



C A S F M

TECHNICAL PAPER NO. 2

PERMIT MONITORING STRATEGIES FOR STORMWATER NPDES

Jon Sorensen, Senior Project Manager,
Stormwater Engineering

Introduction

Stormwater monitoring for National Pollutant Discharge Elimination System (NPDES) permit compliance will be a fact of life for medium and large municipalities and for selected industries. The cost for the relatively short-term Part 2 permit application monitoring have been significant in themselves, but we can expect a much higher investment for the longer term permit monitoring. Because of this large investment and the potential financial consequences in mandated permit conditions based on monitoring results, permit monitoring strategies need to be planned carefully. Presented below is a discussion of the regulatory framework, several basic alternate strategies for monitoring programs, and advantages and disadvantages of each.

Regulatory Framework

The basic regulatory requirements for municipal stormwater monitoring are brief and lack specific guidance. The applicable portion of the stormwater regulation describing monitoring requirements for large and medium municipalities is the following:

A proposed monitoring program for representative data collection for the term of the permit that describes the location of outfalls to be sampled (or the location of instream stations), why the location is representative, the frequency of sampling, parameters to be sampled, and a description of sampling equipment.

(U.S. Environmental Protection Agency [EPA], 1991a).

The monitoring requirements for industrial activities have not yet been finalized.

Nonspecific regulatory requirements such as the above leave room for permittees to interpret the intent of the regulation in their best interests and to customize responses to local conditions. However, there are several other resources and related regulations that also guide monitoring program development. **EPA Draft Part 2 Guidance Manual for Municipalities**

The EPA *Draft Guidance Manual* for large and medium municipalities (EPA, 1991b) broadens the scope of permit monitoring beyond the basic discharge characterization theme stated in the regulation. The *Draft Guidance Manual* includes the following additional goals: evaluation of specific pollutant sources, characterization of control performance, and identification of water quality impacts. While discharge characterization and evaluation of specific pollutant sources are achievable goals, the characterization of individual control performance and identification of water quality impacts are beyond the scope of most compliance monitoring. The latter goals could, in fact, become burdensome and costly.

The *Draft Guidance Manual* also states that "The development of the goals of the monitoring program must be closely coordinated with the development of proposed stormwater management programs (SWMP)." This statement indicates that the SWMP's and the monitoring must somehow be linked and is consistent with the goal of characterizing the performance of controls.

The authors recognize the material in the *Draft Guidance Manual* as suggestions that may or may not be applicable to a specific municipality. However, until the manual is finalized and more specific information is furnished to regulators, the manual will be a reference to permit writers. Municipalities will, therefore, be best served by proposing a monitoring program that offers sound technical support to help regulators judge compliance with the basic intent of the overall NPDES program. The basic intent of the program is to reduce discharges of pollutants from the municipal separate storm sewer system to the Maximum Extent Practicable (MEP). When proposing a definition of MEP in the context of a municipal system, a permittee should consider several factors and local water quality concerns, the most important of which is why receiving water quality standards are not being met.

Maximum Extent Practicable (MEP) and the Monitoring Program

The MEP requirement definition is still under debate as the Clean Water Act reauthorization proceeds. However, a memorandum from EPA legal counsel and a decision in the Natural Resources Defense Council (NRDC) legal challenge to the stormwater regulations provide additional informa-

tion for a permittee. In a January 1991 memorandum, the EPA general council ruled that discharges from municipal separate storm sewer systems (MS4) were required to "include any requirements necessary to achieve compliance with water quality standards" (*Federal Register*, November 16, 1990). This provides a target for MEP in terms of helping meet receiving water quality standards. In the NRDC challenge to the stormwater rule (EPA, 1992) NRDC argued for detailed permit conditions to be imposed pursuant to the MEP standard in the regulation. According to Robert J. Saner, Esq. who reviewed the Court's June 1992 ruling for the National Association of Flood and Stormwater Management Agencies (NAFSMA): "the Court dismissed NRDC's MEP arguments virtually out of hand ... the Court relied on the statutory language in 402(p) to find that Congress did not mandate a minimum standards approach or specify that EPA develop minimal performance standards" (Saner, 1992). Saner went on to say that EPA and NAFSMA, as an intervenor supporting EPA's position, both argued that the regulation did not require detailed MEP standards, but rather left the development of individualized control programs to the discretion of the permit writer, working jointly with the municipal applicant (Saner, 1992).

