Overview of the Quality and Quantity of Roadway Runoff and Current Status of Phase II Storm Water Rules
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Final Report

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This report represents the results of research conducted by the authors and does not necessarily reflect the official views or policies of the Minnesota Department of Transportation. This report does not contain a standard or specified technique.
This report provides a summary of the current storm water rules and proposed rules as they may effect the construction and operation of the streets and highways of Minnesota Cities and Counties. This report also summarizes *The Quantity and Quality of Runoff from Selected Guttered and Unguttered Roadways in Northeast Ramsey County, Minnesota*; a study and resulting report that was conducted for the Minnesota Local Road Research Board by the United States Geological Survey. The rules summarized include the Federal Phase II Storm Water Rules, the Minnesota Pollution Control Agency’s response to the proposed rules, and the process of obtaining Industrial and Municipal Storm Water Permits and Construction Storm Water Permits.
1.0 Executive Summary

On November 16, 1990, the Environmental Protection Agency (EPA) published Phase I Storm Water Rules in an effort to reduce contaminants associated with non-point runoff. These rules require storm water discharge permits for medium (population >100,000) and large (population >250,000) municipalities, certain industrial sites, and construction sites that disturb five acres or more of land.

On January 9, 1998, the EPA published proposed Phase II Storm Water Rules which will require storm water discharge permits for small municipal separate storm sewer systems (MS4s) in communities in urbanized areas with a population of less than 100,000, and for construction sites that disturb one to five acres of land. EPA defines MS4s, in part, as a conveyance or system of conveyances that are owned or operated by a state, city, town borough, county, parish, district, association, or other public body designated or used for collecting or conveying storm water which is not a combined sewer and which is not part of a Publicly Owned Treatment Works (POTW). MS4s covered under the new rules (see Section 4.0) are required to apply for storm water discharge permit coverage by May 31, 2002.

There is concern that the proposed Phase II Storm Water Rules, coupled with the potential for future storm water regulations, will require MS4s to monitor and manage roadway runoff. This concern stems from the fact that roadway runoff is difficult to monitor and manage due to location, diffuse sources of potential contaminants, varied climatic conditions, variable traffic patterns, and other associated factors. Since roadway runoff is a classic non-point pollutant source, there have been a number of studies addressing runoff quality, its impact on receiving waters, and management techniques. The results of these studies and the concern of city and county engineers about roadway runoff management prompted the Local Road Research Board (LRRB), in cooperation with the Minnesota Department of Transportation (Mn/DOT), to enlist the partnership and services of the United States Geologic Survey (USGS) in implementing a three-year study to examine storm water runoff and snow-melt runoff at five municipal roadways in Minnesota. The LRRB asked Braun Intertec to provide a brief summary of this study, which is provided in Section 3.0. Perhaps more importantly, the LRRB also asked Braun Intertec to summarize the proposed Phase II Storm Water Rules, review the MPCA’s position on the Storm Water Rules, provide information on obtaining a storm water permit, and provide information and references on best management practices (BMPs).

It should be pointed out that according to the Minnesota Pollution Control Agency (MPCA), who administers the EPA’s storm water program, the aim of the proposed rules is not to regulate roadway runoff. At this time, the MPCA does not have a municipal roadway runoff management program in place. The MPCA believes that Minnesota already has effective legislation and rules in place to protect water quality. It is the MPCA’s aim to focus on roadway runoff associated with roadway construction and maintenance projects through construction storm water permits. According to the MPCA, there may be special situations where municipal roadway runoff could impact specially designated habitats or water
bodies such as trout streams; these situations may need to be reviewed under the Phase II Storm Water Rules. Since MS4s may own storm water conveyance systems, especially where the point of discharge may be to significantly impaired waters, there is the potential that they may be required to monitor roadway runoff and establish BMPs to control runoff and reduce pollutants. Therefore, MS4 planners and engineers may want to consider reviewing and establishing BMPs prior to obtaining a permit under the Phase II Rules.

This report did not include any research on the cost associated with selection and implementation of BMPs, some of which are very costly. For example, those BMPs associated with removal of dissolved metals using traditional methods are cost prohibitive when implemented on a large scale and may not be effective.
2.0 Introduction

The protection of water quality has long been on the agenda of federal, state, and local governments. Historically, water quality regulations have been directed toward large municipal sewage treatment plants and industries that generate industrial process wastewaters or what has been termed point-source discharges. Consequently, most of the early water regulations required monitoring and improvement of the quality of process wastewaters prior to being discharged. Under the Federal Clean Water Act (CWA), these facilities were required to obtain a National Pollutant Discharge Elimination System (NPDES) permit in order to legally discharge process wastewaters to surface waters of the United States.

