA/QC for ESC practices can be challenging, but it is often necessary. The effectiveness of ESC products can drastically decrease when improperly installed. The following list provides a summary of items and common instances when corrective actions are required.

- Seeding – not uniform placement, not seeded with drill when required, depth of seed incorrect, no seedbed firming, incorrect rate of seed application, less than 3 inches tillage, not mulched within 24 hours.
- Fertilizer – Incorrect rate of application, not uniform placement.
- Mulch material – Incorrect rate of application, not uniform placement.
- Disc anchoring – Insufficient depth of mulch anchoring, not done immediately after mulch placement.
- Erosion control blankets and mats – Inadequate soil loosening or preparation, up-grade ends not embedded on slopes, improper overlaps and joints, wrong staples used, insufficient number of staples, improper stapling pattern, joints not embedded in drainageways.
- Silt Fence – Not trenched properly, posts on uphill side of fence, wrong type of fabric, not properly compacted.

Duane Stenlund, Mn/DOT



Properly disc anchored mulch will be punched into the ground.

Duane Stenlund, Mn/DOT



Silt fence will need to properly embedded and installed along the contour.

### Important Tip

Failure to bring the site into compliance with stabilization requirements in the fall will require the site to be monitored and inspected in accordance with Part IV.E of the NPDES Permit until final stabilization can be completed in the spring.



Tracking the weather will help prepare for a potential storm or hold off on work in a specific area.

## Work With the Weather

Contractors must be ready for whatever Mother Nature plans to send their way. A good project supervisor is always aware of upcoming weather patterns.

Weather conditions can not only stop grading activities; serious erosion and sedimentation problems can result if there has been poor site planning. Here are a few helpful tips when dealing with the weather.

- During or immediately after rain events, check BMPs for needed modifications or routine maintenance.
- Permit conditions for temporary cover are required year-round. Mulch and erosion control blankets can be effectively installed on snow-covered ground.
- A small weather-band radio can be very valuable when determining how to “button up” the site for the weekend or extended holiday.
- Mn/DOT covers the costs of repairs from damage due to severe weather or circumstances beyond the control of the contractor.
- Identify an acceptable method of dewatering your site before it rains.

Rain events can sometimes aid in erosion control efforts. For instance, seeding areas just prior to a small rain event can increase seed germination rate and vegetative cover.

## FYI

Useful weather sites:

- [www.new.noaa.gov](http://www.new.noaa.gov)
- [www.weather.com](http://www.weather.com)
- [www.climate.umn.edu](http://www.climate.umn.edu)

## Avoiding Complacency

When instances of land disturbance slow down, extended dry periods or winter conditions prevail, complacency towards site management can settle in. A good way to keep this from happening is to schedule a certain period of time each week to walk the project site and conduct the required weekly inspection. When doing this, think in terms of how a rain event or snow melt might impact the site, and make any modifications you think necessary.

## Get Your Money's Worth

Since controlling erosion on some projects can be a notable percentage of total construction costs, it's important to get your money's worth.

- Installing sediment control BMPs in the wrong location can be a waste of money and sometimes causes a larger problem downstream.



- Perimeter sediment control BMPs should never be placed across contours.
- Similar to other industries, erosion control work can differ in price and quality of workmanship. It's important for the Mn/DOT Project Team to stay up to speed on product types, and installation techniques, and overall workmanship.

## Did You Know?

Erosion and sediment control inspections are required weekly and within 24 hours of a 0.5 inch rainfall event or greater.

During frozen ground conditions, the required inspections and maintenance must take place as soon as runoff occurs (including snow melt) or prior to resuming construction, whichever comes first.



### 1.2.5 Avoiding or Working Through Tough Situations

Work at a construction site that is adjacent to, and/or draining to a critical resource or steep slope requires coordinating with the project team to protect the surrounding natural resources. This can be successfully accomplished by planning ahead, monitoring discharge, and documenting site conditions with photos, both pre- and post-construction.



Duane Sterlund, Mn/DOT

Working in critical areas will require rapid stabilization and team coordination.

#### Planning Ahead Includes:

- Watching the weather
- Tracking/coordinating work around critical areas
- Keeping extra materials on-site
- Anticipating means for diverting or pumping water
- Developing a site plan for conducting site work
- Minimizing time soils are exposed

### Getting Your Money's Worth

- Silt fence back fill or installation slice must be mechanically compacted **BEFORE** placement of posts
- While the silt fence fabric is laying on the ground, drive over it with wheel centered over the trench or slice.

## Monitoring Discharge

Monitoring discharge will help determine if sediment loss from the site has been successfully minimized or eliminated. This process is performed with a turbidity meter or turbidity tube. Although the sun reflecting off soil particles can make construction site discharge look more harmful than it actually is, high turbidity values in the receiving water is proof that appropriate BMPs are not being employed to effectively manage soil loss. Monitoring discharge can determine if further action is required.

Duane Stenlund, Mn/DOT



Turbidity values represented with their corresponding water sample.

## Photo-Document Site Conditions

During construction it is important to document the site conditions of receiving waters or any other erosion problems that may exist prior to the start of construction. This may minimize the potential of getting blamed for creating problems that existed prior to construction.

During the construction phase photos should be used to document the progress of the construction site and most importantly document any erosion control issues that develop at the site and to document what actions were taken to resolve the violation.

Sharing these photos with the project team and any regulating parties will be used to be able to gain trust and illustrate the team's willingness to coordinate and resolve erosion control violations.

Duane Stenlund, Mn/DOT



Monitoring discharge can be as simple as collecting a sample in a cleaned out soda bottle and analyzing the discharge with a hand-held turbidity meter.

## Remember

When monitoring discharge it is also important to test the turbidity of the receiving water.



## 1.3 Design/Build Projects

### 1.3.1 What's Different About Design/Build?

Design build projects bring the designer and the contractor together a lot sooner in the construction process in order to provide a project in a more timely and efficient manner (Mn/DOT). Design build projects offer a unique ability to offer project that can be completed in a shorter timeframe, since the project will start before all the project details are finalized.

### 1.3.2 Design Requirements

In Design/Build projects Mn/DOT will assemble the initial plan submittal information required by the MPCA, which will identify an approved layout, indication of the receiving water bodies and conceptual locations of permanent ponding for treating permanent stormwater (Mn/DOT Tech Memo 04-02-ENV-01).

Upon Award of the contract the Design Build contractor will:

- Develop a SWPPP concept plan.
- Submit the concept plan to the MPCA 60 days prior to the start of project construction.
- As the project proceeds the details are added to the SWPP concept plan.

### Important Tip

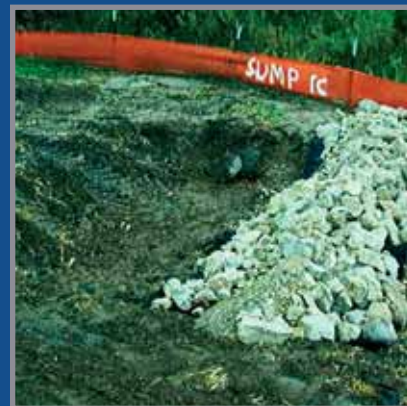
Experience has shown that having transparent stormwater compliance efforts is a good idea. Make agency representatives aware of how the SWPPP will be implemented, invite them to accompany the EMI on stormwater compliance inspections.

### 1.3.3 Roles and Responsibilities

Mn/DOT's Design/Build projects have specific requirements for stormwater compliance as part of overall "environmental compliance" requirements. The Design/Build Contractor is responsible for all provisions of the permit relative to design and construction and in terms of the NPDES permit is both the Owner and the Operator. In order to comply with the environmental requirements of the project the design/build contractor may identify an environmental compliance team which will:

- Implement the SWPPP
- Work with the contractor's ESC supervisor to make them part of the environmental compliance team
- Maintain project compliance with all the environmental permits.
- Performing weekly inspections to meet the NPDES permit requirements and all other environmental permit requirements.
- Mn/DOT will function in an oversight role to ensure site maintenance is being maintained, however they are there for suggestion and observation rather than enforcement.

Granite McCrossan



Install temporary sediment traps as a tool to slow water and trap sediment.

#### Remember

According to the permit all sites disturbing an acre or more must have a SWPPP. Design/Build projects are not exempt!



- **Material BMPs to have onsite**
  - Straw mulch and a way to apply it
  - Temporary down drain materials
  - Cover crop seed
  - Rock for ditch checks and culvert outlets
  - Flocculent
  - Category 3 ECB
  - Silt fencing materials
- **Method BMPs that are critical for achieving compliance**
  - Slope tracking
  - Flow diversion
  - Regular maintenance of the BMPs (have adequate manpower and equipment)
  - Pumping down sediment basins and using for dust control
  - Minimizing exposed soil areas

## Standards For Success

In working to control erosion on your project site, these standards will maximize your success:

- Disturb and then restore more small areas, rather than few large areas
- Leave as much undisturbed vegetation as possible
- Minimize the time of disturbance
- Protect soil stockpiles from eroding
- Use sufficiently sized temporary basin(s)
- Break up slope lengths and flow concentrations
- Minimize slope exposure time

Post event reports will key in on failures of BMPs, run-on, and off-site sedimentation.

## Remember

The contractor is still required to name an ESC Supervisor for Mn/DOT Design/Build projects.

### 1.3.5 Roles and Responsibilities

Mn/DOT's Design/Build projects have specific requirements for stormwater compliance as part of overall "environmental compliance" requirements. Documents that, in effect, become part of the contract, spell out specifics regarding staffing, documentation, and inspections.

- The contractor's ESC Supervisor must be part of the project's environmental compliance team.
  - The ESC Supervisor plays a significant role in SWPPP implementation and compliance
- SWPPP Concept Plan
- There is an Environmental Compliance Manager (ECM) that is charged with ensuring compliance with regulations pertaining to many environmental parameters, stormwater compliance among them.
- There are Environmental Monitoring Inspectors (EMI) for each parameter.
  - ESC/Stormwater Compliance may be coupled up with another complementary parameter
- Mn/DOT functions in an oversight role, so the Mn/DOT inspector is there for observation and recommendations, not direct enforcement.

### 1.3.6 Permitting, Oversight, and Documentation

- In terms of the NPDES Permit, the Design/Build contractor is both the Owner and Operator, and therefore accepts complete responsibility for implementation and compliance
- Documentation requirements can be extensive and detailed
  - Weekly inspections may serve as updates to the SWPPP
  - Weekly inspections are likely to carry the burden of ensuring compliance
- The DB contractor is still responsible for complying with Mn/DOT requirements for ESC, final stabilization, etc. (MOU, Specs, Rapid Stabilization)



## Part 2 - SWPPP Implementation The Stormwater Pollution Prevention Plan (SWPPP)

The most important step toward controlling erosion and minimizing soil loss is to have a good SWPPP in place with the flexibility to amend and implement it successfully. In this chapter we discuss the following issues to help implement a SWPPP efficiently and successfully:

- Objectives of a SWPPP
- SWPPP Requirements and Content
- Implementing the SWPPP
- Tools For Contract Administration
- Site Management

### 2.1 Objectives of a SWPPP

#### 2.1.1 SWPPP Objectives

The overall objectives of the SWPPP are:

- Tailor ESC measures to site conditions
- Prevent erosion and manage sediments
- Prepare for varying field conditions
- Clearly show the location and type of devices necessary
- Provide a stable and well-vegetated construction site
- Contain the provisions to keep the project in compliance from start to finish

#### Remember

The contractor is still required to name an ESC Supervisor for Mn/DOT Design/Build projects.

## 2.1.2 Critical Information

At a minimum, the SWPPP should inform the reader of:

- Surrounding area - Identity and description of water resources, land use, and landscape characteristics
- Critical areas - Environmentally sensitive areas adjacent to or near the project site
- Erosion and sediment control measures - A description of the temporary erosion control measures that will be used in the project, why they have been selected, and their functional objective
- Permanent stabilization - A brief description of how the site will be stabilized after construction
- Pay items/estimated quantities - An explanation of ESC items to be measured by the project staff
- Maintenance - An explanation of the maintenance required for the devices, and how maintenance is to be paid for
- Other pollutants - A description of other potential pollutants on the site, and how to manage them
- Stormwater management - Details of the permanent stormwater management system and how to protect it
- Areas not to be disturbed
- Direction of flow
- Receiving waters

### FYI

Interim conditions are:

- Going to present problems
- Difficult to anticipate just what, when, or how
- Easy to plan for by having adequate materials, methods, and manpower available

See Section **x** for more on interim conditions

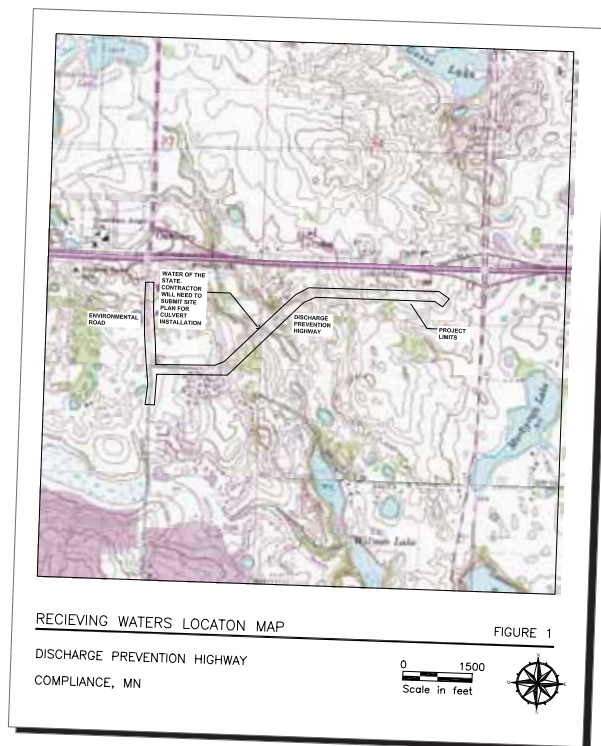
## 2.2 SWPPP Requirements

As indicated by its name, the SWPPP is the document to guide the project teams through the process of stormwater compliance. The very first thing that the ESC Supervisor and the Contractor Superintendent should do is carefully review the contents of the SWPPP. All of the information discussed below must be included and should be presented in a way that is understandable and usable.

If any of this information is not included, or is incomplete or confusing, contact Mn/DOT right away so that clarification or correction can be completed prior to the beginning of the project.

A SWPPP must be a combination of narrative, plan and detail sheets and must address these major areas of concern:

- Temporary ESC (Including Temp Sed Basins)
- Permanent ESC (Final Stabilization)
- Permanent Stormwater Management
- Discharges to Special or Impaired Waters



Receiving waters will need to be identified and reviewed in the field to determine if any additional precautions need to be taken before construction begins in that area.

### Remember

The SWPPP document is what you are going to hang your stormwater compliance hat on for the life of the project, it is supposed to have all the information you need to minimize the potential for enforcement action, make sure it is right.

### 2.2.1 General SWPPP Requirements:

Identify the following:

- A “chain of responsibility” for SWPPP implementation through and including submission of the NOT
- ESC Supervisor (must be a certified Site Manager and in good standing)
- Who has responsibility for the Operations Management of the permanent stormwater management system

Include a map of all Water-of-the-State that may receive discharge during construction

- Highlight Water-of-the-State with a TMDL and the portion of the site discharging to it

#### The SWPPP Narrative should:

- Describe the project
- Discuss the potential for discharge and mitigative measures
- List and describe potential receiving Water-of-the-State
- Include requirements on these topics
  - Timing for Installation of BMPs
  - Dewatering and Basin Draining
  - Inspection and Maintenance
  - Non-Stormwater Pollutants/Pollution Prevention
  - Final Stabilization Methods

### 2.2.2 General Design Requirements:

- The SWPPP must factor in all requirements that are part of any previous, but still valid, environmental or archeological document issued by any local, state, or federal agency as related to:
  - Stormwater discharges associated with the construction activity
  - Erosion prevention and sediment control
  - Permanent stormwater management systems
- The SWPPP must comply with any published surface and ground water requirements when working in Karst regions
- If discharging to a waterbody with a TMDL, the SWPPP shall comply with the TMDL implementation plan

#### Important Tip

Upon reviewing the SWPPP prior to the beginning of the project, if any of these SWPPP requirements are not included, or are not adequately addressed, Notify the Mn/DOT Project Engineer.

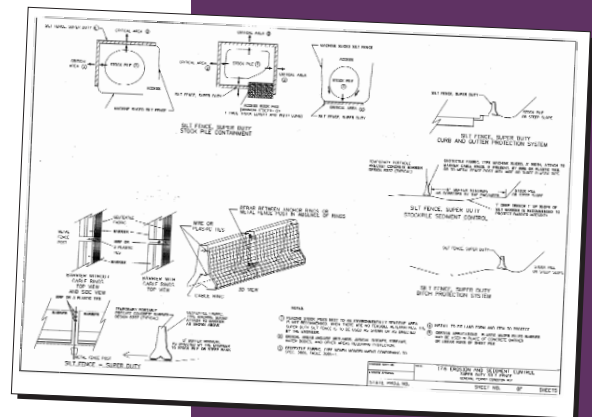
## 2.2.3 Temporary ESC Plan

All SWPPPs must contain a Temporary ESC Plan. The goal of the plan is to minimize erosion and prevent sediment from leaving the job site. The following are typical items identified in the Temporary ESC Plan.

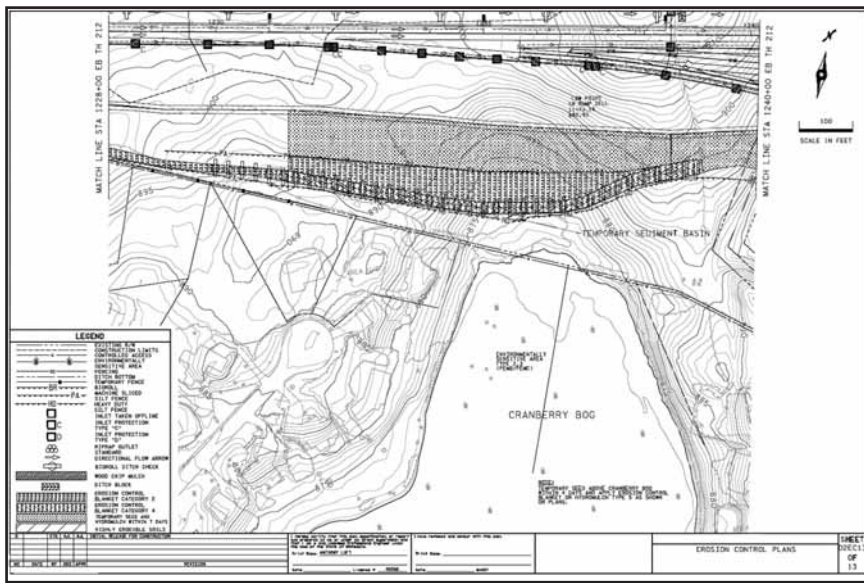
- Existing, preliminary and final contours
- Site phasing and/or staging
- Existing vegetation
- Clearing and grading limits (areas not to be disturbed)
- Location and type of:
  - Inlet protection
  - Temporary cover (seed mix, blanket, mulch, etc.)
  - Temporary perimeter control (silt fence, berms, etc.)
  - Velocity checks
  - Silt curtain
  - Temporary sediment basins or traps
  - Construction entrances
- Soil stockpile areas



Inlet protection will need to be provided and maintained until vegetation has been established.



## Super duty silt fence detail



Receiving waters need to be identified and reviewed in the field to determine if any additional precautions need to be taken before construction begins in that area.

## Don't Forget

**Seven Days – Many storm drain inlets provide a direct conduit to waters of the state, so disturbed slopes of 3:1 or steeper grade within 200' of inlets must be stabilized within seven days of disturbance.**





Duane Stenlund, Mn/DOT

J-hooking silt fence will avoid long runs and inevitable failure of silt fence.

## 2.2.4 Permanent ESC Plan

All SWPPPs must contain a Permanent ESC Plan. The goal of the plan is to prevent pollutants from leaving the site after construction. The following are typical items identified in the Permanent ESC Plan.

- Final contours - Usually 2 feet contours of final design
- Final vegetation/landscaping – Type and location of trees, bushes, retaining walls, etc.
- Storm drain system – Size and/or location of storm drain inlets, pipes, basins, etc.
- Pipe energy dissipation – Location of riprap or engineered structures for reducing flow velocity to prevent scour
- Permanent cover - Seed mix, blanket, mulch, etc.
- Permanent stormwater ponds – Location/size of final stormwater pond



Duane Stenlund, Mn/DOT

Slope will need to be established within 200 linear feet of a surface water within 7-21 days depending on grades.

## 2.2.5 Non Stormwater Pollutants

Non-stormwater pollutants require special attention at a job site. Leaving a fuel container in the middle of a site uncontained or allowing concrete trucks to wash out material in non-designated and protected areas constitute violations of the general permit.

### Permit Requirements

The permit requires the use of the following pollution prevention measures:

- Solid wastes must be disposed of properly
- Hazardous wastes must have restricted access to prevent vandalism and secondary containment to prevent leaks
- External truck washing must be confined to designated areas of the site with the runoff contained
- No engine degreasing is allowed on site
- Disposal shall be in compliance with the MPCA disposal requirements
- Dust shall be minimized by watering or any other applicable means to help prevent it from becoming airborne

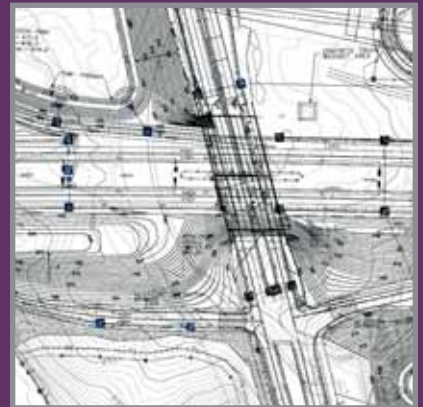


Concrete washout areas will need to be identified in the SWPPP and on the site plan and must be placed to prevent discharges to Waters of the State.

Duane Stenlund, Mn/DOT



Secondary containment.



Concrete washout areas can be made from the native materials found at the project site.



Duane Stenlund, Mn/DOT

Signage needs to be used to identify concrete washout areas.

Site specific pollutants consist of the following:

- **Solid Waste**
  - Collected sediment
  - Asphalt and concrete millings
  - Floating debris
  - Paper
  - Plastic
  - Fabric
  - Construction and demolition debris
  - Other associated wastes
- **Hazardous Waste**
  - Oil
  - Gasoline
  - Paint
  - Other associated hazardous waste
- **Concrete dust must be minimized by watering or other applicable means to prevent it from becoming airborne**

## Important Tip

The permanent stormwater management system will be considered to be a surface water once it is connected to downstream resources.