In the context of the above information, a monitoring program should first have as an objective the characterization of discharges from the stormwater system. This objective is consistent with the theme of representative data collection stated in the regulation. The responsibility of the permittee for the impact of stormwater discharges on receiving water is discussed below.

Monitoring Responsibility

The Stormwater NPDES regulation targets the discharges from certain municipal and industrial systems. Permittees are primarily responsible for the quality of discharges from their systems to Waters of the United States. Monitoring in downstream receiving waters or upstream of discharges to receiving waters has some value for documenting changes in the water quality for which the permittee is responsible, provided the discharge is the major factor affecting water quality in the receiving water and other discharges and background conditions could be isolated.

Description NPDES Program Monitoring:

Objectives and Resulting System Design

The overall objective of the monitoring program drives the system design. Two primary objectives need to be considered: (1) Monitoring to meet EPA requirements (compliance monitoring) and (2) Monitoring to provide information on which to base program decisions. Program decisions are defined as decisions made to implement or adjust management programs. The primary objectives can overlap; compliance monitoring can but *will* not always provide enough of the right kind of information on which to base program decisions.

Meeting Monitoring Program Objectives

The monitoring process can produce data or information. The difference is that information provides adequate results and conclusions for use in making management program decisions and data are simply number generations to meet stormwater permit terms. Complying with permit terms requires that monitoring be conducted when and where the permit dictates. Monitoring to produce results and conclusions require careful planning and consideration of statistics, data management, and other monitoring components.

General System Design

The essential goal of monitoring to produce adequate results and conclusions is that the information you produce is the information you need to meet the monitoring program objectives. Several questions must be answered to provide a direction for the design of the program. The questions are as follows:

"What are the objectives of the monitoring program?"

"What information is needed to meet the objectives?"

"What information can be produced from monitoring?"

"Does the information needed to meet the objectives compare with the information that can be produced?"

A stormwater quality monitoring program is similar to any water quality monitoring program, and should be approached in a similar manner.

General Options for Locations of Monitoring

The authors have discussed the regulatory framework surrounding stormwater NPDES and some monitoring program objectives. Presented below are three basic strategies for approaching stormwater monitoring.

Receiving Water Monitoring

Monitoring a receiving water (water of the United States) that will have various categories of discharges coming into it can provide information on the combined characteristics of all the discharges and possible instream sources of pollutants that have been previously discharged. Receiving water (or instream) monitoring can be implemented downstream and/or upstream of discharges of concern to the permittee. Instream monitoring usually requires larger and more expensive flow measurement structures than outfall system monitoring. However, in some cases monitoring locations have already been established for other purposes and usable structures and historical data may be available.

Monitoring downstream of where a permittee's discharges enter the receiving water has the advantage of sampling the cumulative affect of all the discharges at that point. The disadvantage is the challenge of sorting out the stormwater system discharge impacts from the nonstormwater point discharges, impacts from sources upstream of the permittee's responsibility, groundwater impacts, instream contaminated sediments, illicit dumping and connections, spills, and miscellaneous other sources. If the other discharge sources can be identified, this may be a viable option to detect trends in stormwater point source discharges.

If the permittee conducts receiving water quality monitoring, it should be clearly stated in the permit that the permittee is not responsible for instream water quality standards. The permittee's responsibility should be limited to the discharges from its stormwater system.

Stormwater System Outfall Monitoring

System outfall monitoring is monitoring at the point where the permittee's water discharges to a receiving water. The outfall can be a pipe or open channel as defined in the regulation as a "major outfall." While this is the optimum point at which to monitor, the disadvantage of this monitoring strategy is that most permittee's have numerous major outfalls. For an industrial applicant with a single outfall, this strategy makes the most sense.