In 1987, the United States Environmental Protection Agency (EPA), at the direction of the United States Congress, extended the NPDES rules, requiring that large metropolitan areas and certain industries also monitor the quality of discharges associated with storm water runoff or what have been termed non-point discharges. Since 1992, storm water discharge permits have been required for municipalities with populations greater than 100,000, for certain industries that have “significant materials” exposed to precipitation events, and for construction sites where five acres or more of land has been disturbed. These rules are known as the Phase I Storm Water Rules. A new proposal by the EPA to regulate storm water runoff from small municipalities and construction sites (Phase II Storm Water Rules) was signed in December of 1997 and will be finalized by March 1999. As proposed, these regulations will require storm water discharge permits for municipalities with populations less than 100,000 and for construction activities on one to five acres of land. These new Storm Water Rules may also require municipalities to monitor discharges to selected land-use types within the municipality.

Subsequent to implementation of the Phase I Storm Water Rules, a number of studies were conducted on the impact of population density, agricultural practices, construction, and other conditions associated with the quality of storm water runoff and receiving waters in the United States. One area of concern in the urban setting is the impact of potential contaminants contained in roadway runoff and how they could affect the quality of receiving waters. The potential impact of roadway runoff to surface waters coupled with proposed Federal Phase II Storm Water Rules which may affect up to 3,500 municipalities throughout the nation, presents new concerns and challenges to state and local planners and municipal engineers. For a summary of the Phase II rules, see Section 4.0.

In Minnesota, the impending regulation of smaller municipalities prompted a study to examine roadway runoff issues within the state. The Local Road Research Board (LRRB), in cooperation with the Minnesota Department of Transportation (Mn/DOT), enlisted the partnership and services of the United States Geological Survey (USGS) in implementing the three-year study (1993-1995) to examine storm water runoff and snow-melt runoff at five municipal roadways in Ramsey County, Minnesota. This study is entitled: The Quantity and Quality of Runoff from Selected Guttered and Unguttered Roadways in
Northeast Ramsey County, Minnesota. As a result of this study and other storm water-related issues, LRRB requested Braun Intertec to complete the following tasks:

- Provide a brief summary of the study: *The Quantity and Quality of Runoff from Selected Guttered and Unguttered Roadways in Northeast Ramsey County, Minnesota*;

- Provide an overview of the proposed Federal Phase II Storm Water Rules;

- Provide information on the Minnesota Pollution Control Agency’s (MPCA) response to the proposed Federal Phase II Storm Water Rules;

- Provide current information on obtaining a storm water permit; and

- Provide information and references on selected BMPs.

This paper addresses the above tasks.
3.0 Summary of: The Quantity and Quality of Runoff from Selected Guttered and Unguttered Roadways in Northeast Ramsey County, Minnesota (1)

Since runoff from municipal roadways may impact receiving waters, and in light of the potential for EPA to require small municipalities to monitor discharges to selected land-use types, the USGS in cooperation with Mn/DOT and the LRRB implemented a three-year study to examine storm water runoff and snow-melt runoff at five municipal roadways in Minnesota. The study was conducted at five sites located in Ramsey County, Minnesota, from 1993-1995. The Abstract, location map, and summary from this report are included in the Appendix. The following is a brief summary of this study.

3.1 Purpose of Study
The overall purpose of the study was to describe the quantity and quality of runoff from selected roadways. The study had the following objectives:

1. To compare rainfall runoff and snow-melt runoff water quality;

2. To determine rainfall runoff event loading of dissolved solids, nutrients, dissolved ions, selected metals, and semi-volatile organic compounds; and

3. To describe the effects of traffic patterns and latent periods on runoff quality from selected guttered and unguttered roadways.

3.2 Description of Selected Roadways
The study centered around five primary and secondary arterial roadways located in Ramsey County, Minnesota. These five sites consisted of the following: county unguttered; residential guttered; county guttered; municipal state-aid unguttered; and, municipal state-aid guttered. A sixth site, an unguttered residential roadway, was also planned in the study, but a satisfactory site could not be located.

3.3 Runoff Volume
Equipment for collecting and recording rainfall data, and monitoring and recording flow measurements was set up at each monitoring site. This equipment was used to monitor all storm water events except those of low-intensity duration. Rainfall and flow data collected during the study period showed considerable variation in rainfall intensity, amount, and duration from event to event and site to site.

Runoff response time to storm water events, which is the interval between the beginning of a precipitation event and the beginning of measurable runoff, was measured at guttered and unguttered sites. The authors concluded that runoff from guttered sites, which are paved and practically impervious, responded much more rapidly - in one third the time - to the onset of rainfall than did unguttered sites. It was observed during the study that hot, dry guttered pavement responded more slowly to precipitation than
did cool, saturated pavement. The authors believe that response times could have been delayed due to absorption into and evaporation from the pavement. According to the authors, even though pavement is impervious, it can absorb some moisture, especially if it is old and weathered.

