

Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance

August 2007

U.S. Environmental Protection Agency
Office of Wastewater Management
Water Permits Division
1200 Pennsylvania Avenue, NW
Washington, DC 20460

EPA 833-B-07-004



**WATERSHED-BASED
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
(NPDES) PERMITTING TECHNICAL GUIDANCE**

EPA 833-B-07-004

August 2007

U.S. Environmental Protection Agency
Office of Wastewater Management
Water Permits Division
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Foreword

Watershed-based NPDES permitting provides potential for flexibility and innovation to achieve new efficiencies and environmental progress in watersheds. This technical guidance is a follow up to the 2003 *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance* and provides greater detail concerning a number of permit development and issuance questions not addressed previously. It is designed to help NPDES authorities develop and issue NPDES permits that fit into an overall watershed planning and management approach with input from watershed stakeholders.

Benjamin H. Grumbles

Assistant Administrator for Water

Disclaimer

This Guidance expresses the United States Environmental Protection Agency's (EPA's) support for watershed-based National Pollutant Discharge Elimination System (NPDES) permitting, including development of multisource watershed-based permits. Implementation of watershed-based permitting will be governed by existing requirements of the Clean Water Act (CWA) and EPA's NPDES implementing regulations. CWA provisions and regulations contain legally binding requirements. This document does not substitute for those provisions or regulations. The recommendations in this Guidance are not binding; the permitting authority may consider other approaches consistent with the CWA and EPA regulations. The use of non-mandatory words like "should," "could," "would," "may," "might," "recommend," "encourage," "expect," and "can" in this Guidance means solely that something is suggested or recommended and not that it is legally required or that the suggestion or recommendation imposes legally binding requirements, or that following the suggestion or recommendation necessarily creates an expectation of EPA approval. When EPA makes a permitting decision, it will make each decision on a case-by-case basis and will be guided by the applicable requirements of the CWA and implementing regulations, taking into account comments and information presented at that time by interested persons regarding the appropriateness of applying these recommendations to the particular situation. This Guidance incorporates, and does not modify, existing EPA policy and guidance on watershed-based permitting. EPA may change this Guidance in the future.

Contents

	Page
Glossary of Terms	v
List of Abbreviations	viii
Introduction: EPA and Watershed-based Permitting	1
Purpose of this Document	1
Chapter 1: Approaches to Water Quality Management Using an NPDES Watershed Framework	3
Section One: The NPDES Program and a Watershed Approach	3
What is a Watershed Approach?	3
What is the role of the NPDES program in a watershed approach?	4
How is the NPDES program integrated into a watershed approach?	5
Section Two: Why Should a Permitting Authority Consider a Watershed Framework?	6
What factors lead to consideration of an NPDES watershed framework?	6
What are the potential benefits of applying an NPDES watershed approach?	8
Section Three: Navigating the Watershed Permitting Process	9
Navigator Element 1: Create Watershed and Source Data Inventories	11
Navigator Element 2: Apply a Watershed Permitting Analytical Approach	14
Navigator Element 3: Construct an NPDES Watershed Framework	23
Section Four: How is Performance Measured Under an NPDES Watershed Approach?	40
Chapter 2: Guide for Multisource Watershed-based NPDES Permitting	43
Section One: Multisource Watershed-based Permits	43
What is the geographic scope of the multisource watershed-based permit?	43
Who is covered by the multisource watershed-based permit?	44
How is a multisource watershed-based permit administered?	45
How might trading be considered in a multisource watershed-based permit?	46
Section Two: Cover Page	48
Key Technical Questions	48
Section Three: Effluent Limitations	51
Key Technical Questions	51
Section Four: Monitoring Requirements	58
Key Technical Questions	59
Section Five: Reporting and Recordkeeping Requirements	61
Key Technical Questions	61
Section Six: Special Conditions	64
Key Technical Questions	64
Section Seven: Public Notice	66
Key Technical Questions	67
Chapter 3: Watershed-based Permitting Case Studies	69
Big Darby Creek Watershed, Ohio: Construction Watershed-based General Permit	69
Chesapeake Bay Watershed, Virginia: Watershed-based General Permit for Nutrient Discharges and Nutrient Trading	69
Lake Lewisville Watershed, Texas: City of Denton Watershed Protection Program	70

Michigan Statewide Watershed-based MS4 Stormwater General Permit	70
Neuse River Watershed, North Carolina: Neuse River Compliance Association Watershed-based Permit	71
North Carolina Statewide Approach: Basinwide Planning and Permitting	71
Sand Creek Watershed, Colorado: Watershed-based Selenium Standard	71
Tualatin River Watershed, Oregon: Clean Water Services Integrated Municipal Permit	72
References	73

List of Exhibits

Exhibit 1-1. The watershed management process (Davenport 2002)	4
Exhibit 1-2. Goals, questions, and results associated with Navigator elements	10
Exhibit 1-3. Potential data inventory data types, uses, and sources	12
Exhibit 1-4. Example permit analysis matrix.....	15
Exhibit 1-5. Priority setting to construct an NPDES watershed framework	38
Exhibit 1-6. Example watershed environmental performance measures based on EPA's <i>National Water Program Fiscal Year 2007 Guidance</i>	41
Exhibit 1-7. Example watershed program performance measures by NPDES watershed framework implementation option.....	41
Exhibit 2-1. Example of a cover page for a watershed-based permit administered as an individual permit issued to an individual discharger or to co-permittees	49
Exhibit 2-2. Example of a cover page for a watershed-based permit administered as a general permit.....	50
Exhibit 2-3. Example effluent limitations and monitoring requirements for nutrients	57
Exhibit 2-4. Options for establishing appropriate sampling locations	59
Exhibit 2-5. Example permit text for reporting requirements	63
Exhibit 2-6. Example permit reopener	65
Exhibit 2-7. Example permit text for ambient monitoring.....	66

Glossary of Terms

This glossary includes definitions or explanations of some of the terms used in this Guidance. Where there is a definition or explanation in the federal regulations for a term included in the glossary, that definition or explanation, or a portion thereof, is included with an appropriate citation. The citations also note instances where the regulatory definition or explanation is not used verbatim, but has been adapted or modified to be consistent with the format of the glossary. To the extent that a definition or explanation provided in this glossary differs from that found in EPA regulations or other official documents, it is intended for use in understanding this Guidance only.

Baseline: A term used in water quality trading to denote the pollutant control requirements that apply to buyers and sellers in the absence of trading. Sellers must first achieve their applicable baselines before entering the trading market to sell credits. Buyers can purchase credits to achieve their applicable baselines.

Bedload: Portion of sediment load transported downstream by sliding, rolling, and bouncing along the channel bottom. Generally consists of particles more than one millimeter in diameter.

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, maintenance procedures, and other treatment controls and pollutant removal devices (structural and nonstructural) to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and activities to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage [Title 40 of the *Code of Federal Regulations* (40 CFR) 122.2]. Treatment controls may also include systems of controls (e.g., a series of devices designed to progressively reduce the discharge of pollutants to waters of the United States). For nonpoint sources, BMPs are defined as methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during and after pollutant-producing activities to reduce or eliminate the introduction of pollutants into receiving waters [40 CFR 130.2(m)].

Composite Sample: Sample composed of two or more discrete aliquots (samples). The aggregate sample will reflect the average water quality of the compositing or sample period.

Co-Permittee: A term used in this Guidance to refer to one of a group of wastewater dischargers who all are covered by the same NPDES permit.

Credit: A measured or estimated unit of pollutant reduction representing a level of control beyond that needed from a particular source to meet a baseline requirement (a water quality based effluent limitation for an NPDES permittee or allocation for a nonpoint source) and which may be exchanged in a trading program.

Discharge Monitoring Report: The forms used (including any subsequent additions, revisions, or modifications) by NPDES permittees to report self-monitoring results [see 40 CFR 122.2].

Flow-Proportional Composite Sample: A composite sample in which the volume or timing of the individual aliquots is based on discharge flow.

Grab Sample: A sample taken from a wastestream on a one-time basis without consideration of the flow rate of the wastestream and without consideration of time of sampling.

Load: The amount of matter or amount of thermal energy that is introduced into a receiving water. Loading may be either human-caused (pollutant loading) or natural (background loading) [40 CFR 130.2(e)].

Load Allocation: The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished [40 CFR 130.2(g)].

National Pollutant Discharge Elimination System: As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

Nonpoint Source: Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Atmospheric deposition and hydromodification are also sources of nonpoint source pollution.

Nutrients: Chemical elements and compounds found in the environment that plants and animals need to grow and survive. Nutrients include compounds of nitrogen (nitrate, nitrite, ammonia, organic nitrogen) and phosphorus (orthophosphate and others), both natural and man-made.

Permitting Authority: EPA or a state, tribe, or territory that is authorized to administer the NPDES permit program. Forty-five states and one territory (the Virgin Islands) are authorized to administer the NPDES permit program.

Point Source: Any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation (CAFO), landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff [40 CFR 122.2].

Pollutant Loading Cap or Cap: A term used in this Guidance to refer to cumulative pollutant loadings for all point and nonpoint sources established and assigned to different watersheds or waterbodies through a TMDL or other watershed analysis.

Technology-based Effluent Limitation (TBEL): An effluent limitation for a pollutant that is based on the capability of a treatment method to reduce the pollutant to a certain concentration. TBELs for POTWs are derived from the secondary treatment regulations at 40 CFR Part 133. TBELs for non-POTWs are derived from national Effluent Limitations Guidelines and Standards (effluent

guidelines) for specific industries, or on a case-by-case basis from the best professional judgment of the permit writer [see 40 CFR 122.44(a)(1)].

Time-Proportional Composite Sample: A composite sample in which the sample volume of each aliquot and the time between sampling individual aliquots are constant.

Total Maximum Daily Load (TMDL): The sum of individual WLAs for point sources and load allocations for nonpoint sources and natural background [40 CFR 130.2(i)]. TMDLs often include a margin of safety in addition to WLAs and load allocations.

Total Nitrogen: The sum of organic, nitrite, nitrate and ammonia species of nitrogen in water or wastewater. For compliance determination and reporting purposes, total nitrogen is calculated as the sum of the Total Kjeldahl Nitrogen (TKN) and the nitrite and nitrate nitrogen.

Total Phosphorus: The sum of organic and inorganic forms of phosphorus.

Trading: An arrangement where a pollutant source, typically a point source discharger, compensates another party in exchange for pollutant reduction credits and uses those credits to meet an applicable regulatory obligation. A buyer or user of credits in a trade compensates another party for creating this overcontrol and uses the resulting pollutant reductions, typically to meet its regulatory obligation. A seller or provider of credits in a trade has controlled pollutant loadings beyond what is needed to meet its baseline requirement and can receive compensation from a buyer wishing to use the surplus reductions.

Trading Ratio: A ratio developed to either discount or normalize the value of pollutant credits between a buyer and seller in a trade or between a source and a downstream waterbody. Trading ratios may be used to account for pollutant attenuation because of fate and transport, watershed characteristics, distance, time, different forms of a pollutant, uncertainty, or a desire to *retire* credits. For example, a location ratio is used to convert the amount of pollutant discharged at a specific point to the amount that reaches the waterbody of concern in a TMDL or watershed analysis. For additional information, see EPA's *Water Quality Trading Toolkit for Permit Writers*.

Wasteload Allocation (WLA): The proportion of a receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution [40 CFR 130.2(h)].

Water Quality-based Effluent Limitation (WQBEL): An effluent limitation that is designed to achieve an applicable water quality standard, including those that are based on a WLA specified in an approved TMDL [see 40 CFR 122.44(d)].

Watershed Analysis: A term used in this Guidance to refer to an analysis of pollutant sources and loadings (similar to a TMDL) completed for a waterbody where a TMDL is not required or where a TMDL has not been performed. A watershed analysis is used to determine appropriate WQBELs for the point sources in the watershed.

List of Abbreviations

AML	average monthly limitation
AWL	average weekly limitation
BMPs	best management practices
CFR	<i>Code of Federal Regulations</i>
CWA	Clean Water Act
DMR	Discharge Monitoring Report
ELGs	effluent limitations guidelines and standards or effluent guidelines
EPA	U.S. Environmental Protection Agency
lbs	pounds
lbs/day	pounds per day
MDL	maximum daily limitation
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
NPDES	National Pollutant Discharge Elimination System
POTW	publicly owned treatment works
TBEL	technology-based effluent limitation
TMDL	total maximum daily load
TSD	<i>Technical Support Document for Water Quality-based Toxics Control</i>
WLA	wasteload allocation
WQBEL	water quality-based effluent limitation
U.S.C.	United States Code

Introduction: EPA and Watershed-based Permitting

For more than a decade, the U.S. Environmental Protection Agency (EPA) has supported and encouraged a watershed approach to addressing water quality problems. Awareness and understanding of this approach has grown over time, but with demonstrated gaps in implementation. On December 3, 2002, the EPA Office of Water Assistant Administrator issued a policy memo entitled, *Committing EPA's Water Program to Advancing the Watershed Approach* (Mehan 2002). This policy memo not only reaffirmed EPA's commitment to the watershed approach, but also re-energized efforts to ensure that the Agency as a whole fully integrates the approach into its programs and supports regulatory authorities that implement water programs on a watershed basis.

In December 2003, EPA issued the *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance* (Implementation Guidance) (USEPA 2003c) that describes EPA's recommended steps and ideas for watershed-based permitting implementation under the NPDES permit program. This approach, aimed at achieving new efficiencies and environmental results through the NPDES program, provides a process for considering all stressors within a hydrologically defined drainage basin or other geographic area (e.g., municipality), rather than addressing individual pollutant sources on a discharge-by-discharge basis. The December 2003 guidance followed a long series of EPA guidance, policy, and training supporting a watershed-based approach to addressing water quality concerns.

Purpose of this Document

This document, the *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance* (Technical Guidance), is a supplement to the 2003 Implementation Guidance and provides greater detail concerning a number of permit development and issuance questions not addressed previously. This document is focused on helping NPDES authorities develop and issue NPDES permits that fit into an overall watershed planning and management approach with input from watershed stakeholders. It consists of three chapters, each of which is summarized below.

- Chapter 1 is *Approaches to Water Quality Management Using an NPDES Watershed Framework*. This Chapter discusses the role of the NPDES program in an overall watershed approach and presents a tool called the NPDES Watershed Navigator (Navigator). The Navigator is simply a series of questions to guide permitting authorities and others through the process of analyzing watershed data and determining how to develop a framework for structuring and managing implementation of the NPDES program so that the entire watershed is considered in the permit development process.
- Chapter 2 is *Guide for Multisource Watershed-based NPDES Permitting*. One of the potential outcomes of the process described in Chapter 1 is a decision to develop a multisource watershed-based permit, which is a permit that would allow point sources in a watershed to apply for and obtain permit coverage under the same permit for one or more pollutants. Chapter 2 presents permitting options designed to ensure that sources achieve and maintain WQBELs derived from applicable water quality standards while providing opportunities for reducing implementation costs and improving administrative efficiencies using a watershed-based approach. The options presented give the permitting

authority maximum flexibility to customize a multisource watershed-based permit while meeting federal, state or local requirements and site-specific concerns.

- In Chapter 3, *Watershed-based NPDES Permitting Case Studies*, EPA has developed a series of case studies describing how watershed approaches have been implemented across the country.

It is important to note that many of the NPDES implementation options discussed in this document (e.g., synchronizing permit issuance or expiration dates or water quality trading), as well as implementation of other water resource programs that may be used to meet watershed goals (e.g., water quality standards assessment or watershed management planning under the CWA section 319 nonpoint source program), are addressed in other guidance or training provided by EPA and other agencies. Although most of the approaches and programs discussed in this document are not new, this is the first time that EPA has developed an integrated guidance regarding their relationship to the NPDES program within a watershed framework. Where appropriate, this document points readers to existing resources that provide additional technical assistance in implementing specific watershed-based approaches. For example, EPA's *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007) complements this Guidance and helps facilitate incorporating water quality trading into NPDES permits. Also, EPA's Watershed Academy provides a variety of training related to watershed planning and management (see EPA's Watershed Academy Web site at <http://www.epa.gov/owow/watershed/wacademy/>).

Chapter 1: Approaches to Water Quality Management Using an NPDES Watershed Framework

Although significant water quality improvements have been made through CWA programs during the past 35 years, the complex mix of remaining water quality problems and sources of pollution, including both point and nonpoint sources, calls for an integrated environmental management approach that can provide creative, comprehensive solutions. EPA and its state partners continue to promote a watershed approach to water quality management as a way to meet this need. This Chapter helps permitting authorities and others involved in the NPDES permitting process work through the analytical process of developing and applying an NPDES watershed framework as part of an overall watershed approach.

Section One: The NPDES Program and a Watershed Approach

As EPA and state partners have worked to implement a watershed approach, one significant finding is that a true watershed approach should begin to identify opportunities for environmental program integration at a watershed-level. Integrating implementation of CWA programs on a watershed-basis, rather than focusing on individual programs, pollutant sources, and waterbody segments, will enhance all stakeholders' efforts to protect watersheds from the cumulative impacts of a multitude of activities. The potential role of the NPDES program will be an important part of any discussion of program integration on a watershed-basis. The remainder of this section reviews the concept of a watershed approach, discusses the role of the NPDES program in a watershed approach, and considers how the NPDES program might be integrated into a watershed approach.

What is a Watershed Approach?

As defined in the *Watershed Approach Framework* (USEPA 1996a), “[T]he watershed approach is a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically defined geographic areas, taking into consideration both ground and surface water flow.” A watershed approach has three basic components:

Geographic Focus: Watersheds are nature’s boundaries. They are the land areas that drain to surface waterbodies, and they generally include lakes, rivers, estuaries, wetlands, streams, and the surrounding landscape. Ground water recharge areas are also considered.

Sound Management Techniques Based on Strong Science and Data: Sound scientific data, tools, and techniques are critical to inform the process. Actions taken include characterizing priority watershed problems and solutions, developing and implementing action plans, and evaluating their effectiveness within the watershed.

Partnerships/Stakeholder Involvement: Watersheds transcend political, social, and economic boundaries. Therefore, it is important to involve all the affected interests in designing and implementing goals for the watershed. Watershed teams may include representatives from all levels of government, public interest groups, industry, academic institutions, private landowners, concerned citizens, and others.