## 2.2.6 Permanent Stormwater Management

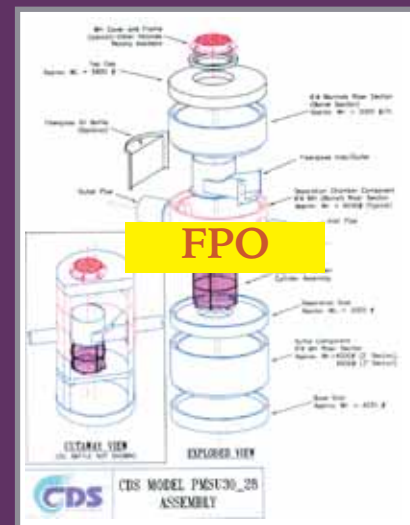
The permanent stormwater management system will most likely consist of one or more of the following practices:

- Wet sedimentation system
- Infiltration/filtration
- Regional ponds
- Combination of practices
- Alternative methods

Duane Stenlund, Mn/DOT



A permanent pond has considerable potential for floodplain, shoreline and future wetland vegetative buffer. Wetland plants will improve water quality and pond function by tying up heavy metals in their root mass and nutrients in their biomass.



Wet sedimentation basin need to be dug as early as possible in the construction process to be used as a temporary sedimentation basin.

### Design Tip

Temporary sediment basins must be designated to provide storage below the outlet pipe for a 2 year, 24 hour storm from each acre of drainage.

## 2.27 Discharges To Special Waters

If special waters have been identified, or if you suspect that there may be a special water within 2000 feet of your project, review Appendix A of the NPDES Permit for clarification of what a special water is and for specific requirements for discharge to special waters.

If the project will discharge to a special water, the SWPPP must address the requirements found in Appendix A of the permit. In general, the SWPPP must include the following for construction and post-construction conditions:

- Identification of special waters and the portion of the site discharging to it
- Additional BMPs
- Enhanced runoff controls
- Temperature controls
- Minimum buffer zones

### Did You Know?

Appendix A of the permit also describes requirements for discharges:

- To wetlands
- Requiring environmental review
- Affecting endangered or threatened species
- Affecting historic or archeological sites



Duane Stenlund, Mn/DOT

Working around critical areas will require rapid stabilization and will require innovative techniques to provide temporary stabilization.



## 2.3 Implementing the SWPPP

### 2.3.1 Environmental Compliance Pre-Con Meeting

An environmental compliance pre-con meeting is a method that can help get a handle on erosion/sediment control issues associated with a project. An environmental compliance pre-con should be scheduled at the construction pre-con. The environmental pre-con meeting will discuss/review:

- Project coordination and work done by subcontractors

- ESC Supervisor's roles and responsibilities

- A detailed review of the SWPPP Plan should be conducted

- A field site review should be conducted and possible problem area identified on the plan.

- Work being conducted in critical areas

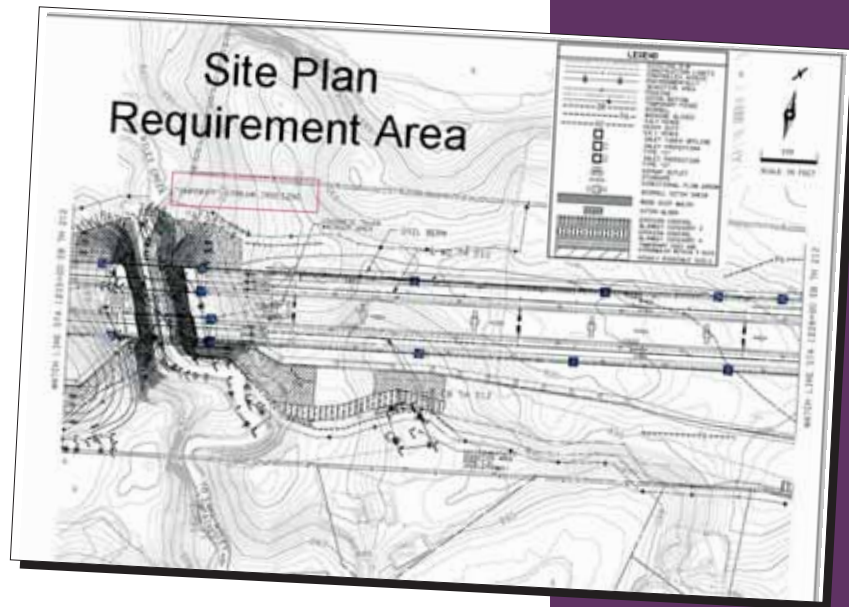
- Contractor site plan submittal for work in critical areas

- Construction of steep slopes and staging of stabilization

- Work adjacent to or in waters of the state

- Weekly inspections/meeting

- SWPPP implementation



Submittal of site plans by the contractor will be requested for work being conducted in critical areas.

SWPPP amendments are required by the NPDES construction general permit. The SWPPP amendments should be performed to not only help stay compliant with legal requirements to satisfy the permit, but also to help successfully manage the project and implement the SWPPP.



- There has been a change in design, construction, operation, maintenance and/or when seasonal adjustments are necessary
- Inspections reveal inadequacies in the plan to minimize soil loss
- SWPPP is no longer consistent with the terms and conditions of the permit and is ineffective at meeting the permit goals
- Amendments or supplemental BMP action plan to the SWPPP in response to MPCA request due to:
  - Determination that project stormwater discharge does not meet any applicable water quality standard
  - SWPPP does not incorporate requirements of a TMDL implementation plan for a downstream waterbody

All amendments must be documented in the SWPPP. Any changes or updates to the erosion control plan must be noted on the SWPPP, with hand drawings/notes on the original ESC Plans developed for the SWPPP or updated by a CAD technician or other appropriate drawing software.

### 2.3.3 Site Inspection

Site inspection is required for managing the construction project to review erosion and sediment control BMPs functionality. Failures or ineffective BMPs shall then be repaired, replaced or supplemented in accordance with the NPDES construction general permit as illustrated on Page **XXX**.

#### Permit Requirements for Inspection

The NPDES Phase II construction general permit administered by the MPCA requires that inspections be performed every 7 days and after every 0.5" rainfall event or greater. However, on sites where portions have undergone final stabilization, the inspections may be reduced to once per month.

All inspections and maintenance must be documented in writing, and these records must be retained with the SWPPP. Records of each inspection and maintenance activity shall include:

- Name of person(s) conducting inspections
- Finding of inspection, including recommendations for corrective actions
- Corrective actions taken (including dates, times, and party completing maintenance activity)
- Date and amount of all rainfall events greater than ½ inch in 24 hours
- Documentation of amendments made to the SWPPP

The image shows three overlapping forms related to stormwater management. The top form is titled 'Stormwater Compliance Report Construction Routine Inspection' and includes fields for 'To:', 'Builder Approval:', 'Attn:', 'Date:', and 'FAX #'. It also features a 'Corrective Action List for' table with columns for 'Item', 'Instructions, Locations, Details, etc.', 'Responsible Party', and 'Priority Status'. The middle form is titled 'Stormwater Construction' and includes sections for '2. General / Site Conditions' and '3. Site Management'. The bottom form is titled 'Stormwater Construction' and includes sections for '1. General / Compliance' and '2. General / Site Conditions'.

#### Remember

The contractor shall name an ESC Supervisor responsible for implementing the quality control program specified in section 1717.2.C in the Mn/DOT 2005 specifications, which is subject to review and verification by the engineer.



Duane Stenlund, Mn/DOT

Inspections will need to monitor the effectiveness of each BMP and will require an up close visual inspection to make sure it is functioning properly.

## Effective Inspection

Effective inspections are those that evaluate how BMPs are functioning, foresee future problems to prevent failures, and plan for future work that may impact a critical area. The results of inspections are then used to generate the weekly erosion control schedule.

The erosion control schedule is required and must address the following:

- Proposed erosion control installations
- Areas ready for permanent turf establishment
- Grading operations and how erosion will be incorporated into their work
- Repair or maintenance on erosion control installations
- Dates for the work to be completed

Inspections cannot be done from any distance away from the BMP being inspected. Walking right up to and around the BMP is necessary. Also, it is important to recognize that how you do an inspection, and what to focus on or look for, will vary with different times in the project. When doing an inspection, here are some of the things to look for at those different times:

### *Installation*

Silt fence

Well entrenched and compacted

Compacted

Resists the tug test

Any runs too long

### *Erosion control blanket*

Good soil contact

Any tenting

Installed with a head trench

Enough staples

## Did You Know?

There is an old saying that often applies to effective inspections: “it looks good from far but is far from good”.



### *Routine Weekly*

Silt Fence

Undercutting (will need to look on the back side)

Blowouts, pushed over, or destroyed

Greater than 1/3 full of sediment

Erosion control blanket

Dislodged, torn, covered with sediment



Agency representatives and the project team need to get together to discuss the results of inspections and how the project is progressing.

### *Post Rain Event*

Blowouts

Sediment discharges

Devices greater than 1/3 full of sediment

Damaging concentrated flow

### *Winter*

Melting conditions which would cause erosion

Rain in the last 7 days

Run-on causing nuisance conditons

Perimeter control devices in place and functioning

Exposed soil areas within 200' of a Water-of-the-State stabilized

### *Close out*

Temporary devices removed

Exposed soil areas stabilized

### **Important Tip**

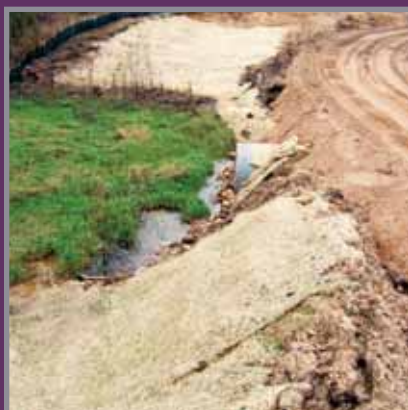
If inspections are to be effective, the inspection and erosion control schedule should be shared with all Federal, State, and Local agencies.





Bonestroo Rosene Anderlik and Associates

SWPPP will be to be stored on site or in a project vehicle and if requested provided to a MPCA inspector or their representative within 72 hours.



Duane Stenlund, Mn/DOT

Working adjacent to critical areas designated as waters of the state will need to be provided with temporary cover multiple times.

## 2.3.4 Record Retention

The SWPPP, all amendments, and inspection and maintenance records must be kept at the site. All records shall be made available to any other Federal, State, or Local agency within 72 hours of request.

After project completion, the Owner must keep all documentation for three years. The Contractor should also keep records for three years. Documentaion to be retained are:

- The SWPPP
- All permits required for the project
- Inspection and maintenance records
- O&M agreements
- Calculations for design of temporary and permanent stormwater management

## 2.3.5 Concurrent Critical Area Stabilization

Concurrent critical area stabilization applied to all areas within 200 feet of surface waters is necessary for the duration of the project. The contractor shall schedule, construct and/or install rapid stabilization measures in critical areas designated in the contract or in accordance with the permit requirements without having to obtain approval or having to be so directed by the engineer.



Duane Stenlund, Mn/DOT

Slopes adjacent to Waters of the State such as ditches, curb & gutter systems, or ponds need to have temporary stabilization.

## Critical Resources

Critical resources are defined as surface waters such as streams, lakes, wetlands and rivers. Critical resources shall also include areas connected or draining to surface waters such as constructed stormwater pond side slopes, and any exposed soil areas within a positive slope to a stormwater conveyance system, such as curb and gutter system storm sewer inlet, temporary or permanent drainage ditch, or other natural or manmade systems that discharge to a surface water.

## Using Rapid Stabilization

These critical resource areas need rapid stabilization measures as discussed in the vegetation establishment section. Designed to be fast and mobile, rapid stabilization techniques allow a quick response and offer the flexibility needed to stabilize these areas.

## Project Completion

At construction closeout, all permanent stormwater management systems must be restored to their original design volume if used as a temporary sedimentation basin. Infiltration systems should be evaluated for their effectiveness. Alternative stormwater BMPs will need to be monitored for a period of two years to verify they meet the required 80% removal efficiency.

### 2.3.6 Construction Considerations

Before you begin to implement the SWPPP during construction, be sure to review the permit requirements found in Section x regarding:

Erosion Prevention Practices	(Permit Part IV.B)
Sediment Control Practices	(Permit Part IV.C)
Dewatering and Basin Draining	(Permit Part IV.D)
Inspections and Maintenance	(Permit Part IV.E)
Pollution Prevention	(Permit Part IV.F)
Final Stabilization	(Permit Part IV.G)

### Temporary ESC

Most temporary sediment control BMPs must be installed prior to any land disturbing activities, with special attention given to critical resource areas. It's important to discuss temporary BMP installation schedules at the pre-construction meeting to keep the entire project team aware of responsibilities, and to coordinate installation with others on the project team.

According to Mn/DOT specs, temporary ESC quantities/bid items include furnishing, installing, maintaining, and removing ESC devices. Maintenance will always be necessary for the BMPs identified in the Temporary ESC Plan. Removing sediment from temporary ESC devices shall be incidental to the project. No direct compensation will be made for this task.

### Payment for sediment removal from basins/sediment traps

Upon satisfactory installation of temporary erosion control devices, the engineer may authorize partial payment not exceeding 80 percent of the contract bid price for that item. The remaining percentage will be paid after the devices are removed. During final stabilization, all temporary ESC devices must be removed.

Duane Stenlund, Mn/DOT



Removal of sediment from temporary ESC devices will be considered incidental to the project.

### Temporary ESC

These temporary ESC rules of thumb are a good approach:

- Perimeter control - use the most effective BMPs for the situation/conditions
- Sediment control basins - put wherever necessary to detain sediment-laden water
- Seeding and mulching - do it as soon as possible and in stages
- Diversions - use them to direct flows away from exposed soil areas
- Temp down drains - install them where you think grades and concentrated flows could cause problems



Duane Stenlund, Mn/DOT

Permanent stormwater management basin can be used to provide temporary storage.

## Get Your Money's Worth

- Ditch checks must be installed so that water cannot flow around the ends
- Proper installation of BMP's is critical for keeping your site in compliance. The manufacturer's details need be followed to insure maximum benefit.

## Permanent Stormwater Management Systems

In most cases, the Permanent ESC Plan should be completed in stages. Critical areas and hard-to-manage slopes should be converted to permanent stabilization as soon as possible. Although the ESC subcontractor may need to make multiple trips to the site, expenses such as repairing slopes, cleaning downstream sediment devices, or mitigating the effects of damaged receiving waters after rain events will be reduced.

- **Wet sedimentation basins**
  - Construct as early in the project as possible, then utilize as a temporary sedimentation basin
  - Is required when 10 or more acres is draining to a common discharge point
  - Provide temporary stabilization
- **Infiltration/filtration**
  - Infiltration systems should not be excavated to final grade until catchment area has been constructed and fully stabilized
  - Use all means possible, such as diversion berms, to prevent sediment from entering the infiltration basin
  - Make sure it is fenced, staked, or similar to prevent heavy construction equipment from compacting soils

## Special Waters

The requirements for special waters are more stringent during construction.

- Slopes that are 3:1 or steeper must be stabilized within 3 days
- All other slopes must be stabilized within 7 days
- Temp sed basins must be used for 5 acre common drainage areas of disturbed soil
- A minimum 100 lineal foot buffer zone will need to be maintained at all times, except for areas such as water crossing where the buffer encroachment will need to be documented in the SWPPP.



## 2.4 Tools for Contract Administration

### 2.4.1 Stormwater Noncompliance Resolution

Contract administration tools provided for in the contract are important in the process of resolving stormwater noncompliance. The tools available are categorized into the following main topics:

- Management
- Withholding
- Deductions
- Payment for items missing
- Quality control

Bonestroo Rosene Anderlik and Associates



Failure to stabilize slope adjacent to a Water of the State such as a curb and gutter system will result in regrading the slope, cleaning out the stormsewer system and possible fines.

#### Important Tip

Failure to stabilize slope within the required timeframe may result in withholding of payment



Duane Stenlund, Mn/DOT

Diversion and critical area temporary stabilization will reduce the potential for erosion at a project site.

## Site Management

The contractor is required to maintain compliance with the NPDES permit throughout construction. The following site management provisions will enhance compliance efforts:

- Designated contractor ESC Supervisor
- ESC precon meeting
- Erosion control schedule
- Erosion control site plans
- Year-round soil stabilization
- Work orders

### ESC Supervisor (2005 Mn/DOT Specification 2573.3.A1)

The contractor is required to supply a valid certified ESC Supervisor to direct the contractor and the subcontractor operations. Further information regarding certification requirements can be found in the certification section.

To successfully execute all erosion and sediment control measures, the following must be conducted:

- Schedule the work of subcontractors
- Oversee the work of the subcontractors
- Prepare the weekly erosion control schedule
- Attend all weekly meetings to discuss the finding of the NPDES inspection log
- Prepare ESC site plans as requested by the engineer
- Provide ESC methods for temporary work done by the contractor not shown on the site plan
- Ensure applicable permits are acquired and complied with for borrow pits, dewatering, and any temporary work conducted by the contractor in rivers, lakes, and streams
- Conduct ESC work in a timely manner
- Install ESC measures to the fullest extent
- Work with Federal, State, and Local regulatory agencies regarding ESC issues due to the contractor's operations
- Clean up tracked material on paved surfaces or any other location where sediment has left the right-of-way



## Contractor's Erosion Control Schedule (Mn/DOT 2005 Specification 1717.2.D)

For all Mn/DOT projects, the contractor is required to submit a weekly erosion control schedule to the engineer. The erosion control schedule should be done right after the required weekly inspection of ESC measures.

Depending on the situation, the schedule can be relayed to the Mn/DOT engineer verbally or in writing. The scheduling must include the following issues:

- Proposed ESC installations and when they will be installed
- Areas ready for permanent turf establishment and when it will be accomplished
- Grading operations and how ESC will be incorporated into the work
- Repair or maintenance required for ESC installations and when it will be accomplished
- Proposed ESC measures during periods of suspension of work

## Erosion Control Site Plans (Mn/DOT 2005 Specification 1717.2.E)

At any time, the engineer may require the contractor to submit a site plan for critical areas where land disturbances will occur around water bodies. These plans should describe the specific methods used to keep sediment from entering those waterbodies. Site plans could be required for small localized areas such as stream crossings, or for larger portions of the project corridor. The submittal can be very informal “on the hood of your truck” as long as it provides the Mn/DOT inspector with the information needed to review each situation.

Part of the reason for erosion control site plans are that many times the persons performing the work on site are not those who order the materials. Also, sometimes situations in the field prove to be more challenging than originally thought. When this happens, it's a great opportunity to use imagination and available materials on site. However, the Mn/DOT engineer must review and approve the plan before the work may start.

### Permanent ESC

- Make sure the proper vegetation is used in each situation
- Concentrated flow makes it difficult to establish turf, use adequate soil stabilization or diversion BMPs
- Must enough of and properly sized energy dissipation at pipe outlets
- Ponds are designed to overflow, use the appropriate surface armor

## Contractor is a CO-Permittee (MPCA construction general permit Part II.B.2)

The contractor is required to sign the contractor portion of the MPCA construction general permit. This requires the contractor to stay in compliance with Part II.B, Part II.C, and Part IV of the permit. The contractor is jointly responsible with the owner for permit compliance.

## Stabilization to Occur Year Round (Mn/DOT 2005 Specification 1717.A2)

Stabilization will need to occur year round to stay in compliance with the MPCA construction general permit and is further reinforced in the Mn/DOT 2005 specifications. Depending on the slopes, stabilization will need to occur in a specific timeframe. This is also true if within 200 linear feet of a surface water, as described in further detail on page **XXXX**.

## Work Orders

The engineer can use work orders to specify work that a contractor needs to do. They will also provide documentation for Mn/DOT to track a contractor's stormwater noncompliance. If there are multiple work orders for lack of erosion and sediment control measures it will identify the ESC measure not being completed in a satisfactory manner by the contractor, and may be taken into consideration in the event of a MPCA enforcement action.



Aaron Mlynec, Carver County Soil and Water Conservation District

Mulching over the top of snow to protect the site during the spring runoff period.

## Withholding for Stormwater Noncompliance

Failure to install erosion and sediment control measures ordered by the engineer may result in withholding payment of related work until the contractor undertakes proper control measures.

## Exposed Soils

According to the Mn/DOT 2105 specification, \$3000 per acre will be withheld for areas of soils exposed to probable erosion. The roadbed not included in the area calculation. The withholding will apply until the areas are topsoiled, seeded and mulched.

## Important Tip

Failure to prepare a site plan with the proposed schedule requested by the engineer will not allow the contractor to start work in the affected areas.

## Deductions for Stormwater Noncompliance

If the contractor is not sufficiently maintaining stormwater compliance, money may be deducted for items they are failing to provide.

### ESC Supervisor (2005 Mn/DOT Specification 2573.3.A1)

If the contractor fails to provide an ESC Supervisor, a \$1000 per calendar day deduction for noncompliance may result.

### Inlet Protection (2005 Mn/DOT Specification 2573.B3)

Failure to properly install, remove sediment, or maintain storm drain inlet protection may result in a \$500 per calendar day deduction to the contractor.

The deduction will be applied to each inlet in noncompliance.

### Certified Installer (2005 Mn/DOT Specification 2573.3.P1)

Failure to provide a certified installer for each of the erosion control practices listed in 2573.3.P1 in the 2005 Mn/DOT specifications may result in a \$500.00 per calendar day deduction for each required installer.

### NPDES Inspections (2005 Mn/DOT Specification 1717.2.G)

Failure to conduct NPDES inspections by the contractor can result in a \$500.00 per calendar day deduction for noncompliance.

### Quality Control (2005 Mn/DOT Specification 1717.2.G)

Failure by the contractor to conduct the quality control program as listed in section 1717.C of the 2005 Mn/DOT specifications can result in a \$500.00 per calendar day deduction for noncompliance.

### Action Ordered by the Engineer (2005 Mn/DOT Specification 1717.2.G)

Failure to take action ordered by the engineer to remedy erosion and sediment control problems can result in a \$500.00 per calendar day deduction for noncompliance.

Bonestroo, Rosene, Anderlik and Associates



Failure to properly maintain and install inlet protection devices may result in a deduction for each inlet that is out of compliance.



Duane Stenlund, Mn/DOT

Temporary sediment basin.

## Payment for Items Missing From the ESC Plan

Mn/DOT will pay for items when they are missing a contract bid price. Examples of these items are (Mn/DOT 2005 Specifications 2573.5.E and 2575.5.I):

- Backhoe sediment removal
- Sediment trap excavation
- Temporary ditch checks
- Flocculant
- Temporary pipe downdrains
- Rapid stabilization
- Temporary seed mixes
- Erosion control blanket Category 4

## Improperly Performed Work (2005 Mn/DOT specification 2575.3W)

The contractor must perform good quality work. If work is not performed in a workmanship manner, the contractor will not be paid for the item until it is installed properly.