The unguttered sites consisted of more unpaved area than the guttered sites, which resulted in longer recession periods (period of withdrawal). The authors believe that the longer recession periods are due to the extent and type of ground cover present along the roadway, since pervious, grass covered, undeveloped, and unsaturated soils may absorb more moisture before reaching saturation, resulting in slower response times. Since the unguttered sites underwent longer recession periods, more total rainfall and total runoff were monitored at these sites than at guttered sites. That is, the recession period continued at unguttered sites during pauses in precipitation where at guttered sites runoff had ceased.

The authors calculated rainfall-runoff coefficients (percentage of the rainfall that ran off from the area measured) for primary drainage areas averaging 0.53 for guttered sites and 0.37 for unguttered sites.

### 3.4 Snowmelt-Runoff and Rainfall Water Quality - Findings and Conclusions
Precipitation and runoff events were monitored for five sections of roadway in Ramsey County, Minnesota, from 1993-1995. Water samples were collected from 31 snowmelt-runoff events representing 10 separate snowmelt events, and 71 rainfall-runoff events representing 31 separate rainfall events. Samples were analyzed for selected physical properties, dissolved solids, nutrients, dissolved ions, selected metals, and semi-volatile compounds. Investigators were also interested in determining if the rainfall itself contributed to constituents found in the roadway runoff. Therefore, additional rainfall samples were collected and analyzed from 19 rainfall events.

The authors noted the following findings and conclusions.

**Snowmelt-Runoff Findings**
- Mean concentrations for sodium and chloride were approximately 1,000 times greater in snowmelt-runoff samples than in rainfall-runoff samples.

- Mean concentrations of the dissolved metals, aluminum, chromium, lead, and zinc were two to four times higher in snowmelt-runoff samples than in rainfall-runoff samples.

- Median concentrations of total suspended solids (TSS), dissolved chloride, dissolved sulfate, and total chromium in snowmelt-runoff were two to seven times higher at guttered sites than at unguttered sites. Median concentrations of total phosphorus and zinc were not noticeably different between these site types.

- Median concentrations of TSS, dissolved chloride, and total zinc in snowmelt-runoff in 1993 were one half to one third lower than in 1994 and 1995.
When the median concentrations of TSS and dissolved chloride in snowmelt-runoff were compared with similar data obtained from Metropolitan Minnesota interstate system (1981, 1987, and 1988), they were up to 10 times higher for the study sites.

Conclusions

The authors believe that the severity of winter conditions and the application of sand and road salt may be responsible for the year-to-year variations in the median concentrations of various constituents. Elevated dissolved ions such as sodium and chloride, as well as other dissolved ions and metals in snowmelt-runoff, may be due to the application of sand and road salt and the corrosive effects of road salt on metals, especially motor vehicles.

Rainfall Findings

Analysis of rainfall samples showed that dissolved nitrate and dissolved ammonia were present in rainfall in high enough concentrations to be a source in roadway runoff.

Conclusions

Analysis of collected rainfall at two sites suggested to the authors that rainfall was not a direct source of most constituents. However, the authors did conclude that rainfall can account for up to 50 percent of dissolved nitrate and dissolved ammonia detected in roadway runoff.

3.5 Rainfall-Runoff Quality, Loads, and Yields

Rainfall-runoff samples were collected and analyzed for constituent concentrations. Constituent loads were also calculated. The authors define constituent load (in grams or kilograms) as the total event runoff (cubic feet \( A_q \)) multiplied by 28.32 L/ft\(^3\) (the cubic-foot to liter conversion factor), multiplied by the constituent concentration (mg/L \( A_c \)), and divided by 1,000 (the milligrams to grams conversion factor). Load is symbolized by the following equation:

\[
\text{Load}_c = \frac{A_q \times 28.32 \times A_c}{1,000}
\]

The authors also calculated yields from time-compositied samples. The authors define yield (for primary drainage area) as the constituent load (in grams \( L_c \)) divided by the total rainfall (in inches \( P \)) multiplied by \( K \), which equals 43,560 square feet per acre/the study site primary drainage area (in square feet). These calculations were performed using the formula:

\[
\text{Yield}_c = \frac{L_c}{P}(K)
\]

Rainfall-Runoff Quality Findings

Flow or time-compositied rainfall-runoff samples collected from 31 rainfall events yielded higher concentrations of TSS, total chromium, and total zinc at guttered sites than at unguttered sites.
• Concentrations of total phosphorus and fecal Streptococcus bacteria were higher at unguttered sites than at guttered sites.

• The median concentrations of TSS, total phosphorus, total chromium, and total zinc and dissolved chloride in rainfall-runoff were compared with similar data obtained from the Metropolitan Minnesota interstate system. While the median concentrations for total phosphorus, TSS, and total chromium were similar, the concentrations of total zinc were higher at the interstate system than the study sites.