EPA has promoted the use of a watershed approach to manage, protect, and restore water resources through implementing an iterative, dynamic watershed management planning process. This process involves a series of steps to characterize existing conditions, identify problems and set priorities, define management objectives, develop protection or remediation strategies, and implement and adapt selected actions as necessary. The outcomes of this process are often documented or referenced in a watershed management plan. The watershed planning process includes participation from a variety of stakeholders in the watershed to develop goals and objectives, as well as to assist with the implementation of the plan.

What is the role of the NPDES program in a watershed approach?

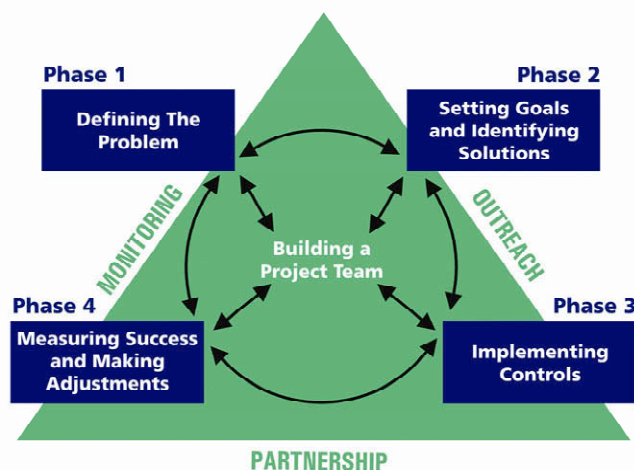
EPA believes that the NPDES program is an important part of an integrated watershed approach, and several Agency guidance documents and policy statements highlight and describe the NPDES program's role in implementing such an approach.

The *NPDES Watershed Strategy* (USEPA 1994a) supports using a watershed approach for NPDES permitting in conjunction with other CWA programs. The NPDES program is both a key customer and an essential partner in supporting other Office of Water program activities and achieving many of EPA's broader water quality goals. For example:

- NPDES permits implement portions of TMDLs and other watershed plans
- Water quality standards decisions affect the content of NPDES permits and decisions that point sources must make about treatment or process changes; point source discharges might impact the hydrology of a stream and the structure of an aquatic community
- Sources of pollutants are either subject to NPDES program requirements (e.g., municipal and industrial stormwater) or represent potential nonpoint source trading partners for point sources in a water quality trading program and
- NPDES permit conditions may be written specifically to protect sources of drinking water.

Over the past several years, EPA has continued to advance an NPDES watershed framework as described in the *NPDES Watershed Strategy*. In addition to the December 2002 policy memorandum *Committing EPA's Water Program to Advancing the Watershed Approach* (Mehan 2002), which provides direction to EPA program offices for implementation of a watershed approach, on January 7, 2003, EPA released the *Watershed-based NPDES Permitting Policy Statement* (Mehan 2003). This statement communicates EPA's policy on implementing NPDES permitting activities on a watershed basis, discusses the benefits of watershed-based permitting,

Exhibit 1-1. The watershed management process (Davenport 2002)



presents an explanation of the process and several mechanisms to implement watershed-based permitting, and outlines actions to encourage watershed-based permitting. It is both a formal commitment and a strategy for fully integrating the NPDES permitting program into the watershed approach.

As noted in the introduction, in December 2003, the Office of Water issued the *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance* (EPA 2003c) to more fully describe the concept of and the process for developing and issuing NPDES permits on a watershed basis.

How is the NPDES program integrated into a watershed approach?

Integrating NPDES permits and the NPDES program into a watershed approach means developing and using a watershed-based analysis as part of the permitting process and using that analysis to identify a range of NPDES implementation options and, potentially, other program options to achieve watershed goals. A *watershed permitting analytical approach* is the data gathering and analysis performed to support development and issuance of NPDES permits (and complementary activities) that consider the diverse pollutant sources and stressors within a defined geographic area (i.e., watershed boundaries). The primary difference between a watershed permitting analytical approach and the more common, historical approach to permitting is that a watershed permitting analytical approach explicitly considers the impact of multiple pollutant sources and stressors, including nonpoint source contributions, when developing point source permits. A watershed permitting analytical approach also considers watershed goals during the permitting process. In many ways, a watershed permitting analytical approach is similar to the analysis undertaken to develop a TMDL. Elements 1 and 2 of the *Navigator*, introduced later in this Chapter, serve as a guide to a watershed permitting analytical approach.

Once a permitting authority has completed a watershed permitting analytical approach, it can begin to construct an NPDES watershed framework. This framework could consist of a variety of watershed-based permitting implementation options and tools or other water program tools appropriate for a specific watershed. For example, NPDES implementation options might include coordinating individual permits; issuing municipal permits that include integration of multiple programmatic requirements (e.g., wastewater treatment plant, stormwater, and combined sewer overflow requirements); issuing multisource watershed-based permit; or implementing a water quality trading program. Other program options might include approaches such as developing monitoring consortiums to support a watershed study or TMDL development; implementing a rotating basin approach; or supporting source water protection plan development.

The permitting authority and other stakeholders in the watershed would coordinate implementation of watershed-based permitting options and other tools according to their priorities. The set of priority options selected for implementation would constitute what this document refers to as an *NPDES watershed framework* for the watershed. The specific options and tools selected for short-term and longer-term implementation will depend on the characteristics of the watershed and the permitting context. For example, in an urban area the best option may be integration of wet-weather programs and permitting within the watershed. A watershed where there are water quality impacts from multiple point source nutrient discharges

could be well suited to a point source water quality trading program. If nonpoint sources also are significant contributors within the watershed, the water quality trading program could be expanded to include nonpoint sources. In many cases, it might be advantageous to use a multisource watershed-based permit as a mechanism for implementing a water quality trading program. In a watershed where there are many sources of a common pollutant, but the contributions of those sources are not well quantified, a watershed-based permit or trading program might not be feasible. However, it still might be appropriate to address some aspects of NPDES permitting in the watershed on a watershed basis or to take actions involving related clean water programs. For example, coordinating point source and ambient monitoring in the watershed could help provide a better picture of the relationships between sources and their pollutant contributions. These are just a few examples of approaches to implementing the NPDES program that may be included in an overall NPDES watershed framework for a specific watershed. Element 3 of the *Navigator* in Section 3 of this Chapter describes some of these permitting options and discusses tools for and examples of setting priorities for implementation. Stakeholders in different watersheds across the country have developed a variety of frameworks targeted to address specific pollutant or stressor types and water quality concerns. Chapter 3 of this Technical Guidance is a collection of watershed-based permitting case studies that highlight specific watershed frameworks implemented to address a pollutant, stressor, or water quality concern in various watersheds around the country.

Section Two: Why Should a Permitting Authority Consider a Watershed Framework?

Implementing the NPDES program within a watershed framework could initially require additional time and effort on the part of the permit writer, the permittee, and other stakeholders. However, there are potential environmental and administrative benefits to this process. Developing comprehensive and simultaneous solutions to water quality problems, as well as setting priorities for implementing those solutions, should result in better and, potentially, faster water quality improvements for the resources invested. Several permitting options under an NPDES watershed framework have the potential to streamline the administration of the NPDES permitting process with the promise of reducing administrative costs over time. The drivers and potential benefits associated with an NPDES watershed approach are discussed below.

What factors lead to consideration of an NPDES watershed framework?

There are several factors that lead to consideration of a watershed approach to NPDES permitting, depending on the issues and concerns in a watershed. In some watersheds, environmental conditions are the catalyst. In others, regulatory and programmatic factors can influence the permit writer or other stakeholders to consider using a watershed approach. In most cases, these drivers are related to efforts to effectively and efficiently achieve water quality goals. Some of the factors that might motivate consideration of an NPDES watershed approach are provided below.

- **Waterbody Impairment and TMDL Development and Implementation.** Waterbodies that do not meet water quality standards are placed on a state's list of impaired waters, and the development of a TMDL usually is required. TMDL development involves determining the amount of a pollutant the waterbody can receive while still attaining water quality standards and assigning a portion of that load to each source in the

watershed. A watershed permitting approach considers all sources in the watershed when determining permit provisions. Thus, a watershed-based permit could be an effective way of implementing the TMDL, particularly if the watershed-based permit were designed to match the geographic scope of the TMDL and address all facilities for which the TMDL and WLAs were developed. An NPDES watershed framework likely will be a more effective way to implement TMDL WLAs for certain sources. Multisource watershed-based permits might also be useful in situations prior to TMDL development. The Chesapeake Bay is an example of a watershed using an NPDES watershed approach to address water quality impairments before developing TMDLs. In addition, permitting authorities can provide data from a watershed permitting analysis to assist in TMDL development and implementation. This type of approach was used in the Passaic River Basin in New Jersey to develop TMDLs for segments impaired by phosphorus. Finally, a multisource watershed-based permit could obviate the need for a TMDL in situations where the only causes of impairment are point sources, and the permit establishes controls on the point sources that will result in attainment of water quality standards.

- **Upstream Pollutant Contributions.** Many waterbody segments experience water quality problems attributable to upstream sources rather than just local discharges. Traditional approaches to NPDES permitting often provide little consideration of upstream sources except as background concentrations of a pollutant. Often attainment of water quality standards and other water quality goals is dependent on addressing upstream pollutant contributions. A watershed permitting approach accounts for upstream pollutant contributions and also promotes early and continuous involvement of parties responsible for upstream sources.
- **Nonpoint Source Challenges.** Achieving water quality standards and goals in most watersheds requires pollutant load reductions not only from point sources, but also nonpoint sources. Involving nonpoint sources in efforts to improve water quality can be challenging given the lack of regulatory mechanisms. A watershed permitting approach can include nonpoint source pollutant loadings in the overall watershed analysis; involve nonpoint source representatives in the process; and be used to coordinate, prioritize, and provide incentives for addressing nonpoint source reductions.
- **Local Support for Water Quality Improvements.** An NPDES watershed framework can be used to achieve local goals in a watershed where there is local support and interest. Where watershed stakeholders have already put time, effort, and other resources into watershed planning, an NPDES watershed framework could be a logical extension of those efforts and benefit from the watershed analyses already completed and local implementation efforts already underway. Permit writers should ensure that NPDES permits are consistent with watershed plans by complementing community efforts, such as smart growth and sustainable development, supporting the protection of critical areas identified in the watershed plan, and addressing priority pollutants identified in the watershed plan.
- **Large Financial Investments.** Capital costs and operation and maintenance investments in clean water and drinking water infrastructure are significant. An NPDES watershed framework can address disparities between project needs and current spending on clean water and drinking water infrastructure by simultaneously considering all needs and setting priorities on the basis of potential water quality outcomes. An NPDES watershed framework promotes (1) better infrastructure management, (2) more efficient water use,

(3) full cost pricing for revenue and conservation, and (4) watershed-based approaches to infrastructure planning.

- **Multiple Regulatory Challenges.** Many communities face the challenge of meeting multiple regulatory requirements at the federal, state, tribal, and local levels. Regulatory requirements may overlap, be redundant, or, in some instances, conflict (e.g., increasing water use efficiency to meet a local water use reduction requirement might conflict with meeting concentration-based NPDES effluent limitations). As a result, the regulated community might feel burdened by uncoordinated regulatory activities, and regulators have the associated burden of administering multiple regulatory programs. Through an NPDES watershed framework, it is possible to coordinate and streamline regulatory requirements, producing programmatic efficiencies and ensuring compliance with measurable environmental results.

What are the potential benefits of applying an NPDES watershed approach?

EPA has promoted using an NPDES watershed approach for more than a decade. Real-world applications of an NPDES watershed framework help highlight associated benefits to water quality to permitting authorities, permittees, and other stakeholders; however, some of the potential benefits of applying an NPDES watershed framework remain theoretical. Presented below is a discussion of potential and observed benefits of using an NPDES watershed framework.

- **Water Quality Benefits.** The primary benefit of an NPDES watershed framework is that it can more effectively and efficiently improve water quality than uncoordinated, single-source oriented water resource management programs. Using a watershed permitting approach can adjust the focus of the NPDES program from the “end of the pipe” to broader watershed considerations such as ambient monitoring, permit conditions that more directly consider upstream and downstream impacts, and pollutant loadings from all stressors (e.g., nonpoint sources as well as point sources). Applying an NPDES watershed framework will not only help to achieve improvements in water quality, but can also expedite these improvements. Many current water quality goals have a time-sensitive component (e.g., achieving a percent reduction in a pollutant load by the year 2015). The potential to achieve significant water quality improvements in the near term is one of the most compelling benefits of applying an NPDES watershed framework.
- **Benefits for the Permitting Authority.** NPDES permitting authorities are facing significant permit backlogs and other challenges related to developing and issuing NPDES permits. As a result, permitting authorities are working to improve the integrity, efficiency, and environmental results of their NPDES programs. Applying an NPDES watershed framework has the potential to streamline the permitting process, if not in the initial permit issuance, then certainly in subsequent reissuances. For example, for sources in a watershed where developing and issuing watershed-based permits is a viable option, permitting authorities have the option of developing one permit to cover multiple sources or discharges rather than developing and issuing multiple permits. A watershed permitting approach might initially require a greater investment of time and resources, but, in the long run, it has the potential to cut down on the time necessary to write a permit and to conduct the associated administrative activities, such as planning and facilitating public hearings.

- **Benefits for Permittees.** An NPDES watershed framework includes opportunities to consolidate actual permits or permit requirements, such as monitoring and reporting. In addition, an NPDES watershed framework could assist dischargers who wish to set priorities for potential solutions (e.g., determine which pollutants and which sources to focus on first to achieve the greatest water quality improvements). The end result would be implementation of strategies and approaches that could generate both cost savings and improved environmental conditions.

Section Three: Navigating the Watershed Permitting Process

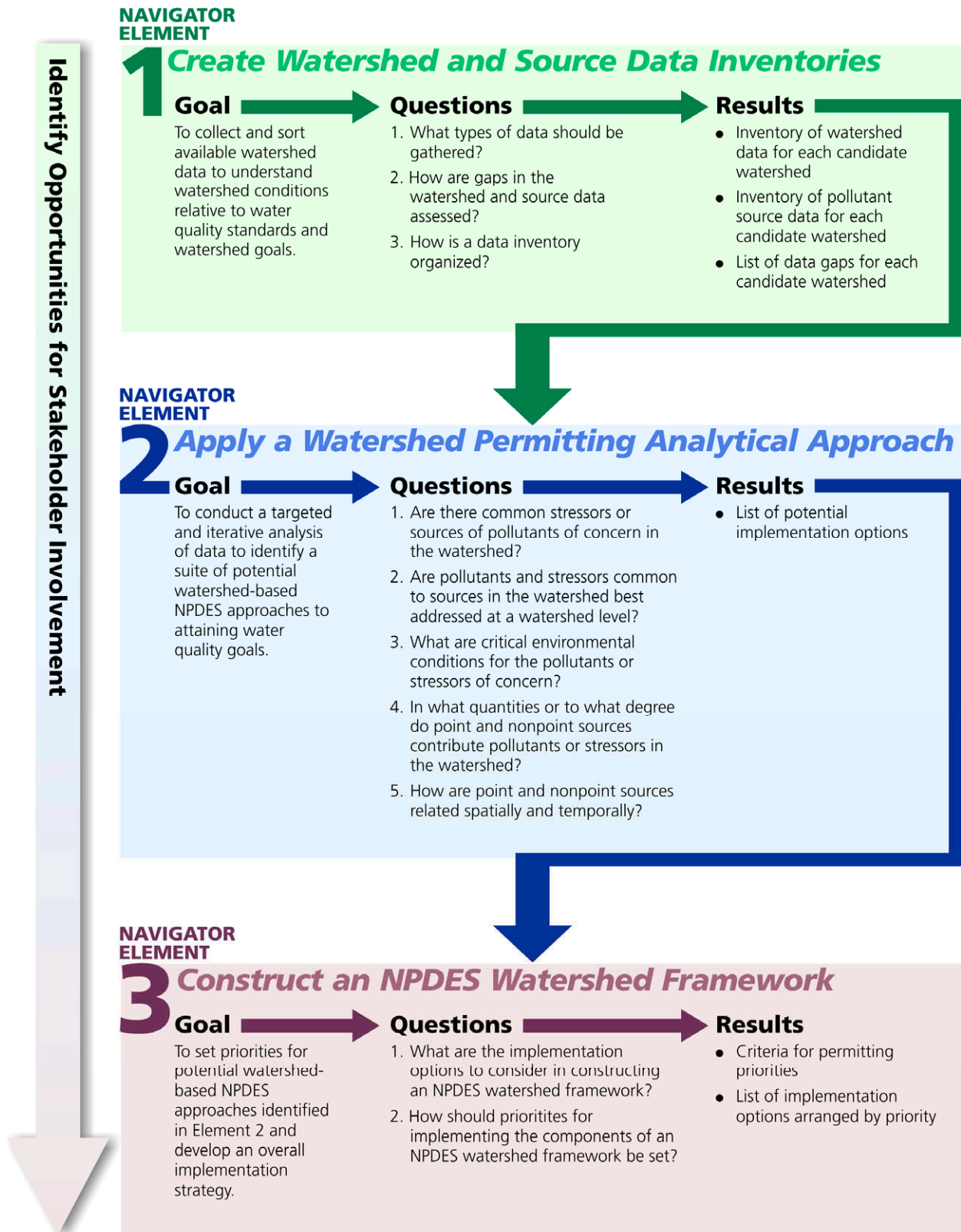


As discussed in Section 2 above, a number of factors might lead an NPDES permit writer or other stakeholders to select a candidate watershed for application of an NPDES watershed approach—but what kind of analysis and decision making are needed, and what is the outcome of this process? EPA has developed a basic decision-making tool called the NPDES Watershed Navigator (the Navigator) to help those involved in the NPDES program work through a watershed permitting analytical approach and construct an NPDES watershed framework in a watershed. The Navigator consists of a series of questions that facilitates analysis of watershed data and determines how best to structure and manage implementation of the NPDES program in a way that considers the entire watershed. The Navigator consists of three elements:

- **Element 1: Create Watershed and Source Data Inventories.** This element identifies the types of data recommended to conduct a watershed permitting analysis. The process outlined in this section results in watershed and source data inventories that can be used in Element 2.
- **Element 2: Apply a Watershed Permitting Analytical Approach.** Using the watershed and source data inventories, this element presents several ways to analyze the data to identify implementation options that could form an NPDES watershed framework. Such options might include establishing a monitoring consortium, developing a water quality trading program, or issuing a multisource, watershed-based permit, among many others. The approaches that could be applied in a given watershed will depend on the data available, the nature of the water quality concerns, the sources of pollutants or stressors, and the relationships among those sources.
- **Element 3: Construct an NPDES Watershed Framework.** Through Element 2 of the Navigator, a permitting authority and other stakeholders are likely to identify several implementation options that, together, would constitute an NPDES watershed framework. This element discusses these options in more detail and presents an example of priority-setting. Chapter 3 of this Technical Guidance presents case examples of how NPDES watershed frameworks were applied in different permitting contexts.