Quality of work that falls below the threshold to perform work as in accordance with Table 2575-4 and 2573-1 of the 2005 Mn/DOT specifications will require the contractor to correct unacceptable work before they can qualify for payment.

### 2.4.2 Specifications and Special Provisions

The following order of documents prevails in enforcing the implementation of the SWPPP. Mn/DOT Tech Memos and the MOU between Mn/DOT and the MPCA should be referred to for guidance.

- The contract between Mn/DOT and the prime contractor (project proposal)
- Mn/DOT Special Provisions
- Mn/DOT Plan Sheets
- Mn/DOT Specifications

## Remember

Temporary Sediment basins are required when 10 acres or more drain to a common location.

## ESC Related Specs

The following Mn/DOT specifications apply to the implementation of a SWPPP. This information is based on Stormwater Management and Erosion Control Mn/DOT Specifications 2005. This information is for quick reference only and does not constitute enforceable guidance.

Many of the issues covered in Mn/DOT specs are also reflected in the Phase II permit.

Subject Area	Specification 2005	#Page(s) <sup>1</sup> 2000
Laws to be observed	1701	40-41
Requirement for Erosion Control Supervisor	2573.3A1	43, 83
NPDES permit Requirement	1717.2	25, 73
Installation of temporary ESC Before Constructon	1717.2A1	82
Stabilizing exposed soil within 200 feet of water of the State	1717.2A2	82
Vehicle tracking	1717.2A3	82
Removal of sediment	1717.2A4	82
ESC measures before suspended grading	1717.2A5	83
ESC measures for related work	1717.2B	83
Quality control ESC measures	1717.2C	83, 769
Erosion control schedule	1717.2D	83-84
Contractor's Site Plan	1717.2E	84
Compensation for extra work	1717.2F	84
Withholding payment erosion control	1717.2G	84
Withholding payment for erodible area	2105.5	153-157
ESC measures on an area by area basis	1717.2A2	765, 774
Removal of Sediment that has left the ROW	2573.3A3 1717.24A	
Construction and removal of temporary ESC measures	2573.3O	766
Storm drain inlet protection	2573.3F	766
Silt fence installation:	2573.3C	767
Temparary ditch check instalation	2573.3E	
Filter log installation	2573.3J	
Flocculants	2573.3K	

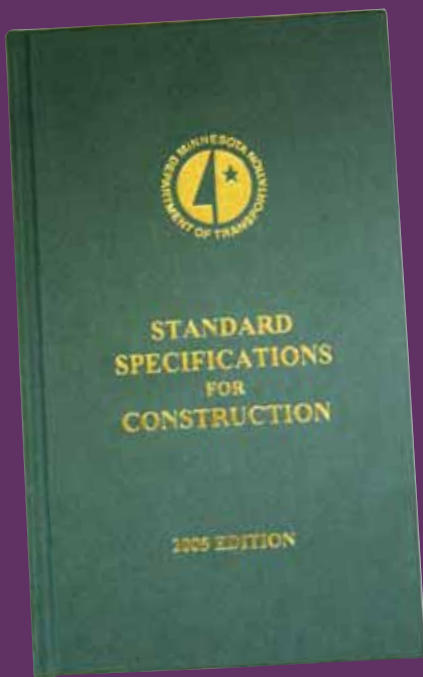
### Remember

Maintenance is an important part of keeping temporary BMP's functional.



Subject Area	Specification 2005	#Page(s) <sup>1</sup> 2000
Acceptance of temporary ESC work	2573.5	767
Maintenance and removal of sediments from BMPs	2573.3M2	767
Maintenance of temporary sedimentation basins	2573.3M3	767-768
Sediment removal from permanent retention ponds	2573.3N	768
Quality of workmanship for temporary ESC BMPs	2575.3P,Q	Table 2573-1
Basis of payment for ESC measures	2573.5	771
Placement of sod	2575.3I	780-782
Dormant sodding	2575.3A4c	782
Placement of erosion control BMPs	2575.J	782-784
Maintenance/acceptance of turf establishment	2575L,O	784-787
Restoration/compensation of turf damaged after acceptance	2575.3P	787
Quality of workmanship for turf establishment	2575.3V,W	788, table 2575-3
Basis of payment for turf establishment work	2575.5	791-793
Soil bioengineering	2577	793-798

Subject Area	Specification 2005	#Page(s) <sup>1</sup> 2000
Erosion control materials types and installation:		
• Mulch	3882	1068-1070
• Erosion Control Netting	3883	1070
• Hydraulic Soil Stabilizers	3884	1071-1073
• Erosion Control Blankets	3885	1073-1076
• Silt Fence	3886	1077-1079
• Flotation Silt Curtains	3887	1080-1081
• Erosion Stabilization Mats	3888	1082
• Temporary Ditch Checks	3889	1083-1084
• Compost	3890	1084-1086
• Inlet Protection	3891	1086-1087
• Temporary Down Drains	3892	1087
• Sandbags	893	1087-1088
• Sediment Mats	3894	1088
• Fiber Logs	3895	1088-1089
• Filter Logs	3887	
• Flocculants	3898	
• Rip Rap	3601	942-944
• Gabion and Revetment Mattresses	3602	944-945
• Concrete Armor Units	3608	945-946
<b>New Items</b>		
Maintenance for BMP Measures	2573.3M	
Rapid Stabilization Methods	2575.3N	
Concurrent Area Stabilization	2575.3A1	
Erosion Control Supervisor	2573.2	
Critical Resources	2573.3A7	
Flocculents	2573.3K	
Winter Stabilization methods	2575.3A	
<sup>1</sup> Refers to the page number in Mn/DOT Specifications 2000		



## Special Provisions

Unique to each project, special provisions should be the first thing you review when considering erosion and sediment control. Developed by the plan designer to supplement the ESC Plans, special provisions are intended to give more specific information on a range of issues including staging of materials, details on a new device, modifications to seed mixes, and special operations. Special provisions are also designed to include any changes, updates, or modifications to the Mn/DOT standard specifications.

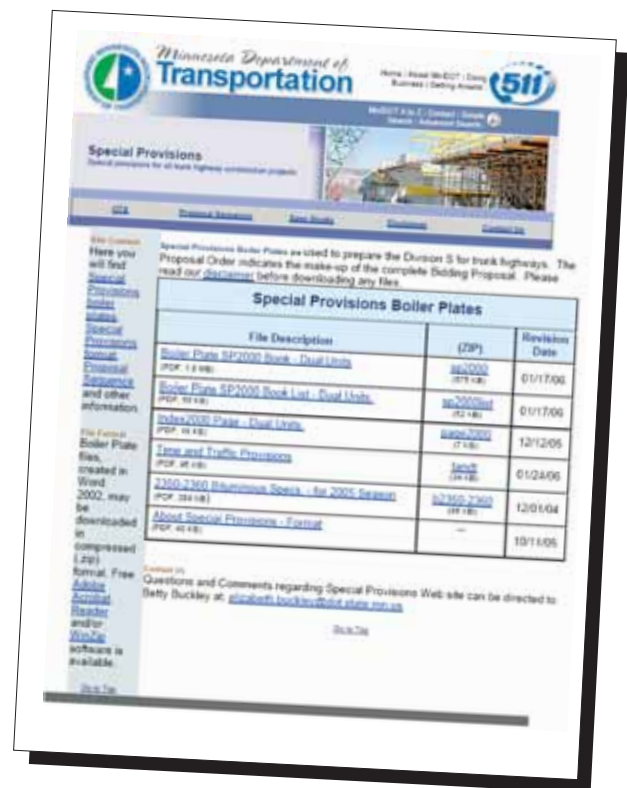
Special provisions are numbered in accordance with the Mn/DOT specification they reflect. For instance, special provisions dealing with turf establishment will be numbered in the Spec 2575 series.

When checking a project's special provisions, look for the following numbers for provisions dealing with erosion and sediment control:

- 1717
- 1803
- 1804
- 2105
- 2573
- 2575
- 2577
- 3882 thru 3895
- 3601 thru 3608

## Important Tip

Understand that Mn/DOT specifications regarding erosion and sediment control are driven, in large part, by the NPDES Permit. Complying with Mn/DOT specs, and the results of doing so, will go a long way in ensuring permit compliance.



Please view <http://www.dot.state.mn.us/tecsup/prov/index.html> for boiler plate special provisions.

## Erosion Control Technical Memorandums

Technical memorandums are often developed when new technology is developed, an item in a specification is updated, or a new federal or state law is not covered in the current specifications. Since Mn/DOTs 2005 specifications were developed, there have been several Technical Memoranda related to erosion control, some of which are now included in the 2005 specs.

They are listed as follows:

- Certified ESC inspector required, 05-07-ENV-05
- Guidelines to designers for SWPPP, 05-06-ENV-04
- Update the Mn/DOT permit application process for adherence to the NPDES permit, 04-02-ENV-01
- Rapid stabilization for critical areas on Mn/DOT construction projects, 02-14-ENV-03
- Rapid stabilization/temporary erosion control included in design plans, 02-15-ENV-04
- Heavy duty silt fence specification update, 05-04-ENV-02
- Storm drain inlet protection required as per NPDES permit, 05-05-ENV-01
- Conversion of seed mixes from previous specifications to the current boiler plate specifications, 05-03-ENV-01
- Quality assurance of seed, 05-09-ENV-06
- Turf establishment and erosion control recommendation process, 05-16-ENV-08

The technical memoranda listed have been integrated into the Mn/DOT 2005 specifications. As time progresses, laws change, technology improves and processes become more efficient. This requires Mn/DOT to keep current; therefore, additional technical memorandums will continue to be developed.

### Remember

IN ALL CASES, special provisions take precedence over the general specifications in the plans and specs.

## Chain of Command

As a part of the SWPPP implementation process it is important that a chain of command be developed for the contractor and subcontractors onsite (Mn/DOT Tech Memo 05-07-ENV-05).

### Mn/DOT, Contractor, ESC Supervisor

The ESC Supervisor is responsible for developing a chain of command for their contractors and subcontractors. The purpose of this chain of command is to ensure that the SWPPP is carried out for the life of the project.

## 2.4.3 Certification/Training

### University of Minnesota – Erosion and Sediment Control Certification Program

For all Mn/DOT or Minnesota state-aid projects, ESC training and certification is required for the contractor, design professional, project engineer and inspector on the project.

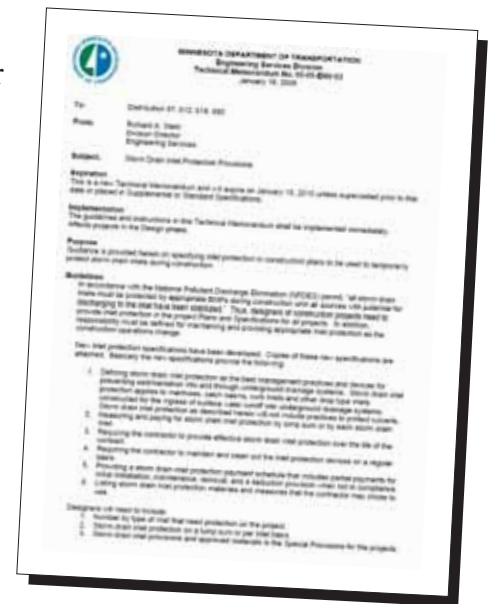
The University of Minnesota administers these classes throughout the state on a yearly basis, normally during the winter months. The certification is valid for three years after passing the exam, and recertification classes are available for each of the classes. For a current class schedule and detailed descriptions visit the following U of M website (<http://erosion.coafes.umn.edu/>).

### U of M Course Descriptions

Erosion/Sediment Control Inspector/Installer – One-day course for those who install or inspect the installation of ESC devices and establish vegetation

Erosion/Sediment Control Site Management – Two-day course for those who supervise, run, or direct grading work, culvert replacement, or bridge construction

Design of Stormwater Pollution Prevention Plans – Two-day course for those who design stormwater pollution prevention plans (SWPPPs)



???

## Reminder

Remember to view the most current list of erosion control technical memorandums at [http://www.dot.state.mn.us/environment/tech\\_memos.html](http://www.dot.state.mn.us/environment/tech_memos.html).



## Who should be certified?

**Contractors** - According Mn/DOT specification 2575.A1, the contractor must provide an Erosion Control Supervisor who has attended and obtained valid certification of the “ESC Site Management” course. This person is normally the prime contractor on the project and must have the following duties:

- Have authority to make decisions on the project
- Be available within 24 hours at all times from initial disturbance to final stabilization
- Coordinate, schedule, and oversee the work of subcontractors
- Prepare required weekly erosion control schedules
- Attend required weekly construction meetings
- Prepare ESC site plans requested by engineer



**Designers** - According Mn/DOT technical memorandum dated 8/29/03, design personnel, design consultants, and design/build contractors are required to attend and obtain valid certification of the “Design of SWPPPs” course. This person is normally a squad leader, engineer, or a design technician with the following duties:

- SWPPP design and preparation
- Guidance and/or review for other members of the design team
- Complying with permanent ESC requirements of NPDES permit

**ESC Subcontractors/Laborers/Inspectors** – Foremen involved in erosion control installation or inspectors that ensure the devices installed under your direction are appropriately installed according to the plan and/or specifications.

## Reminder

The contractor or subcontractor shall provide at least one certified installer to install erosion and sediment control practices.



## Other Training Opportunities

### Minnesota Erosion Control Association (MECA) Conference and Workshops

The annual conference is usually held early to mid-March, and typically in the metro area

Focused erosion control workshops take place throughout the year and throughout the state

Check the MECA website for more information  
([www.mnerosion.org](http://www.mnerosion.org))

### Association of General Contractors (AGC)

Sponsor training and workshops for general contractors

[www.agc.org](http://www.agc.org)

### Minnesota Utilities Commission (MUCA)

Sponsor training and workshops for utilities contractors

Provide educational resources for utilities contractors

[www.muca.org](http://www.muca.org)

### Conferences sponsored by Resource Professional Alliance (RPA)

Minnesota conference is usually held in December

The conference typically focuses on contractor issues

Contact RPA office (952-470-0993)

### Minnesota Water and Annual Water Resource Joint Conference

Annual conference usually held in October

Coordinated by U of M Water Resources

Focus on emerging issues and new/innovative best practices in water resources

## 2.5 Site Management

### 2.5.1 Plan Content/Design

In developing a project's SWPPP and ESC Plan, the design engineer typically works with survey data gathered by others. Available data about soils, geology, and other site conditions also goes into developing the plan. The design engineer may have the opportunity to visit the site once or twice during the design phase of the project, and some local knowledge may come to light that provides information on the characteristics of the project site.

The design engineer rarely has the opportunity to get the firsthand knowledge that comes from construction activities on the project site. This limitation means that he or she can't possibly anticipate all of the different situations that may arise during the course of the project.

The designer may overlook something, or miscalculate the amount/type of ESC measures needed to control erosion and sediment to the maximum extent practical.

The key to successful permit compliance is to be able to recognize and react to potential changes in construction relative to plan content or design.



Installing silt fence across contours will result in premature failure.

## FYI

Lack of ESC measures in the plan, or poorly located measures, are not acceptable reasons for non-compliance. Request or order the devices necessary. Unit prices for items missing in the contract bid price are found in Spec 2573.5E

## Inadequate Devices or Locations

Be sure that ESC is accounted for throughout all construction phases. In some cases, the designer designs only for the initial and final phases of construction. Interim conditions may not be adequately addressed in the SWPPP.

If you feel that something is missing or misplaced in the SWPPP, or site conditions call for a different/additional ESC measure or location than specified in the ESC plan, you are probably right. Notify the project engineer and document your request for additional measures.

Check the Special Provisions for any additional specifications and pay items for ESC measures for that project.

Be sure to coordinate with the design engineer and/or district hydraulic engineer regarding major field changes that affect the design of the project permanent stormwater features.

## Substitution of Materials

Trust your judgment when experience tells you that existing field conditions call for a particular ESC measure that may work better than what is specified in the ESC Plan. Remember, your ultimate goal is to control erosion and sedimentation, not to simply follow the plan.

It is important to keep proper documentation of any modifications to the ESC plan in the SWPPP.

Substitution of materials, devices, or methods should be done when you are confident the new measure will keep sediments from entering a water of the state and there is prior approval by the inspector/project engineer.

## 2.5.2 Erosion and Sediment Control BMPs

Along with turf establishment, effectively managing erosion and sediment control BMPs can prevent or minimize many other potential situations in the course of building a project. Properly functioning BMPs will reduce off-site sedimentation. Best of all, properly managed erosion and sediment control BMPs will keep the project in compliance with the NPDES permit and make project close-out that much easier.

ESC measures are designed to work together on a site to minimize damage from erosion and sediments. When reviewing an ESC plan, remember that while adjusting the ESC plan is acceptable (with proper coordination), the changes may affect other parts of the site or other BMPs.



Sometimes, the ESC measures called for in the ESC Plan need adjustment or “doubling up” to make them work properly. The chances of keeping in compliance with the NPDES permit are enhanced if you look at the site as a whole, and enlist the help of the entire project team to make the ESC Plan work.

## Ensuring Effective BMPs

There are a few elements that contribute to effective BMPs:

- Utilize project team experience
- Work to stay in compliance with the NPDES permit
- Follow the plan, and its scheduling and timing, BUT accept the dynamic nature of ESC and make adjustments
- Maintenance, maintenance, maintenance

If one particular area of silt fence always “fills up” every time it rains, it is probably capturing runoff from too large an area. You should stabilize the upgradient area as soon as possible.

- If possible, stabilize the contributing area with seed and mulch
- J-Hooks are required to be installed in silt fence to break up the length of silt fence.
- No silt fence segment should be longer than 100 feet for each  $\frac{1}{4}$  acre of drainage.

If you recognize deficiencies in the ESC Plan, coordinate with the project engineer to make sure that BMPs are put in place that will keep the project in compliance.

The process for ensuring effective BMPs:

- Install sediment control BMPs
- Always have a course of action for stabilizing disturbed areas
- Clear and grub
- Begin grading activities
- Watch and learn from your site
- Emphasize the details (see Section x)

Stabilizing an area of exposed soil includes:

- Replacing topsoil that has been removed
- Preparing the seedbed
- Seeding and mulching the area
- Providing protection for the ditch bottom areas

## Designer's

Utilize the many available sources to help keep the project in compliance:

- Mn/DOT Turf Establishment Unit
- Manufacturers' Reps
- County SWCD

See Appendix A of this handbook for these and other contacts.

## Remember

Mud tracked onto any impervious surface that drains away from the construction site must be removed within 24 hours as per Mn/DOT Specification 1717.2A2, and to remain in compliance with Part IV.C.6 and Part IV.E.4.d of the NPDES permit



## 2.5.3 General BMPs

### Just-In-Time Grading

Just-in-time-grading is the concept of grading only the areas needed for construction activities on a short-term basis. This will keep the existing ground cover in place for as long as possible, minimizing the amount of exposed soil and the potential for erosion. If just-in-time-grading is not in the original ESC plan, you can work with the project team to make it part of the erosion control schedule. The following guidelines can help it work:

- Explain the concept and timeline at the preconstruction meeting
- Construct temporary stormwater management/sediment control features
- Clear and grub only the areas needed for erosion control measures
- Construct and inspect the plan's erosion control measures
- Clear and grub the necessary remaining site areas, leaving as much undisturbed vegetation as possible
- Rough grade according to schedule for short-term construction
- Begin construction of utilities, roadbeds, and needed structures
- Rough grade the next segment of the site to be constructed
- Stabilize all areas disturbed by grading/construction
- Repeat steps 7, 8 and 9 for each construction segment
- Convert to permanent stormwater and sediment control features
- Fix and maintain erosion control measures after construction is done
- After vegetation is established, remove temporary measures and restore

### Remember

According to Mn/DOT specifications \$3000 per acre will be withheld for acres exposed to erosion

## Construction Sequence Scheduling

This is an extension of just-in-time-grading. Here are a few points to consider when developing the erosion control schedule. Include in this order:

- Clearly mark the areas NOT to be disturbed
- Establish a stabilized access area
- Perform sediment control before and after earthwork
- Construct flow diversions
- Stabilize any primary runoff conveyance channels including inlet and outlet protection
- Perform maintenance as needed

## Grading

- Slope-tracking, or cat-tracking, is a very effective BMP
- Where possible, use well-spaced slope breaks, like diversions or benches
- Treat borrow or stockpile areas the same as you would any graded area
- When not grading, keep equipment on stabilized/paved construction roads

### Important Tip

Car tracking is a cost effective BMP that will help deduce erosion by 52%

## 2.5.4 Maintenance and Repair

Once the hard work of installing the correct ESC devices is complete, and surface waters are protected because erosion has been minimized, that doesn't mean the job is over. Weather can change rapidly in Minnesota! That means that erosion and sediment control is a continual process.

The relentless forces of erosion may ruin even well-installed and established BMPs. Staying in compliance is an ongoing challenge. Non-functioning BMPs don't prevent the damaging effects of erosion and sedimentation, and do nothing to keep your project in compliance—they need to be repaired as quickly as possible.

And, it's important to maintain and repair ESC measures that have been in place and in good working order for some time. In economic terms, it is always cheaper to make adjustments and corrections than to remove and replace a given structure after it has failed due to lack of maintenance. Another important reason to keep established BMPs in good working order for the duration of the project is to keep the site in sufficient shape to take care of future conditions.

### Maintenance Requirements

- Maintenance includes correction or repair needed to keep the ESC device functioning properly
- Maintenance of sod includes replacement and watering, which must be done by the installer for 30 growing days following installation
- Maintenance of installed erosion control blanket shall last for 30 days, including watering and restoration
- Maintenance includes cleanout of inlet protection

### When Repairs Are Necessary

When repairs are needed, action must be taken quickly to prevent possible damage to waters of the state.

- Mn/DOT is not responsible for the cost of corrective actions made necessary by lack of maintenance
- Mn/DOT is responsible for the costs of restoration ordered by Mn/DOT staff after acceptance

### FYI

Spec 2573.3M requires that maintenance be performed as needed on each device until that device is no longer needed.

## Quality of Workmanship

The need for quality installation of erosion and sediment control BMPs is as important as many other aspects of a Mn/DOT project. Careful workmanship of devices will form the backbone of the measures that collectively protect environmentally sensitive resources. After the devices are properly constructed and put into place and all other ESC measures have been installed, quality control is needed to keep them fully functional.