• Concentrations of metals such as aluminum, copper, lead, and zinc in rainfall-runoff exceeded the MPCA’s chronic condition standard limits for metropolitan storm water 96 percent, 52 percent, 9 percent, and 20 percent of the time, respectively.

• Samples that were obtained one or two times a year for analysis of semi-volatile compounds were observed to be below the limit of detection.

Conclusions
• The authors believe that vegetated ditches associated with unguttered sites may filter out heavy particulates such as metals and suspended solids and, at the same time, give up nutrients and coliform bacteria as a result of decaying plant and animal matter.

• Although aluminum, copper, lead, and zinc exceeded the MPCA’s chronic condition standard limits for metropolitan storm water, the authors note that MPCA’s chronic condition standard limits do not necessarily apply to roadway runoff.

Loads and Yields Findings
• Loads and yields were computed for most of the time-composited samples, and for at least one constituent, TSS, 92% of the computed load for the entire study period for one unguttered site occurred in just one rainfall event. This effect was found to be more pronounced at unguttered sites than guttered sites. However, even for guttered sites, the largest runoff event resulted in loadings between 21 and 37 percent of the total loads computed for the study period.
Conclusions

• The authors conclude that the lower percentages of loads for the guttered sites may be due to the shorter response time and recession periods at the guttered sites than at the unguttered sites (see Section 3.3).

3.6 Latent Period and Traffic Volume

The authors hypothesized that the time lapse between consecutive rainfall events, or latent periods, could be a factor that affects water quality; the longer the latent period, the more material that can potentially accumulate on the roadway and be washed to a collection point. Consequently, the authors believed that roadway runoff could transport more accumulated material with longer latent periods, thereby increasing concentrations of constituents, loads, and yields.

Latent Period Findings

• When plotted with length of latent period, concentrations of selected constituents did not increase with the length of latent period. However, when all of the data was compiled and examined statistically, only total phosphorus, dissolved sulfate, and total zinc concentrations showed a statistical correlation with the latent period. Loads for the same constituents did not correlate with latent periods.

Conclusions

• Concentration levels of most of the selected constituents did not tend to increase with length of latent periods. Only total phosphorus, dissolved sulfate, and total zinc concentrations showed a statistical correlation with the latent period. The length of the latent period had no impact on constituent loads.

Similarly, the authors believed that the level of traffic volume could affect the amount of material on the roadway. Leaking automotive fluids, worn materials (tires and brakes) from vehicles, and mud and soil could accumulate and be transported during runoff events.

Traffic Volume Findings

• Average traffic volume for all of the sites averaged 1,888 to 7,122 vehicles per day. Statistical analysis did not reveal significant differences in constituent concentrations, loads, or yields based on traffic volume.

Conclusions

• The volume of traffic did not play a significant role in the concentrations of selected constituents, loads, or yields.

3.7 Reviewers’ Note

This investigation is one of many storm water studies conducted in the wake of federal storm water regulations, many of which are ongoing. Much of the data collected in these studies provides scientists,
engineers, and regulators with insight into the physical, chemical, and managerial aspects of storm water runoff. Ultimately, these studies provide for the protection of our nation’s water resources.

Specifically, this study provides insight into the physical and chemical characteristics of rainfall-runoff and snow-melt runoff, especially as runoff relates to guttered and unguttered sites. This information is beneficial in helping to understand the impact of chemicals on watersheds, and in developing cost-effective and low maintenance BMPs, which are unique challenges in cold weather climates. Furthermore, this study provides baseline information regarding the complexities associated with runoff monitoring and management.

For planners and municipal engineers, this study provides insight into the complexities that engineers face in the development of BMPs and the difficulty that regulators have in balancing community needs and budgets with protection of watersheds. Planners and municipal engineers should use this study as a starting point in understanding the complexities associated with storm water monitoring and management. It should serve as a tool for long-range planning, assemblage of budgets, and the investigation of community-specific, low maintenance and cost-effective BMPs. This study affords the municipal planner and engineer with the opportunity to become more knowledgeable with regard to storm water management.

A brief review of available data on the BMPs appropriate to small municipalities when attempting to mitigate storm water runoff contamination revealed little information at this time relating to financial feasibility. Specifically, the removal of dissolved metals from the runoff is of concern due to the potentially high cost. Traditional methods of dissolved metals removal, for example, include reverse osmosis and precipitation of metals, both of which would likely be cost prohibitive on a large scale. Further efforts are needed to develop BMPs and resolve the financial issues associated Phase II storm water regulatory compliance for small municipalities.
4.0 Overview of Federal Phase II Storm Water Rules

The following is a summary of the Federal Phase II Storm Water Rules obtained from:

Federal Register
Environmental Protection Agency (EPA)
40 CFR Parts 122 & 123
National Pollutant Discharge Elimination System - Proposed Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Proposed Rule