Each element of the Navigator has a goal, specific activities to be undertaken, and a specific set of results to help readers make decisions in the remaining elements. Exhibit 1-2 illustrates the goal, questions, and anticipated results for each Navigator element. Although stakeholder involvement is not specifically listed as an element of the Navigator, it is a key step in conducting a watershed permitting analytical approach and applying an NPDES watershed framework within a watershed. EPA encourages stakeholder involvement in all stages of the Navigator process. Early stakeholder involvement will strengthen the overall NPDES watershed framework by empowering stakeholders and enabling their participation in the process.

Exhibit 1-2. Goals, questions, and results associated with Navigator elements



A discussion on stakeholder involvement in a watershed permitting analytical approach and an NPDES watershed framework is provided in **Appendix A**. The remainder of this section guides the reader through the three elements of the Navigator.

Navigator Element 1: Create Watershed and Source Data Inventories



Once a candidate watershed has been selected for a watershed permitting analytical approach, the permitting authority and other stakeholders should begin to collect and sort available data. The challenge at this point is determining which data will help stakeholders understand conditions in the watershed in relation to water quality standards and watershed goals. In addition, data gaps should be identified. Carefully studying the drivers for considering a watershed permitting approach should help the permitting authority and other stakeholders focus on the most relevant types and sources of data for the watershed and avoid spending time and money gathering data that are not useful. The permitting authority should be careful, however, not to prematurely dismiss a watershed concern or set of watershed or source data when conducting a watershed permitting analytical approach. If time and budgets permit, analyzing a more comprehensive data set in Element 2 might point to potential watershed issues or implementation options that stakeholders had not yet considered.

Question #1: What types of data should be gathered?

The types of data gathered for this element of the Navigator fall into two broad categories: watershed data and pollutant source data. Watershed data include data on the physical and natural features of the watershed and information about watershed goals and conditions. Pollutant source data include data on locations and characteristics of both point and nonpoint sources. These data are analyzed in Element 2 of the Navigator to help identify specific implementation options under an NPDES watershed framework that would be most effective in the watershed. Exhibit 1-3 below identifies the types of data that might be collected for watershed and pollutant source data inventories and some typical uses of these data. Again, note that the more clearly and narrowly the driver for using an NPDES watershed approach in a particular watershed is defined, the more focused the effort of creating watershed and source data inventories can become.

If a watershed assessment or characterization has been developed to support an earlier project in the watershed, much of the information listed in Exhibit 1-3 might have already been gathered into one place (e.g., a TMDL study, a nonpoint source watershed plan). Otherwise, the permitting authority, in cooperation with other stakeholders, should collect and sort available data that are relevant to the issues of concern in the watershed. In addition to using these data in Element 2, some data might be used for environmental indicators to measure performance (see Section Four of this Chapter).

Exhibit 1-3. Potential data inventory data types, uses, and sources

Data type	Typical uses	Sources
Watershed data		
Watershed boundaries	<ul style="list-style-type: none"> ▪ Delineating geographic boundaries for evaluation and coordinating activities ▪ Defining scale for additional data collection 	U.S. Geological Survey Elevation Derivatives for National Application (EDNA) database and interactive map: http://edna.usgs.gov
Hydrology	<ul style="list-style-type: none"> ▪ Defining locations of waterbodies and tributaries ▪ Providing an understanding of how water flows through the watershed ▪ Defining flows at critical conditions (low and high flows) and variations in flow for water quality modeling 	U.S. Geological Survey's National Water Information System web site (NWISWeb): http://waterdata.usgs.gov/nwis/
Topography	<ul style="list-style-type: none"> ▪ Deriving slopes of stream segments and watershed areas for estimating nonpoint source loads and water quality modeling ▪ Evaluating altitude changes and the effect on projected precipitation for runoff characterization 	U.S. Department of Agriculture's Natural Resources Conservation Service: http://www.ncgc.nrcs.usda.gov/products/datasets/elevation/index.html
Soils	<ul style="list-style-type: none"> ▪ Identifying areas with potentially high erosion rates and poor drainage for estimating nonpoint source loads 	Natural Resources Conservation Service's State Soil Geographic Database (STATSGO) and Soil Survey Geographic Database (SSURGO): http://www.ncgc.nrcs.usda.gov/products/datasets/statsgo/ http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/
Climate	<ul style="list-style-type: none"> ▪ Correlating loading conditions and in-stream data (e.g., elevated in-stream concentrations during storm events) ▪ Providing data for wet-weather watershed modeling 	National Climatic Data Center (NCDC), maintained by the National Oceanic and Atmospheric Administration (NOAA): http://www.ncdc.noaa.gov/oa/ncdc.html
Aquatic life and habitat	<ul style="list-style-type: none"> ▪ Identifying areas that support aquatic life and areas that are impaired or are at risk of impairment ▪ Defining stressors that might contribute to impairment ▪ Identifying lack of shade or riparian cover ▪ Assessing the general health of the watershed through biological criteria and biological assessments ▪ Identifying potential habitat protection areas 	<p>U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program's ecological studies: http://water.usgs.gov/nawqa/ http://infotrek.er.usgs.gov/pls/htmldb/f?p=mdc:mdc_home:4392457933367716</p> <p>State water quality agency information: http://cfpub2.epa.gov/npdes/stateinfo.cfm http://www.epa.gov/waterscience/standards/regions.htm http://www.epa.gov/waters/305b/index.html http://www.epa.gov/owow/tmdl/</p> <p>Watershed organizations</p>
Wildlife	<ul style="list-style-type: none"> ▪ Identifying wildlife species for special protection ▪ Identifying potential sources of bacteria and nutrients 	State or local wildlife agencies: http://offices.fws.gov/statelinks.html
Land use and land cover	<ul style="list-style-type: none"> ▪ Identifying potential point and nonpoint sources (e.g., land use, impervious surfaces) ▪ Simulating loadings in watershed water quality models 	Multi-Resolution Land Characteristics (MRLC) Consortium: http://www.mrlc.gov/index.asp
Demographics	<ul style="list-style-type: none"> ▪ Projecting potential future waterbody uses and potential population growth in the watershed ▪ Identifying potential environmental justice concerns 	<p>U.S. Census Bureau: http://www.census.gov/</p> <p>Watershed organizations</p> <p>Local planning agencies</p>

Data type	Typical uses	Sources
Watershed data		
Water quality standards	<ul style="list-style-type: none"> Identifying designated uses and criteria that apply to waterbodies and waterbody segments in the watershed Identifying water quality standards implementation policies (e.g., critical flows, mixing zones) 	State water quality agency information: http://www.epa.gov/waterscience/standards/regions.htm
Water quality assessments and impaired waters	<ul style="list-style-type: none"> Determining the condition and the water quality status of water bodies (e.g., impaired, threatened, attaining standards) Identifying potential causes and sources of impairment 	EPA's STORET database: http://www.epa.gov/STORET/index.html State water quality agency information: http://www.epa.gov/waters/305b/index.html http://www.epa.gov/owow/tmdl/
TMDLs	<ul style="list-style-type: none"> Identifying waterbody impairments, sources, pollutant loads, and reductions needed for attainment 	State water quality agency information: http://www.epa.gov/waters/305b/index.html http://www.epa.gov/owow/tmdl/ EPA Regional offices: http://cfpub2.epa.gov/npdes/stateinfo.cfm
Source Water Protection Plans	<ul style="list-style-type: none"> Identifying source waters areas for special protection 	State water quality agency information: http://cfpub2.epa.gov/npdes/stateinfo.cfm State departments of health State source water protection contacts: http://cfpub.epa.gov/safewater/sourcewater/
Source Data		
Point sources	<ul style="list-style-type: none"> Locating point sources within the watershed Identifying existing permit conditions for point sources Characterizing point sources and point source pollutant loadings Establishing the relationships (e.g., geographic, water quality impact) between point sources and among point and nonpoint sources in the watershed (e.g., for trading) 	EPA's Permit Compliance System (PCS): http://www.epa.gov/enviro/html/pcs/index.html EPA's Integrated Compliance Information System (ICIS): http://www.epa.gov/compliance/data/systems/modernization/timeline.html State water quality agency information: http://cfpub2.epa.gov/npdes/stateinfo.cfm eNOI registrations (for states where EPA is the NPDES authority): http://cfpub.epa.gov/npdes/stormwater/enoi.cfm
Nonpoint sources	<ul style="list-style-type: none"> Identifying types or categories of nonpoint sources Identifying locations of specific nonpoint sources Identifying existing nonpoint source management measures Characterizing nonpoint sources and nonpoint source pollutant loadings Establishing the relationships (e.g., geographic, water quality impact) among nonpoint sources and between nonpoint and point sources in the watershed (e.g., for trading) 	U.S. Department of Agriculture's Census of Agriculture (livestock and cropland) MRLC (land use categories) Natural Resources Conservation Service Local conservation districts Watershed organizations U.S. Census Bureau (septic tank use): http://quickfacts.census.gov National Small Flows Clearinghouse (failing septic systems in the nation by county): http://www.nesc.wvu.edu/nsfc/nsfc_index.htm Bureau of Land Management (silviculture sources): http://www.blm.gov/wo/st/en/info/directory.2.html

Source: USEPA 2005a

Question #2. *How are gaps in the watershed and source data assessed?*

As previously stated, the inventory should focus on the most relevant types and sources of data necessary to address specific issues of concern in the watershed. Once these critical data types are determined, the Watershed and Source Data Gap Assessment Worksheet found in **Appendix B**, or a similar tool, will assist in assessing the availability, source, format, and quality of any existing data needed for the approach, and determine what additional types of data should be sought. If necessary, the permitting authority could alter the worksheet to include those data types relevant to a specific watershed.

Question #3. *How is a data inventory organized?*

After completing the data gap assessment, the permitting authority should organize detailed information about the available data in a formal data inventory using either a text document, spreadsheet, or database. The organizational structure will depend on the type and amount of data sources, as well as the ultimate use of the inventory. If it is necessary to query the data, the data could be entered into a searchable database (e.g., Access). The inventory should be updated as needed as additional data are assembled to ensure that a complete summary of data is available to stakeholders in the watershed. Section 5.10 of EPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (USEPA 2005a) provides detailed guidance on creating a comprehensive monitoring and watershed data inventory.

Navigator Element 2: *Apply a Watershed Permitting Analytical Approach*



After collecting and sorting watershed data and pollutant source data, the permitting authority should begin the process of analyzing these data. The goal of this process is to conduct a targeted and iterative analysis of the data that will allow stakeholders to identify a suite of potential watershed-based NPDES approaches to attaining water quality goals in Element 3. The Navigator approaches this analysis by asking five critical questions about the stressors, pollutants, and sources:

1. Are there common stressors or sources of pollutants of concern in the watershed?
2. Are pollutants and stressors common to sources in the watershed best addressed at a watershed level?
3. What are critical environmental conditions for the pollutants or stressors of concern?
4. In what quantities or to what degree do point and nonpoint sources contribute pollutants or stressors in the watershed?
5. How are point and nonpoint sources related spatially and temporally?

These questions and potential implementation options arising from the answers to these questions are discussed below. More detailed descriptions of the implementation options are provided under Element 3 of the Navigator.

Question #1. Are there common stressors or sources of pollutants of concern in the watershed?

The first task in analyzing the available data for a candidate watershed is to sort the data to narrow the scope of the analysis, if this task was not already performed as part of the data collection and sorting process. This task involves identifying relationships among existing NPDES permits, nonpoint sources, and pollutants or stressors of concern that might appropriately be addressed under an NPDES watershed framework. Exhibit 1-4, below, presents an example of how such information might be arrayed in a simple matrix.

Exhibit 1-4. Example permit analysis matrix

Permit Number or Nonpoint Source		Pollutant or Stressor							
		Total Nitrogen	Nitrate	Total Phosphorus	Soluble Phosphorus	Temperature	Copper	Total Suspended Solids	
		ST0000001	✓		✓	✓		✓	✓
		ST0000002	✓	✓	✓	✓			✓
		ST0000003					✓		
		ST0000004	✓		✓	✓			✓
		ST0000005	✓	✓			✓	✓	✓
		ST0000006					✓	✓	
NPS1	✓		✓				✓		

Pollutants or stressors under consideration in this part of the analysis might include pollutants limited through existing NPDES permits, pollutants discharged by a point source and considered during the permitting process but not limited in the permit, pollutants contributed by nonpoint sources, and stressors on the waterbody or watershed (e.g., lack of riparian buffer resulting in excessive nutrient runoff, hydrologic modifications that reduce dissolved oxygen levels). This type of matrix is a quick and easy approach that highlights commonalities among sources and allows broad groupings of sources, pollutants, and stressors for further analysis. For example, considering Exhibit 1-4, one might decide to further analyze a grouping of permits ST0000001, ST0000002, ST0000004, and ST0000005 and nonpoint source NPS 1 with the pollutants total nitrogen, total phosphorus, and total suspended solids. While not every point source in the grouping is contributing every pollutant in the grouping to the waters in the watershed (for example, the point source holding permit ST0000005 does not discharge phosphorus), the overlap of common sources and pollutants indicates the potential for addressing these sources and pollutants under an NPDES watershed framework. At this point, a permit writer could proceed by asking the remaining four questions about the selected grouping of sources and pollutants or stressors.

In addition to allowing the scope of the watershed analysis to be narrowed, this basic approach to sorting data could also lead to identification of critical data gaps not previously recognized. For example, consider a watershed where nutrient loadings are a concern that is driving consideration of a watershed approach, but when available data are sorted, no effluent data for nutrients is found for one or more point sources in the watershed that might be expected to be discharging nutrients (e.g., publicly owned treatment works). A data gap has been identified. This data gap may point to a specific implementation option under an NPDES watershed framework, such as modifying the monitoring requirements in the permits or developing a watershed-wide or regional monitoring program to ensure that sufficient watershed-wide nutrient data are available.

Question #2. Are pollutants and stressors common to sources in the watershed best addressed at a watershed level?

The second question in this element of the Navigator examines the nature of the pollutants or stressors common to the sources in the grouping, identified through Question #1 above, to determine if they could be addressed at a watershed or regional level. This determination is important in deciding how to proceed with implementing an NPDES watershed approach because, for such an approach to be useful, pollutants of concern within the watershed should have more than just localized effects that can be addressed through the permitting authority's normal process for developing WQBELs in individual permits.

The question of whether common pollutants and stressors may be addressed at a watershed level actually is answered in two parts: (1) by determining whether these pollutants and stressors have watershed-wide, regional, or far-field effects and (2) by determining whether the form of the pollutant or stressor is the same or if the effects of different pollutants or stressors can be equated across the grouping of sources.

To understand the first issue, the presence or absence of far-field effects, it is important to consider the difference between localized effects and far-field effects. Localized effects, or near-field effects, are impacts that are evident within a smaller, more immediate area close to the source of the pollutant or stressor. On the other hand, far-field effects are those impacts felt in a wider area and where there potentially are cumulative impacts from multiple sources.

In most cases one could address pollutants with localized effects (e.g., acute and chronic effects of pollutants such as cyanide or chlorine) by controlling and monitoring them through individual permits or nonpoint source controls that apply effluent limitations or practices reflecting individual controls designed to ensure attainment of water quality standards in the immediate

**IMPLEMENTATION OPTIONS BASED
ON POTENTIAL ANSWERS TO
QUESTION #1**

- Several urban wet-weather sources identified
 - » Wet-weather integration
 - » Indicator development for stormwater management
- Few common pollutants across sources
 - » Permit synchronization
- Common stressors unknown because of lack of data
 - » Monitoring consortium development
- Several common sources and stressors
 - » Continue to Question #2 - additional watershed-based approaches are possible

vicinity of the discharge. Where several point source dischargers experience problems with localized effects of specific pollutants, however, a watershed permitting approach might be helpful. For instance, a monitoring consortium could be established to quantify pollutant sources, assess the impacts of pollutant discharges, and develop site-specific water quality criteria for the waterbody.

Nutrient discharges from point and nonpoint sources often present both near-field and far-field concerns. For example, a state might have water quality criteria for nutrients to protect waters in the immediate vicinity of each source, but the fate and transport of nutrients discharged throughout the watershed could affect a downstream lake. If the state has water quality criteria or goals for nutrients in the lake, these could be translated into necessary nutrient loading reductions throughout the watershed (see Question #5).

The second issue, determining whether the form of the pollutant or stressor is the same or whether a common measurement can be applied across the grouping of sources, recognizes the fact that some pollutants are discharged in more than one form (e.g., phosphorus, nitrogen, oxygen demand). For an NPDES watershed approach to be most effective, it should be possible to limit or measure the pollutant or stressor of concern in the same form or to convert different forms to a common measurement.

After determining whether pollutants common to dischargers within the watershed have known watershed-wide or regional effects – or are likely to have such effects – and can be limited or measured in a common form, appropriate groups of permits and pollutants or stressors can be considered at a watershed level. EPA’s *Water Quality Trading Assessment Handbook* (USEPA 2004), provides a methodology for determining the suitability of pollutants for development of a trading program. Many of the same questions and procedures considered in the *Water Quality Trading Assessment Handbook* are more generally applicable to determining the suitability of a pollutant for any watershed-based NPDES approach.

For those pollutants likely to have only localized effects or in cases in which measurements cannot be converted to a common form across dischargers, WQBELs should be determined using the procedures in EPA’s *Technical Support Document for Water Quality-based Toxics Control* (USEPA 1991), modified as necessary for conventional and nonconventional pollutants, or similar state procedures for individual permit development.