Successfully minimizing erosion and sedimentation depends on properly installed and maintained ESC measures, like these examples:

- **A well-constructed sediment basin will hold more sediment-laden runoff**
- **Mulch that is spread evenly won't leave areas of exposed soil vulnerable to erosion**

The quality and/or workmanship of ESC measures may not always be sufficient to achieve the required level of protection of resources. Quite often success is a combination of factors relating to installation, maintenance, and inspection. It is critical that the quality of ESC measures satisfy the terms of both Mn/DOT specs and the NPDES permit.

## General Information & Requirements

Regardless of the cause, BMPs that are not functioning properly should be corrected quickly, to prevent significant and continued erosion and sedimentation problems.

- **The contractor's obligation to maintain NPDES inspection records is an important part of the project quality control program**
- **Mn/DOT is not responsible for the cost of reworking a slope grade needed as a result of delayed stabilization efforts or rutting by mulching equipment**
- **If soil is going to rut from mulching equipment it would be wise to find a different method**
- **Requirements to maintain satisfactory progress are explained in Mn/DOT Specification 1804**

### FYI

Spec 2573.3W require work to be performed sufficiently to maintain stormwater compliance. The contractor will not be paid for the item until it is installed properly.

## 2.5.5 Interim Conditions

### What Constitutes Interim Conditions

Quite common during the construction process, interim conditions are those periods when work halts in one specific area of the site due to potential seasonal fluctuations, utility installations, holidays, etc. Interim conditions also occur during periods of construction between the start date and project completion where the slopes are not at final grades, however due to shutdowns will require that all sediment control measures are in place and that the site be temporarily stabilized.

### Improvising

Controlling erosion and managing sediment during these interim conditions will require that the contractor improvise to stay compliant with the permit requirements. The contractor may need to use what is available to him at the project site such as:

- Cat tracking
- Using woodchips to provide temporary cover
- Diversion berms
- Having materials available and on-hand to make the necessary repairs



Duane Stenlund, Mn/DOT

Geotextile fabric can be installed to protect a slope on an interim basis.



## Quick Response BMPs

The contractor should always have method and material BMPs available that can be employed at a moment's notice to prepare for a potential storm. The following are BMPs recommended to have available on the construction site:

- **Material BMPs to keep handy**
  - Straw mulch and a way to apply it
  - Temporary down drain materials
  - Cover crop seed
  - Rock for ditch checks and culvert outlets
  - Flocculant
  - Category 3 Erosion Control Blanket
  - Silt fencing materials
- **Method BMPs that are critical for achieving compliance**
  - Slope tracking
  - Flow diversion
  - Good site drying discharge
  - Regular maintenance (have adequate manpower and equipment)
  - Pumping down sediment basins
  - Minimizing exposed soil areas

Duane Stenlund, Mn/DOT



Geotextile fabric

Bonestroo Rosene Anderlik and Associates



????????



Duane Stenlund, Mn/DOT

Plastic sheeting is a great way to protect a stockpile and sandbags can be used to divert water away from the stockpile.

## FYI

Temporary mulch is a great way to protect slope during project shutdown.

## Controlling Runoff During Construction

During the construction process, runoff must be controlled and contained to prevent the discharge of sediment-laden water from a construction site. This can be done by properly grading the site or temporarily bypassing water around a construction site using a:

- Bypass pump
- Temporary pipe
- Diversion berm

## Managing Shutdowns (Temporary and Long-term)

During the course of a project, shutdowns for weekends, long holidays, winter work, and switching work areas will require special attention. Eliminate any potential discharge resulting from the poor management of these areas when no work is being conducted.

### Weekends

During the weekends the site must be prepared to prevent any potential discharges from storm events. Slopes will need to be protected and channels stabilized if they are within 200 feet of surface waters. This is an easy way to stabilize these areas is to spread mulch over the slopes, geotextile fabric, or riprap, dependant on size of area.

### Switching Work Areas

Switching work areas requires that the portion of the site where work has ceased be temporarily stabilized to stay in compliance with the MPCA permit requirement. Temporary cover must be provided within 7, 14, or 21 days depending on the situation when the exposed soils are within 200 feet of a water of the state. Slopes near special waters need to be stabilized within 3 to 7 days.

## Shutdown

Shutdown will require that the site have temporary cover and all adequate sediment controls. Adjustments will need to be made to compensate for the season during which the site is shutdown. It will be necessary to comply with all requirements for seeding and mulching, make the adjustment with respect to the given season, and use the following Mn/DOT Specifications:

Stabilization Technique	Mn/DOT Specification
Winter Mulching	2575.3A4b
Seeding Adjustments	2575.A3 & 2575.A4a



Shutdown during the winter months will require applying temporary mulch over the snow or frozen soils.

### Inspections During Shutdown

MPCA construction general permit inspections must still be conducted during project shutdowns. However on those portions of the site that have been brought into compliance with the final stabilization requirements, inspections may be reduced to once per month. Where construction has ceased due to frozen ground conditions, inspections may be delayed until runoff occurs or until construction resumes.

Duane Stenlund, Mn/DOT



Stockpiles will need to be stabilized during project shutdown.

### Don't Forget

Be sure to reference your project SWPPP to make sure your site does not have any additional construction activity requirements for TMDLs or Special Waters.



### 2.5.6 Discharge From A Mn/DOT Site

Discharge from a Mn/DOT site during the construction phase of a project require monitoring the discharge points to prevent nuisance discharges to adjacent MS4 storm sewer systems and nearby lakes, wetlands, and rivers.



Bonestroo Rosene Anderlik and Associates

Discharges to surface waters will need to be evaluated to determine if action will need to be taken to remediate the situation.

#### **Drainage Impact to Adjacent MS4s will involve concerns with:**

- Construction site runoff
- Pollution prevention/good housekeeping
- Permanent stormwater management
- Sediment discharge into munitiple storm drain inlets.

#### **Drainage Impacts To:**

- Lakes are subject to oversight by a Lake Association, Army Corps of Engineers, Local agencies, and DNR
- Wetlands are subject to oversight by the Wetland Conservation Act and Army Corps of Engineers, and Local agencies
- Rivers are subject to oversight by Army Corps of Engineers, DNR and Local agencies

## Monitoring Discharge

When measuring water turbidity values, it is important to understand what the turbidity of the discharge for base flow and storm-related conditions was before construction. This enables one to differentiate between pre- and post-construction conditions, which will help to illustrate the cause of the high turbidity values as they relate to the construction activities.

The readings should be taken both upstream and downstream of the construction site to illustrate how the turbidity value changes as it flows through the construction site. This may help pinpoint any potential areas that are causing the high turbidity, and guide treatment in the area with the appropriate BMPs to eliminate any future discharges.

Sampling Protocols for Turbidity Meters:

- Collect sample as far away from the shore as possible
- Place your body downstream of the collection point if standing in a stream, creek, or ditch
- Dip the bucket or collection device in and pull it upstream to obtain the sample
- Prevent air bubbles from being present within the sample
- Calibrate the turbidity meter to make sure it is taking accurate measurements
- Chill the sample if it is taken off-site, and take the reading within 24 hours

Duane Stenlund, Mn/DOT



Monitoring discharge during the construction process will involve taking turbidity meter readings.



### 2.5.7 Devil Is In The Details

As with most other worthwhile endeavors, to get it right, the devil is really in the details. In this section we'll look at a few situations where paying attention to the little things can make a big difference.

#### Site Drying/Pumping

After a rain of any size, low spots have to be dried, or bridge pier foundations need to be pumped out, etc. And it is usually the case that the water being discharged from the end of the trash pump is pretty turbid. To a Stormwater Compliance or ESC Inspector, a hose draped over a silt fence, or into a culvert or storm inlet, is a clear indication of intentional discharge of sediment laden water.

An effort must be made to settle or filter the sediment out of the water before it enters a Water-of-the-State. And, the discharge of water must not cause erosion or any other nuisance conditions. See Section **xx** for more information on how to treat site drying or dewatering discharge.



#### Important Tip

In stormwater compliance, often you DO need to sweat the small stuff.

When discharging clean groundwater from a pump, make sure it is not causing erosion at the end of the hose.

Failure to install and maintain inlet protection will result in a daily deduction for each stormwater inlet out of compliance.

## Proper Riprap Installation

In many instances, riprap is required in places that are not easy to get to. Yet it is often the really tough places to reach that have riprap failure. So make sure that you follow these rules of thumb when installing riprap:

Use the proper type and amount of geotextile fabric under the riprap. If fabric is not used, the rock will become buried in the soil on which it was placed.

Make sure the leading edge of the fabric is secured in such a way that water cannot get under the fabric and erode the underlying soil. Put it right up against the flared-end and over-staple it, or put the edge of the fabric in an anchor trench, staple in the trench, and compact the backfill.

Use the appropriate size rock for the discharge or flow velocity. If in doubt, go with larger rather than smaller. Water is a powerful force; it will carry away improperly sized rock.

Make sure that the rock is angular and variably sized. Along with the largest diameter needed for the flow rate of the discharge; have enough small, sharp-edged rock to lock the large rock in place.

Duane Stenlund, Mn/DOT



In concentrated flow areas riprap may be needed to stabilize a drainage swale. Check with the project engineer to determine the best solution.

## Remember

Energy dissipation is required to be installed within 24 hours of connection to a surface water.

## Remember

If you are having problems with erosion in critical areas during construction, the same areas will cause problems for maintenance forces in the future.

## Did You Know?

The same type of erosion might also occur on other parts of the pond sideslopes. A little bit of prevention could have side-stepped these situations.

## Erosion at Pond Corners

Pond corners unintentionally form swales, and a swale usually results in concentrated flow. To minimize the erosion from concentrated flow in pond corners, consider one or more of the following:

- Take advantage of a small rain event to indicate where runoff is coming from and where it becomes erosive (then assume more/earlier erosion with more rain)
- Round out the pond corners
- Install blanket in the pond corners
- Divert and dissipate runoff from concentrating in the corners
- Utilize a temporary down drain until the corners and slopes are fully stabilized and resistant to erosion
- Install checks across the swale formed in the pond corners



Bonestroo Rosene Anderlik and Associates

Pond corners will require special attention as these areas are prone to concentrated flow and erosion.

## Culvert Elevations

Sometimes, the standard design/method of riprap at culvert outlets is not enough. When a culvert outlet is situated somewhere in the middle of the slope, and the discharge flows over a good portion of the slope (25-30 feet or more) beyond the pipe end or riprap, erosion is likely to occur. Rill or gully erosion starts at the bottom of the slope and, if unchecked, will work its way up-slope.

Eventually it will undermine the riprap and perhaps the pipe itself, which may result in a hanging FES and associated problems. You will need to take extra measures to reduce slope, pipe, and sedimentation damage. Consider the following:

- Prior to construction of the storm pipe/outlet culvert, anticipate the potential problem with the culvert elevation in relation to the length of the slope. Check the cross sections
- Request a design change to have the FES discharge stormwater at or near the bottom of the slope
- Request detailed survey work at the pipe location

If a design change is not possible and the culvert will discharge somewhere in the middle of the slope, consider using one or more of the following BMPs:

- Take advantage of a small rain event to check where discharge is becoming erosive (then assume more/earlier erosion with more rain)
- Install an elbow on the pipe and extend more pipe to bottom of slope
- Utilize angular riprap
- Utilize a temporary down drain until the flowpath is fully stabilized and resistant to erosion

FPO

Outlets installed midway up hill slope will require measures to properly convey water down the slope.

### Design Tip

Energy dissipation is effective to break to velocity and concentration of flow from a culvert outlet, but water will re-concentrate and become erosive.

All culvert locations must include a surveyed cross section along the longitudinal length of the pipe. Do not guess or interpolate culvert outlet or inlet elevations.

If you are limited in culvert outlet placement location, be sure to include BMPs that will provide a stabilized flowpath from the edge of riprap to the bottom of the slope.



Duane Stenlund, Mn/DOT

A diversion will be needed to direct the water to a temporary down drain.

## Important Tip

Run on areas are more easily detected when plans are designed with contours rather the cross sections.

## Important Tip

Controlling run-on is one of the basic principles in controlling erosion.

## Run-on

Stormwater compliance is not entirely dependent on the conditions within the project limits. Often, concentrated flow from off site will “run-on” to your site and become a source of continual nuisance. Even small amounts of rain/run-on can cut away at your slope. And if slope stabilization is not a concern, then sediment discharge may be. This is a detail that can be easily managed.

- Check the Temp ESC Plan for indications of potential run-on
- As you inspect disturbed soil areas early in construction, look for the locations indicated on the ESC Plan and other spots where you think run-on might occur. Make note of the locations.
- After the first rain for each newly disturbed area, check to see if you did have run-on, and if it did cause erosion.
- Check for the source and see if the run-on can be prevented, minimized, or diverted. If not...
- If slope stabilization is a concern, install additional flowpath stabilization or a temporary down drain
- If sedimentation is a concern, install a temp sed trap before the point of discharge from the site

In any case, rest assured that if after the first rainfall, run-on erodes a path down a slope you just stabilized, it will happen after most rainfalls. Making the same repairs time after time eats up time and budget.

- Check with the project hydraulic engineer for an estimate of the size of the contributing drainage area

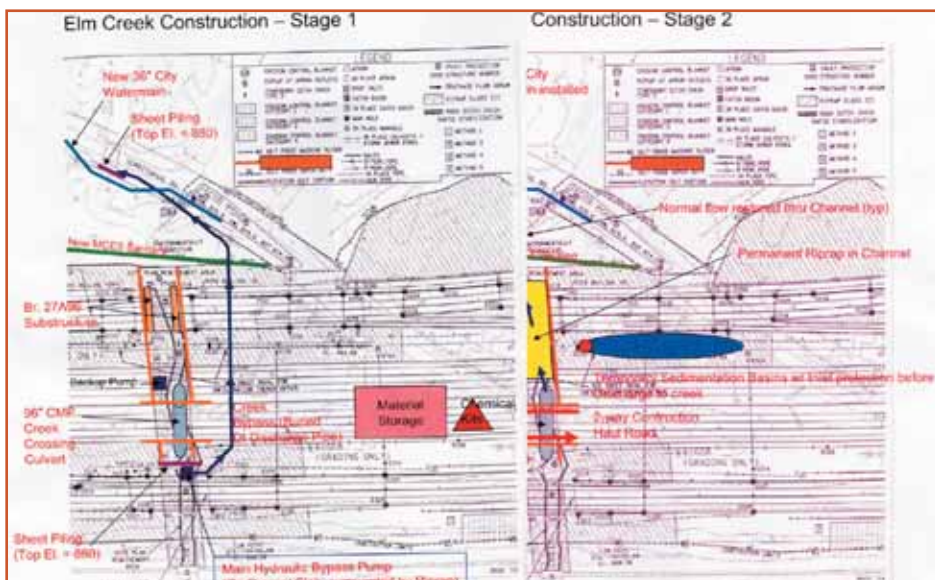


## 2.5.8 Working In/Near Water-of-the-State

Due to the linear nature of Mn/DOT projects, the project corridor will often cross some type of watercourse or nick a wetland/lake edge, etc. The challenge to the ESC Supervisor and rest of the project team is balancing road construction needs with stormwater compliance. And because construction activities will be so close to, or come into contact with Water-of-the-State, working in these areas will require an effort that is above and beyond the rest of the project corridor.

Working in/around a Water-of-the-State is high visibility work; therefore exposure to potential enforcement action is also high. It will require that special care be taken to minimize any loss of soil into the adjacent water body. Be sure of how to proceed before beginning this type of work.

- If you feel that your plans do not adequately address working in or around Water-of-the-State, contact the Mn/DOT designer ASAP.
  - If you are not clear or confident in how you will implement the plans for working in or around Water-of-the-State, contact your Mn/DOT project engineer ASAP.
  - If not included in the plan set, details, notes, or special provisions, that demonstrates how work will be done, require a site plan submitted by the contractor.
- The ESC Supervisor must then provide an ESC schedule consistent with the site plan.



Site plans may be requested for work occurring in a critical area.

### Important Tip

Working around a water-of-the-state will require additional BMP's.



Working in critical areas will require a combination of BMPs.

Construction activities occurring in or around water—such as installing an outfall structure, bridge or bridge abutment, culvert, or rerouting the water—means special considerations must be taken to prevent sediment from leaving the site. Working around water requires the contractor to submit a site plan to the engineer. Amendments should be made to the plan if conditions change. As you approach the situation of working in/around Water-of-the-State, to the extent possible, incorporate these method and material BMPs to minimize the risk of discharging sediment laden water to a Water-of-the-State.

- Stabilize all exposed soil within 200 feet of the Water-of-the-State at the end of each day.
- Try to schedule construction activities so that permanent vegetation can be established on a continuing basis.
- Get your material BMPs to establish permanent vegetation in place ASAP as smaller areas are completed.
- Review the plans and specifications for rapid stabilization. If necessary, make adjustments to pick the best rapid stabilization material/method combination for the situation.
- Consider working these areas as early in the construction and growing season as possible so that vegetation has plenty of time to get established.
- Do the work during a time of the year with a lower potential for erosion (like winter).
- Most importantly, have the necessary materials on hand, and the necessary equipment and staff available to apply them immediately.

Common measures to minimize soils loss are:

- Require a situation specific site plan describing how the contractor will do the work
- Minimize the amount of time spent working in this area (get in/get out)
- Divert water away from or around exposed soils
- Watch the weather
- Do not start a job if it can't be finished before the weekend
- Provide temporary stabilization as many times as needed until the area can be permanently stabilized

## Important!

Working in or around a Water-of-the-State is high exposure and high risk, make sure you are set to go before getting started.

## Minimizing Extent and Duration of Disturbance

The best way to avoid impacts when working around water is to limit the areas of disturbance and get in/get out. Limiting construction disturbance will require the contractor to work in a smaller area and avoid impacting excessive areas beyond where construction needs to occur.

Committing more resources to the construction phase can minimize the duration of construction. The area must be stabilized using Mn/DOTs rapid stabilization techniques as discussed in Section X.

## Site Plan

Working in and around water requires the contractor to submit a site plan explaining how work will be completed in the project area. This requirement is further discussed in Section X.

## Winter Work

Consider doing work during the winter to minimize the impact to the surrounding soils. The water will be at a low flow state, which minimizes the potential for impact to the downstream water body.

## Temporary Haul or Access Roads

Temporary haul or access roads should not be installed across a stream or water body without first receiving approval from the appropriate Federal, State, or Local government agency.



Woodchips provide a great way to minimize any long term impacts to wetlands when an access road is need to install bridge pilings.

## Remember

Prior to doing any work that may affect a surface water such as a stream, lake, or river, the contractor's ESC Supervisor will need to coordinate with the appropriate Federal, State, or Local agencies to make sure all required permits have been obtained.



## Temporary Work Pad or Cofferdams for Bridge Construction

Cofferdams may be required to construct bridge abutments, piers in shallow or deep water, or work pad facilities to partially divert the stream or dewater the work area.

## Barge Pier Construction

Barges are often used to construct water piers. Barges can be used in as little as 2 feet of water. During the construction process there may be a need to dewater a work area protected by cofferdams. If the water is sediment-laden, it is required to be treated with adequate measures prior to discharge.

## Wetland Excavation or Fills

Wetland excavation for the purpose of filling and installing a new road bed requires that the muck be removed before back filling can occur.



### Important Tip

Before commencing any work in or near a Water-of-the-State, determine whether or not that WOS is a Special or Impaired Water. If it is, review Section x and Appendix A of the NPDES Permit for special requirements for working in proximity to a special water.

This site is not in compliance with permit requirements. The downstream swales must be stabilized within 24 hours of installing the culvert.

## Maintain hydrology in remaining wetland

Any permitted wetland work will not be allowed to adversely affect the remaining portions of the wetland by drawing the water level down or blocking flow into the wetland, unless approved by the LGU. Any such alteration of wetland hydrology would constitute an impact to the wetland according to WCA.

## Dewatering Permit Requirements

Dewatering the wetland will require a permit from the DNR Area Hydrologist.

## Protecting the outlet

The wetland outlet must be protected to prevent downstream damage in the event of a discharge of sediment-laden flow from the worksite.

Outlet protection must include BMPs that provide for stabilizing the soils.

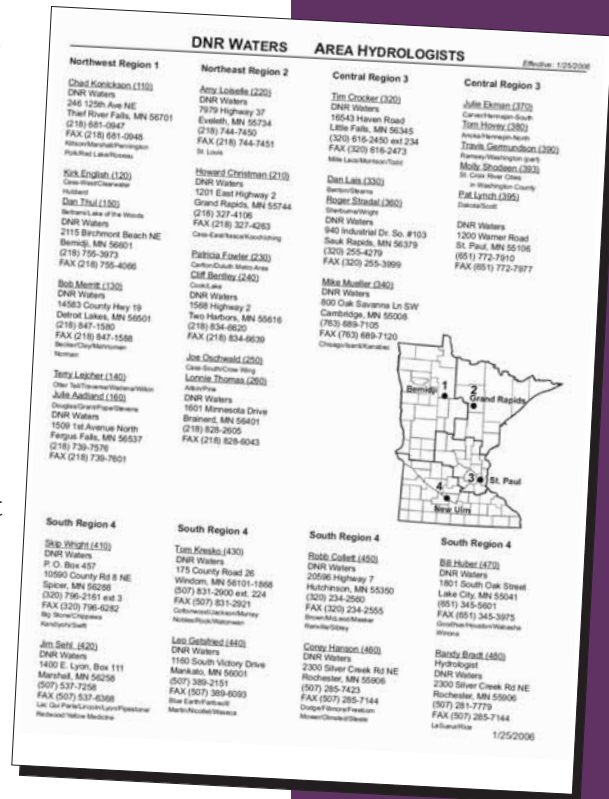
Outlet protection BMPs must be maintained as often as necessary

The outlet must be maintained to ensure that the normal water level is not altered

## Leaving Vegetative Buffers

It is strongly recommended that, where and as much as possible, a natural vegetative buffer be left in place. The slope's structural integrity can be compromised when the areas adjacent to the stream are disturbed.

The permit requires that a 100-foot vegetative buffer is left unaltered when working adjacent to any special water as defined in Appendix A of the NPDES Permit.



**FYI**

Partial excavation may cause the remaining portion of the wetland to dry up. According to the Wetland Conservation Act (WCA), this event would result in an impact, and may result in a cease and desist order issued by a Mn/DNR Conservation Officer.



## 2.5.9 Maximizing Project Resources

Utilize BMPs that may be generated on-site. These BMPs will be more accessible and it will likely be more feasible to reapply them more often, especially if protection is needed before a large rainfall event.



Topsoil berms will act as a perimeter control device..

### Using Topsoil

Topsoil is often stockpiled at the construction site and left alone until needed for final grading. It should be considered a valuable resource that can be used as a BMP until needed elsewhere. Topsoil can be used as a temporary BMP in one of the following ways:

- Controlling runoff as a diversion berm
- Managing sediments as perimeter control

### Important Tip

Diversion berms may require temporary stabilization, energy dissipation if there is a designated outlet, or a temporary down drain.