4.1 Background

In 1972, Congress amended the Federal Water Pollution Control Act (referred to as the Clean Water Act (CWA)) to prohibit the discharge of pollutants from point sources unless regulated by a NPDES permit. In 1987, Congress amended the CWA to require implementation of a comprehensive approach for addressing storm water discharges under the NPDES program. Under the current regulations, known as Phase I Storm Water Rules, only medium (>100,000 people) and large (> 250,000 people) municipal separate storm sewer systems (MS4s) are required to obtain an NPDES storm water discharge permit; small municipalities (<100,000 people) are not required to obtain a permit. However, on January 9, 1998, the EPA released proposed amendments to the Federal NPDES program, Phase II Storm Water Rules, which include proposed storm water regulations for revision of the Clean Water Act.

The regulations set forth in the new Phase II Storm Water Rule were conceived by a 32 member, representative subgroup designated by the EPA, called the Storm Water Phase II FACA Subcommittee. The parent group to the Storm Water Phase II FACA Subcommittee originated in March, 1995, when the Office of Management and Budget approved the charter for establishment of the Urban Wet Weather Flows Advisory Committee (FACA Committee). EPA intended for this parent committee to assist with coordinating and implementation of the urban municipal wet weather water pollution control program.

The Storm Water Phase II FACA Subcommittee consists of representative outside members including municipalities, industrial and commercial sectors, agriculture, environmental and public interest groups, States, Indian Tribes, and EPA staff. The Storm Water Phase II FACA Subcommittee met twelve times, between September 1995 and October 1997, and conducted numerous conference calls to discuss the regulatory framework that serves as the basis for this proposed storm water rule.
4.2 Applicability

Small municipalities and construction sites that are not currently required to obtain storm water permits may soon fall under the new Phase II Storm Water Regulations proposed by the EPA. On January 9, 1998, the EPA released a draft rule proposal (Phase II) that expands the existing NPDES storm water regulations (Phase I) and permit requirements under 40 CFR Parts 122 and 123 and the CWA, Section 402(p)(6). The public comment period for this new rule ended on April 9, 1998, with the finalized regulation to be released by March 1, 1999.

Under the proposed Phase II requirements, the following entities will automatically be required to obtain an NPDES storm water discharge permit by May 31, 2002:

- construction sites that disturb 1 to 5 acres; and
- small municipalities (< 100,000 persons) located within urbanized areas, as defined by the National Census Bureau, that operate MS4s.

A list, by state, of U.S. counties, municipalities, and incorporated townships or villages located in urbanized areas that will be regulated under the proposed rule is provided in Appendix 6 of the Preamble to the Federal Register document. Those counties, municipalities, and incorporated townships or villages that are in Minnesota and that will be regulated under the proposed rule are provided in Table 1.

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<thead>
<tr>
<th>Incorporated Townships or Villages and Counties, within Urbanized Areas*, in Minnesota to be Regulated Under the Proposed Phase II Storm Water Rule**</th>
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<td>Andover</td>
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<th>Incorporated Townships or Villages and Counties, within Urbanized Areas*, in Minnesota to be Regulated Under the Proposed Phase II Storm Water Rule**</th>
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* As defined by the U.S. Census Bureau.
** From the 1990 Census of Population and Housing, U.S. Census Bureau.

In addition, MS4s located outside of urbanized areas that have a population of at least 10,000 or more and have a population density of at least 1,000 people per square mile may potentially be subject to these new regulations. EPA is proposing designation criteria to be applied to these municipalities, including:

- discharge to sensitive waters;
- high growth or growth potential;
- high population density;
- contiguity to an urbanized area;
- significant contributor of pollutants to waters of the United States; and
- ineffective control of water quality concerns by other programs.

A list, by state, of U.S. counties, municipalities, and incorporated townships or villages located outside of urbanized areas that may be potentially regulated under the proposed Phase II rule is provided in Appendix 7 of the Preamble to the Federal Register document. Those MS4s that are in Minnesota and may be potentially regulated under the proposed Phase II rule are provided in Table 2.

The permitting authorities may, however, regulate any additional sources of pollution if there is sufficient evidence indicating impairment to waters of the U.S. It is important to note that only separate storm sewer systems are subject to regulation. Combined sewer systems, which include both storm and sanitary waste water that flows to a wastewater treatment plant, are not included in the new rule coverage.
### Table 2

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<th>Incorporated Townships or Villages, outside of Urbanized Areas*, in Minnesota to be Potentially Regulated Under the Proposed Phase II Storm Water Rule**</th>
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<td>Brainerd</td>
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* As defined by the U.S. Census Bureau.
** From the 1990 Census of Population and Housing, U.S. Census Bureau.