IMPLEMENTATION OPTIONS BASED ON POTENTIAL ANSWERS TO QUESTION #2

- Common pollutants or stressors are not best addressed at the watershed level
 - » Permit synchronization
- Common pollutants and stressors lend themselves to being addressed at a watershed level
 - » Continue to Question #3—additional watershed-based approaches are possible

Key References:

- Applicable Water Quality Standards, TMDLs, or watershed goals that set loading targets
- *Technical Support Document for Water Quality-based Toxics Control* (USEPA 1991) or similar state procedures

- *Water Quality Trading Assessment Handbook* (USEPA 2004) (see especially “The Six Step Suitability Analysis”)

Question #3. What are the critical environmental conditions for the pollutants or stressors of concern?

The next question a permitting authority should consider when analyzing watershed and source data is what the critical environmental conditions are for the pollutants or stressors of concern. Critical environmental conditions are environmental conditions in the waterbody where controls designed to protect those conditions will ensure attainment of water quality standards and goals for all other conditions. These conditions could include a combination of factors (e.g., stream flow, temperature) and might actually occur infrequently. Depending on the pollutant or stressor of concern and the sources of those pollutants and stressors, critical conditions might occur during low stream flow, runoff events, rainfall events, or hot and dry periods.

The permitting authority, and other stakeholders, might first look to the applicable water quality standards or written water quality goals for the waterbody for information about critical conditions. Water quality standards generally define critical conditions for those pollutants subject to numeric water quality criteria, usually a critical low flow (e.g., a 1Q10 low flow, which is the lowest 1-day average flow that occurs, on average, once every 10 years or a 7Q10 low flow) for streams and rivers for aquatic life criteria and some measure of low flow or mean flow (e.g., harmonic mean) for human health criteria. In addition, the applicable water quality criteria could be dependent upon characteristics of the receiving water, such as pH or hardness. This information will define one set of critical conditions, typically related to prevention of localized impacts in a water column. If a TMDL has been completed for a pollutant, the critical conditions might be adequately identified for that pollutant for both near-field and far-field effects. For other pollutants, however, the permitting authority should examine the nature of the pollutant or stressor, its impacts, and potential sources to ensure an understanding of critical conditions. For instance, EPA’s *Protocol for Developing Pathogen TMDLs* (USEPA 2001) states that critical conditions for bacteria depend on the source behavior. That is, sources of bacteria are diverse and could include a combination of sources; therefore, there might be multiple sets of critical conditions. Pollutant sources and stressors could be evaluated under various conditions to determine the scenario where the greatest impacts are likely. Are conditions most critical during the wet season? The dry season? During certain wet-weather events or

**IMPLEMENTATION OPTIONS BASED
ON POTENTIAL ANSWERS TO
QUESTION #3**

- Critical environmental conditions unknown because of insufficient data
 - » Monitoring consortium development
- Critical conditions are well defined, but vary by pollutant
 - » Consider narrowing the scope of the watershed analysis
 - » Continue to Question #4—additional watershed-based approaches possible
- Critical conditions are well defined and consistent for pollutants of concern
 - » Wet-weather integration (if wet-weather conditions are critical)
 - » Indicator development for watershed-based stormwater management (if wet-weather conditions are critical)
 - » Continue to Question #4—additional watershed-based approaches are possible

low flow conditions? Are the critical conditions the same throughout the year? EPA's technical protocols for TMDL development provide helpful background information on potential critical conditions for various pollutants. In addition to the pathogen TMDL protocol, see EPA's *Protocol for Developing Sediment TMDLs* (USEPA 1999a) and *Protocol for Developing Nutrient TMDLs* (USEPA 1999b) for additional background information.

Understanding critical conditions helps to ensure that all key sources of the pollutants of concern have been identified and provides an indication of the level of complexity that might be involved in further analysis of the watershed. For example, if critical conditions for some pollutants occur during the wet season while critical conditions for other pollutants of concern occur only during low flow or dry conditions, the permitting authority should consider pursuing a more complex analysis of the watershed that considers a range of conditions (i.e., wet and dry) or, alternatively, simplifying the analysis by focusing on a single set of conditions and, therefore, potentially reducing the number of pollutants addressed through a watershed-based NPDES approach. It is possible to proceed without defining critical conditions, but potential implementation options under an NPDES watershed framework might be limited to administrative options, such as permit synchronization, or developing permit conditions that promote additional data gathering.

Key References:

- Applicable water quality standards
- State impaired waters on the section 303(d) list
- Draft or completed TMDLs
- Regional or watershed monitoring data
- *Protocol for Developing Sediment TMDLs* (USEPA 1999a)
- *Protocol for Developing Nutrient TMDLs* (USEPA 1999b)
- *Protocol for Developing Pathogen TMDLs* (USEPA 2001)
- Data collected and sorted in Navigator Element 2

Question #4. In what quantities or to what degree do point and nonpoint sources contribute pollutants or stressors in the watershed?

After defining critical conditions in the watershed, the permitting authority and other stakeholders should analyze the available data to determine whether point and nonpoint source contributions of pollutants of concern at critical conditions have been quantified through monitoring or have been modeled. If a TMDL has been developed, this information should be available. When a TMDL has not been developed for a particular pollutant, contributions from continuous point sources would be quantifiable using data available through NPDES permits, Discharge Monitoring Reports (DMRs), and other permit records, such as permit applications, fact sheets, or statements of basis. Because monitoring is not always required for discharges from noncontinuous point sources, such as stormwater or concentrated animal feeding operations (CAFOs), models or estimates of these contributions might be needed. Similarly, nonpoint source contributions of pollutants that are not measured may be modeled or otherwise estimated. Methodologies for estimating or modeling contributions for individual nonpoint sources may differ from watershed to watershed and from state to state and will vary in complexity, depending on the available data and the individual watershed's needs or desired programmatic outcomes. A simple method for estimating individual nonpoint source loads could involve

determining the load attributable to all nonpoint sources in the watershed (for example, by subtracting the known loading from point sources from a known overall loading) and estimating the load from each individual nonpoint source on the basis of relative percent land cover. If more certainty is needed in the estimate, a modeling tool, such as EPA's BASINS (Better Assessment Science Integrating Point & Nonpoint Sources) available online at <http://www.epa.gov/waterscience/BASINS/> could be used. In addition, the state's TMDL program might provide guidance on acceptable methods for estimating nonpoint source contributions to overall pollutant loads. Finally, some agencies, like the U.S. Geological Survey's National Water Quality Assessment (NAWQA) program, are beginning to systematically monitor nonpoint source contributions to water quality problems in some watersheds. (NAWQA data are available online at <http://water.usgs.gov/nawqa/index.html>.)

Quantifying relative contributions of sources within the watershed allows stakeholders to assess the feasibility of various watershed-based approaches to NPDES permitting. For example, the contributions of the various sources in the watershed should be quantified to determine whether supply and demand of water quality credits are reasonably aligned so that a trading program is viable. EPA's *Water Quality Trading Assessment Handbook* (USEPA 2004) provides more detail on quantifying various source contributions to assess the feasibility of establishing a trading program in a watershed. If this task of quantifying and estimating various source contributions has not been completed, it should be considered as a potential implementation option under an NPDES watershed framework.

Understanding the relative contributions of point and nonpoint sources within the watershed also is necessary for answering a key question at this point in the analysis: *Do point sources in the watershed contribute enough of the pollutant load, relative to nonpoint sources, to warrant continuing with an NPDES watershed approach?* In other words, if the majority of the pollutant load in the watershed is contributed by nonpoint sources, most implementation options under an NPDES watershed framework may not be effective means of attaining water quality standards and goals in the watershed. An exact accounting of contributions from each individual source should not be necessary to answer this question. Rather, the question could be answered with a rough estimate of relative contributions from the different types of sources. With input from stakeholders, criteria for what constitutes a significant contribution from point sources should be developed. These criteria

IMPLEMENTATION OPTIONS BASED ON POTENTIAL ANSWERS TO QUESTION #4

- Relative contributions unknown because of insufficient data
 - » Monitoring consortium development
 - » Watershed management plan development
 - » TMDL development and implementation support
 - » Statewide rotating basin planning
- Pollutants predominantly contributed by nonpoint sources
 - » State-approved watershed management plan development and implementation
 - » Section 319 nonpoint source management program and watershed planning
- Point sources are significant contributors
 - » NPDES permit development on a watershed basis
 - » Water quality trading
 - » Permit synchronization
 - » Continue to Question #5—additional watershed-based approaches are possible

can depend on a variety of considerations, including the specific type of pollutant, priorities for protecting specific uses, or the resources available to the regulatory authority for addressing point sources and nonpoint sources. If only a small percentage of the total contributions of a pollutant in the watershed is from point sources, WQBELs may be considered for that pollutant using standard permitting procedures for individual point sources and federal or state nonpoint source programs (e.g., Section 319 Nonpoint Source Management Programs) may be used to address nonpoint sources.

Key References:

- State impaired waters on the section 303(d) list
- Draft or completed TMDLs
- Regional or watershed monitoring data
- EPA guidance documents on nonpoint source funding at www.epa.gov/owow/nps/funding.html
- Data collected and sorted in Navigator Element 2 (permits, DMRs, permit supporting documentation)
- *Technical Support Document for Water Quality-based Toxics Control* (USEPA 1991) or similar state procedures

Question #5. How are pollutant sources and stressors spatially and temporally related?

Finally, consideration should be given to defining the spatial and temporal relationships among contributing sources. An understanding of the spatial and temporal relationships among multiple point sources will foster a robust watershed analysis, allowing consideration of the widest possible range of options for watershed-based NPDES approaches. Understanding relationships among sources is especially important for implementing a successful trading program. For pollutants with watershed-wide or regional effects, contributions at one point in a watershed are not necessarily equivalent to contributions at another point in the watershed in terms of their overall impact on the watershed.

Consider the example of a lake that has experienced nuisance aquatic plant growth and dissolved oxygen sags resulting from nutrient enriched water. Total phosphorus has been identified as a pollutant of concern. Nine sources of phosphorus have been shown to contribute loads to the basin. These sources are along the river that feeds the lake. One of the sources, a publicly owned treatment works (POTW), is a permitted point source upstream of the lake, but 20 miles downstream of an irrigation return flow to the river. A farm, an agricultural nonpoint source, is the only source discharging phosphorus to the irrigation return ditch. In addition, there is an agriculture diversion that diverts 75 percent of the river flow between the farm and the POTW. Total phosphorus discharges from the farm and the POTW would not have the same relative impact on the downstream lake. First, the phosphorus is likely to be in different forms—soluble from the POTW and non-soluble from the farm. Second, the distance between the farm and the POTW and the significant agricultural diversion between the two sources mean that even phosphorus discharges from the two sources that are in the same form would not have equal impact on the lake. The regulatory authority would need to quantify the relationship between the effects of a pound of phosphorus discharged by the farm and a pound of phosphorus discharged by the POTW to determine an approach for effectively managing water quality in the lake.

It might be helpful to use equations and models that have been developed to estimate the decay rate, or attenuation, of water quality pollutants to account for spatial relationships in calculating the relative contributions of various sources in a watershed. For example:

- EPA provides information on calculating pathogen die-off rates in its *Protocol for Developing Pathogen TMDLs* (USEPA 2001).
- Various approaches to evaluating the relationships between nutrient sources and water quality responses are evaluated in EPA's *Protocol for Developing Nutrient TMDLs* (USEPA 1999b).
- *Principles of Surface Water Quality Modeling and Control* (Thomann and Mueller 1987) is a popular reference text that presents comprehensive discussions of fate and transport and modeling techniques for a variety of pollutants in different types of aquatic systems.

An example of a watershed-based permitting solution that accounts for spatial relationships is Connecticut's General Permit for Nitrogen Discharges. Connecticut issued a permit for the 79 POTWs within the Long Island Sound watershed that discharge at least 20 pounds of total nitrogen per day. The permit addresses only nitrogen discharges and supplements permits issued to each facility for the discharge of non-nitrogen pollutants. The permit covers all 79 POTWs but functions in a manner similar to individual permits in that each POTW has an individual, end-of-pipe limitation for total nitrogen. Connecticut assigned each discharge a total annual nitrogen allocation on the basis of discharge volume to reduce nitrogen loading and raise dissolved oxygen levels in western Long Island Sound. To facilitate a trading program, however, end-of-pipe nitrogen loads had to be related to one another in a way that accounted for attenuation on the basis of the location of each POTW in the watershed and its relative effect on dissolved oxygen in the Long Island Sound. Total nitrogen reductions at points close to the low dissolved oxygen zone in the Long Island Sound are considered more valuable than total nitrogen reductions from more distant sources that are naturally attenuated.

In addition to spatial variation, loadings from various sources could fluctuate daily, monthly, seasonally, or year-to-year. For example, certain beef cattle operations confine animals only for a few weeks in the spring for calving. The sediment, nutrient, and pathogen loadings for such a facility can be higher during these seasonal periods of confinement than would be expected during the remainder of the year when the cattle remain on pasture. Temporal fluctuations in pollutant contributions would also be expected from industrial facilities with variable production cycles, from all wet-weather sources, from recreational areas that experience seasonal use

IMPLEMENTATION OPTIONS BASED ON POTENTIAL ANSWERS TO QUESTION #5

- Spatial and temporal relationships unknown because of insufficient data
 - » NPDES permit development on a watershed basis
 - » Monitoring consortium development
 - » TMDL development and implementation support
 - » Statewide rotating basin planning
 - » Permit synchronization
- Spatial and temporal relationships well defined
 - » NPDES permit development on a watershed basis
 - » Water quality trading
 - » Permit synchronization
 - » Statewide rotating basin planning

fluctuations, from wastewater lagoon systems that discharge for a few days each year, from crop agriculture, and from any other source where activity is not constant over time. Likewise, the water quality effects of some pollutants might also show temporal variability. For example, biochemical oxygen demand (BOD) has a greater effect on dissolved oxygen levels during warmer months. Permits for point source BOD contributors often include seasonal effluent limitations for oxygen-depleting substances to account for this fact. These temporal fluctuations could be important in determining how loadings from different sources within the watershed will affect indicators of water quality. For example, if nutrient loadings are of concern to a downstream lake, short-term fluctuations in loadings might be relatively unimportant. But if nutrient loadings contribute to depressed dissolved oxygen concentrations in a stream segment near the source, nutrient discharges over a shorter period of time could be of greater concern.

Key References:

- Water quality models (e.g., BASINS, QUAL2K, AQUATOX, CORMIX, WASP6, HSPF) recommended in TMDL Protocol documents
- *Monitoring Guidance for Determining the Effectiveness of Nonpoint Source Controls* (USEPA 1997a)
- *Water Quality Trading Policy* (USEPA 2003a)
- *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007)
- *Principles of Surface Water Quality Modeling and Control* (Thomann and Mueller 1987)
- *Protocol for Developing Sediment TMDLs* (USEPA 1999a)
- *Protocol for Developing Nutrient TMDLs* (USEPA 1999b)
- *Protocol for Developing Pathogen TMDLs* (USEPA 2001)

Navigator Element 3: Construct an NPDES Watershed Framework



Element 2 of the Navigator presented five key questions to help assess the current conditions in the watershed and identify potential watershed-based approaches for achieving water quality standards and goals. Given the unique conditions characterizing each watershed and the variety of tools available through the CWA and state laws, a wide variety of possible approaches could be identified through this analysis. For a given watershed, a permitting authority may choose to implement all or only a subset of these approaches according to the permitting authority's and other stakeholders' priorities. Element 3 of the Navigator describes a range of possible implementation options that could form an NPDES watershed framework for a specific watershed. This Element also suggests a simple method of setting priorities for applying these approaches in an overall implementation strategy.

Question #1. What are the implementation options to consider in constructing an NPDES watershed framework?

An NPDES watershed framework might encompass a variety of tools and approaches for implementing the NPDES program on the basis of the results of the watershed permitting analytical approach. Although an NPDES watershed framework should focus primarily on programs and approaches directly related to NPDES program implementation and activities, other water programs influence NPDES implementation and may also be included.

Implementation options to consider under an NPDES watershed framework include the following:

- NPDES Permit Development and Issuance on a Watershed-basis
- Water Quality Trading
- Wet-Weather Integration
- Indicator Development for Watershed-based Stormwater Management
- TMDL Development and Implementation Support
- Monitoring Consortium Development
- Permit Synchronization
- Statewide Rotating Basin Planning Approach
- State-Approved Watershed Management Plan Development and Implementation
- Section 319 Nonpoint Source Management Program and Watershed Planning
- Source Water Protection Plan Development and Implementation.

Stakeholders might identify and desire to implement only one or two of these approaches or, in some cases, stakeholders could design a comprehensive framework that incorporates a suite of these approaches. A discussion of each of these potential approaches follows.

NPDES Permit Development and Issuance on a Watershed Basis

The watershed permitting analytical approach might show that the conditions in the watershed are well understood, that there are common stressors or pollutants of concern among sources in the watershed, and that point sources have a significant impact in the watershed. In this case, the NPDES permit writer, along with point source dischargers and other watershed stakeholders, might determine that developing and issuing NPDES permits on a watershed basis is an appropriate approach for addressing point source loads of one or more pollutants. The types of permits that might be considered for a watershed will vary depending on the specific conditions and types of dischargers within a watershed. These permit types include coordinated individual permits, integrated municipal permits, and multisource watershed-based permits. Each of these permit types is discussed in greater detail below.

Watershed characteristics leading to consideration of this option: common stressors or sources of pollutants of concern; critical environmental conditions are defined; point and nonpoint source contributions are understood, at least for the pollutant(s) of concern; point sources contribute a notable portion of the pollutant load or there are significant differences among the loadings contributed by various point sources, or there are a number of point sources with similar types of discharges.

Coordinated Individual Permits. This permitting approach is the closest to traditional NPDES permitting in that each discharger receives an individual permit. The difference is that WQBELs and other conditions of coordinated individual permits are developed using a holistic analysis of the watershed conditions rather than being established to ensure attainment of water quality standards on a permit-by-permit basis. Collectively, the individual permits are designed to meet watershed-specific goals (e.g., comprehensive watershed monitoring, nutrient reduction,

management of biosolids or manure). The permitting authority may issue permits to single dischargers or modify existing single discharger permits. To strengthen the coordination among individual permits, the permitting authority could consider synchronizing their expiration and reissuance or effective dates (see discussion on “Permit Synchronization” below).