## Woodchips From Site Clearing

Woodchips generated from the clearing and grubbing phase can be used for:

- Vehicle tracking pad
- Supplementing silt fence
- Temporary stabilization
- Protecting trails or existing roads
- Placed under a dewatering device such as a dewatering bag or Dewatering Basin

## Sediment Basin Water

- Sediment basin water can be used for:
- Dust control
- Watering vegetation?



Temporary sediment basin water can be used to provide dust control on a project.

## 2.5.10 Winter Work

For winter season construction projects, stormwater compliance must continue all season for those parts of the project where construction is occurring. The best way to minimize erosion during the winter freeze-thaw periods and spring runoff events is to make sure that BMPs are put into place as required otherwise. Every effort should have been made in the fall to “button up” the site by stabilizing all exposed soil areas possible.

### Winter Inspections

Inspections need to continue throughout the winter, except the areas where work has ceased and the soil has been stabilized. In those areas, inspections must resume when work resumes, or at the first sign of spring runoff.

- In lieu of ½-inch rain-falls, it is a good idea (no official requirements at this point) to inspect your site coincidental to a 3rd straight day of significant melting.



Working around water during the winter is instrumental in minimizing impacts.

- Winter is a good time to learn where runoff/run-on, erosion, and sedimentation problems are likely to occur.
  - Look for drainage patterns to tell you where concentrated flow will occur at other times of the year.
  - Look for small build-ups of sediment behind perimeter control BMPs to tell you where big problems might occur with big rains on non-frozen soil
  - Take a look around right after even a short melting period, you'll get a lot of indicators
- During regular weekly [winter] inspections, look for these things:
  - Any newly disturbed soil
  - Inlet protection needing maintenance
  - Inlet protection causing potential public safety hazards

### Important Tip

The winter season is defined as the period where soils temperatures are such that seed will not germinate and normal plant rooting does not occur. Is this a definition that applies or matters to highway work?

- Ice/frozen mud on streets and parking lots
- Damage to down-gradient perimeter control
- Opportunities, due to frozen conditions, to address sedimentation incidents
- Construction entrances that need maintenance
- Any unstabilized flowpaths
- Status of stockpiles

## BMPs In Winter Conditions

BMPs installed in the wintertime require different methods and may cost more than if installed in other seasons. So it's a good idea to make every effort to stabilize soil and have perimeter control up to par before snow flies and frost moves in. If soil disturbance during the winter cannot be avoided, the appropriate BMPs are still required.

- Sometimes, it may be advantageous to wait for the right conditions to install BMPs. In those cases, just make sure that the BMPs are in place comfortably ahead of spring melt and rainfall events.
- Make sure you have a plan, don't just say "we'll get to it later"
- Stay on top of changes in the weather; be aware of upcoming snow, warm-ups, or freeze-ups
- Apply soil protection ASAP to any areas that might be subject to concentrated runoff/runon.
- Utilize the correct BMP for flow conditions
- Perimeter control also has to be in place prior to spring melt or rainfall.

## Mulching

- Mulch can and must be applied if exposed soil conditions are created in the winter. It can be placed on bare soil or on top of snow.



Working in the winter will require blowing mulch over the top of the snow.

## Important Tip

**IT'S TOO WET TO GET ANY EQUIPMENT IN THERE!** This commonly used phrase is why soil protection must be applied during winter months. When spring finally comes around, exposed soil must have been covered.





Working in the winter will require blowing mulch over the top of the snow.



Installing erosion control blanket in the winter will require the use of nails with washer in substitution for the standard staples.

- **Mulch that is spread on top of snow cover will work its way to the soil as snowpack is reduced and another snowfall occurs.**
  - When straw is applied, it will absorb sunlight and melt a very small amount of snow and freeze into the snow
- **Mulching can also be done on bare soil, with a little more attention to detail.**
  - If applying on frozen ground, spray a tackifier on top (water can work in some cases) to freeze it in place
  - If the soil is freshly graded and somewhat moist, you probably can still disc anchor the mulch.
  - If the soil is freshly graded, it's not windy and there is a snowfall coming up very soon, the snow will hold it in place

### **Erosion Control Blanket**

ECB can also be installed on bare soil. Installing ECB on top of light snow up to 2 inches has been demonstrated, so that should be done.

- **The best situation is top install ECB on freshly graded soil, whereas normal installation can take place (don't forget the details).**
- **Installing ECB on frozen soil will require substituting nails w/washers for the standard staples to keep the blanket in place. (show pic)**

### **Perimeter Control**

If damaged or removed, or there will be new areas of disturbed soil, down-gradient perimeter control is required to be installed during the winter. It can be easier than you'd expect.

- **Use an alternative method such as wood chip berm, earthen berm, rock/rock logs. biorolls, etc.**
  - These require little or no earthwork
  - They follow the micro-contours very well, creating consistent contact with the soil



- Frozen ground presents a real challenge to installing silt fence, but it can be done. Instead of using traditional manual or machine-sliced installation methods, you will have to:
  - Machine dig a trench with a ditch-witch or the like; make sure you backfill with loose soil and compact. Get the backfilled soil good and moist, it will freeze up and grip the silt fence fabric in place, OR
  - Use specially equipped (typ. carbide tipped) slicing machine. DO NOT leave large frost chunks as the backfill. Compact as well as possible (before installing the posts) with a heavy piece of equipment. Gaps and voids should be filled with very moist, loose soil, then compact it again.

### 2.5.11 Emergency Situations

There will be events that you cannot anticipate; however having a plan in place and measures designed to handle emergency situations will help minimize the extent of the damage. You cannot anticipate when it might happen, but drawing on project/life experience, you could probably come up with a couple examples of what might happen. The following section reviews of couple of potential situations.



An emergency response contractor may need to be notified in event of a hazardous spill.



The installation of silt fence when the ground is frozen will require the use of a mechanical trencher.

### FYI

Part of site management is to anticipate things that could go wrong. As you get to know the site and how the construction process is going, develop a plan, at least mentally, for situations that may occur. Depending on your estimate of the likelihood, have materials and methods ready to react quickly.?



Flooded inlet protection.

## Localized Flooding

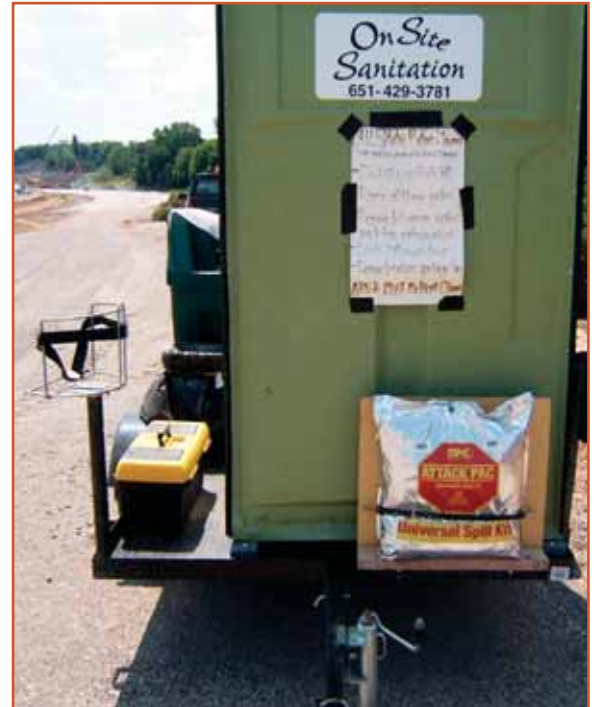
During the construction process, there are times when water may back up due to a clogged inlet, slope failure, or water flooding in an excavated area. To avoid emergency situations, take the following steps:

- Place equipment in areas not subject to flooding
- Store all hazardous materials in areas that will not be subject to flooding
- Perform daily maintenance on BMPs in critical areas to prevent/minimize the flood potential

## Response

In the event that a localized flooding emergency does occur, the ESC Supervisor (as according to the Mn/DOT specification 2573.A1) must be available within 24 hours to direct emergency operations such as:

- Sandbagging
- Dewatering/emergency pumping – be sure to use the proper BMPs to prevent nuisance discharges
- Flocculant application
- Spill kit deployment
- Coordinating an emergency response team
- Collecting and disposing of hazardous material



Spill response kits need to be provided at a site to contain a spill.

## Remember

ESC Supervisor must be available within 24 hours to direct emergency operations.

## Hazard Material Spill

In the event that a hazardous material or a petroleum product is spilled, you must call:

Local Information	911	Threat to life or property
The Minnesota Duty Officer	1-800-422-0798 or 651-649-5451	Threats to public safety, environmental, or if a state agency notification is required
The National Response Center	1-800-423-8802	For a Federal notification

### Reportable Spills

Circumstances warranting reporting:

- Any spills outdoors
- Spills to secondary containment areas
- Spills having the potential to directly impact the environment or human health
- When in doubt, report!

Petroleum products:

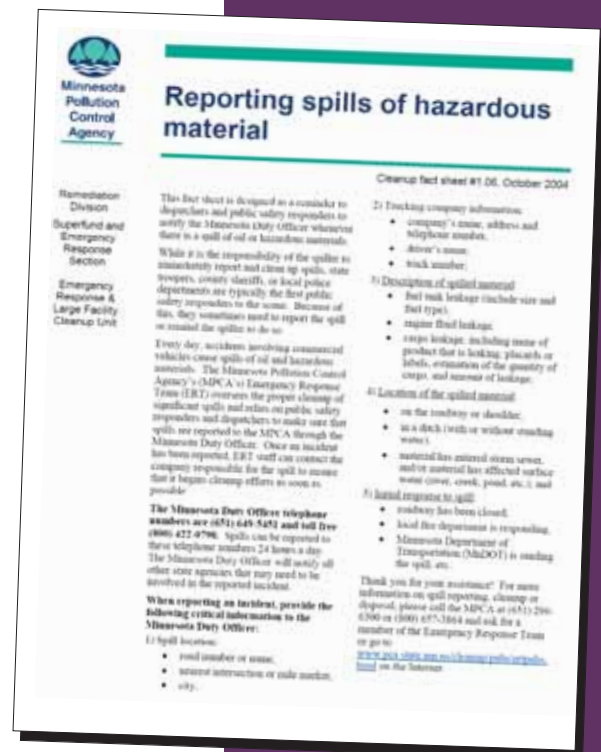
- Report all spills greater than 5 gallons
- Report any size spill that poses a threat to public safety

Hazardous materials:

- Spills of any other chemical substances or environmentally damaging substances are reportable

### Response

- Isolate the spill area
- Prevent the spread of spilled substance
- If possible, scoop up the contaminated soil, and leave it sitting in the equipment bucket
- Keep kitty litter handy to soak up spilled liquids in an emergency



??????



## Pond Overflow

Repeated or large rain events may stress sediment basins or ponds beyond capacity, resulting in the discharge of sediment laden water. Anticipate and avoid emergency situations, by taking the following steps:

- When the pond has acceptable water quality, draw it down prior to a rain system moving into the area.
  - If water quality is not quite acceptable, apply a flocculant and wait 24 hours

## Response

- Install rock weepers downstream from the pond outlet
- Temporarily increase pond storage volume without creating local flooding or public safety concerns
- Apply flocculant upstream from pond (only if pond is drawn down or capacity is increased)



Discharge may need to be treated with a flocculent prior to the discharge to a surface water.

## Important Tip

Anticipate and avoid emergency situations, plan ahead.

## Significant Sediment Discharge

A combination of factors may lead the deposition of a large amount of sediment in a Water-of-the-State or onto adjacent property. The permittee is responsible to get permission from the landowner for removal, or for contacting any agencies having jurisdiction, and for obtaining any applicable permits, prior to removal of the sediment.



Sediment laden water in ponds can be treated with hydraulically applied flocculent. Do not treat lakes or natural water bodies.

- Sediment removal needs to be completed within 7 days, or as soon as conditions allow, or permission is granted.
- Concurrent critical area stabilization requires that rapid stabilization techniques be used to stabilize the construction site around critical areas

### Response

When possible, cut off the source of the sediment and re-direct

Enclose the deposition area to contain the sediment

Provide other BMPs to minimize the amount of sediment being discharged



Significant sediment discharge will need to be reported to the Minnesota Duty Officer.

### FYI

Applying flocculants at a construction site should be done carefully to obtain best results.

Treated water should not be discharged to a Water-of-the-State until the sediment has settled out.

Flocculants require a minimum of 20 minutes reaction time.

Flocculants can be used when there is not enough time to allow the material to settle naturally, which could take days.





Hydromulching is an effective tool to stabilize the soil during the vegetation establishment stage.

### 2.5.12 Project Completion

Finally, project wrap-up is close at hand. Along with all the other things that must be done to close out the project, don't forget the few erosion and sediment control tasks that will close the project out. Staying with the SWPPP will go a long way toward keeping the project site in good shape.

Leaving the project site stabilized will minimize the risk of erosion and sedimentation problems after you leave. Mn/DOT is still obligated to correct erosion problems that may occur later, so with good project completion, chances are you won't have to come back.

Think of this part of the project as your opportunity to make a contribution to successful ESC planning and implementation for future projects. Take this time to jot down your comments and suggestions about how the project went. Have a 10-minute "overall project" conversation with the project designer.

Have a good two-way exchange about both positive and not-so-positive aspects of the project. Chances are you may work with this person again. A good discussion will help you understand each other and foster a good working relationship.

#### Project Wrap-up To Do's

By taking care of all the little details, you will have done your best to protect nearby environmentally sensitive resources.

- Make sure people assigned to provide short-term maintenance of the permanent ESC measures know their responsibilities.
- Make sure that all features of the permanent stormwater management system are built per design, are well stabilized, and are functioning per design
- Take time to look over the entire project corridor. Make note of all of the areas that need just a little more attention before they are permanently stabilized.

Keep these tasks in mind:

- Clean out all areas where sediment has left the right-of-way
- Remove all temporary stormwater compliance BMPs
- Fill in all depressions and/or washouts
- Reseed/re-mulch where necessary

## Specification and Permit Punch List

Turf establishment shall be completed at final stabilization in accordance with the Mn/DOT 2005 Specification Section 2575.3.O. Partial payments (generally 80%) may be given if there is a maintenance schedule established.

At project completion, a NOT will need to be submitted to terminate coverage under the MPCA permit (MPCA Permit Part IIC). The NOT must be submitted within 30 days of completing final stabilization at the project site. The following must be completed:

- All soils must be stabilized to a uniform cover to achieve 70 percent cover over all exposed areas of the project site
- Temporary synthetic and structural erosion prevention and sediment control BMPs must be removed; also see Mn/DOT Spec 2573.3.O
- All sediment from conveyances and from temporary sediment basins designed to be used a permanent sediment basin will need to be restored to the original design volume and the sediment stabilized, also see Mn/DOT Spec 2573.3N



Once vegetation has been established and the temporary erosion and sediment controls have been removed the NOT will need to be submitted to close out the project.



Soils that are temporarily stabilized can have the inspections in those areas reduced to once every 30 days.

### Remember

Mn/DOT must keep the SWPPP, amendments, other permits, stormwater calculations, and all inspection and maintenance records on file for three years after submitting the NOT.

## A Smooth Closeout

Listed below are some ideas that, although not required, may help project completion go a little more smoothly.

- Don't forget about haul roads, borrow pits, storage areas, and disposal sites. These areas require the contractor's own NPDES permit if the sites are one acre or more.
- Consider contacting people from DNR, SWCD, and the Corps to have a look over the project corridor.
- Get your notes together and forward copies to the SWPPP designer and the Turf Establishment Unit.
- Then, make sure they take the time to respond to you. You've made the effort to write, make sure you get a response.
- Follow-up with the MPCA after the NOT has been submitted to make sure the project has been accepted.



### Remember

Mn/DOT field staff, per Spec 2573.3C, can authorize up to 80% payment after devices are installed, and the remaining percentage when all temporary ESC devices are removed.

Mn/Dot native seed mixes contain a large percentage of oats or winter wheat cover crop. These areas should be mowed so that the desired seedlings are not shaded out.



## Part 3 - BMP's and How to Use Them

There are a number of BMPs that can be used to enhance your stormwater compliance efforts. When used correctly, they can perform the three primary objectives of construction site erosion and sediment control very well.

- **Control Runoff**
- **Minimize Erosion**
- **Manage Sediments**

By controlling runoff, you are able to use fewer resources to minimize erosion. By minimizing erosion, there will be less of a need to manage sediments. Following this logic will result in a smaller hit to budget and less staff/time needed for stormwater compliance.

It is critical that BMPs are used correctly in order to maximize their effectiveness. Keep these things in mind.

- Use the correct BMP for the situation (hay bales are NOT a good ditch check)
- Avoid a band-aid approach (will need to be redone and cost more in the long run)
- Employed at the wrong stage, or are not prepared or installed properly, BMPs will not be able to prevent losing valuable topsoil.

### 3.1 Controlling Runoff

Controlling runoff will help reduce the volume of water likely to run off during construction. Uncontrolled runoff and run-on can cause erosion and then carry soils particles that may end up in a downstream water body. Controlling run off will divert water around a site or aid in the establishment of vegetation. To control runoff, you may need to consider the volume, velocity, and flow path of the potential runoff.

- Runoff from paved surfaces can prove to be a particular threat because the velocity of the water flowing over the slopes will have the potential to create slope failure, damage a roadway or bridge abutment.
- The flow must also be prevented from carrying excessive amounts of soil eroded from the slope into waters of the state.

Duane Stenlund, Mn/DOT



The use of the proper BMPs such as erosion control blanket on the slope and installing down drains in concentrated flow areas will maximize the potential for successful vegetation establishment.





Duane Stenlund, Mn/DOT

Temporary down drain are adhered to the soils surface with large nails.



Duane Stenlund, Mn/DOT

Filter logs can be use to direct water to the down drain.

### 3.1.2 Temporary Down Drains

#### Temporary Down Drains (Spec 3892)

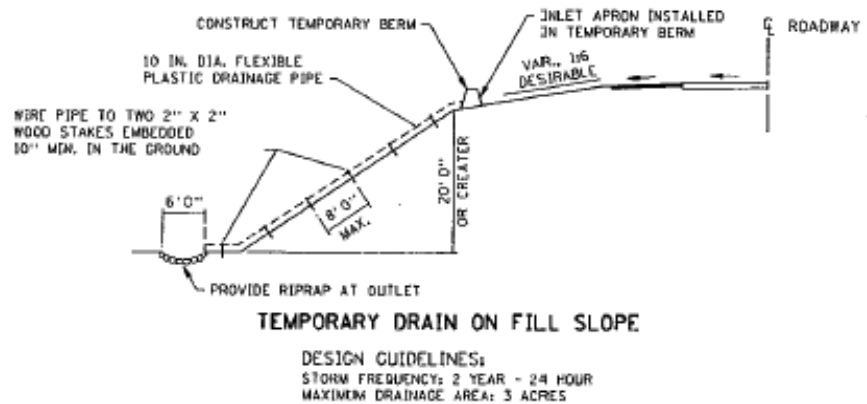
Temporary down drains are designed to convey concentrated flow volumes from the top of the slope to the bottom of the slope to prevent rill or gulley erosion.

#### Installation Tips

- Direct water into the pipe with a berm, sandbags, or other measures
- Energy dissipation must be installed at the outlet
- Down drains must be staked to the soil surface

Drainage Area (acres)	Piping Diameter (inches)
0.5	12
0.75	15
1.5	18
2.5	21
3.5	24
5.0	30

Temporary down drain pipe sizing criteria.



Temporary down drain detail.

## Geotextile Lined Flume

Geotextile lined flumes can be used to collect water and convey it safely down a slope or divert water around the work site.

### *Installation Tips*

- Geotextile fabric must be trenched in at the upstream end and staked to keep it in place
- Rock may be used to provide added protection and slow the flow of water
- Install energy dissipation at the downstream end

### 3.1.3 Flow Diversions

Flow diversions are used to divert water around the site to prevent runoff from flowing over a slope and causing rill or gulley erosion. Fabric and portable Jersey barriers can be used for flow dividers.



A stabilized diversion channel or berm can be used to divert run-on around a site and minimize the volume of water flowing through a site.

Granite McCrossan



Geotextile fabric can be used to convey water down a hill slope.

Duane Stenlund, Mn/DOT



Duane Stenlund, Mn/DOT

Sandbags can be used to direct flows into a temporary down drain or too a stabilized flow path.

## Stabilized Soil Berm

Stabilized soil berms will divert water around the construction site and reduce the volume of water that needs to be treated within the project site.

### *Installation Tips*

- Install along the contour
- Stabilize with ECB where the berm is subject to concentrated flow
- Install energy dissipation on the downstream end of diversion berm

## Sandbagging

Sandbags can be used to divert water into a catch basin or into a temporary down drain.

### *Installation Tips:*

Install to direct the flow from going over a slope and direct it into a down drain, flume, or diversion berm

Sandbags need to be installed at an adequate height to direct the flow into the pipe inlet

### 3.1.4 Bypassing or Pumping

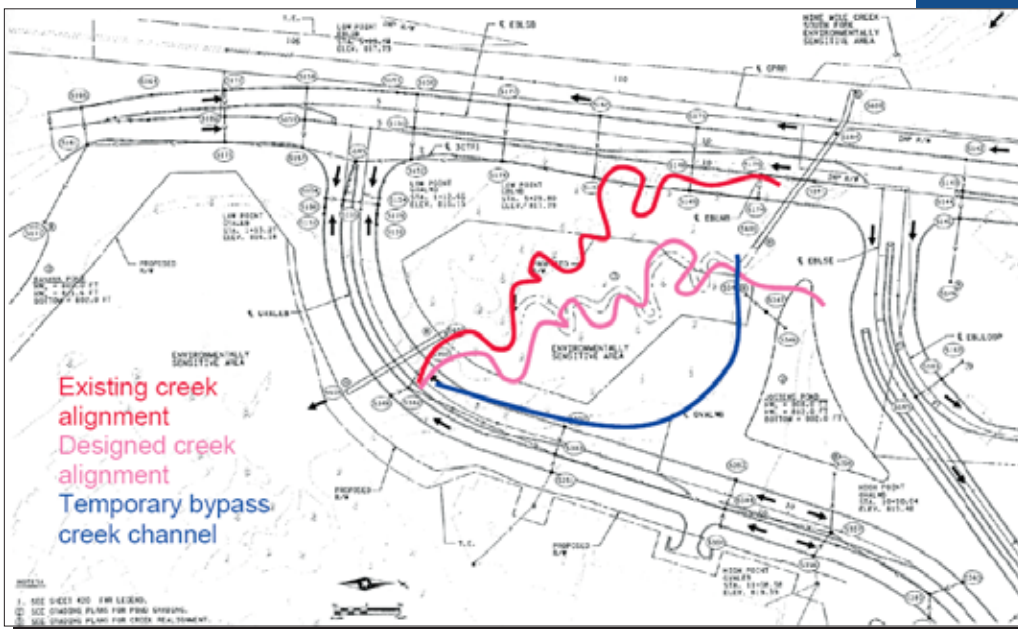
Bypassing or pumping will help divert water around a site or reroute the water so a water crossing can be installed such as a culvert, bridge, or other permanent structure.