Under the proposed Phase II rule, the NPDES permitting authority is allowed to waive otherwise applicable requirements for a regulated MS4 if the jurisdiction served by the system includes a population of less than 1,000 persons and meets additional water quality-based conditions. Water quality-based conditions would be the basis for a waiver of requirements for construction activities between 1 and 5 acres as well. A proposed rule summary is presented in Section 4.3.

#### 4.3 Proposed Rule Requirements

The proposed Phase II Storm Water Rule requires regulated MS4s to develop and implement a storm water management program. Program components, known as the six minimum controls, include the following:

- measures to address requirements concerning public education and outreach;
- public involvement;
- illicit discharge detection and elimination;
- construction site runoff control;
- post-construction storm water management in new development and redevelopment; and
- pollution prevention and good housekeeping of municipal operations.

These program components will be implemented through NPDES permits. Regulated MS4s will be required to submit to the NPDES permitting authority a description of best management practices (BMPs) to be implemented in their watershed and measurable goals for each of the six minimum control measures listed above. Flexible requirements for permittees are built into the process by allowing BMPs to be tailored to the needs of a particular watershed.

The EPA is advocating the use of general permits and partnerships in the proposed Phase II rule. The rule is intended to facilitate a watershed approach as the management framework for efficiently, effectively, and consistently protecting and restoring aquatic ecosystems, and protecting public health. The watershed approach is a decision-making process based on the following standards for all stakeholders within a watershed:
• a common strategy for gathering data;
• a common understanding of roles;
• a common understanding of priorities; and
• a common understanding of responsibilities.

For instance, the proposed rule would allow a regulated municipality to join as a co-permittee with another regulated municipality, referencing a common storm water management program. EPA is also recommending use of the watershed approach for storm water management, which focuses on coordination between public and private parties to address the highest priority waters within hydrologically defined geographic areas.

Under the proposed rule, a permittee is expected to reduce pollutants to the maximum extent practicable (MEP) by implementing BMPs with measurable goals to achieve the six minimum control measures mentioned above. EPA intends for MEP compliance to be evaluated with respect to a specific region or basin and for the character of identified BMPs to reflect this evaluation. The MEP compliance evaluation process would consider such factors as:

• conditions of receiving waters;
• specific local concerns;
• the effectiveness to address the pollutant(s) of concern;
• public acceptance;
• cost;
• technical feasibility; and
• compliance with federal, state and local laws and regulations.

Small MS4s located within urbanized areas and automatically regulated based on the 1990 or 2000 census must apply for a permit or submit a notice of intent (NOI) to be covered by a general permit by May 31, 2002. Small MS4s located outside urbanized areas that are found to be regulated are required to submit a permit application within 60 days of designation. Also, NPDES permitting authorities are required to designate non-urbanized MS4s by May 31, 2002.
5.0 Minnesota Pollution Control Agency’s Response to the Proposed Federal Phase II Storm Water Rules (2)

On January 9, 1998, the EPA published proposed regulations for the Phase II Storm Water Rules, followed by a public review and comment period which ended in April, 1998. Since the MPCA administers EPA’s environmental programs for the State of Minnesota, they formed a focus group of stakeholders, partners, and affected parties to discuss the proposed regulations and offer comments to the EPA. A consensus of comments was reached and provided to EPA in a letter dated April 9, 1998.

Braun Intertec spoke with Mr. Gene Soderbeck, (MPCA) on July 29, 1998, regarding MPCA’s position on EPA’s proposed Phase II Storm Water Rules. Mr. Soderbeck reiterated the MPCA’s position as outlined in their April 9 comment letter to EPA. As can be seen in the attached letter, the MPCA believes that the proposed regulations will add conflict and confusion between federal and state rules in trying to reach similar goals, much like the conflict associated with federal wetland protection regulations. The MPCA also believes that Minnesota already has the legislation and a network of rules in place to bring about the federal government’s desired outcome. The MPCA is therefore requesting exemption from portions of the federal rules. The MPCA, however, does believe that eventually there will be changes in Minnesota’s storm water program. At this time, the MPCA has not formatted or proposed any municipal storm water permits nor could they predict the final outcome and the net effect of the federal government’s proposed rules. Once the Phase II Storm Rules are finalized, the MPCA will provide informational and outreach programs to assist the regulated community.