Integrated Municipal NPDES Permit Coverage. This approach may bundle a number of point source permit requirements for a municipality (POTWs, combined sewer overflows (CSOs), biosolids, pretreatment, and stormwater, including municipally owned industrial activities such as public works and utility yards) into a single permit. In cases where the treatment plants, stormwater, CSOs (if applicable), and other municipally controlled point source activities are all under single ownership, the permitting authority could consider one permit that covers and integrates all NPDES requirements. Ideally, these activities would take place within the boundaries of the same watershed. This approach may reduce the administrative burden for both the permittee and permitting authority (e.g., one application, one public notice and public hearing, one compliance report) and allow the permitting authority to develop permit conditions (limitations and monitoring requirements) that specifically address existing watershed goals and watershed management plans. The Clean Water Services integrated municipal NPDES permit in the Tualatin Watershed in Oregon is an example of this type of permit. For more detailed information on related approaches, see the discussion under “Wet-Weather Integration” in this section.

Multisource Watershed-based Permit. This type of permitting approach is also a single permit and would cover multiple sources included in the same watershed, watershed plan, or TMDL. It would allow several point sources in a watershed to apply for and obtain permit coverage under the same permit. This type of permit might be appropriate in situations where a watershed plan or TMDL identifies the need to address a specific pollutant. A watershed plan or TMDL implementation plan might include agreed-upon controls necessary to achieve watershed goals. Stakeholders could then identify point sources that would be logical to group under a single permit. Some permitting authorities have chosen to issue a single watershed-based permit that supplements or overlays the existing individual permits for the covered facilities. This approach allows the permitting authority to focus effluent limitations, monitoring requirements, trading provisions, and other special permit conditions that are developed on a watershed basis in a single permit and clearly links the permitted facilities in a way that simply incorporating watershed-based permit conditions into individual permits does not accomplish. The permit would identify all point sources that have agreed to the controls and the individual specific requirements for each point source. An example is a permit that includes control requirements for nutrients issued to all POTWs in the watershed and requires specific nutrient reductions that reflect agreed-upon goals and, possibly, trades. This permit might be issued in addition to the existing individual permits and, if so, would include limitations or controls to address only the watershed-specific common pollutant or pollutants. Other pollutants would continue to be addressed through each facility’s individual permit. This approach is similar to the approach used to permit wastewater treatment plant discharges in North Carolina contributing nutrients to the Neuse River watershed or to Connecticut’s Long Island Sound nitrogen permit.

Another type of multisource watershed-based permit might address all pollutants of concern in the watershed for similar types of discharges. For example, a single permit might implement a comprehensive watershed plan with each facility regulated as a co-permittee. Assuming the watershed plan included procedures for addressing a number of stressors and identified specific

point sources, the permit might include controls for the point sources and all requirements that would otherwise be found in individual permits for the point sources.

In addition to using individual permits, NPDES permit writers might also consider using general permits as multisource watershed-based permits. These permits would be similar to many existing general permits, except that the watershed boundary (in addition to type of discharge) would be a criterion defining eligibility for coverage or the applicability of certain conditions in the permit. The permit might include requirements that reflect watershed-specific goals (e.g., comprehensive watershed monitoring, nutrient reduction, management of biosolids or manure). Point sources would request coverage through a Notice of Intent (NOI) once the permit is issued rather than through the application process used for individual permits. A general permitting approach could be further refined on the basis of the category or source of discharger and would allow coverage of common sources (e.g., all POTWs, CAFOs, or stormwater) in the watershed. The limitations and requirements within a category or subcategory of sources would largely be the same, but specific limitations and requirements might differ among categories or subcategories.

Multisource watershed-based permits may facilitate water quality trading and provide a vehicle for cooperative efforts (such as watershed-wide monitoring) necessary for meeting watershed goals. This approach also focuses public participation on a single permit.

Chapter 2 of this Technical Guidance provides more detail on writing multisource watershed-based permits.

Water Quality Trading

EPA's *Water Quality Trading Policy* (USEPA 2003a) encourages using voluntary trading programs to achieve water quality improvements at reduced costs on a watershed basis. The policy discusses water quality trading as a market-based approach that increases flexibility to meet water quality goals while increasing efficiencies. The policy recognizes the connections between water quality trading and the NPDES Program, as well as other CWA programs and requirements. According to the policy, "Provisions for water quality trading should be aligned with and incorporated into core water quality programs ... by incorporating provisions for trading into TMDLs and NPDES permits" (USEPA 2003a).

Watershed characteristics leading to consideration of this option: common stressors or sources of pollutants of concern; critical environmental conditions are defined; point and nonpoint source contributions are understood; disparities exist between sources in ease or cost of reducing loads, providing the potential for cost efficiencies.

The watershed permitting analytical approach described in Element 2 might reveal that the relationship among point sources or between point and nonpoint source contributions in a watershed is conducive to trading. Watersheds that have one or more TMDLs or an equivalent pollutant budget with allocations made to point sources and, if applicable, nonpoint sources might consider water quality trading to achieve water quality standards and goals. Water quality trading will allow point sources to identify opportunities to purchase lower cost, environmentally equivalent or superior pollutant reductions from one or more trading partners. Water quality trading might be considered on a watershed-wide scale or on a smaller scale through site-specific offsets or intraplant trades. The appropriate type of water quality trading activities might not be

immediately apparent from the results of the NPDES watershed analytical approach, so stakeholders may conduct additional analysis to determine the feasibility of water quality trading at different scales. EPA's *Water Quality Trading Assessment Handbook* (USEPA 2004) provides a process for assessing the likely viability of watershed-scale trading in the context of a TMDL.

As water quality trading activities increase, EPA expects that there will be an increase in the number of NPDES permits that incorporate or allow for water quality trades. A trading program should be reflected in the NPDES permits for facilities involved in the program. EPA identifies several flexible approaches for incorporating provisions for trading into NPDES permits, including the "use of watershed general permits, where appropriate, to establish pollutant-specific limitations for a group of sources in the same or similar categories to achieve net pollutant reductions or water quality goals" (USEPA 2003a).

To assist NPDES permitting authorities in developing and implementing water quality trades, EPA has developed a toolkit for NPDES permitting authorities and other interested stakeholders entitled *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007). Through the toolkit, users can obtain technical information on how to develop an NPDES permit that contains effective limitations and conditions for implementing water quality trades.

Wet-Weather Integration

Watersheds characterized by municipalities with wet-weather discharges (e.g., stormwater, CSOs, sanitary sewer overflows, peak excess flows at POTWs, nonpoint sources) may identify wet-weather integration as a potential programmatic outcome of an NPDES watershed analysis. Municipal wet-weather discharges are currently addressed through various EPA and state regulatory and policy frameworks that reflect different statutory and policy mandates. Wet-weather integration is an approach to addressing wet-weather discharges in a holistic manner to provide for greater efficiency, more comprehensive planning, less redundancy among permitting requirements, and, most importantly, better water quality outcomes.

Watershed characteristics leading to consideration of this option: identified critical conditions occur during wet weather; predominantly urban or urbanizing watershed, or watershed with multiple wet-weather problems competing for the same resources.

Municipal wet-weather discharges share a number of common characteristics. Besides being driven by rainfall and snowmelt events, they discharge similar types of pollutants: pathogens, floatable material, nutrients, sediment and suspended solids, metals, oxygen-demanding substances, as well as other conventional and toxic pollutants. In addition, they may be hydraulically connected such that controlling one source has impacts elsewhere in the system. Because of this connectivity, focusing on one programmatic area, such as CSO control, may lead to or ignore problems related to discharges from storm sewers. For example, sewer separation as a CSO control often increases the amount of flow and pollutant load in separate storm sewers unless management practices are used that reduce the overall flow to both the combined and separate systems.

Integrating individual municipal wet-weather programs under a single or coordinated program is the centerpiece of this approach. It is focused on urban areas and an urban footprint that encompasses permitted wastewater treatment facilities and sewer systems. Integrated evaluation and priority setting for water quality issues and coordination among different water quality

programs should not only expedite the resolution of water quality impairments, but should significantly enhance the protection of unimpaired resources. EPA recommends that all relevant information on wet-weather programs be shared and stored in a single system and a process put in place that provides for a single decision-making nexus for all programs. Wet-weather integration might involve both NPDES permit programs and other programs and includes:

- Unifying individual NPDES permits and programs, and consolidating and streamlining their overlapping requirements
- Coordinating with water quality standards programs and enforcement and compliance programs across an urban area (municipal footprint)
- Coordinating with the development and implementation of TMDLs
- Considering the water quality goals and objectives of existing watershed management plans and the resources needed to address pollutant loads and setting priorities
- Planning and developing solutions across all municipal wet-weather programs to achieve the best environmental benefits at a reasonable or lower cost.

Wet-weather integration has the potential not only to produce a single local program that consolidates individual municipal wet-weather programs, but also to consolidate the separate NPDES permits into one integrated wet-weather permit similar to the integrated municipal permit discussed above under “NPDES Permit Development and Issuance on a Watershed Basis.” An integrated wet-weather permit provides permitting authorities and permittees the opportunity to manage all the consequences of rainfall within the urban area, considering the unique characteristics of a municipality’s infrastructure.

Wet-weather management focuses on both quantity and quality of stormwater. In fact, managing quantity is an important facet of this approach. In all wet-weather programs, the quantity of water discharging via collection systems (including nonpoint source runoff) has a profound effect on receiving water quality. Therefore, managing wet-weather with a focus on reducing stormwater quantity in sewer systems will have a ripple effect on all wet-weather discharges. A guiding principle for the integration of wet-weather permitting programs is reducing the volume of water entering sewer systems (sanitary, combined, and storm sewers). Achieving net reductions in volume of water that enters sewer systems can provide many benefits including the following:

- Better management of separate, combined and storm sewer systems and permit programs
- Preservation of sewer system conveyance capacity
- Reduction of stress on existing infrastructure
- Reduction in CSOs and sanitary sewer overflows (SSOs)
- Reduction in stormwater volume and pollutant load
- Relief from localized or downstream flooding
- Reduction in erosion, scour and other hydrologic and hydraulic impairments that accompany stormwater discharges
- Less impairment attributable to urban runoff and sewer overflows
- Better effluent quality on average from POTWs due to lower loads during wet-weather
- In many cases, improved ground water recharge.

Municipalities undertaking wet-weather integration and focusing on reducing the amount of rainfall entering the sewer systems might find it necessary to shift from traditional wet-weather management approaches to more innovative approaches. Conventional approaches to managing stormwater focus on effectively and efficiently conveying and either managing or treating stormwater using end-of-pipe technologies. Innovative approaches to stormwater management focus on reducing inflow and infiltration to sewer systems through design techniques that promote management of rainfall at the source through natural infiltration (e.g., low impact development (LID) and smart growth), proper sewer system maintenance and operation, and water conservation techniques. Addressing the quantity of stormwater entering sewer systems might involve a combination of management practices, similar to the combination of practices required under the NPDES Stormwater Program (e.g., Phase II municipal separate storm sewer system (MS4) six minimum control measures) and the CSO Policy (e.g., nine minimum controls and capacity, management, operation, and maintenance activities).

A discussion of each type of innovative wet-weather management approach focused on reduced inflow and infiltration to the sewer system is presented below.

Promoting Natural Infiltration: Low Impact Development/Green Infrastructure and Smart Growth. Innovative techniques that promote natural infiltration are increasingly considered as alternatives to conventional approaches to managing runoff. Techniques under the umbrella of LID/green infrastructure focus on using small, cost-effective landscape features, such as rain gardens, permeable pavement, and green roofs, that allow a developed site to maintain its predevelopment hydrology by retaining rainfall on site. EPA has highlighted opportunities to increase the development and use of these *green infrastructure* techniques in water program implementation in a memorandum from Assistant Administrator for Water, Benjamin H. Grumbles, to the EPA Regional Administrators. The memorandum notes that, “green infrastructure can be both a cost effective and an environmentally preferable approach to reduce stormwater and other excess flows entering combined or separate sewer systems in combination with, or in lieu of, centralized hard infrastructure solutions” (Grumbles 2007).

Another approach that promotes natural infiltration is *smart growth*, a type of growth management strategy that emphasizes the preservation of open space and redevelopment of urban areas as opposed to new development in outlying areas. Preserving open space and undertaking redevelopment promote natural infiltration by limiting the spread of impervious surfaces as well as promoting the preservation of an area’s natural hydrologic function. For more information about smart growth and LID, visit EPA’s web pages at <http://www.epa.gov/smartgrowth> and <http://www.epa.gov/nps/lid>, respectively. Resources on LID and smart growth are available from the Low Impact Development Center at www.lowimpactdevelopment.org and Smart Growth Online at www.smartgrowth.org.

Maintaining and Operating Sewer Systems to Reduce Inflow. Another strategy for wet-weather management is to improve maintenance and operation of sewer systems as a means of reducing inflow. The concept of developing and implementing operation and maintenance (O&M) programs for separate and combined sewer systems to reduce inflow and infiltration (I/I) is not new. In fact, proper operation and regular maintenance programs for the sewer system is the first of the Nine Minimum Controls under EPA’s *Combined Sewer Overflow Control Policy* (USEPA 1994b). Focusing O&M programs on inflow and infiltration reduction is a strategy for managing wet weather. Similar to the concept of promoting natural infiltration, developing and

implementing O&M programs to reduce I/I is a form of source control that will limit the volume of water entering the system and allow the system to operate more efficiently and effectively. O&M is one of many management practices used to address CSOs and SSOs. The concept of wet-weather integration could also use a combination of management practices similar to those required under the CSO Nine Minimum Controls or SSO Capacity, Management, Operation and Maintenance activities.

Given the age and condition of infrastructure across the country, effective O&M programs are only part of the solution to reducing I/I. In a growing number of communities, aging sewer systems are in need of rehabilitation and replacement to effectively control I/I. The *Clean Watersheds Needs Survey 2000 Report to Congress* (USEPA 2003b) presents the financial needs for publicly owned municipal wastewater collection and treatment, as well as CSO correction, municipal stormwater management, and nonpoint source control. According to this report, facilities participating in the survey need approximately \$8.2 billion for correcting I/I to the sewer system and \$16.8 billion for sewer rehabilitation or replacement (USEPA 2003b).

Practicing Water Conservation. Water conservation is an important tool for reducing the amount of water entering sewer systems. WaterSense, EPA's voluntary partnership program, promotes water conservation in agricultural, residential, municipal, industrial, commercial, and landscaping uses. In addition, EPA has issued guidelines for public water systems in states that require development of water conservation plans as a condition for receiving a loan under the Drinking Water State Revolving Fund. Economics can play an important role in conservation; thus, EPA has incorporated the concept of full-cost pricing as a pillar of action in the Agency's sustainable water infrastructure initiative to encourage conservation and maintain infrastructure. Full-cost pricing factors in all past and future operation, maintenance, and capital costs and uses a rate structure that promotes conservation, such as time-of-day pricing or seasonal rates. EPA provides a wide range of resources on water conservation and full-cost pricing through the Agency's Water Use Efficiency Program Web site at <http://www.epa.gov/owm/water-efficiency.html>. For more information about EPA's sustainable water infrastructure initiative and the full-cost pricing pillar, visit <http://www.epa.gov/waterinfrastructure/>.

Indicator Development for Watershed-based Stormwater Management

Excessive stormwater runoff is often the cause for aquatic life impairment because of the relationship among stormwater runoff volume, pollutant loadings, and habitat degradation. The connections between these stressors are very complex, posing a unique challenge for effectively managing stormwater and tracking progress toward water quality standards attainment. As a result, EPA and some states are considering the development of stormwater/hydrologic targets, or indicators, for use in developing and implementing stormwater TMDLs. Indicators might include a percent reduction in annual surface runoff volume or a percent reduction in peak runoff rates for a specific design storm. Using stormwater/hydrologic indicators is based on the premise that the hydrologic condition of a watershed where streams have aquatic life impairments related to stormwater is a surrogate for the pollutant and non-pollutant stressors contributing to those impairments.

Watershed characteristics leading to consideration of this option: multiple sources of pollutant loads; critical conditions identified and occur during wet weather.

The state of Vermont has developed a site-specific approach for calculating stormwater/hydrologic indicators for use as surrogate TMDL targets. The approach provides a tailored estimation of target stormwater runoff volumes and stream characteristics using reference watersheds to define the hydrologic conditions that represent the stream channel conditions and pollutant loadings necessary to meet aquatic life criteria. In addition to providing a tailored target for TMDLs, this site-specific approach will also generate information to support the development of stormwater permit limitations on a watershed basis. The approach developed by Vermont to generate watershed-based stormwater/hydrologic TMDL targets involves the following activities:

- Watershed delineation of both impaired and unimpaired streams
- Calculation of stormwater runoff volume from watershed and climate data
- Generation and comparison of flow duration curves for both impaired and unimpaired streams (using fairly simple models, such as the Generalized Watershed Loading Functions)
- Calculation of percent stormwater runoff volume reductions needed to attain water quality standards (USEPA 2005b).

The recommended steps to developing and implementing a stormwater TMDL using site-specific stormwater/hydrologic indicators are:

1. Express the TMDL target using a surrogate measurement of stormwater impairments, such as percent impervious cover or stormwater runoff volume
2. Calculate reductions in loadings for use as a stormwater WLA for a category of discharges rather than individual end-of-pipe loading requirements
3. Implement the TMDL by outlining state and local approaches to
 - a. applying BMPs strategically using a phased program addressing smaller, more frequent storms in the most sensitive areas first
 - b. conducting regular ambient monitoring to measure response to BMP implementation
 - c. comparing monitoring results to water quality standards.

Innovative TMDLs that use stormwater indicators provide information for a watershed-based approach to NPDES stormwater permitting. Calculating percent impervious cover or runoff volume reduction as a single categorical stormwater loading promotes implementation using an adaptive, watershed-based approach. Consequently, a watershed-based stormwater permit could be an effective mechanism for implementing this phased program for attaining water quality standards. The permit could require development and implementation of the phased BMP program and periodic plan updates. The monitoring program required by the permit might include stormwater effluent monitoring, where appropriate, but also could focus on cooperative ambient monitoring (e.g., a monitoring consortium) by the regulated community. The ambient monitoring could include biological monitoring, with follow-up stressor identification analysis to verify the appropriateness of selected BMPs.