Types:

- Temporary pumping
- Plastic sheeting lined channel
- Geotextile and riprap lined channel
- Temporary piping/flume

*Installation Tips:*

- Pumps must be sized adequately to be able to maintain desired water levels
- A second pump will need to be on hand in case of failure
- Riprap and geotextile fabric shall be of the proper type and class for anticipated flow rates
- Temporary pipe must be sized accordingly
- Align with the channel to prevent scouring and downstream erosion



Site plans are a useful tool to direct how work will be conducted in a critical area.





Aaron Mlynsek, Carver County Soil and Water Conservation District

Preservation of existing vegetation will enhance the effectiveness of the existing BMPs.

## Reminder

Temporary mulch should be used to rapidly stabilize a critical area.

Mulch installed at the improper rate must be reapplied by the contractor.

## 3.2 Minimizing Erosion

This section provides an overview of some of the more commonly used erosion control practices, products, and devices, as well as some recent modifications and innovations.

### 3.2.1 Soil Protection

Preventing soils from becoming dislodged from their location is the most efficient and effective way to avoid soils from being lost from the construction sites. There are a number of BMPs used for this purpose and they are illustrated as indicated.

#### Preserving Existing Vegetation

Used as a sediment buffer, existing vegetation can increase the effectiveness of other sediment control methods and provide added protection around important resource areas.

- Preserving existing vegetation is a low-cost BMP that will improve the effectiveness of sediment control devices.
- Preserving existing vegetation will reduce runoff volumes and will help capture sediment before leaving the construction site

#### Temporary Mulching (Spec 3882)

Temporary mulch can effectively reduce the erosion potential from a construction site by 80 to 90 percent and foster the germination and growth of new vegetation.



Duane Stenlund, Mn/DOT

Temporary mulch will need to be properly disc anchored when used to establish vegetation.

Material (MN/DOT type)	Consider These Points
Straw/hay/grasses (Type 1)	<ul style="list-style-type: none"> <li>• Reduces rainfall erosion</li> <li>• Can be applied by hand or machine</li> <li>• No noxious weeds</li> <li>• No cattails, no reed canary grass</li> <li>• Avoid moldy, compacted material</li> <li>• Distribute uniformly</li> <li>• Soil surface should be barely visible (90% coverage)</li> </ul>
Grain straw - certified* (Type 3)	<ul style="list-style-type: none"> <li>• Look for MCIA tag certifying weed free</li> <li>• Must be air-dry on delivery</li> <li>• Lasts six months to a year</li> </ul>
Straw and wood cellulose (Type 4)	<ul style="list-style-type: none"> <li>• Combination of Type 1 mulch and Type 5 hydraulic soil stabilizer</li> </ul>
Wood chips (Type 6)	<ul style="list-style-type: none"> <li>• Should be free of dirt, dust, mildew, chemically treated wood</li> <li>• Should not have more than 20 percent bark or leaf (by mass)</li> </ul>
Prairie mulch/short-mid (Type 7a) and (Type 7b)	<ul style="list-style-type: none"> <li>• Free of noxious weeds and seeds</li> <li>• Must be from approved vendor/source list</li> </ul>
Prairie hay/short-mid (Type 8a) and Prairie hay/mid-tall (Type 8b)	<ul style="list-style-type: none"> <li>• May have seeds, no noxious weeds/seeds</li> <li>• Must be from approved vendor/source list</li> </ul>
Aggregate mulch (Type 9)	<ul style="list-style-type: none"> <li>• Sized from <math>\frac{3}{8}</math> inch to 2 inch</li> </ul>
<p><i>*Certification of mulch ensures that the mulch used on the project won't spread unwanted or noxious weeds and grasses like Canada thistle, reed canary grass, and leafy spurge.</i></p>	



Temporary mulch will reduce the impact from raindrops which sets the erosion process in motion..

## FYI

Type 1 mulch shall be used in the majority of applications except where there are increased flows or slopes steeper than 3:1.



Temporary mulch will need to be sprayed in even back and forth motion to prevent the shadow effect.

## Hydromulching (Spec 3884)

Hydromulching can be used to rapidly stabilize critical areas that are hard to reach or are on slopes greater than 3:1. The specific content of the mulch and application rates vary; therefore it is important to pay attention to what the plan has specified.



Duane Stenlund, Mn/DOT

Stabilization of a critical area can be completed with temporary hydromulch.

## Temporary Seeding (Spec 3876)

Temporary seeding is designed to achieve a quick cover that will provide erosion protection around critical areas such as wetlands, streams, lakes, rivers and other high value resource areas. Information regarding the application of seed mixes can be found in Section **X**.

### *Installation Tips:*

- Temporary seed mixes should be used such as winter wheat and rye grass
- Soils must be graded and loosened to the appropriate depth to allow successful establishment of the temporary seed
- Inter-seeding may be needed to establish permanent vegetation in the spring

## Reminder

Seasonal adjustment must be made for frozen soils and winter conditions



## Types of Hydraulic Soil Stabilizers (Spec 3884)/Important Points

Material (Mn/DOT type)	Consider These Points
<b>Natural tackifier (Type 1)</b>	<ul style="list-style-type: none"> <li>•Duration lasting &lt; 3 months</li> <li>•Non-corrosive</li> <li>•Consists of water soluble natural proteins, vegetable gums, or guar gums blended with gelling and hardening agents, or a water soluble blend of hydrophilic polymers, viscosifiers, sticking aids and other gums.</li> <li>•Can be used to “set up” loose soils while vegetation is establishing</li> <li>•Application rate of 200 lbs/acre when used to overspray Type 1 straw mulch</li> </ul>
<b>Hydromulch (Type 5)</b>	<ul style="list-style-type: none"> <li>•Consists of wood cellulose fibers and 2.5 to 5% of a Type 1 tackifier</li> <li>•Used in combination with Type 1 straw mulch where disc anchoring is not possible</li> <li>•Application rate of 2500 lbs/acre</li> <li>•Contains 2.5 to 5 percent tackifier (Type 1) by weight</li> <li>•Absorbs surface water, allowing infiltration</li> </ul>
<b>Hydromulch Blend (Type 6)</b>	<ul style="list-style-type: none"> <li>•Same as hydromulch, contains 40-60 percent recycled paper and 40-60 percent wood cellulose fibers by weight</li> <li>•Application rate of 2500 lbs/acre</li> </ul>
<b>Bonded Fiber Matrix (Type 8) (BFM)</b>	<ul style="list-style-type: none"> <li>•Contains 100 percent wood or wood by products</li> <li>•Primary use is on inaccessible steep slopes</li> <li>•Contains non-toxic coloring for uniform application</li> <li>•Type 8 is a permanent mulch cover</li> <li>•Application rate of 3500 lbs/acre</li> <li>•Mix ratio is 100 to 125 gallons water to 50 pounds material</li> <li>•Spray in two different directions to ensure good soil coverage</li> <li>•Application must occur at least 24 hours before a rainfall to allow BFM to cure</li> </ul>

\* Hydraulic soil stabilizers can do what most mulch does, plus have some additional functions. Each type has a slightly different function when used as specified, and all are applied by hydro-spraying.

Duane Stenlund, Mn/DOT



Temporary seed mix installation with a properly applied mulch.

### Important Tip

Consider using Type 6 hydromulch where the slopes are temporary in nature, have limited access, or are stockpiles.



### 3.2.2 Method BMPs To Minimize Erosion

#### Site Phasing

Site phasing limits the amount of soils exposed to erosion by stabilizing one area before moving on to the next. Properly phased sites have the potential to reduce erosion by more than 40% (Center for Watershed Protection, Technical Note # 58).

Often Mn/DOT sites are staged so they are stabilized in specific phases, such as after pond construction or wall construction. If working near critical resources, these areas may require temporary cover multiple times in addition to being stabilized at the end of construction.

*Other benefits also required in the permit:*

- Site inspections can be suspended to once every 30 days for stabilized areas
- Removes or minimizes the potential for sites to discharge to a Water-of-the-State



Proper phasing and construction techniques reduces the impacts to water resources.

#### Remember

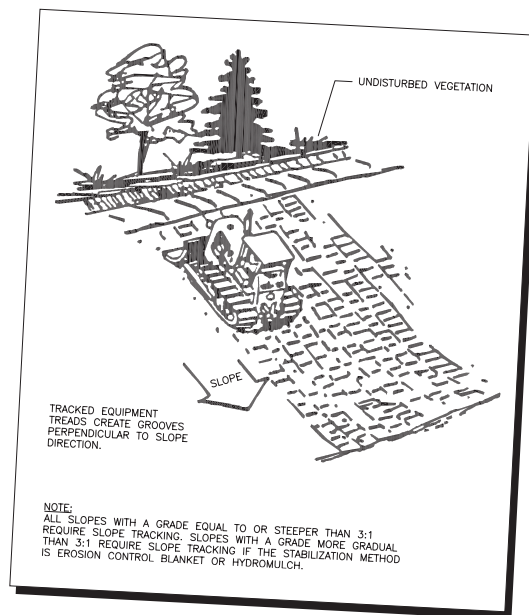
Properly phased sites have the potential to reduce erosion by 40 percent.

## Slope Tracking

Slope tracking is designed to create multiple velocity checks or speed bumps on the hill to slow water as it flows down the hillside.

### Benefits:

- Reduces erosion by a range of 20-40%
- Cost effective
- Practical for short time periods
- Increases effectiveness of other erosion control practices
- Practical for long slopes or areas draining to a critical resource



Use cat tracking to minimize erosion.

## Soil Ripping/Subsoiling

Soil ripping will improve the soil's ability to infiltrate water therefore reducing the runoff volume.

### Benefits:

- Decrease runoff from slopes by up to 20%
- Reduces erosion potential by slope roughening
- Aids in vegetation and root development

### Installation Tips:

- Can be conducted prior to or after topsoil placement
- Soil should be ripped to a target depth of 20 inches with an effective depth of 15-18 inches
- Spacing of the shanks should be 30 inches
- Call for locates prior to deep soil ripping

Duane Stenlund, Mn/DOT



When preparing the soil for vegetation establishment soils ripping can be used to increase the rooting depth of plants and decrease erosion.

## FYI

Soil ripping is often used in areas where infiltration basins are proposed, however care should be taken to minimize any compaction of these areas during construction.



Method 3 rapid stabilization.

### 3.2.3 Rapid Stabilization BMPs

Rapid stabilization are methods used to temporarily stabilize critical area and especially those areas within 200 lineal feet of a water of the state. This tool can be used multiple times to comply with the requirements of the permit. Rapid stabilization consists of five different methods designed for rapid deployment to provide temporary stabilization, as outlined below:

- Method 1: Type 1 mulch disc anchored at 2 tons per acre
- Method 2: Type 1 mulch at 1.5 tons per acre or Type 5 Hydraulic Soil Stabilizer at 750 tons per acre
- Method 3: Type 6 Hydraulic Soil Stabilizer at 350 pounds per 1000 gallons of slurry mix with seed mixture 190 at 10 pounds per 1000 gallons of slurry mix, and fertilizer at 50 pounds per 1000 gallons of slurry mix
- Method 4: Category 3 erosion control blanket with seed mixture 190 at 2 pounds per 100 square yards, and fertilizer at 8 pounds per 100 square yards
- Method 5: Class II riprap over Type III geotextile fabric



Duane Stenlund, Mn/DOT

Rapid stabilization along slopes and stream banks is best done using Method 4.

## 3.3 Managing Sediments

Managing sediment involves capturing sediment suspended in surface water discharging from your jobsite. In general, sediment is managed in two ways:

- Holding back sediment-laden runoff long enough to let sediment settle out
- Filtering and trapping sediment from the runoff

### 3.3.1 Scheduling and Timing

There are a wide variety of sediment control BMPs required to keep the jobsite in compliance during the many stages of a typical project. The scheduling and timing of installation of BMP's is critical.

- All perimeter sediment control BMPs must be installed prior to any land disturbing activities. Many times, this includes perimeter silt fence or berms.
- Temporary sediment basins, or permanent ponds that will be used for sediment retention during the project, should be installed very early in the project and prior to major upgradient disturbance
- Inlet protection is required for all types of stormwater inlets during each phase of construction. Be sure to schedule the appropriate labor/material in time to meet this requirement.
- Be ready for the unexpected! Sediment control BMPs are often damaged by construction traffic or large rain events. Keep an emergency supply of material to quickly fix problem areas.





Bonestroo Rosene Anderlik and Associates

Haybales are in effective BMP when used as ditch checks or concentrated flow areas.

## Remember

Silt fence will not remove all sediment particles—the minimum opening size is larger than most clays and silts found in sediment laden discharge.

Common problems with silt fence are a result of installing the wrong fabric, ties, or posts.

### 3.3.2 Perimeter Control

Perimeter sediment control BMPs are used as the last line of defense after controlling runoff and minimizing erosion.

#### Silt Fence (Spec 3886)

Silt fence is intended to slow the velocity, settle sediment, filter water from sheet flow runoff and protect the adjacent areas. It is not intended for concentrated runoff.

Types:

- **Standard Machine Sliced** – monofilament fabric installed by machine and tied with plastic zip ties to steel t-posts
- **Super Duty** – monofilament fabric fastened to the face of a median barrier
- **Heavy Duty** – same as machine sliced but is installed by hand
- **Preassembled** – woven fabric installed to wooden posts with gun staples



Duane Stenlund, Mn/DOT

Tug on the silt fence after the installation to verify that it have been installed properly.

### Installation Tips:

- Silt fence shouldn't be used for perimeter control in high flow areas. (In some cases, it can be used as ditch check, which requires a different installation method. See page [x](#).)
- Install the silt fence into the ground a minimum of six inches
- After trenching make sure the soils are compacted properly
- Give the silt fence a good tug to make sure it is installed properly
- Make sure the silt fence is attached to the posts using the appropriate method
- To be effective, silt fence needs to be installed along the contour
- Long runs of silt fence need to be broken up into with J-Hooks
- Post need to be spaced a maximum of 6 feet apart
- Fabric need to be tight and not saging between posts

### Bale Barriers

Straw bale barriers must meet the minimum requirements outlined in Spec 3882 Type 1 mulch. Each bale must be trenched and staked with two wood stakes.

### Installation Tips:

- Use to protect wetlands and other critical resources areas where installation and removal will cause minimal damage
- Use in combination with silt fence for added reinforcement

Duane Stenlund, Mn/DOT



Use haybales to improve the effectiveness of other BMPs such as silt fence.

Duane Stenlund, Mn/DOT



Haybales are permissible to install in critical areas when the temporary BMPs may not be recoverable.

### Note

See Spec 2573.3.C1 for proper machine sliced silt fence installation





Ditch checks will slow the flow of water and aid in the establishment of temporary and permanent vegetation as well as filter and contain sediment in ditch bottoms.

### 3.1.1 Ditch Checks

#### Temporary Ditch Checks (Spec 3889)

Ditch checks are used to slow water velocity and temporarily contain sediment in ditch bottoms.

*Types in the Mn/DOT Specifications*

- Type 1— Silt fence - Machine-sliced silt fence with 5' metal T-post spacing.
- Type 2— Bioroll blanket system
- Type 3— Compost filter log.
- Type 5— Rock weeper - A 2' high rock check with interior geotextile liner. Side slopes should be a 2:1 (V: H) slope and made of coarse concrete aggregate on the front half and Class I riprap on the back half.
- Type 6— Geotextile triangular dike - A geotextile-covered foam block across the channel.
- Type 7— Rock check - A 2' high rock check with interior geotextile liner. The bottom of the check should be 5' wide, and 2' wide at the top.

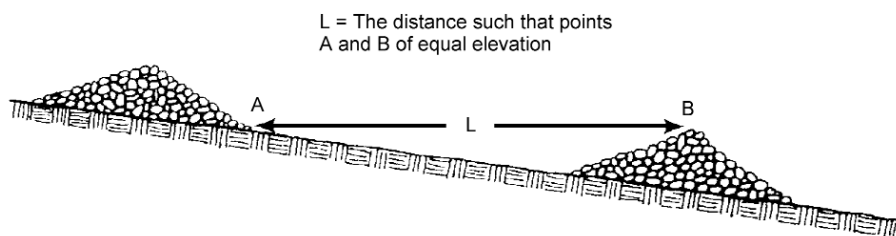


Granite McCrossan

Where additional filtering and settling is needed it is helpful to install 1 ½" clear rock within the rock check.

## Installation Tips

- For silt fence: embedment must be at least 12 inches and the soil compacted very well. T-posts must be embedded at least 24 inches and spaced no more than 4 foot intervals.
- Caution: Due to the height of silt fence, when installed in high flow areas, it can block and divert water around the ditch check, causing additional gullies. Do not use in narrow confined ditches. Do not use in ditches above 17° grade.
- The ends of each ditch check should be installed up the ditch side slopes so the bottom of the check is 6 inches higher than the top of the center. This practice prevents water from running around the ends and causing additional erosion.
- Appropriate spacing between ditch checks is important
- Generally Spacing = [Height (ft) x 100]/slope gradient
- Materials need to be sized or appropriately staked in the ditch bottom to withstand the anticipated flows



Ditch check spacing detail.

Ditch Grade (%)	Triangle/Air dyke & Bioroll	Silt Fence	Rock
1	50	50	100
2	25	NA	50
4	12	NA	25
6	NA	NA	20
Above 6% ditch grade, you may need to riprap the ditch When NA is indicated do not use.			



## Filter Logs (Spec 3897)

Filter logs are designed to slow and filter runoff from storm water related runoff and are commonly used as a ditch check, perimeter control, inlet protection or as a method to break up the slope length.

Types:

- **Straw Bioroll** – grain straw encased in biodegradable netting usually 6-7 inch diameter
- **Wood Fiber Bioroll** – wood fiber (excelsior fibers) encased in biodegradable netting usually 6-7 inch diameter
- **Compost Log** – 30-40% compost + 60-70% decomposed wood chips pneumatically shot into a knitted sock usually 8 inch diameter
- **Rock Log** – small to medium sized washed rock encased in a strong netting usually 4-6 inch diameter

*Installation Tips:*

- Filter logs when used to establish vegetation in a ditch must be installed following ditch check spacing requirements
- Filter logs must be staked securely to the soil surface



Duane Stenlund, Mn/DOT

Filter logs can be used in conjunction with erosion control blanket to establish permanent vegetation.



Duane Stenlund, Mn/DOT

## Reminder

Perimeter control must be provided for temporary stockpiles.

Use compost filter logs as ditch checks as once they get wet they stay in place.

## Compost Berms

Compost berms are an effective tool to be used as a perimeter control device along the project site and offer a positive alternative where the installation of silt fence is not feasible.

### *Installation Tips:*

- Compost berms are pneumatically applied on-site
- Usually used in combination with applying compost to exposed areas for minimizing erosion
- Compost material used for berms must meet material specification requirements of Spec 3890 Grade 2
- For best results, compost berms should be a minimum of 2.5 feet wide and 1 foot tall



Compost filter berms can be used as perimeter or as a slope break when establishing permanent vegetation.

Duane Stenlund, Mn/DOT



Leaving woodchips on-site generated during the tree and grubbing phase can substitute as a secondary perimeter protection device.

## Shredded Wood Mulch Berms

Shredded wood mulch is a valuable resource that is derived from the tree and grubbing phase of the project. Having a stockpile on hand may help provide perimeter control when the ESC contractor is not on site or an alternative perimeter control device is needed.

### *Installation Tips:*

- For best results, wood mulch berms should be a minimum of 2.5 feet wide and 1 foot tall
- Often used in combination with silt fence to minimize under-draining and increase sheet flow runoff filtering

## Engineered Soil and Rock Berms

Existing topsoil can be used to divert water around the construction site or as perimeter control. Using topsoil for these purposes is an effective way to stockpile soil.

### *Installation Tips:*

- The part of the berm that is subject to concentrated flow should be stabilized with ECB or other adequate BMPs
- The rest of the berm should be provided with (at least) temporary cover
- Temporary ditch checks may be needed depending on the slope and grade
- Include installation of a stabilized outlet
- Utilize a rock weeper to allow water to flow through the berm at controlled points
- Adjustment of the BMPs may be needed to improve the effectiveness and match the field conditions.



Topsoil can be moved to the perimeter of the site, shaped, and stabilized to be used as a perimeter protection device.

## Installation Notes

You may need to adjust the exact location of BMPs from that indicated on plans to increase effectiveness for actual field conditions

At least one certified installer must be on-site at the time of installation



### 3.3.3 Inlet Protection (Spec 3891, Tech Memorandum 05-05-ENV-03)

All inlets on a job site must be protected for the life of the project until all exposed soil that could potentially discharge sediment-laden water to the structure has reached final establishment.

The term “storm drain inlet” refers to manholes, catch basins, curb inlets and other drop type inlets constructed to accept stormwater into and through underground drainage systems

There are inlet protection BMPs for three primary types of inlets:

- **Drop structures** – used in median areas, field inlets and other areas where vegetation will be established
- **Drive over inlet** – used in parking lots, streets and other paved areas.
- **Catch basin inlet**– used in and adjacent to streets, parking lots, and other areas that will be paved

Check the approved Products List provided by Mn/DOT to determine the acceptable materials and products to protect each type of inlet.

Types:

- Rock logs
- Compost logs
- Silt fence ring and rock filter (berm or log) combination
- Pop-up head risers
- Filter bag inserts
- Other manufactured products (see Approved Products List)

Duane Stenlund, Mn/DOT



Use compost logs as inlet protection devices at the site to slow and settle sediment prior to leaving the site.

Duane Stenlund, Mn/DOT



Inlet protection devices will need to be provided for each inlet at the site and even those in a main haul route or downstream from the site in the curb and gutter.





Rock weepers can be used to increase the effectiveness of other temporary inlet protection devices.

*Installation Tips:*

- Make sure the type of device being used matches the field conditions
- Provide an emergency overflow to ensure flow in areas where public safety is a must
- Inspect the device regularly and especially after a rainfall event to verify its effectiveness

Winter conditions will require increased maintenance to prevent flooding

## Safety First!

Inappropriate or poorly maintained inlet protection can cause flooding. Be sure to provide emergency overflow on all devices. Perform maintenance in accordance with the permit, and more often if the site conditions warrant increased maintenance due to excessive erosion, hauling, or winter conditions.