Some changes will also occur in Minnesota’s General Storm Water Permit for Construction Activity in the near future. According to Mr. Soderbeck, the MPCA has recently mailed a reissued General Storm Water Permit for Construction Activity to various interested parties for public review and comment. Although the reissued permit reflects no changes from the previous permit, changes are anticipated over the next several years. Mr. Soderbeck indicated that a working group will be established to allow participants to work with the MPCA in the development of both the Municipal Storm Water Permit and Construction Storm Water Permit programs under the Phase II Storm Water Rules. Planning for the working group is currently being carried out under the MPCA’s Policy and Planning Division. To be included in the working group, interested participants should call Ms. Marge Velky or Mr. Don Jakes, both with Policy and Planning at the MPCA.
6.0 Obtaining a Storm Water Permit

6.1 Industrial and Municipal Storm Water Permits

Under the current Phase I Storm Water Rules, industrial and municipal dischargers of storm water with certain Standard Industrial Classification (SIC) codes are required to obtain an NPDES storm water permit. A list of these SIC codes can be found in the Minnesota Pollution Control Agency’s “Application Instructions for a National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Storm Water Permit for Industrial Activity” report. (3) A second list of SIC codes, also found in the application instructions, designates those facilities for whom permit coverage is at the discretion of the MPCA. These facilities must apply for a storm water permit; however, a permit will be issued to the facility only if storm water comes in contact with significant materials, which are defined as follows:

- Raw, intermediate or final products: in addition to those products and materials listed on the application, this category includes, but is not limited to other manufactured products used or created by the facility.

- Industrial waste/byproducts: in addition to those materials listed on the application, this category includes, but is not limited to slag, ash, and other waste resulting from the manufacturing or industrial process.

- Loading, unloading, or other handling of industrial waste or byproduct, raw, intermediate, or final product: includes but is not limited to storage, transportation, or conveyance of raw, intermediate, final products or waste materials.

- Vehicle or process equipment maintenance: in addition to those activities listed on the application, this category includes, but is not limited to vehicle rehabilitation, lubrication, and servicing of loading, unloading, and processing equipment.

Note that both the mandatory and discretionary SIC codes lists apply also to facilities that are owned by municipalities. Municipalities serving less than 100,000 individuals are deferred from Phase I Storm Water Regulations as stated above; however, airports, landfills and steam electric generating facilities are not granted this deferment and are required to obtain a permit under the Phase I rules.

If a facility’s SIC code is not listed, then permit coverage is not required. The storm water permit application must be completed and mailed to the MPCA, excluding a permit fee. Prior to application for coverage, a permittee must develop a Storm Water Pollution Prevention Plan (SWPPP) to meet permit requirements. Plan requirements are spelled out in detail in the permit, but generally the SWPPP must contain BMPs to minimize contact of storm water with potentially polluting materials or treat storm water runoff prior to release from the facility.
Frozen conditions can present special challenges in implementing BMPs. The BMPs outlined in the following Table were excerpted from *Stormwater BMP Design Supplement for Cold Climates*, Caraco, D., Claytor, R., and Center for Watershed Protection, December 1997, under cooperative grant - EPA Region V and Office of Wetlands Oceans and Watersheds.

<table>
<thead>
<tr>
<th>Type</th>
<th>BMP</th>
<th>Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ponds</strong></td>
<td>Wet Pond</td>
<td>○</td>
<td>Can be effective, but needs modifications to prevent freezing of outlet pipes. Limited by reduced treatment of volume and biological activity in the permanent pool during ice cover.</td>
</tr>
<tr>
<td></td>
<td>Wet Extended Detention Pond</td>
<td>○</td>
<td>Some modifications needed to conveyance structures needed. Extended detention storage provides treatment during the winter season.</td>
</tr>
<tr>
<td></td>
<td>Dry Extended Detention Pond</td>
<td>○</td>
<td>Few modifications needed. Although this practice is easily adapted to cold climates, it is not highly recommended overall because of its relatively poor warm season performance.</td>
</tr>
<tr>
<td><strong>Wetlands</strong></td>
<td>Pond/Wetland System</td>
<td>○</td>
<td>Pond/Wetland systems can be effective, especially if some Extended Detention storage is provided. Modifications for both pond and wetland systems apply to these BMPs. This includes changes in wetland plant selection and planting.</td>
</tr>
<tr>
<td></td>
<td>Extended Detention Wetland</td>
<td>○</td>
<td>See Wet Extended Detention pond. Also needs modifications to wetland plant species.</td>
</tr>
<tr>
<td><strong>Infiltration</strong></td>
<td>Infiltration Trench</td>
<td>○</td>
<td>Can be effective, but may be restricted by groundwater quality concerns related to infiltrating chlorides. Also, frozen ground conditions may inhibit the infiltration capacity of the ground.</td>
</tr>
<tr>
<td>Type</td>
<td>BMP</td>
<td>Classification</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Infiltration Basin</td>
<td></td>
<td></td>
<td>Can be effective, but may be restricted by groundwater quality concerns related to infiltrating chlorides. Also, frozen ground conditions may inhibit the infiltration capacity of the ground.</td>
</tr>
<tr>
<td>Filtering Systems</td>
<td>Underground</td>
<td></td>
<td>When placed below the frost line, these systems can function effectively in cold climates.</td>
</tr>
<tr>
<td></td>
<td>Sand Filter</td>
<td></td>
<td>Problems functioning during the winter season because of reduced infiltration. It has some value for snow storage on parking lots, however.</td>
</tr>
<tr>
<td></td>
<td>Bioretention</td>
<td></td>
<td>Some concerns of bypass during winter flows. Has been used in relatively cold regions with success, but not tested in a wide range of conditions.</td>
</tr>
<tr>
<td></td>
<td>Submerged</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gravel Wetland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Channel Systems</td>
<td>Grassed Channel</td>
<td></td>
<td>Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Valuable for snow storage.</td>
</tr>
<tr>
<td></td>
<td>Dry Swale</td>
<td></td>
<td>Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Very valuable for snow storage and meltwater infiltration.</td>
</tr>
<tr>
<td></td>
<td>Vegetated Filter Strip</td>
<td></td>
<td>Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Valuable for snow storage.</td>
</tr>
<tr>
<td></td>
<td>Wet Swale</td>
<td></td>
<td>Reduced effectiveness in the winter season because of dormant vegetation. Can be valuable for snow storage.</td>
</tr>
</tbody>
</table>