TMDL Development and Implementation Support

Pollutants with watershed-wide or regional effects might impair one or more waterbodies or segments of waterbodies within the candidate watershed. A state's list of impaired waterbodies developed pursuant to CWA section 303(d) identifies impaired waterbodies or segments of water

bodies and the pollutants causing impairment. If a TMDL for the impaired water has not been developed or is not already in process, the state might consider development of the TMDL as the core of its watershed approach. In fact, a permitting authority might determine that TMDL development is the highest priority implementation effort within the watershed and that other potential watershed-based permitting approaches should follow completion of scheduled TMDLs. EPA has produced a series of technical and policy guidance documents addressing TMDL development. Additional information on TMDLs and these guidance documents can be found at <http://www.epa.gov/owow/tmdl/>.

Watershed characteristics leading to consideration of this option: impaired segment(s) in watershed; pollutants with watershed-wide or regional effects; point sources contributing pollutants of concern.

On the other hand, in cases where a TMDL has been developed or is in process, the permitting authority should consider possible watershed-based permitting approaches in addition to the use of traditional individual permits to implement the TMDL. Examples of such approaches include trading programs, multisource watershed-based permits, and watershed-based conditions in permits that address pollutants not covered by a TMDL.

Even when TMDL development is the highest priority and other watershed-based approaches are delayed, the NPDES program can adopt an immediate watershed focus by including, as appropriate, conditions in permits that will contribute to TMDL development (e.g., ambient monitoring requirements). EPA has developed guidance on establishing monitoring consortiums within a watershed (see subsection below). These consortiums could be able to provide a unique, watershed-based method of implementing monitoring requirements to support TMDL development.

Monitoring Consortium Development

Identifying and implementing effective watershed management strategies requires quality, watershed-level, ambient monitoring data. Application of the watershed analytical approach might highlight gaps in existing ambient monitoring data for a watershed and point to the need for additional data collection. Watershed-level ambient data, if they exist, are most likely collected by the state as part of its overall water quality management responsibilities for use in activities such as TMDL development and permitting. Where there are data gaps, developing and implementing watershed-level monitoring programs might be the highest priority activity under an NPDES watershed framework.

Watershed characteristics leading to consideration of this option: data gaps relative to defining critical environmental conditions, point and nonpoint source contributions, temporal, and spatial relationships; need for long-term coordinated evaluation of management measures to determine implementation effectiveness.

More importantly, even once a framework for implementing water programs is in place, long-term monitoring to evaluate the effectiveness of those programs is pivotal. Without good data on which to base ongoing management decisions, even the best watershed-based program cannot realize its full potential.

To ensure a watershed-based approach to collecting new ambient monitoring data, stakeholders should consider a cooperative data collection effort by sources within the watershed. A group

using a coordinated, cooperative approach to collecting water quality data is referred to as a monitoring consortium. EPA has developed guidance on establishing monitoring consortiums within watersheds titled *Monitoring Consortiums: A Cost-Effective Means to Enhancing Watershed Data Collection and Analysis* (USEPA 1997b).

A consortium offers a watershed-based method of implementing many monitoring needs (e.g., TMDL development, water quality trading, watershed-bounded multi-source permit development). In addition, monitoring consortiums assist participants in pooling funds and sharing expertise while collecting data to identify trends, evaluate attainment of water quality standards, develop management strategies, and improve data consistency and comprehensiveness.

Permit Synchronization

Another implementation option to consider under an NPDES watershed framework is permit synchronization. This implementation option focuses on coordinating expiration and reissuance of existing NPDES permits within a specified watershed. This option might be part of the rotating basin approach described below. The schedule for permit reissuance for a watershed is based on a predetermined timetable, often following a rotating basin approach. The state of Michigan uses this approach.

According to the Michigan Department of Environmental Quality, permit synchronization has several benefits including coordination of NPDES support activities such as biological and water quality surveys, industrial pretreatment inspections, and compliance inspections that provide up-to-date information at the time of permit issuance. An important benefit of this approach is that watershed-based needs, such as monitoring requirements or WLAs, are reflected equitably in all permits even within the standard individual permit approach, because all permits in a watershed are being considered simultaneously.

Watershed characteristics leading to consideration of this option: some overlap in pollutants discharged by sources within the watershed that present the opportunity to achieve efficiencies by simultaneously analyzing watershed data for the same pollutant(s).

While permit synchronization is driven by watershed data analysis, this option is also related to program administration. Therefore, in addition to the five questions posed under Element 2 of the Navigator, the feasibility of permit synchronization as an implementation option might depend on answers to the following questions:

1. What types of permits (e.g., general or individual) currently are issued to dischargers in the watershed?
2. What is the current timing of permits in the watershed?
3. Is it necessary to delay issuance of some permits to synchronize permit issuance on a watershed basis? Are all stakeholders in support of the synchronization concept and the process to achieve synchronization?

Several states are using permit synchronization (e.g., Michigan, Maryland, West Virginia). Pennsylvania, on the other hand, has tried and discontinued permit synchronization. To obtain more information on permit synchronization lessons learned, contact a state's Permitting for Environmental Results NPDES Program Integrity point of contact found on EPA's Web site at www.epa.gov/npdes/pubs/per_contacts.pdf.

Statewide Rotating Basin Planning Approach

Watersheds in which a watershed permitting analytical approach shows a lack of adequate watershed data might also benefit from a statewide rotating basin planning approach. This implementation option entails delineating state watershed boundaries and grouping the watersheds into basin management units, usually by the state water pollution control agency. After delineating and grouping the basin management units, states then implement a watershed management process according to a statewide rotating schedule. The process, which varies from state to state, usually comprises five activities: (1) data collection and monitoring, (2) assessment, (3) strategy development, (4) basin plan review, and (5) implementation. This implementation option has the potential to generate the data necessary to support future activities under an NPDES watershed framework, such as the development and issuance of NPDES permits on a watershed basis. A number of states use a rotating basin planning approach including Delaware, Florida, Georgia, Massachusetts, Michigan, North Carolina, Ohio, Tennessee, Texas, Utah, and Washington. More information on developing and implementing a statewide rotating basin planning approach is available from EPA, including *Watershed Protection: A Statewide Approach* (USEPA 1995) and *A Review of Statewide Watershed Management Approaches* (USEPA 2002b).

Watershed characteristics leading to consideration of this option: data gaps relative to defining critical environmental conditions, point and nonpoint source contributions, temporal, and spatial relationships; need for long-term coordinated evaluation of management measures to determine implementation effectiveness.

State-Approved Watershed Management Plan Development and Implementation

Watershed management planning is an iterative process for documenting watershed goals; known, suspected, and potential pollutant sources and loadings; potential management strategies; and evaluation tools. Many local watershed organizations develop watershed management plans to provide a roadmap for their site-specific water restoration and protection activities. Depending on the level of technical detail, watershed management plans can often serve as the basis for grant-funded projects (see “Section 319 Nonpoint Source Management Program” below).

Watershed characteristics leading to consideration of this option: multiple sources of pollutants or causes of environmental degradation; point and nonpoint contributions understood; local interest in protecting high quality watersheds.

Elements 1 and 2 of the Navigator might reveal that a watershed could benefit from a formal process or approach to guide future management activities, which may or may not include developing and issuing NPDES permits on a watershed basis. The need might be evident because of the variety of watershed data collected by multiple, uncoordinated stakeholders and projects (i.e., duplicative efforts or large gaps in watershed data), or because of a well-defined set of problems that require formal goals and actions. These scenarios point to a watershed that might benefit from the development and implementation of a watershed management plan. Through a watershed management planning process, one that either follows a state recommended approach or is less formal in nature, watershed stakeholders have the opportunity to formulate goals, identify data needs, and evaluate potential pollutant control strategies. The information collected, organized, and analyzed to support the development of a watershed management plan can serve as the foundation for future implementation options under an NPDES watershed framework. EPA’s web-based Watershed Academy presents a module on watershed management planning at

www.epa.gov/watertrain/planning/index.htm. EPA has developed additional resources to aid watershed management planning. The *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (USEPA 2005a) is a comprehensive document that addresses each phase of the watershed management planning process. A Watershed Plan Builder Tool, an interactive, web-based tool, is also available. This tool, available at <http://iaspub.epa.gov/watershedplan/watershedPlanning.do?pageId=48&navId=35>, complements the handbook and is designed to help local watershed organizations develop integrated watershed plans to meet state and EPA requirements and promote water quality improvement. The tool walks practitioners through the key planning steps and produces a customized watershed plan that is tailored for a particular watershed and populated with relevant links to EPA, other federal agencies, and state water programs.

Section 319 Nonpoint Source Management Program and Watershed Planning

No matter how stringent permit requirements are for point sources, conditions in some watersheds simply will not improve without reductions in nonpoint source pollutant contributions. Watersheds that have significant nonpoint source pollutant contributions, identified under Question #4 of Element 2, might benefit from incentives that promote voluntary nonpoint source participation. Section 319 of the CWA provides grant funding authority to solve water quality problems in watersheds affected by nonpoint source pollution, especially those that are impaired. Funding provided through the section 319 grant program (and other associated funding programs such as Farm Bill programs for agricultural nonpoint sources) can play a significant role in achieving necessary nonpoint source pollutant reductions.

Watershed characteristics leading to consideration of this option: critical environmental conditions defined; point and nonpoint source contributions understood; contributions dominated by nonpoint sources.

EPA recently published section 319 grant guidelines that contain nine elements for developing effective watershed plans for threatened and impaired waters. The guidelines include a focus on estimating pollutant load reductions that are (1) necessary to achieve watershed goals and (2) associated with selected nonpoint source pollution control management measures. For more information about the section 319 guidelines, see EPA's *Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003* (USEPA 2002c). Although the focus of the nine elements is on nonpoint source pollution control, the information compiled and analyzed to meet the nine elements can facilitate future implementation options under an NPDES watershed framework, such as water quality trading and development of multisource watershed-based permits. Development of a watershed plan that meets the section 319 guidelines might also provide a mechanism for obtaining grant funding necessary to address nonpoint source pollution control, providing a much needed incentive for nonpoint source participation. EPA's *Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (USEPA 2005a) provides a step-by-step approach for developing a watershed plan that addresses each of the nine elements.

Source Water Protection Plan Development and Implementation

The watershed data inventory under Element 1 would reveal whether a watershed contains surface water intakes or ground water wells that supply public drinking water. If one or both types of drinking water supplies are present within the watershed boundaries, developing and

implementing source water protection plans are significant implementation options under an NPDES watershed framework. The 1996 Safe Drinking Water Act Amendments required states to develop and implement Source Water Assessment Programs that establish a process for identifying potential sources of contamination to public drinking water supplies. The assessment process was to be completed as of 2003, although some states required additional time to complete the assessments. The assessment process varied from state to state, but included the following basic activities:

Watershed characteristics leading to consideration of this option: watershed contains source of public drinking water.

- Delineating source water protection areas (also referred to as protection zones)
- Conducting contaminant source inventories
- Determining the susceptibility of the public water supply to contamination from the inventoried sources
- Sharing the assessment information with the public

Operators of public water systems and other stakeholders involved in source water protection efforts can use the assessment information to develop and implement source water protection strategies. Strategies can range from creating buffer zones using conservation easements to collecting household hazardous waste. In the context of an NPDES watershed framework, this potential implementation option could be used in a number of ways. The information collected for purposes of a source water assessment could aid in the watershed permitting analytical approach by contributing to the watershed data inventory. In terms of source water protection activities, NPDES permitting authorities might consider the proximity of point sources to surface water intake structures when developing permit limitations. For example, to decrease risk, permit writers might generate more stringent permit limitations for the point sources in the source water protection zone closest to the surface water intake structures than for those in the protection zone farthest from the intake structures. Information on source water protection is available on EPA's Web site at <http://cfpub.epa.gov/safewater/sourcewater/>.

Question #2. How should priorities for implementing the components of an NPDES watershed framework be set?

A wide range of approaches might be available under an NPDES watershed framework to address a pollutant, stressor, or water quality concern. In some watersheds, one particular watershed-based tool might clearly be the most effective in achieving watershed goals and gaining water quality improvements. Most watersheds, however, are likely to require a suite of tools to address pollutant loadings or stressors and make strides towards water quality improvements. Below is an example of an approach to setting priorities for implementation options under an NPDES watershed framework. The example assumes that the permitting authority and other stakeholders have identified the following implementation options for this specific NPDES watershed framework:

- Watershed-based multisource permit development
- Water quality trading
- Wet-weather integration
- Indicator development and tracking for watershed-based stormwater management

- TMDL development and implementation support
- Monitoring consortium development (including additional watershed and point source data collection)

The first step in the suggested approach is to determine whether and how to group implementation options for priority setting. Three initial groupings to consider in this example are (1) watershed analysis, (2) pollutant source analysis, and (3) permitting. These groupings represent three major activities that could be undertaken in implementing an NPDES watershed approach that focuses on watershed-based permitting as the primary implementation option. Grouping implementation options in this manner allows assessment of the implementation options in a process-oriented manner. Potential implementation options can also be grouped under other categories, such as TMDL development and implementation or data collection. In some cases, there might not be any obvious groupings, so it will make sense to assess each potential implementation option individually. For the sake of this example, the potential implementation options listed above have been organized in this process-oriented manner.

Once potential implementation options are listed and grouped, the permitting authority, with input from other stakeholders as appropriate, should consider establishing criteria for setting priorities and determining the manner in which the criteria will be used to evaluate potential options or groups of options. Criteria could consider factors such as environmental impact, availability of resources, and current planning priorities. It is at this point in developing an NPDES watershed framework that the permitting authority and other stakeholders might need to look beyond technical feasibility and environmental impact to include administrative criteria (e.g., availability of funding) to set priorities among the possible implementation options.

One screening level method for priority setting is to develop a scoring process for all potential implementation options. For example, a scoring scale from one to three for a series of criteria could be used to evaluate each implementation option on how it compares to each criterion. The criteria can be weighted, with those most important to stakeholders receiving a higher weighting factor than others. Implementation options with the highest weighted total scores would be initially identified as potentially higher priority approaches. Such a procedure does not provide mathematical precision in ranking potential implementation options. It simply helps stakeholders get a general sense of which approach seems to best fit the group's multiple and, sometimes, competing priorities. The group could use the results of such an analysis to further refine its selection of the highest priority projects or approaches.

Exhibit 1-5 provides an example of how such an analysis might work in ranking six hypothetical watershed permitting projects or approaches. The scoring criteria, their definitions, and scores

IMPLEMENTATION OPTION GROUPING EXAMPLE

Watershed Analysis

- ◆ Additional watershed data collection
- ◆ Monitoring consortium development
- ◆ TMDL development support
- ◆ Indicator development and tracking for watershed-based stormwater management

Pollutant Source Analysis

- ◆ Additional source data collection
- ◆ Monitoring consortium development
- ◆ TMDL development support

Permitting

- ◆ TMDL implementation support
- ◆ Water quality trading
- ◆ Wet-weather integration
- ◆ Watershed-based multisource permit

are illustrative only. EPA encourages stakeholders to work together to establish an agreeable set of criteria and a system for applying them to potential approaches.

Exhibit 1-5. Priority setting to construct an NPDES watershed framework

Project or Approach	Sequence in standards to permits process	Environmental consequences	Staffing and technical expertise	Cost and available funding	Stakeholder priority and interest	Consistency with strategic plan	Total	Weighted total
	<i>1.5*</i>	<i>3.0</i>	<i>2.0</i>	<i>3.0</i>	<i>1.5</i>	<i>0.5</i>		
1	1	2	2	2	1	1	9	19.5
2	1	1	3	1	2	2	10	17.5
3	3	2	2	3	3	2	15	29
4	2	3	1	1	1	3	11	20
5	2	1	1	1	1	1	9	13
6	2	1	2	1	2	1	9	16.5

*Note: Weighting factors in *italics*

Example Scoring Criteria Definitions: The scores above are based on the example scoring criteria defined below. These criteria were selected and weighted by watershed stakeholders. Each potential project or approach that could be part of an NPDES watershed framework is evaluated against each criterion using the scoring definitions below and is assigned a score of 3, 2, or 1 accordingly.

Sequence in Standards to Permits Process:

- 3 = On the basis of the current cycle of standards to permits activities in the watershed (e.g., data collection and monitoring, assessment, standards development or modification, permitting), the implementation option represents the next logical step with other potential projects dependent on the results of this project.
- 2 = On the basis of the current cycle of standards to permits activities in the watershed, the implementation option is somewhat out of sequence, but could still be completed and likely would yield benefits such as informing decision-making in other critical elements of the cycle.
- 1 = On the basis of the current cycle of standards to permits activities in the watershed, the implementation option is completely out of sequence; key information to complete the project is missing or other projects must be completed first.

Environmental Consequences:

- 3 = The implementation option is highly likely to yield tangible environmental benefits that might not be realized using a more traditional approach to the permitting process.
- 2 = The implementation option will potentially yield environmental benefits over a more traditional approach to the permitting process, but those benefits could be difficult to quantify or define.

- 1 = The ability of the implementation option to yield environmental benefits is questionable.

Staffing and Technical Expertise:

- 3 = Staff are available for the implementation option and have the specific expertise needed to complete it.
- 2 = Either staff time or expertise are not available to fully implement the implementation option; additional staff training or some shifting of staff time to the project would be necessary.
- 1 = Neither staff time or expertise are available to fully implement the implementation option; implementation would require major shifts in staffing priorities.

Cost and Available Funding:

- 3 = Costs for the implementation option have been accurately determined, and the current budget provides funding to cover the cost.
- 2 = Costs for the implementation option can be or have been accurately determined, and some budget revisions might be necessary to fund the project.
- 1 = Either the cost for the implementation option is undetermined, or it cannot be funded under the current budget.

Stakeholder Priorities and Interest:

- 3 = Key stakeholders have expressed a specific interest in this implementation option and will provide resources and expertise to assist with its completion.
- 2 = Key stakeholders have expressed a specific interest in this implementation option but may not have resources or expertise to assist with its completion.
- 1 = Key stakeholders have expressed little interest in the implementation option or have responded negatively to the implementation option.

Consistency with Strategic Plan:

- 3 = The implementation option would fulfill specific goals in the organization's strategic plan.
- 2 = The implementation option generally fits within the framework of the organization's strategic plan.
- 1 = The implementation option is unrelated to the goals and framework of the organization's strategic plan.

Section Four: How is Performance Measured Under an NPDES Watershed Approach?