### 3.3.4 Sediment Basins

Sediment basins are common BMPs used to detain water long enough for sediment to settle to the bottom of the pond. Specific sizing requirements are outlined in the NPDES Permit Section III.B and C.

#### *Installation Tips:*

- Sed basins must be installed very early in the project and prior to upgradient soil disturbance
- Sediment basins are required when 10 acres or more of exposed soil drain to a common location
- When space is limited uses multiple sediment traps
- Sediment basins/traps must be provided with a riser overflow, a stabilized overflow swale, or other stabilized outlet

Duane Stenlund, Mn/DOT



Geotextile can be used as portable temporary sediment basins for site dewatering activities.

### 3.3.5 Maintenance Considerations (Spec 2573.3M)

Maintenance is one of the key factors that will ensure the long term reliability of temporary BMPs. It is not ok to install temporary BMPs and walk away until the end of the project.

Maintenance Tips:

- Inspect all BMPs on a weekly basis, after every rainfall greater than 0.5", or if work is being conducted in a critical area where the BMPs are subject to being damaged.
- Continual maintenance and upkeep on temporary erosion control devices will minimize extensive costs and the need for repairs resulting from slope failures or sediment loss from the project site requiring recovery
- The contractor will need to maintain the temporary sediment control measures until they are no longer necessary or are removed.
- Sediment must be removed from temporary devices such as bale barriers, silt fences, ditch checks and stormwater filter logs when the sediment reaches 1/3 the height of the device and the maintenance shall occur within 24 hours
- Inlet protection devices need to have maintenance performed on a regular basis to ensure that they are fully functional for the next rainfall event
- Devices which are damaged during sediment removal must be replaced by the contractor
- Sediment will need to be removed from temporary sediment basins once sediment diminishes the storage volume by 50 percent; removals shall occur within 72 hours
- Proper disposal of sediment means:
  - It will be placed well away from the BMP that is being maintained, and has no chance of washing right back to it with the next rain
  - If spread over a slope, it must be (at least temporarily) stabilized
  - If piled within 200 feet of a Water-of-the-State, it must be enclosed and/or stabilized to prevent discharge into the Water-of-the-State
- Sediment removal and proper disposal is incidental to the project, except
  - The contractor will be compensated for sediment removal in sediment basins or traps on an equipment rental hourly basis as according to Mn/DOT Spec 2123.

## 3.4 Permanent Vegetation Establishment

Establishing vegetation is the most important methods used to prevent erosion at a project site. Every emphasis should be made to provide the permanent stabilization at the earliest possible stage and each phase of construction (Mn/DOT 2005 Specifications, 2573.A2).

### 3.4.1 Preserving Existing Topsoil

Existing topsoil can be used at the end of the project to provide a proper medium for growing, establishing and sustaining healthy vegetation.

Duane Stenlund, Mn/DOT



#### *Installation Tips*

- Existing topsoil will be the most cost effective way to reestablish vegetation and stabilize the site
- Topsoil will be spread out, loose and friable to a depth of 6 inches

Use topsoil generated on-site for topsoil to reduce project cost and limit haul times.

### 3.4.2 Topsoiling

Prior to placement of topsoil, the subsoil must be properly prepared. It must be in a loose, friable condition for a uniform depth of at least 3 inches. There must not be rills or washouts greater than 3 inches in depth (Mn/DOT 2005 Specifications, 21054.3G).

To establish permanent vegetation, topsoil is needed as a medium to begin and sustain healthy plant growth. In addition to having the appropriate pH in accordance with Tables 3877-1, 2, or 3, topsoil must be composed of the proper percentage of sand, silt, clay, and organic matter. The topsoil shall be placed to a minimum of six total inches, including in-place topsoil.

Duane Stenlund, Mn/DOT



Make sure the topsoil is prepared properly before seeding.

Duane Stenlund, Mn/DOT



Topsoil will need to be installed as early as possible in the construction phases as possible.

#### **Important Tip**

Topsoil can be placed in a strategic location on a job-site so that it diverts water around a site or can be used as perimeter control.





Duane Stenlund, Mn/DOT

### 3.4.3 Seeding

Seed can be sown into the soil using one of the methods listed below. The methods are specific to how the soils have been prepared and their location in the landscape. Sowing must occur at the rate specified in Table 2575-2 of the Mn/DOT 2005 Specifications. Within 24 hours of seeding, one of the erosion control measures listed in Section X shall be utilized to enhance germination and protect the seed source (Mn/DOT 2003 Seeding Manual).

Seeding Method	Use
Drop Seeding	Prepared seed bed
Hydroseeding	Steep slopes or other areas inaccessible by a drop seeder such as wetland or pond edges
Broadcast Seeding	Scattering seed over the soil surface
Interseeding into existing vegetation	Sites that did not establish well or where temporary vegetation was established

Used interseeding when a temporary cover was established in the fall.

#### Important Tip

Hydroseeding is recommended as a two step process for the soil seed to make intimate contact with the soil (seed first and apply hydromulch second)

Establishing vegetation will minimize the amount of soils lost by 100 times that of bare soil



Duane Stenlund, Mn/DOT

Use Hydroseeding when installing seed in hard to reach places.

## Seed Mixes

Mn/DOT seed mixes have been reformulated. Mn/DOT seed mixes numbered in the 100s are for temporary stabilization, 200s are the general seed mixes, and the 300s are the native seed mixes. The Mn/DOT Seeding Manual and district seeding recommendations can be found at <http://www.dot.state.mn.us/environment/erosioncontrol/seedmixes.html>

## Native Seed Mixes

Native seed mixes require more care than general seed mixes; seed bed preparation requires special attention.

### Installation Tips

- Large and/or fluffy seeds should be buried approximately  $\frac{1}{4}$  inch deep
- The seedbed will need to be firm
- Seed should be lightly covered with soil (harrowing or raking works well)
- Small seeds (mostly forbs) should be scattered over the soil surface
- Natives shall consist of local ecotype plant materials
- Cover crops should be used when seeding natives on slopes

### Maintenance

Maintenance will be required after both general and native seed mixes have been installed. Maintenance will aid in the establishment of vegetation and help control the invasion of undesirable vegetation. Common maintenance practices include:

- Watering to aid vegetation establishment
- Mowing to control weeds and other growth that will shade the desired seedlings
- Volunteer plants and cover crop native seedlings should be mowed 2-4 times the first year
- Spot spraying to control weeds such as thistles
- Burning and haying at 3-5 year rotations
- Some sites may require two consecutive years of mowing or haying



Native vegetation is a great way to increase infiltration due to its deep rooting depths.

## FYI

The Office of Environmental Services as (according to ENV Technical Memorandum 05-16-ENV-08) will develop and distribute annual turf establishment/erosion control recommendation for each Mn/DOT District and Metro Division.



Duane Stenlund, Mn/DOT

Use native vegetation to improve the aesthetics and function of a wet sedimentation basin.

## Season of Planting

Seeding should be done during specific recommended seeding dates. In the event that stabilization must occur to adhere to the NPDES construction stormwater permit requirement, the engineer may specify an alternative seed mixture or temporary mulch can be placed to provide cover and allow seeding to occur at a later date if the conditions are not optimal for seeding due to the existing weather conditions. The specific seed mixtures should be installed in accordance with the table below:

Seed Mixture Number	Spring	Fall	Dormant Seeding	Dormant Seeding Max. Soil Temp
5B, 10B, 20B, 25B, 26B, 28B, 310, 330, 340, 350	April 15 to July 20	Sept 20 to Oct 20	Oct 20 to Nov 15	50
50B, 60B, 240, 250, 260, 270	April 1 to June 1	July 20 to Sept 20	Oct 20 to Nov 15	40
80B, 90B, 280	April 1 to Sept 1	–	Oct 20 to Nov 15	40
100B	–	Aug 1 to Oct 1	–	–
110B	May 1 to Aug 1	–	–	–
150, 190	April 1 to July 20	July 20 to Oct 20	Oct 20 to Nov 15	35

## Remember

Sodding has to be completed during the growing season and be maintained by the contractor for a period of 30 days, which includes watering and/or replacing dead sod.

## Dormant Seeding

Dormant seeding is a way to establish seed in the fall after the soils are too cold for germination and establishing vegetation.

### *Installation Tips*

- Seeding shall be done after the soils are at or below 40 degrees Fahrenheit to a depth of 1 inch below the soil surface
- Different species of grasses will be dormant at different times of the year and will not germinate
- Forbs should be installed in the fall as they need to go through a freeze thaw cycle before they will germinate
- If the site is subject to soil erosion, or being wind blown it is recommended that the site have a temporary cover be installed and that interseeding be done in the spring

Duane Stenlund, Mn/DOT



Dormant seeding may improve the potential for successful establishment of native vegetation as forbs often need to go through a freeze thaw cycle.

## Keys To Success

- Seed areas in phases
- Install runoff controls prior to seeding
- Prepare soils by making sure they are in a friable and loose condition to a minimum of 3 inches and install the proper amount of topsoil
- Install erosion control measures immediately after seeding
- Seed during the specified dates of planting
- Use harrowing and raking to make sure the seed makes intimate contact with the soil
- Install the proper erosion control measures and at the appropriate rate
- Slopes greater than 3:1 and ditch bottoms will need beefed up erosion control measures, such as erosion control blanket, sod, bonded fiber matrix, or erosion stabilization mats, etc.



### (H3) Sod

Sod is a great way to establish permanent vegetation at a construction site; however, keep in mind that it will need watering for the first 30 days after installation, and replacement of any dead sod after that time.

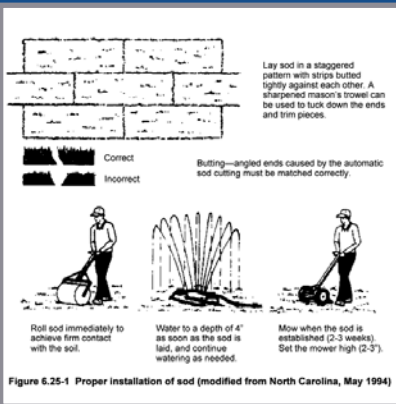
#### Installation Tips

#### Slopes

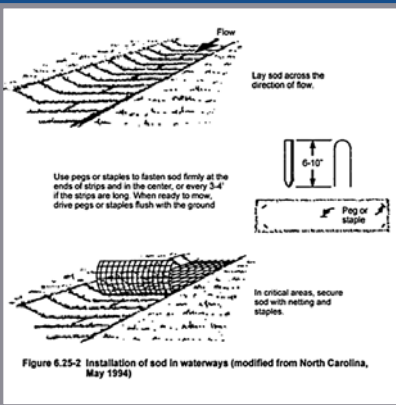
- Install immediately upon arrival at the site
- The end joints must be staggered
- Install the sod from the bottom upward
- Stake the sod to the soil surface
- Trench in at the top of the slope a minimum of 3 inches

#### Ditch Bottoms

- Begin at the upgradient end of the ditch
- Install parallel to the direction of flow
- Anchor trench at least 3 inches and staple in the trench
- Shingle upgradient over down
- Overlap the edges
- Incorporate netting into the rooting material or install Type 1 netting to the ditch bottom
- Staple parallel to the direction of flow



#### Sod installation detail



Sod installed in a concentrated flow area detail.

#### (H4) Dormant Sodding (Spec 2575.A4c)

Soils that are exposed late into the fall can be stabilized to eliminate any potential for runoff during the winter or spring melt by using dormant sodding techniques.

##### *Installation Tips*

- Approval for the installation will need to must be granted by the engineer
- Soil must to be prepared for sod installation
- Sod on slopes and in ditches will be pegged or stapled
- Sod is watered to saturation immediately after placement
- Sod is watered a second time if the site has not received an inch of rain within 7-10 days or has received significant amounts of snow

Do not dormant sod near the shoulder of the roadway or other areas where winter salt will desicate and kill the sod.

Bonestroo Rosene Anderlik and Associates



Sod will need to be watered and maintained to aid in the successful establishment and will be done for a period of 30 days before being accepted and inspected by the engineer.

## 3.5 Working Around Water

When working around water, some sedimentation may be unavoidable. There is still a requirement to try to capture sediment that has been released into the water column. Try these methods:

- Sediment traps
- Jersey barriers or rock berms parallel to the stream bank
- Silt curtains
- Super duty silt fence protection for stockpiles
- Perimeter protection parallel to the stream edge (remember to leave a buffer)

### 3.5.1 Flootation Silt Curtain (Spec 3887)

Flotation silt curtains are used in open waters to keep sediment from migrating into the rest of the water body.

Curtains are for the following specified uses:

- Still water - Lakes, ponds, or other large bodies of water with little or no current
- Moving water - Streams and rivers with current less than 7 ft/sec
- Work area - Moving or still water to confine work area

Silt curtains are impermeable material with a flotation carrier on top and weighted bottom. A heavier material and weighting system is required for areas in moving water or work areas.

### Important Tip

Install the curtain as close to the shore as possible, parallel to the shoreline to create a barrier.

## Installation Tips

- Depth of the curtain must be a minimum of 2 feet and maximum of 10 feet
- Both ends of the curtain must be secured to land for still water, and one downstream end for moving water
- Removing the curtain must be done such that the amount of sediment re-suspended in the water is minimized
- DO NOT install silt curtain across a stream, ditch, or channel that has any level of flow. It does not work and will cause erosion to the banks and/or bottom of the waterway. The curtain forces the water to flow down and under it or around it. No sediment is trapped and scour is likely to occur
- DO NOT install silt curtain too close to a culvert outlet or other source of discharge in a lake or pond. Again, the velocity of the water will not allow sediment to settle out, will force the water under the fabric, possibly eroding the bottom and dispersing the sediment over a larger portion of the waterbody

Duane Stenlund, Mn/DOT



Working in a flowing stream? Install floating silt curtain in a herringbone/staggered pattern.

Duane Stenlund, Mn/DOT



Working along the bed or bank of a stream or lake will require the installation of a floating silt curtain..

## Remember

Work in critical resource will require that DNR general permit requirements are met.





Partial stream diversion.

### 3.5.2 Diverting Water Around the Work Area

One effective means of controlling runoff (and so minimizing erosion) is to divert water around the construction site. The following tools/strategies can be used to divert stormwater:

- Dikes/cofferdams
- Ditch blocks
- Pumping
- Pipe diversions
- Temporary channels
- Partial stream diversions
- Working from a barge

#### Dikes (Cofferdams)

Dikes are used to stop the flow of water from entering a specific area on a body of water or to stop and divert water to a temporary bypass at a water crossing.

##### Types

Shallow Water  
(less than 3 feet)

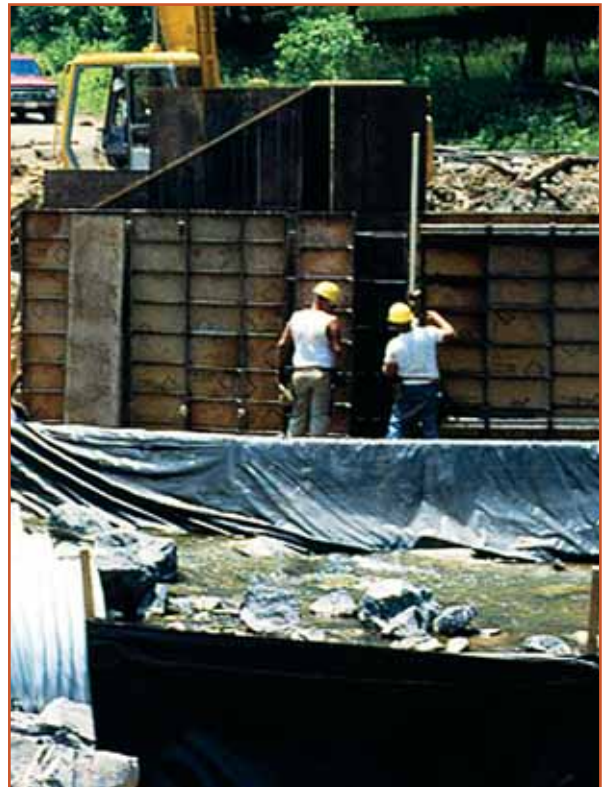
- Plywood barriers
- Median barriers
- Aqua tubes
- Sandbags

Medium Water Depth  
(3 to 6 feet)

- Porta-dam
- Riprap with weighted silt curtain or plastic

Deep Water  
(6 feet or greater)

- Sheet piling
- Winter work



Duane Stenlund, Mn/DOT

Working along the bed or bank of a stream or lake will require the installation of a floating silt curtain.

### *Installation Tips*

- Dikes need to be installed upstream and downstream of the proposed structure
- Dikes need to be installed high enough to prevent water from entering the work area

Duane Stenlund, Mn/DOT



Flow from adjacent ditch will need to be blocked or diverted to the redirected stream flow.

### **Ditch Blocks**

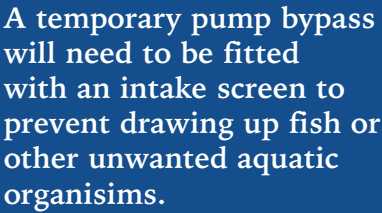
Ditch blocks are used to prevent water flowing from adjacent ditches into the construction area.

#### *Installation Tips*

- Use one of the methods discussed in the dikes/cofferdam section
- Flows may need to be diverted to the main stream if high flows are anticipated

### **Remember**

The dewatering of a construction area will require that sediment water be treated with the appropriate BMPs to prevent a sediment water discharge.



## Pipe Diversions

Pipe diversion can be used to safely divert the water around the construction area and allow the contractor to work in dry conditions.

### *Installation Tips*

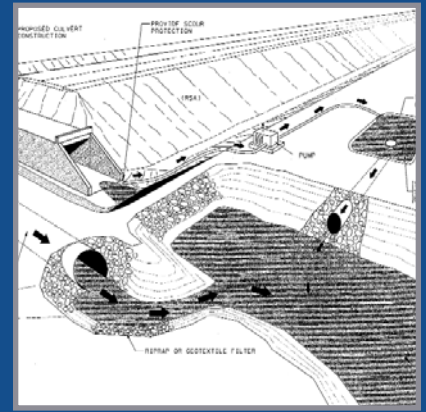
- Select a pipe large enough to handle anticipated high-flow conditions
- Install a diversion tube adjacent to the dike area
- Stabilize exposed soils using the rapid stabilization criteria
- Method will need to allow fish passage during migration periods (generally 2 fps for a 2-year, 24-hour storm event)
- Provide energy dissipation at the downstream end of the pipe bypass
- Diverted water is to be directed to a sediment basin before discharging to a Water-of-the-State.

## Temporary Channel

Temporary channels can be used to divert water around a construction site in lieu of using a temporary bypass pump or temporary pipe.

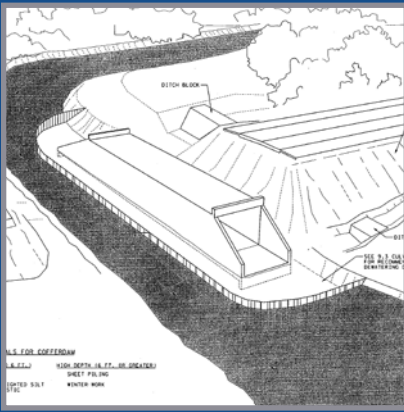
### *Installation Tips*

- Channel bed should be designed to resist erosion and bed shear potential
- Side slopes shall be provided with temporary erosion protection using rapid stabilization criteria
- Size channel appropriately to treat flows from the area



A temporary bypass should be fitted with the appropriate energy dispersion to prevent scouring at the pipe ends.





## Partial Stream Diversion

A partial stream diversion can be used when there are high flows and the stream being diverted is too wide to use a temporary bypass pump or channel pipe. Because this practice allows work to be completed on one side of the channel at a time, it is especially effective for culvert installations, open bottom structures, and bridge construction.

## Types

- Sheet pile
- Precast concrete portable barrier
- Portadam™ or Aquatube™, or similar

## Installation Tips

- Construct a center dike parallel to the stream flow
- Shift the upstream and downstream ends of the center dike to conduct work on to the opposite side of the channel



**Duane Stenlund, Mn/DOT**

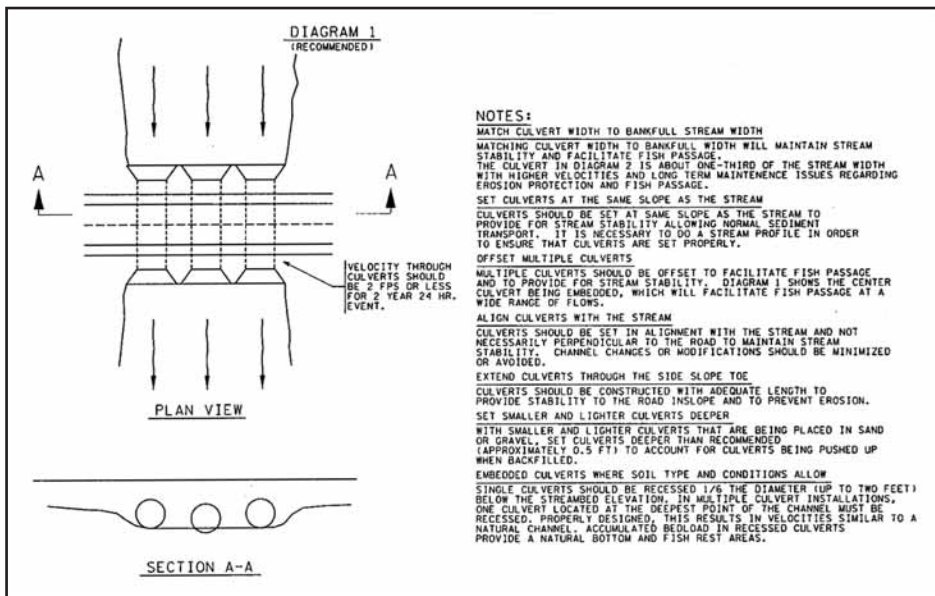
A partial stream could be done on both sides of the channel to allow the work to occur simultaneously on both sides of the stream.

### 3.5.3 Temporary Stream Crossings

Temporary haul or access roads help to access the entire span of the project. In some cases, they need to cross streams. Care will need to be taken to promote minimal disturbance to bed and bank at the water crossing.

Types of Haul Road Crossings:

- Temporary bridge
- Engineered fill material
- Temporary crossings
- Temporary culverts



Culvert crossing detail.



Temporary stream crossings must not impede the existing flow of water.

### Important Tip

Diverting water around the work area and doing the work in the dry is recommended in critical areas such as streams.



Duane Stenlund, Mn/DOT

Temporary crossings need to have all the proper temporary BMPs installed to control erosion.