- Easily applied to cold climates; can be effective during the winter season.
- Can be used in cold climates with significant modifications; moderately effective during the winter season.
For more information on implementing BMPs and monitoring storm water runoff, please refer to the following guides:


Permit requirements include inspections every two months during non-frozen conditions as well as submittal of first and second annual reports certifying that the BMPs outlined in the SWPPP are being implemented.

Upon completion of the application for coverage, a general storm water permit is issued for the site. At the discretion of the MPCA, an individual storm water permit may instead be issued. In addition to the requirements outlined above, individual permits also require discharge monitoring and reporting on a regular basis. Individual permits are issued to sites where there is a greater potential for contamination of storm water runoff.

### 6.2 Construction Storm Water Permits

During a storm, silt, sediment, and other pollutants are washed off construction sites. Sediment losses from construction sites can range from 30 to 750 tons per acre. Sediment loading rates from construction sites are as high as 100 times that of agricultural lands, and 1,000 to 2,000 times that of forest lands. In a short period of time, construction sites can contribute more sediment to surface waters than was previously deposited over several decades. Examples of other pollutants that can wash off of construction sites include: phosphorous, nitrogen, petroleum products, construction chemicals, and solid wastes. In urban areas, streets and other paved areas carry polluted storm water into storm sewer systems where, unless diverted to a storm water detention basin, it is directly released into surface waters. In rural areas, storm water runs off construction sites into drainage ditches and other conveyances where it is directly released into rivers, streams, lakes, and wetlands.

Anyone conducting a construction activity that disturbs five or more acres of total land area is required to apply for coverage under the MPCA’s General NPDES Construction Storm Water Permit. (4) (MPCA’s answers to common questions and the instructions for permit application are included in the Appendix.)

Construction activity includes the following:

- Clearing
- Grading
- Excavation
• Road Building
• Construction of:
  Residential Houses
  Office Buildings
  Commercial Facilities
  Industrial Buildings
  Landfills
  Airports
  Feedlots

The General Construction Storm Water Permit requires that a Temporary Erosion and Sediment Control Plan be developed for the project. The goals of this plan are to:

• prevent erosion from occurring;
• keep sediment on the site during construction; and
• minimize the tracking of soil and other sediment from the construction site onto paved surfaces by vehicles.

The permit also requires that a Permanent Erosion and Sediment Control Plan be developed for the project. The goal of this plan is to minimize negative impacts caused by storm water runoff from the project’s ultimate development. The plans must contain BMPs developed to meet the goals of each plan. Neither the project’s plans and specifications, nor the Temporary or Permanent Erosion and Sediment Control Plans need to be submitted to the MPCA for review and approval. The only document that needs to be submitted is a completed application form certifying that the plans were completed and incorporated into the construction project’s final plans and specifications.

The owner will be responsible for completing the application form and certifying (signing) that the Temporary and Permanent Erosion and Sediment Control Plans have been prepared for the project. The owner is responsible for compliance with all parts of the permit.

At the owner’s discretion, the general contractor will also be responsible for signing the application form prepared by the owner, certifying that the Temporary and Permanent Erosion and Sediment Control Plans will be implemented on the project. The general contractor is a co-permittee with the owner for certain parts of the permit.
The MPCA and the EPA have developed the following guidance manuals to assist applicants with developing Temporary and Permanent Erosion and Sediment Control Plans:

MPCA Water Quality Division, *Protecting Water Quality in Urban Areas*

7.0 Best Management Practices

In the wake of storm water regulations there are number of proven BMPs as well as a number that are in various stages of development. A number of references for relevant BMP research, practices, and information are listed below (also see Section 6.0):


References


Appendix A
Excerpts from USGS Report
Appendix B
Commonly Asked Questions and Answers about The Storm Water Permit Program for Construction Activities
Appendix C

Application Instructions for General Storm Water Permit: Construction Activity