Measuring success under an NPDES watershed approach is potentially challenging because it encompasses a wide range of existing programs with their own specific set of metrics. As a result, performance of an NPDES watershed approach can involve drawing upon the existing measures of success related to each of the implementation options or developing a specific set of new performance measures. Each program will play an important role in meeting *environmental* performance goals such as progress toward attaining water quality criteria; moving waters from impaired or threatened status to full attainment of designated uses and not threatened; or improvement of waters in relation to biological indicators. EPA, states, tribes, and territories might already have established specific measures of environmental performance and environmental performance goals and these may be appropriate environmental performance measures for an NPDES watershed approach. Exhibit 1-6 presents examples of outcome-based environmental performance measures based on EPA's *National Water Program Fiscal Year 2007 Guidance* (USEPA 2006b). These measures assume performance is measured statewide. A permitting authority would need to adapt these performance measures or add other measures in order to apply them to a specific watershed where the permitting authority is implementing an NPDES watershed framework. For example, under aquatic life protection, the permitting authority could adapt the measure for percentage of river miles and lake acres with improved water quality and increased fish consumption in Exhibit 1-6 to simply track progress toward attainment of aquatic life uses and associated water quality criteria for a specific watershed or waterbody. The permitting authority might also add to this list performance measures that are not a direct measure of environmental performance, but indirectly indicate environmental improvement, such as progress toward meeting a pollutant load reduction goal.

Appropriate *programmatic* measures of success will depend on the final suite of implementation options under an NPDES watershed framework for a specific watershed. As with environmental performance measures and goals, EPA, states, tribes, and territories might already have some programmatic measures and goals in place. Exhibit 1-7 presents potential programmatic performance measures for tracking the progress of implementation options under an NPDES watershed framework.

Exhibit 1-6. Example watershed environmental performance measures based on EPA's *National Water Program Fiscal Year 2007 Guidance*

Environmental goal	Environmental performance measure
Source water protection	Percent of source water areas for community water systems that will achieve minimized risk to public health
Aquatic life protection	Percentage of river miles and lake acres identified as having a fish consumption advisory in 2002 for which water and sediment quality have improved and allow for increased consumption of safe fish
	Percentage of shellfish-growing acres monitored that are approved or conditionally approved for use
Waters safe for swimming	Percentage of waters identified in 2000 as unsafe for swimming that have been restored
	Percent of days of the beach season that beaches monitored by beach safety programs will be open and safe for swimming
Overall watershed protection	The number of watersheds where water quality standards are met in at least 80 percent of assessed water segments
	The number of watersheds where all water segments maintain their water quality and at least 20 percent of assessed water segments show improvement of conditions since 2002

Exhibit 1-7. Example watershed program performance measures by NPDES watershed framework implementation option

Implementation option	Program performance measure
Watershed-bounded multisource permit development	<ul style="list-style-type: none"> ▪ Number of individual NPDES permits developed and issued using a watershed permitting analytical approach ▪ Number of general NPDES permits developed and issued using a watershed permitting analytical approach
Water quality trading	<ul style="list-style-type: none"> ▪ Number of point source-to-nonpoint source trades ▪ Number of point source-to-point source trades
Wet-weather integration	<ul style="list-style-type: none"> ▪ Number of NPDES wet-weather permits incorporating runoff volume reduction strategies that are based on a watershed analysis
Indicator development and tracking	<ul style="list-style-type: none"> ▪ Number of watersheds with indicator development projects ▪ Number of watershed-based indicators developed to serve as TMDL stormwater targets
TMDL development and implementation	<ul style="list-style-type: none"> ▪ Number of TMDLs implemented through NPDES permits that incorporate permit limitations developed using a watershed-based analysis
Monitoring consortium development	<ul style="list-style-type: none"> ▪ Number of watersheds with monitoring consortia ▪ Number of NPDES permits developed using data collected by watershed monitoring consortia
Permit synchronization	<ul style="list-style-type: none"> ▪ Number of watersheds or sub-watersheds with synchronized permit expiration and reissuance
Statewide rotating basin planning approach	<ul style="list-style-type: none"> ▪ Number of water quality programs using data from a rotating basin planning approach
Watershed management plan development and implementation	<ul style="list-style-type: none"> ▪ Number of watershed management plans initiated as a result of the watershed permitting analytical approach
Section 319 nonpoint source management program	<ul style="list-style-type: none"> ▪ Number of watersheds analyzed through a watershed permitting analytical approach with significant nonpoint source pollutant load contributions that initiate section 319 watershed management plans
Source Water Protection Plan development and implementation	<ul style="list-style-type: none"> ▪ Number of watersheds with surface water intakes with protective NPDES permit limitations for sources based on proximity to the source water

Chapter 2: Guide for Multisource Watershed-based NPDES Permitting

Chapter 1 of this Technical Guidance helps permitting authorities construct an NPDES watershed framework by analyzing watershed data and determining how best to structure and manage implementation of the NPDES program so that the entire watershed is considered in the permit development process. An NPDES watershed framework might include actions such as issuing permits to single dischargers, modifying existing single discharger permits to incorporate watershed-based provisions, or synchronizing permit reissuance dates or effective dates to facilitate consideration of watershed-wide concerns during permit development. One of the potential implementation options within an NPDES watershed framework is a multisource watershed-based permit, which is a permit that would allow point sources in a watershed to apply for and obtain permit coverage under the same permit for one or more pollutants.

This Chapter describes the concept of multisource watershed-based permitting and presents approaches for developing each component of a multisource watershed-based permit. Section One answers some basic questions about multisource watershed-based permits and the remaining sections are organized to correspond with the major components of an NPDES permit. For each NPDES permit component, the Chapter presents an overview of issues related to watershed-based permitting, key questions for permitting authorities to consider, and, for some permit components, example NPDES permit text.

Section One: Multisource Watershed-based Permits

Where a permitting authority chooses to issue a multisource watershed-based permit, EPA recommends that it first determine the geographic scope of the permit, then determine which facilities within that geographic area will be covered by the permit and how the permit will be administered.

What is the geographic scope of the multisource watershed-based permit?

By the time a permitting authority has decided to issue a multisource watershed-based permit, EPA expects that the geographic scope of that permit would be relatively well defined. The Navigator tool presented in Chapter 1 leads permitting authorities through a series of questions about the pollutants of concern and pollutant sources in a watershed that help identify whether a multisource watershed-based permit would be an effective permitting approach in a candidate watershed. These questions also help to refine the geographic scope of the permit. Typical approaches to defining the geographic scope of a permit, in terms of both watershed and jurisdictional boundaries, include:

- **Single watershed in a state** (one watershed in the jurisdiction of one state). Choosing this option would result in a permit for specific dischargers within a particular watershed or river basin. It would not account for situations where a watershed crossed state boundaries. This approach is likely the most straightforward type of permit to issue and manage of the two options presented here because of its narrow geographic scope.
- **State-wide permit with watershed-specific requirements** (multiple watersheds located in one state). This option would produce, in effect, a statewide watershed-based approach

for developing and issuing permits. Under this option, the NPDES permitting authority might issue a single statewide permit that covers multiple watersheds or basins within the state's boundaries or create permit *bubbles* within such a permit. Unlike most statewide general permits, each watershed might have watershed-specific permitting requirements. For example, the permitting authority might create a permit bubble by assembling all point sources between a basin's headwaters to a defined point downstream, such as the first segment impaired for the pollutant of concern. The permitting authority might then establish pollutant loading caps for each bubble or basin. These caps would be implemented through individual facility allocations and effluent limitations for individual discharges and any requirements governing interactions among sources within or across permit bubbles or basins (e.g., trading). This approach would provide a broad geographic scope for potential trading within the permit.

Who is covered by the multisource watershed-based permit?

A multisource watershed-based permit addresses the point source dischargers of concern within the defined watershed or geographic area (e.g., state, basin, permit bubble). It also might address an entity, such as a watershed association, engaged to help administer such a permit. For example, a multisource watershed-based permit might be developed to cover:

- **Specified dischargers within a defined area as co-permittees** (hereinafter *permit for co-permittees*) where the permitting authority issues a watershed-based permit that applies to multiple individual dischargers within a specified geographic region.
- **Specified dischargers under the control of a single entity** (hereinafter *permit for facilities controlled by single entity*) where the permitting authority issues a permit to a single entity with control of multiple sources.

In a permit for co-permittees, the co-permittees might choose to develop an association to function as an administrative body. The individual dischargers ultimately would be responsible for meeting all permit requirements, but they would have the opportunity to take advantage of membership in the association to accomplish some administrative functions more efficiently. For example, the permit might specify that the association could undertake certain tasks such as tracking interim compliance, compiling reported data, and facilitating any trading. In addition, under this option, the permit might include an overall pollutant loading cap for the permittees making up the association and facility-specific effluent limitations for each facility based on facility-specific WLAs. Together, the individual facility WLAs would meet the cap. Trading or offsets might be allowed between sources within the association in order to meet the overall loading cap, but EPA recommends that the permit should clearly define the responsibilities of individual dischargers if the cap is exceeded.

Where there is no association or corporate entity to work with the dischargers seeking coverage under a watershed-based permit, the permitting authority might issue such a permit to the group of dischargers as a permit for co-permittees without specifying a role for an association. Without an association, the permit might serve as the only mechanism linking the individual dischargers. The permit could still include both a cap and facility-specific WLAs and the permitting authority, rather than an association, would aggregate the individual discharger data. EPA recommends that the permit also clearly define the responsibilities of the individual dischargers if the cap is exceeded. The permit might allow trading among co-permittees, but EPA

recommends that both the permittees and the permitting authority clearly understand responsibilities for the administration of trades.

A permit for facilities controlled by a single entity might function much like a permit for co-permittees that are part of an association. Where all of the facilities are controlled by a single entity, an overall pollutant loading cap might be assigned to the single entity controlling the individual facilities. Technology-based standards and protection of receiving waters in the immediate vicinity of each discharge would be unique to each facility and, therefore, would be addressed through facility-specific effluent limitations in such a permit as required in 40 CFR 122.44 (a) and (d). The single entity, however, potentially has the opportunity to trade loading allocations among its own facilities as long as it meets the overall loading cap and does not exceed any individual facility limitations that may not be met through trading. An example of this type of permit is an integrated municipal permit, which might bundle a number of point source requirements for a municipality (publicly owned treatment works (POTWs), combined sewer overflows (CSOs), biosolids, pretreatment, and stormwater, including municipally owned industrial activities such as public works and utility yards) into a single permit.

How is a multisource watershed-based permit administered?

A permitting authority might administer NPDES permits for multiple dischargers as either individual permits or as a general permit, depending on state regulations, practice, and preference. General permits are subject to specific requirements addressing coverage area, sources regulated, and water quality-based limitations (see 40 CFR 122.28). For example, general permits typically are used to address a category or subcategory of facilities with similar operations and similar wastes, discharging within some common geographic, political, or other appropriate boundary, and that require the same or similar effluent limitations and the same or similar monitoring requirements. In addition, a facility usually applies for coverage under a general permit by submitting a NOI to obtain coverage after the permit is issued. In contrast, an individual permit usually is issued to a specific facility with limitations based on a site-specific characterization of the effluent discharged and its impact on the receiving water. An individual permit is developed in response to a permit application submitted by the facility.

In many cases, a multisource watershed-based permit might be administered as an individual permit issued to multiple permitted entities. Though administratively similar to an individual permit, such a permit would share some characteristics with general permits. These characteristics would include coverage of multiple discharges in the same geographic area and effluent limitations that, while not necessarily the same for each facility, would be for the same parameters and would be based on the same WLA formula. Such a permit could also incorporate limitations for point sources based on a trading scheme. Note that a multisource watershed-based permit might also be issued directly to existing dischargers (i.e., no separate application may be required) given that the permitting authority already could have the necessary information for permit development through the existing application process.

As discussed in Chapter 1, some permitting authorities, such as Connecticut, have issued a single watershed-based permit that supplements or overlays existing individual permits for covered facilities. Connecticut's permit limits nitrogen discharges from POTWs in the Long Island Sound watershed. This approach allows the permitting authority to focus the effluent limitations, monitoring requirements, trading provisions, and other special permit conditions that are

developed on a watershed basis in a single permit and clearly links the permitted facilities in a way that simply incorporating watershed-based permit conditions into separate individual permits does not accomplish. Of course, as noted above, permitting authorities might consider modifying existing individual facility permits to incorporate watershed-based permit conditions, consistent with applicable regulations.

How might trading be considered in a multisource watershed-based permit?

Point source-point source trading involves matching a discharger seeking to purchase water quality credits, in lieu of installing new technology to meet applicable WQBELs, with a discharger that has reduced its pollutant load below its baseline requirement, thus generating a credit. Point source-nonpoint source trading involves a point source purchasing credits from a nonpoint source that has generated credits pursuant to approved criteria. A multisource watershed-based permit potentially serves as a good mechanism for implementing water quality trading.

As previously discussed, EPA's January 13, 2003, *Water Quality Trading Policy* (Trading Policy) (USEPA 2003a) encourages the development and implementation of water quality-based trading frameworks and programs that are consistent with the CWA and its implementing regulations. In the Trading Policy, EPA states that it believes market-based approaches, such as water quality trading, provide greater flexibility and have potential to achieve water quality and environmental benefits greater than would otherwise be achieved under more traditional regulatory approaches. It recommends that water quality trading be integrated into core water quality programs by incorporating provisions into NPDES permits and TMDLs.

The Trading Policy provides details on the characteristics of water quality trading programs (e.g., type of pollutant, impaired versus unimpaired water quality conditions) that EPA supports. For example, it expresses EPA's support for trading nutrient (e.g., total phosphorus, total nitrogen) and sediment load reductions. It also recognizes the potential for environmental benefits from trading pollutants other than nutrients and sediments but says that these trades may warrant more scrutiny. The Trading Policy does not support any trading activity that would cause a toxic effect, exceed a human health criterion, or cause an impairment of water quality. It also states that EPA does not support trading of persistent bioaccumulative toxics (PBTs) at this time but would consider a limited number of pilot projects to obtain more information regarding trading of PBTs.

The Trading Policy supports trading used as a means to maintain water quality in unimpaired waters and supports trading in impaired waters where it is consistent with a TMDL or used to achieve progress toward attaining water quality standards before TMDL development. It also states that EPA does not support trading that delays implementation of an approved TMDL.

RECOMMENDED ELEMENTS OF A TRADING PROGRAM FROM EPA'S TRADING POLICY:

- ◆ Water quality trading that is consistent with CWA requirements, specifically including water quality program requirements
- ◆ Trading that occurs pursuant to adequate legal authority and mechanisms, including legislation, rule making, provisions for trading in NPDES permits, a TMDL or watershed plan and private or third-party contracts
- ◆ Trading provisions that establish clear units of trade compatible with permit limitations
- ◆ Clear criteria for the creation and duration of credits (e.g., At what point are credits available for trading? Is there a start-up period for a new technology or best management practice (BMP) before credits are generated? Do credits expire, such as when a BMP becomes less effective over time?)
- ◆ Standardized protocols for quantifying the generation, use and reporting of credits and for addressing uncertainty, including uncertainty associated with estimating nonpoint loads and reductions
- ◆ Trading that is subject to effective compliance and enforcement provisions, including record-keeping, monitoring, reporting and inspection requirements, as well as compliance audits when appropriate and periodic accounting and reconciliation periods. Compliance and enforcement provisions that include clear enforceable mechanisms consistent with NPDES regulations and address actions taken in the event of default by a source generating credits (e.g., How will a potential buyer's effluent limitations be enforced in the event that a trade fails?)
- ◆ Public participation and access to information regarding the program

In addition to the recommended elements of a trading program described in the Trading Policy, EPA recommends that trading program identify who is eligible to trade with whom, what can be traded (e.g., which, if any, limitations may be satisfied through trading), when trades can occur, and conditions under which trades cannot occur (e.g., when they would result in localized exceedances of water quality standards).

There are both formal and informal state trading programs. A formal program often is established pursuant to legislation, such as the programs in Virginia (see, *Chesapeake Bay Watershed Nutrient Credit Exchange Program*, Code of Va., sec. 62.1-44.19:12 through 19:19) and Connecticut (Public Act 01-180: *An Act Concerning Nitrogen Reduction in Long Island Sound*). Typically, such programs establish a trading infrastructure or agent (e.g., the Virginia Nutrient Credit Exchange Association in Virginia or the Nitrogen Credit Exchange in Connecticut). These programs, which can be referenced in NPDES permits, specify the basic framework for trading. A more informal program might rely on general or existing state authority or regulations to conduct trading and might address some of the elements listed above through permits.

EPA's Trading Policy is flexible in the approaches it supports for incorporating provisions for trading into NPDES permits. The Trading Policy supports using general permits to authorize trading and describe appropriate conditions and restrictions. It also recognizes that state law, regulation, or a formal state trading program may define what trades are eligible to fulfill NPDES permit requirements. Where authorized, necessary, and appropriate, the Trading Policy also recognizes that it is possible that a state could issue a multisource watershed-based permit

with no formal trading program in place and that the permit itself could specify conditions for trading.

To provide additional guidance and support for trading, EPA issued, in November 2004, the *Water Quality Trading Assessment Handbook* (USEPA 2004). This document is designed to help determine where and when trading might be used in watersheds to make cost-effective pollutant reductions that achieve water quality standards and goals.

EPA's *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007) assists NPDES permitting authorities and other interested stakeholders that want to facilitate point source-point source and point source-nonpoint source water quality trading through NPDES permits. The Toolkit fully describes various approaches for developing and incorporating permit conditions and limitations to support five water quality trading scenarios: (1) single point source-single point source trading; (2) multiple-facility, point source trading; (3) point source credit exchange; (4) point source-nonpoint source trading; and (5) nonpoint source credit exchange. Through the Toolkit, NPDES permitting authorities obtain a comprehensive discussion and analysis of key concepts of water quality trading addressed in the 2003 Trading Policy and information to facilitate permit development for the different trading scenarios. The Toolkit provides both real-world examples of water quality trading, as well as hypothetical case studies to illustrate the permit development process for each trading scenario. Refer to the Section Six of this Chapter, as well as the Toolkit, for additional information on issues related to implementing water quality trading through NPDES permits.

Section Two: Cover Page

The cover page is a standard element of an NPDES permit. It typically contains the name and location of the permittee, a statement authorizing the discharge, the name of the receiving waters, and the effective date of the permit.