### *Installation Tips*

- Size haul road crossings to allow for a 2-year, 24-hour storm event
- Fill must be clean material that will allow flow over the top without creating erosion problems or collecting sediment from the roadway
- All exposed soils within a defined area are required to receive concurrent area critical stabilization
- Fills slopes need adequate stabilization to prevent erosion
- Access points to the crossing need appropriate sediment tracking minimization measures installed, such as rock, riprap, or wood slash
- Culverts must be installed to align with the existing channel, if possible
- Culverts must match the bankfull width of the stream or channel

### **Barge Pier Construction**

Barges are often used to construct deep water piers. During the construction process there may be a need to dewater a work area protected by cofferdams. If the water is sediment-laden, it is required to be treated, with an appropriate BMP prior to discharge to a Water-of-the-State.

- Sand filters
- Flocculant
- Clarification tanks on the barge
- Sediment pond

## 3.6 Other Considerations

### 3.6.1 Multi-Function BMPs

It is often the case that when installing a BMP to address one aspect of construction site ESC, it will serve multiple functions.

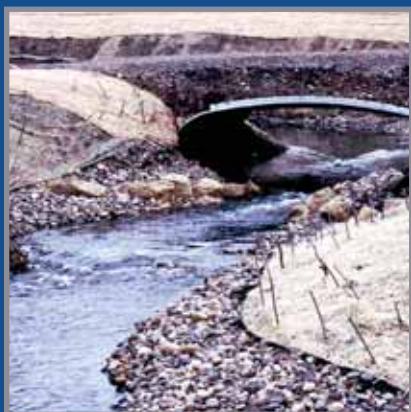
The table below illustrates the primary function of several different BMPs and the side benefit that they can provide.

Method/Material BMP	Control Runoff	Minimize Erosion	Manage Sediment	Permanent Vegetation	In/Around WOS	Other Benefits
Temporary Down Drain	P	*		*		
Hydraulic mulch		P		*	*	Dust Control
Straw Mulch		P		*	*	Dust Control
Geotextiles	*	P	*		*	Dust Control
Rolled Erosion Control Products		P		*	*	Dust Control
Woodchips		*	P			Dust Control
Diversion Berms	P			*	*	
Riprap		*	*	P	*	
Silt Fence			P			
Temporary Sediment Basins/Traps			P		*	
Check Dams		*	P		*	
Energy Dissipation		*		P	*	
Filter Logs	*		P			
Fiber Logs		*		*	P	
Street Sweeping			P		*	Dust Control
Inlet Protection			P		*	
Vehicle Tracking Pad		*	P		*	Dust Control
P=Primary    *=Secondary						

### Remember

BMP's that elp minimize erosion are the most cost effective and successful in controlling erosion.





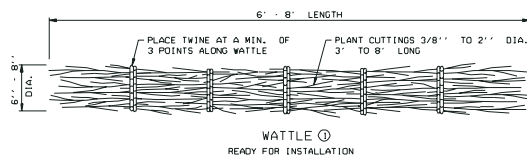
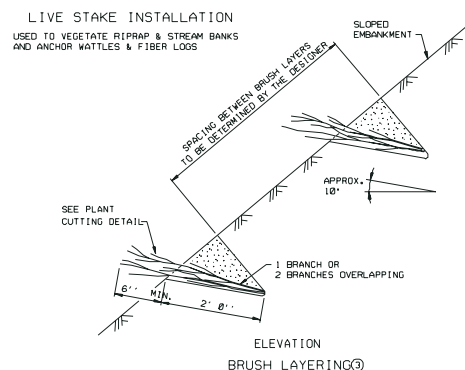
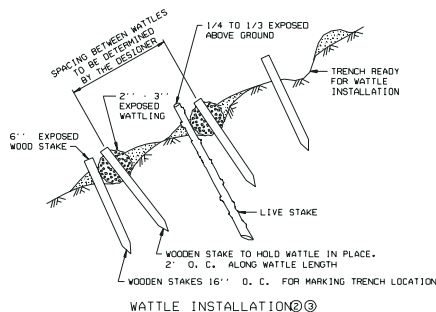
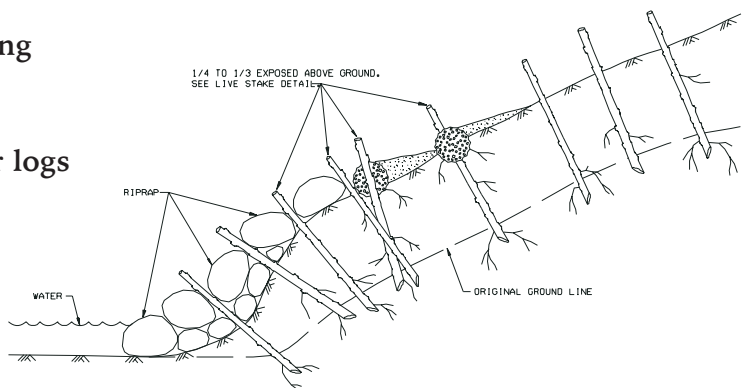
Duane Stenlund, Mn/DOT

Bioengineering can be used as an alternative means to stabilize a hill slope, lake or stream bank rather than riprap.

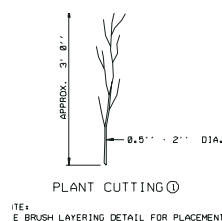
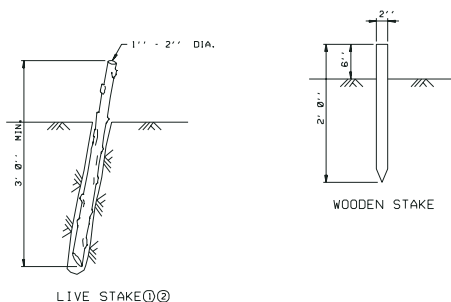
### 3.6.2 Bioengineering

Bioengineering may be used as a permanent soil stabilization system in ditches, along stream banks, on shorelines, or on slopes. This process may employ one of the following techniques:

- Wattles
- Brush layering
- Live staking
- Placing fiber logs
- Root-rap



- NOTES:  
SEE SPECS. 2577 & 3895.
- ① PLANT CUTTINGS SHOULD BE DORMANT, BEFORE LEAF-OUT OR AFTER LEAF DROP. TRANSPORT AND STORE LIVE STAKES & CUTTINGS IN WATER.
  - ② TO INSTALL LIVE STAKES IN RIPRAP, USE PRY BAR TO MAKE PILOT HOLE. NOT ALWAYS NECESSARY TO HAVE PILOT HOLE WHEN RIPRAP NOT PRESENT.
  - ③ IN PLAN VIEW, THE BRUSH LAYERING AND WATTLE INSTALLATION WILL BE IN CONTINUOUS TRENCHES FOLLOWING A CONTOUR.



## FYI

For more information and literature on soil bioengineering contact the Mn/Dot Erosion Control Unit.

Detail drawings for a typical permanent soil stabilization bioengineering installation.

### 3.6.3 Maximizing Project Resources

Utilize BMPs that may be generated on-site. These BMPs will be more accessible and it will likely be more feasible to reapply often. On-site resources/BMPs are especially useful (and handy) if protection is needed before a large rainfall event.

#### Using Topsoil

Topsoil is often stockpiled at the construction site and is never used a valuable resource until the site is ready to be buttoned up. Topsoil can be used for temporary stabilization in one of the following ways:

- Diversion berm
- Perimeter control

Use either of these methods to protect a valuable resource such as an infiltration basin, wetland, lake, or any other Water-of-the-State.

#### Woodchips and Slash Mulch From Site Clearing

Woodchips and slash mulch generated from the clearing and grubbing phase can be used for:

- Vehicle tracking pads
- Temporary stabilization
- Protecting trails or existing roads
- Placement under a dewatering device such as a dewatering bag or WIMCO Dewatering Basin



Woodchip stabilized tracking pad.



Intalling a soil berm or diversion at the top of the slope will be an effective tool in establishing vegetation.

#### Important Tip

Diversion berms may require temporary stabilization, energy dissipation if there is a designated outlet, or a temporary down drain.



Duane Stenlund, Mn/DOT

Water can be collected from temporary basins or other areas to be used as dust control.



Aaron Mlynek, Carver County Soil and Water Conservation District

Alternative devices can be used when space does not permit installation of temporary sediment basins.

## Important Tip

Using a flocculant for dewatering practices will require that the treated water be allowed to settle for a sufficient period of time before discharging to a downstream water-of-the-state.

## Sediment Basin Water

Sediment basin water can be used to control dust on the construction site.

- Use a pump mounted on a floating skimmer to minimize the sediment intake
- Extremely sediment laden water may need a couple of days to settle before being used in a water truck

### 3.6.4 Site Drying, Dewatering, and Basin Draining

Dewatering of sediment-laden water must include treatment with appropriate BMPs to prevent nuisance conditions. The following is a list of BMPs commonly used in dewatering practices:

- Temporary or permanent sediment basins
- Inline flocculant application
- Rock barrel dewatering
- Floating skimmer/pump
- Plastic lined dumpster
- Sand media filter with inline flocculant application
- Energy dissipation to prevent scour
- Other methods as approved by the ESC Supervisor and/or Engineer



Duane Stenlund, Mn/DOT

Filtering through a series of rock weepers is an effective method of treating discharge water. Photo from Mn/Dot TH23 project at Spicer Minnesota.



### 3.6.5 Sheet Piling for ESC

Sheet piling can be used to stabilize slopes, control runoff, or as perimeter control adjacent to:

- Bridge abutments
- Streams/creeks
- Lakes
- Wetlands

Duane Stenlund, Mn/DOT



Sheet piling will need to be anchored into the ground properly to prevent caving in or buckling under hydraulic forces. In this case, pilings were used to block the flow of water and a pump was utilized to divert the water around the construction site.

Duane Stenlund, Mn/DOT



Sheet pile adjacent to a water body can be used to separate the work area from the main channel or redirect the flow of water.



# Appendices

## Appendix A:

### Opportunities for Training and Feedback

#### Annual Construction Technician Workshop

- Includes Erosion and Sediment Control presentations
- Typically a two-day workshop per year, February/March
- Check the Mn/Dot Training Opportunities Bulletin

#### Minnesota Erosion Control Association (MECA) Erosion Control Conference and Workshops

- The annual conference is usually in early to mid-March
- Focused erosion control workshops take place throughout the year and throughout the state
- Check the MECA website for more information ([www.mnerosion.org](http://www.mnerosion.org))

#### Environmental Services Office

- Annual environmental workshop usually in mid-March
- Advertised by the Mn/Dot Training Office, in the monthly Training

#### Resource Professionals Alliance (RPA)

- A group that holds erosion control and stormwater annual conferences in Minnesota, Wisconsin, North Dakota, South Dakota and Winnipeg Canada
- The annual Minnesota conference is usually in early December
- Call the RPA general number for more information 952-470-0993

#### University of Minnesota Erosion/Sediment Control Certification Program

- Offers certification training usually during the period from mid-November through mid-May
- Also offers recertification training  
1-800-646-2202 or 612-625-9733  
[www.erosion.umn.edu](http://www.erosion.umn.edu)



## Mn/Dot Websites

- **Environmental Services Office**  
..... [www.dot.state.mn.us/environment/](http://www.dot.state.mn.us/environment/)
- **Seeding Manual**  
[www.dot.state.mn.us/environment/pdf\\_files/seedingmanual.pdf](http://www.dot.state.mn.us/environment/pdf_files/seedingmanual.pdf)
- **Tech Memos**  
..... [www.dot.state.mn.us/environment/tech\\_memos.html](http://www.dot.state.mn.us/environment/tech_memos.html)
- **Approved Products Lists**  
..... ??????????????
- **MPCA Website – Storm Water Program**  
..... [www.pca.state.mn.us/water/stormwater/](http://www.pca.state.mn.us/water/stormwater/)
- **EPA – NPDES Construction Permit**  
..... [cfpub1.epa.gov/npdes/stormwater/cgp.cfm](http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm)

## Technical Sources of Information

MPCA's BMP Manual – “Protecting Water Quality in Urban Areas”, July 2000

“Storm Water Management for Construction Activities:...”

Mn/Dot Standard Specifications, 2005 Edition

MPCA Minnesota Storm Water Manual

## Technical Resources

### Professional Associations

- **Minnesota Erosion Control Association (MECA)**  
..... [www.mnerosion.org](http://www.mnerosion.org)
- **International Erosion Control Association (IECA)**  
..... [www.ieca.org](http://www.ieca.org)
- **Erosion Control Technology Council (ECTC)**  
..... [www.ectc.org](http://www.ectc.org)

## Government Agencies

- **Local NRCS Office –**  
Natural Resource Conservation Service (formerly SCS) –  
Statewide Information Number .....651-290-3675
- **Corps of Engineers**  
Statewide Information Number .....651-290-5375
- **US Fish & Wildlife Service**  
Statewide Information Number .....952-725-5348
- **Mn Pollution Control Agency**  
General Number .....800-657-3804  
Enforcement – Ken Moon .....  
Stormwater Program – Dale Thompson .....651-296-5897  
Mike Findorff .....651-296-6798  
Todd Smith .....651-215-6008
- **Commonly Asked NPDES Permit Questions**  
.....[www.pca.state.mn.us/water/pubs/sw-cqa.pdf](http://www.pca.state.mn.us/water/pubs/sw-cqa.pdf)
- **Your county Soil and Water Conservation District**  
Statewide Information Number .....651-690-9028  
website .....[www.maswcd.org](http://www.maswcd.org)
- **DNR Waters**  
Statewide Information Number .....651-296-4800
- **Your Watershed Management Organization/District**  
Statewide Information Number .....651-452-8506  
website .....[www.mnwatershed.org](http://www.mnwatershed.org)



## Appendix B: Glossary, & Credits

### Glossary

**Best Management Practices (BMPs)** – a phrase that is used to label as a group and describe the products, methods and devices used to minimize erosion and sedimentation.

**Compliance** – adhering to all provisions, conditions and requirements of permits.

**Contractor** – for each project, the entity contracted by Mn/Dot to construct the project and signs the NPDES permit application as a copermittee.

**Contractor's Site Erosion Plan** – a plan or drawing showing temporary and permanent erosion and sediment control at a particular site.

**Critical Areas** – environmentally sensitive or ecologically important areas on or near the project site.

**Disturbed Area** – the portion of the project site that, at any given time, has been subjected to land-disturbing activities and is, at that time, without a protective cover of vegetation or other material.

**Erosion** – the process of particle detachment and transport due to the forces of wind, rain and overland flow.

**Erosion and Sediment Control (ESC) Plan** – the portion of the entire set of plans and specifications that addresses the methods, practices, devices, and products for both permanent and temporary erosion/sediment control.

**Erosion Control Schedule** – a brief submittal from the contractor to the Mn/Dot inspector, giving a proposed schedule each week of corrective or routine measures to keep the project in compliance.

**ESC** – Erosion and Sediment Control; those practices which protect the soil from the erosive and sediment transport forces of stormwater during and after construction activities.

**ESM** – Erosion Stabilization Mat (also referred to as Turf Reinforcement Mat (TRM)).

**Filter Logs** – biodegradable materials such as straw, wood excelsion, compost or aggregate encased in a roll and used to slow or filter storm water runoff.

**Flocculant** – materials which coagulates dispersed clay particles and causes them to settle within a short period of time. Frequently used in sediment traps to reduce turbidity of discharge water.

**Ground Cover** – vegetation, mulch, or some inorganic material that covers and protects the soil.

**Hydraulic Soil Stabilizer** – Soil stabilizing materials which are mixed with water and applied by a hydroseeder.

**Impaired Waters** – water and water bodies which have a level of contamination and discoloration due to sediment, dissolved solids, metals, nutrients and or bacteria.

**Implementation** – putting into action the practices, and installing the devices and products that minimize erosion and sedimentation.

**Inspection** – review of project site to identify potential problem areas, offsite issues, BMP Placement, proper function and maintenance of BMPs, corrective actions needed and whether project is substantially in compliance with permit requirements.

**Local Permitting Authorities** – defined by the NPDES as any township, county, municipality, conservation district, watershed district, watershed management organization, or other public entity that has the authority to review and approve the construction activities.

**Maintenance** – any and all efforts needed to keep products and devices properly functioning.

**NPDES** – the National Pollutant Discharge Elimination System, which describes the regulatory requirements of eliminating pollution to waters of the US from non-point sources.

**NPDES Permit** – an authorization to discharge stormwater associated with construction activities. Regulates the discharge of stormwater during construction to waters of the state.

**Off-site** – beyond the permanent right-of-way or temporary construction easement limits.

**Permanent Erosion Control Measures** – long term erosion control measures such as combing, culvert aprons, cable concrete, riprap, flutes, sodding, permanent vegetation, and other means to permanently minimize erosion on the completed project.

**Permanent Measures** – measures that will remain in place after the project has been completed.

**Permanent Sediment Control Measures** – measure used to capture sediment of ran extended period of time after the project is completed such as sediment basins, grit chambers, skimmers, sumps, and other means. All these measures require maintenance on a routine basis.

**Rapid Stabilization Methods (RE Mn/Dot 2575.3N)** – operations and methods formulated to rapidly stabilize small, critical, disturbed areas. Within the Mn/Dot specifications, five methods are described.

**Runoff** – the amount of water which, following a precipitation or melting event, does not infiltrate into the ground but flows from the area in a sheet or concentrated flow.

**Runoff Control** – those practices that mitigate the erosive and sedimentation factors of stormwater by reducing the velocity, concentration, and flow-path of runoff. May also include practices to infiltrate water into the soil.

**Sediments** – soil particles that have been eroded and are transported by flowing water or wind.

**Sedimentation** – the deposition of soil particles that have been transported by water or wind.

**Sediment Barriers** – erosion control measures that are intended to separate sediment from the surrounding area.

**Sediment Basin** – a pond created by excavation or embankment and designed to detain runoff and restrict outflow long enough to allow sediment to settle out.

**Sediment Control** – devices or practices used specifically to keep sediment from going offsite.

**Sediment Laden Runoff** – runoff water which containing soil particles either in solution or suspension.

**Sediments, tracked** – soil transported off-site and are deposited any wheeled or tracked construction or related vehicle or equipment.

**Site Erosion Plan** – a sketch or a description of erosion and/or sediment control measures presented by the contractor for working in or near sensitive areas.

**Special Waters** – waters listed in the NPDES construction permit which are unique and require extra protection measures.

**Stabilized Soil** – soil areas that have been temporarily or permanently covered with vegetation, mulch, blankets, etc. to the extent that erosion will be minimized under most conditions.

**Storm Drain Inlet** – drop type inlets that provide for the ingress of surface water into underground drainage systems such as sub inlets, manholes, catch basins and other vertical drop inlet structures.

**Storm Drain Inlet Protection** – best management practices and devices for preventing sediment into and through underground drainage systems. Does not include practices to protect culverts.

**Storm Water Pollution Prevention Plan (SWPPP)** – a plan designed to decrease or prevent off-site nonpoint pollution and ultimately protect waters of the state. Developing the plan is the responsibility of the owner and must contain temporary and permanent erosion and sediment control BMPs, permanent stormwater management provisions and other pollution prevention means.

**Temporary Erosion Control Measures** – short lived soil erosion measures such as mulching, temporary seeding, Mn/Dot Rapid Stabilization methods, and other means to protect exposed soils before the installation of permanent erosion control measures. Temporary erosion control measures may also be used to supplement the permanent measures.

**Temporary Measures** – measures that will be removed or replaced during the “life” of the project.

**Temporary Sediment Control Measures** – measures used for one or two seasons to capture sediment or keep sediment from depositing in adjacent areas such as silt fence, floating sediment traps, silt curtain, bale barriers, inlet protection devices, and other means.

**Time of Disturbance** – the amount of time, after removing in place vegetation or structures, that soil is without protective cover.

**Turbidity** – the measure of how clear or discolored water is, caused by suspended solids such as soil sediments and/or organic matter.

**Turf Establishment** – seeding/sodding/mulching and all operations to establish vegetative ground cover.

**Water(s) of the State** – the NPDES permit in Minnesota defines these as inclusive of all types of water related resources. Also includes drainage ditches, ponds, aquifer, irrigation systems and any accumulation of water.



## Credits

### Information Sources

- Watershed Protection Techniques, Volume 2, Number 3 (February 1997); Center for Watershed Protection; Ellicott City, MD
- Various publications and data; U.S. Environmental Protection Agency
- Biotechnical and Soil Bioengineering Slope Stabilization: D.H. Gray & R.B. Sotir, John Wiley & Sons, Inc., New York; 1995
- Erosion Draw 3.0, Erosion Control Standards and Construction Drawings; Salix Applied Earthcare, Redding, CA; 1999
- Erosion Prevention and Turf Establishment Manual; Minnesota Department of Transportation; 1970
- Mn/DOT Seeding Manual 2003
- Protecting Water Quality in Urban Areas, BMPs for Minnesota; Minnesota Pollution Control Agency, July 2000
- Technical Note TN-20, Northwestern Ontario Boreal Forest Management, 1992
- Designing for effective Sediment Erosion Control on Construction Sites: Jerald F. Fiffeld, Forester Press, Santa Barbara, CA; 2001

### Photos

- Mn/Dot Environmental Services
- WIMCO, Inc.
- Terra Novo, Inc.
- Bonestroo, Rosene, Anderlik and Associates
- DNR
- American Excelsior, Inc.

## Handbook Development

- **MN/Dot Project Manager – Brett Troyer**, Erosion Control Unit
- **Editor – Jesse Carlson**, Bonestroo, Rosene, Anderlik and Associates
- **Senior Art Director – John Kuhne**, Bonestroo, Rosene, Anderlik and Associates
- **Graphic Designer – Jeff Peterson**, Bonestroo, Rosene, Anderlik and Associates

## Contributors

- **Leo Holm**, formerly with Mn/Dot, Forestry and Turf Establishment Section
- **Dwayne Stenlund**, MN/Dot, Turf Establishment Unit



**Mn/DOT Project Manager - Brett Troyer**, CPESC has 10 years of experience in erosion and sediment control and vegetation establishment. For the past ten years Lori has been part of the Erosion Control Unit contributing to planning, construction, and maintenance efforts of all types of Mn/DOT highway projects.

**Editor - Jesse Carlson**, is a Project Scientist in Bonestroo's Water and Natural Resources Group. He has eight years of experience in planning, designing, and implementing runoff management solutions in the areas of erosion and sediment control and water quality. Jesse also contributes to Water and Natural Resource Group projects involving surface water and natural community management.

**Art Director - John Kuhne**, has been with Bonestroo for more than 18 years and is the Senior Art Director in the Marketing Department. John is responsible for the design and implementation of marketing and collateral material for internal and external clients.

**Graphic Designer - Jeff Peterson** is relatively new to Bonestroo, however, he has acquired extensive and versatile experience over the last 12 years. As an independent designer, he has created publications, marketing materials, products and packaging for many clients.