When numerous outfalls are included in a permit, an assessment is required to determine how many outfalls need to be monitored to acquire data that is representative for permitting purposes. If the permittee's goal is to identify long-term trends in the

quality of the discharge from a limited number of representative basins, major outfall monitoring is appropriate. However, if the permittee has the goal of comparing a basin with water quality controls to one without controls, the strategy would require more stations. And if the permittee has the goal of comparing discharge quality from different land uses or comparing quality from a developing basin to a developed basin, more stations would be required. As the number of monitoring points grows, the annual budget grows also. Therefore, while multiple stations are desirable to ascertain differences in the discharge quality of outfall systems, the benefits of additional monitoring certainly need to be balanced with the costs. The benefits may consist of savings in the costs of management programs.

A reduction in a permit-required management program based on monitoring would need to be substantiated with adequate monitoring information and a clear relationship between the information and the management program. It may be difficult to establish clear relationships in basins with multiple management programs.

Monitoring Within an Outfall System

The primary benefit of monitoring within an outfall system is the potential for the monitoring information to help isolate the performance of individual best management practices (BMPs) within outfall systems having multiple BMPs. This can be an advantageous strategy for optimizing the design of costly BMPs and/or combinations of BMPs. A permittee may be able to rely on national or regional data to design and operate BMPs at the most cost effective level, but only if the data is reasonably applicable to local conditions.

While it is hoped that monitoring information can be used to reduce burdensome BMPs required by the permitting authorities, it is also possible that the information can indicate the need for more costly BMPs. However, the permittee has the responsibility to convince the regulators that BMPs are being implemented to the MEP; the word practicable includes an assessment of the burden of costly BMPs on a permittee.

Therefore, it may be a worthwhile strategy to use monitoring to assess the performance of several of the most costly BMPs a permittee is using, particularly if appropriate performance data is not available and if monitoring can provide the needed

information. The performance can then be compared to the incremental cost of making the BMP more or less effective, and the MEP level for implementing the BMP can be selected.

An additional advantage of this type of monitoring is that it can be discontinued when adequate information is acquired.

Summary

The regulatory framework and three basic strategies for monitoring were reviewed. The selection of the type of monitoring to be implemented was found to be dependent on the objectives of the permittee's monitoring program and system design considerations. The basic theme of monitoring program strategy selection is comparing the potential benefits to the costs. Costs are largely defined by monitoring system design considerations.

Should a permittee implement more monitoring than is required by permit conditions? The answer depends on what the permittee has to gain from more and better information than may be provided by compliance monitoring. If the information provides the permittee a clearer picture of a situation that will result in less costly or better permit conditions, more monitoring would be beneficial. Additional monitoring also shows a good faith effort to resolve local problems.

References

U.S. Environmental Protection Agency (EPA). *Compliance With Water Quality Standards in NPDES Permits Issued to Municipal Separate Storm Sewer Systems*. Memorandum to Regional Counsel, Region IX. (1991a).

EPA. *Decisions to NRDC Challenge to Storm Water Regulations*. Memorandum to the Assistant Administrator for Water. (June 11, 1992).

EPA. *Draft Guidance Manual for the Preparation of Part 1 of the NPDES Permit Applications for Discharges from Large and Medium Municipal Separate Storm Sewer Systems*. (1991b).

Saner, Robert J., Esq. Ninth Circuit Upholds Bulk of Stormwater Rule. *NAFSMA Monthly News*. National Association of Flood and Stormwater Management Agencies. Vol. 14, No. 3.

U.S. Government Printing Office. *Federal Register*. Office of the Federal Register. National Archives and Records Administration. Washington, D.C. (November 16, 1990).

Ward, R. C., J. C. Loftis, and G. B. McBride. *Design of Water Quality Monitoring System*. Van Nostrand Reinhold. New York. (1990).