This section provides two examples of a cover page. Of course, the NPDES permitting authority will determine the appropriate cover page format and content based on state requirements and any standard text. The examples given highlight the kinds of information that will be included in this part of the permit and the differences in what is included in a cover page based on how the permit is administered.

Key Technical Questions

What information is included on the permit cover page?

The information on the cover page of a multisource watershed-based permit reflects a number of important decisions made by the NPDES permitting authority that affect the overall permit, including who has permit coverage, the type of permit used to provide coverage, the geographic scope of the permit, and the pollutants addressed by the permit.

In developing a multisource watershed-based permit, the permitting authority considers factors such as the geographic area within which the permitted dischargers are located, similarities in characteristics of the discharges, and the establishment of appropriate effluent limitations, monitoring, and reporting requirements for the permitted entities. These decisions would be

reflected in information provided on the cover page such as the specific facilities and pollutants covered by the permit.

How does the method of administering the permit affect the cover page?

Where the permitting authority chooses to implement a multisource watershed-based permit as an individual permit issued to multiple sources, it might already have the required information in-hand through individual permit applications to determine which facilities will be covered by the permit (i.e., permit applicability). The cover page would likely include basic information about the permit and the facilities covered.

Where a permitting authority chooses to implement the multisource watershed-based permit as a general permit, EPA recommends that the permitting authority provide notification to entities that are eligible for coverage under the general permit. Such entities may need to file NOIs to obtain coverage under a general permit. EPA also recommends that these requirements, as well as information regarding the applicability of the general permit and conditions of coverage under the permit (e.g., ability of the permitting authority to require, upon notice, application for an individual permit) be reflected on the cover page.

Example NPDES permit text is provided below. Exhibit 2-1 is a sample cover page for several co-permittees, or an association with co-permittees, administered as an individual permit. Exhibit 2-2 is for a multisource watershed-based permit administered as a general permit.

Exhibit 2-1. Example of a cover page for a watershed-based permit administered as an individual permit issued to an individual discharger or to co-permittees

<p style="text-align: center;">COVER PAGE</p> <p style="text-align: center;">AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM</p> <p>In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et seq, the "Act"), <Insert name and address of permittee or co-permittees, including association name if applicable> is/are authorized to discharge <pollutant(s)> through discharge serial number(s): <list facilities and corresponding outfall numbers> to receiving waters in <watershed name>, in accordance with effluent limits, monitoring requirements and other conditions set forth herein.</p> <p>This permit will become effective on _____</p> <p>This permit and the authorization to discharge will expire at midnight, <five (5) years after effective date></p> <p>Signed this day of</p> <p style="text-align: right;">_____ <Signatory>, Director <Permitting Authority></p>
--

**Exhibit 2-2. Example of a cover page for a
watershed-based permit administered as a general permit**

COVER PAGE

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, 33 U.S.C. Section 1251 et seq. (the "Act") eligible dischargers are authorized to discharge wastewater in accordance with the effluent limits, monitoring requirements, and other requirements set forth herein. The authorization to discharge wastewater under this permit will be valid only for eligible discharges for which an administratively complete and acceptable Notice of Intent (NOI) has been submitted.

The <name of permit issuing agency> may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information. The authorization is for the discharge of <pollutant(s)>, as defined in this permit, from facilities listed in **Attachment 1** to this permit that have submitted an administratively complete and acceptable NOI discharging to the receiving waters listed in **Attachment 1**. This permit authorizes these facilities to discharge in accordance with conditions set forth in Parts A and B hereof.

NOI REQUIREMENTS

[This example does not address specific application/NOI requirements, but they could be minimal (e.g., a simple notice of intent to be covered under the permit). In some cases, the permitting authority may require all facilities identified for coverage under a watershed-based permit to automatically be subject to permit limits and conditions. Some jurisdictions may develop acknowledgment requirements where a facility submits a form or letter acknowledging their coverage under a watershed-based permit.]

LIMITS ON COVERAGE

Point source discharges are not covered by this permit when one or more of the following conditions exist:

1. <Add any applicable limits on coverage here>

CONDITIONS

The authority granted by this permit is subject to the following conditions:

1. Any discharge from a facility authorized by this permit may, following notice by the permitting authority, be required to apply for and obtain an individual NPDES permit. Any interested person may petition <name of permit issuing agency> to take action under this paragraph. The <name of permit issuing agency> will require any owner or operator authorized to discharge under this permit to apply for a separate, individual NPDES permit only after the owner or operator has been notified in writing that a permit application is required. The applicant must submit the individual permit application or, at the discretion of <name of permit issuing agency>, information to supplement the existing permit application within 90 days of receipt of notice. This notice must include the following: (1) a brief statement of the reasons for this decision, (2) an application form or instructions for submitting information to supplement the existing application, (3) a statement setting a deadline for the owner or operator to file the application or submit the supplemental information, and (4) a statement that on the effective date of the individual NPDES permit, as it applies to the individual permittee, coverage under this permit will automatically terminate. The <name of permit issuing agency> may grant additional time to submit the application upon written request from the applicant. If an owner or operator fails to submit, in a timely matter, an individual NPDES permit application or supplemental information required by the <name of permit issuing agency> under this paragraph, then the applicability of this permit to the permittee is automatically terminated at the end of the day specified for application submittal.

**Exhibit 2-2 (continued): Example of a cover page for a
watershed-based permit administered as a general permit**

2. Any owner or operator potentially authorized to discharge by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator must submit an individual application on approved NPDES application forms or, at the discretion of **<name of permit issuing agency>**, information to supplement its existing individual permit application, with reasons supporting the request, to the **<name of permit issuing agency>**.

3. **<Add others as necessary>**

[For facilities not covered under this permit, the permitting authority likely would modify the facility's existing individual permit to include any effluent limits for the pollutants of concern and other requirements that otherwise would have been addressed in this permit.]

Signed this day of

<Signatory>, Director
<Permitting Authority>

Section Three: Effluent Limitations

EPA recommends that permitting authorities consider several technical issues when developing effluent limitations for a watershed-based permit. How these issues are resolved is central to how a multisource watershed-based permit will be structured and can influence other permit requirements (e.g., monitoring, reporting, compliance, and special conditions, including trading). These issues are presented as a series of technical questions and are discussed below. Following this discussion, Exhibit 2-3 provides example permit text as guidance for establishing effluent limitations.

Key Technical Questions

What types of effluent limitations might be included in a multisource watershed-based permit?

NPDES federal regulations at 40 CFR Part 122 require that NPDES permits include both TBELs and WQBELs, as appropriate. The permitting authority develops effluent limitations that meet any applicable technology-based requirements and are protective of the receiving water quality as required by water quality standards. These limitations are included as the final limitations in the NPDES permit.

The federal technology-based requirements for POTWs are based on secondary treatment standards and include standards for biochemical oxygen demand (BOD), total suspended solids (TSS), and pH. Effluent limitations guidelines and standards (ELGs or effluent guidelines) for non-POTWs include technology-based limitations for a variety of pollutants, including conventional, toxic, and nonconventional pollutants (40 CFR 405 through 499). In addition, the federal NPDES regulations include the authority to develop technology-based limitations for non-POTWs on a case-by-case basis using best professional judgment (40 CFR 125.3(c)). Water quality standards are established by states, territories, and tribes and are approved by EPA.

Which stressors or pollutants might be addressed through a multisource watershed-based permit, and how might the permit express effluent limitations?

The Navigator tool, discussed in detail in Chapter 1 of this Guidance, includes a series of questions that help a permitting authority identify a suite of watershed-based implementation approaches to the NPDES program. One of these potential approaches is, of course, a multisource watershed-based permit. Important factors in determining that this type of permit is appropriate in a watershed are identifying common stressors or sources of pollutants of concern in the watershed that are best addressed at the watershed level and understanding the relationships between those sources. Where a stressor, pollutant, or group of stressors or pollutants is common to multiple sources in a watershed and the relationships between those sources are well understood, that stressor or pollutant might be addressed by the permitting authority through a multisource watershed-based permit.

The NPDES regulations at 40 CFR 122.45(d) require that all permit limitations for continuous discharges be expressed, *unless impracticable*, as both average monthly limitations (AMLs) and maximum daily limitations (MDLs) for all discharges other than POTWs, and as AMLs and average weekly limitations (AWLs) for POTWs. In certain circumstances, as described below, EPA has indicated that these averaging periods may not be appropriate for all types of pollutants.

EPA recommends that permitting authorities consider the following examples of types of pollutants or stressors and corresponding effluent limitations when drafting a watershed-based permit.

- **Toxic Pollutants.** Many NPDES permits include effluent limitations for toxic pollutants. In most cases, the primary concern related to toxic pollutant discharges is short-term toxic effects in the water column near the point of discharge. EPA's 1991 *Technical Support Document for Water Quality-based Toxics Control* (TSD) (USEPA 1991) states that water quality-based effluent limitations should typically be expressed as MDLs and AMLs for all types of dischargers. The TSD notes that toxic pollutant concentration peaks could be missed and the discharger's potential for causing acute toxic effects could be missed by considering a weekly average rather than a daily maximum. Therefore, the TSD notes that permit writers should use MDLs in lieu of the AWL for toxic pollutants for all dischargers, including POTWs, because using AWLs is impracticable.
- **Nutrients.** In many cases, nutrients are well suited to being addressed through a multisource watershed-based permit. Also, different forms of nutrients can be converted to a common form. For example, if the pollutant of concern in the watershed is total nitrogen, the permit writer might consider establishing effluent limitations for total nitrogen in a watershed-based permit. A discharger subject to the permit may be required to measure total nitrogen or, in cases where a particular form or forms of nitrogen also are of concern, the discharger may be required to monitor TKN, nitrate, and nitrite (as N) and then calculate its total nitrogen discharge. Finally, many nutrient pollution issues are best addressed on a watershed-basis, and the spatial and temporal relationships between nutrient discharges can be defined.

The long-term nature of many of the impacts of nutrients, especially in downstream waterbodies such as lakes and estuaries, leads to questions about whether and when it is appropriate to establish effluent limitations on nutrients with longer averaging periods. EPA has provided some direction on answering these questions. EPA supported using

annual limitations, rather than MDLs, AWLs, and AMLs, to meet criteria for nutrients in the Chesapeake Bay and its tidal tributaries in a memorandum from James Hanlon, Director of the EPA Office of Wastewater Management, to EPA Region 3 and the Chesapeake Bay Program Office, dated March 3, 2004 (*Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its Tidal Tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System* (Hanlon 2004)). In this memorandum, EPA affirmed that because of the long exposure period for nutrient loadings to the Chesapeake Bay and its tidal tributaries, the focus on the far-field effects of such nutrients (rather than the immediate vicinity of the discharge) and concerns specific to the average pollutant load rather than the maximum load, it is impracticable to express effluent limitations for nitrogen and phosphorus discharges in the Bay watershed developed to address nutrient criteria for the Bay and its tidal tributaries in terms of average monthly, average weekly, or maximum daily limitations.

The circumstances in the Chesapeake Bay that make annual limitations appropriate are not necessarily unique. For other areas of the country, the memorandum states that “The establishment of an annual limit with a similar finding of ‘impracticability’ pursuant to 40 CFR 122.45(d) may be appropriate for the implementation of nutrient criteria in other watersheds when: attainment of the criteria is dependent on long-term average loadings rather than short-term maximum loadings; the circumstances match those [in the Chesapeake Bay and its tidal tributaries]; annual limits are technically supportable with robust data and modeling... and appropriate safeguards to protect applicable water quality standards are employed.” EPA recommends that annual effluent limitations be used only in these limited circumstances. Most pollutants, other than nutrients, and certainly any toxic pollutants with localized short-term effects, generally have limitations with shorter averaging periods. When considering annual limitations or other longer-term limitations, the permitting authority should confirm that such limitations are consistent with state regulations.

Even for nutrients, the behavior of the pollutant and the type of criteria will affect whether longer-term limitations are appropriate or necessary. For example, in free-flowing streams where there are no impoundments, annual limitations for phosphorus might not be needed or appropriate. Certain forms of phosphorus removal are not temperature dependent, and monthly average limitations might be most appropriate to protect water quality. Furthermore, in cases where nutrient water quality criteria and WLAs to protect those criteria are expressed on a shorter-term basis (generally to protect against local nutrient impacts in rivers or streams), EPA recommends that effluent limitations derived from those criteria or allocations be expressed on a shorter-term basis, such as MDLs or AMLs, during sensitive parts of the year.

- **Bacteria.** EPA’s current bacteria criteria recommendations are based on geometric mean density and single sample maximum density of enterococci and *E. coli* bacteria. Where these criteria have been adopted into approved water quality standards, EPA has recommended permit limitation derivation procedures in its May 2002 Draft *Implementation Guidance for Ambient Water Quality Criteria for Bacteria* (USEPA 2002d). Some permitting authorities continue to use fecal coliform criteria for effluent limitations in addition to limitations based on enterococci and *E. coli* or in cases where fecal coliform is still the indicator criteria in the approved water quality standards. Urban

wet weather sources can be significant contributors to bacteria in waterbodies and are potential candidates for a multisource watershed-based permit that addresses bacteria. Bacteria contributions can come from both point and nonpoint sources. A multisource watershed-based permit that addresses bacteria might give urban areas a more efficient tool for managing their discharges by considering all point source contributions and providing the permittee with the flexibility to focus on the most significant sources.

- **Sediment.** Sediment is the fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits and is transported by, suspended in, or deposited by water. Most sediment discharges are from soil erosion carried by surface runoff and discharged via point sources (e.g., stormwater) or nonpoint sources (e.g., cropping without buffer zones) and within-channel erosion of banks and bedload sediments.

Some states have narrative criteria for sediments or use turbidity as a surrogate and some have total suspended solids or settleable solids numeric criteria. TBELs to address sediment often are expressed as concentration or loading limitations (generally for total suspended solids). In addition, a TMDL or another watershed analysis may be developed to address sediments so that the waterbody meets water quality standards. Most technology-based requirements or requirements based on numeric criteria for TSS, settleable solids, or turbidity would likely be maximum daily or monthly average values. TMDLs might establish longer-term targets. In many watersheds, the point sources with the greatest potential contribution to excessive sediment loads would be stormwater sources that would be controlled largely through BMPs.

- **Temperature.** NPDES permits might need to establish effluent limitations that control the discharges of heat to meet water quality standards. Effluent limitations on temperature often are MDLs or AMLs and may be seasonal, with the most stringent required reductions in discharge temperature required during the summer months. Both point and nonpoint sources of temperature impacts are controllable and, therefore, present opportunities for point-point and point-nonpoint source trading under a multisource watershed-based permit.
- **Oxygen Demand.** Dissolved oxygen is a candidate for coverage under a multisource watershed-based permit. Low dissolved oxygen levels instream might be traced to the effects of pollutants such as nutrients or sediment. A TMDL or watershed analysis could identify one or more pollutants and multiple sources contributing to low dissolved oxygen levels. Effluent limitations might be expressed as MDLs, AWLs, AMLs, or longer-term limitations depending on the nature of the pollutants and impacts (see, for example, the discussion of nutrients above).

When might mass-based or concentration-based effluent limitations be included in a multisource watershed-based permit?

While the NPDES regulations at 40 CFR 122.45(f) require that limitations generally be expressed in terms of mass, these regulations also allow a permit writer to express limitations in other units (e.g., concentration units) where the applicable standards are in other units or to supplement mass units. Where limitations are expressed in more than one unit, the permittee must comply with both. Mass-based limitations are particularly useful when addressing cumulative or watershed-wide impacts, such as the impacts of multiple, upstream sources on a

downstream lake. Mass-based limitations might be expressed as an average mass loading (e.g., lbs/day as a monthly average) or as a cumulative loading over a longer period of time (e.g., total pounds per year). Concentration-based limitations would likely be used in a multisource watershed-based permit to implement a minimum or floor level of treatment (e.g., a concentration-based effluent guideline, secondary treatment standards, or a state treatment standard) or to protect local water quality in accordance with water quality standards for receiving water in the immediate vicinity of the discharge.

If trading is allowed and occurs within the scope of the watershed-based permit, what effect will that have on effluent limitations?

At the permitting authority's discretion, trading may be allowed through, or in conjunction with, a watershed-based permit. Trading can occur in several ways and have different impacts on effluent limitations. For example, trading could be reflected in the relevant effluent limitations in the permit. Changing effluent limitations in the permit is a modification that requires public notice and the opportunity for comment. More likely, trading would be incorporated into NPDES permits through limitations that recognize the potential for trading during the permit term and express an alternate set of effluent limitations based on the quantity of credits purchased or sold. This approach does not involve repeatedly modifying the limitations in the permit. For more detailed information on effluent limitations that incorporate trading and methods for tracking trades, see *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007).

While a multisource watershed-based permit may have more complex permitting requirements, because it may include aggregate limitations, provisions for trading, and conditions applicable only to specific discharges, each permitted discharger is always responsible for meeting the conditions of its permit (40 CFR 122.41(a)).

What are location and delivery ratios and what is their relationship to effluent limitations?

The water quality of a lake, reservoir, or estuary is affected by pollutants differently than one of its tributaries receiving a discharge. For example, because of degradation and removal in its travel time, a pound of pollutant discharged to an upstream tributary might not result in a pound of that pollutant entering the lake, reservoir, or estuary. A location ratio accounts for this difference for a specific facility and is used when calculating an effluent limitation for an upstream facility on the basis of potential downstream impacts on a lake, reservoir, or estuary. A location ratio allows credits to be traded between sources by converting their loadings or reductions into credits needed or available at the waterbody of concern.

A delivery ratio accounts for the distance between trading partners and any unique watershed features that will affect pollutant fate and transport between trading partners. Trading partners that are in close proximity to one another with fewer intervening hydrological features are likely to have a lower delivery ratio than facilities that are farther apart with significant intervening hydrological features (e.g., an agricultural diversion) between them.

EPA recommends that permits using location or delivery ratios describe them in the fact sheet and, if multiple facilities and trading partners are possible, as part of the effluent limitations section of the permit. More detailed information on location and delivery ratios (and other trading ratios) is available in *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007).

What is a pollutant loading cap and how might such a cap be used in a multisource watershed-based permit?

A pollutant loading cap is the total loading requirement for a specific pollutant and could be applied to a group of point source dischargers. The cap represents the total pollutant load from the permitted dischargers within a watershed that will meet the loading requirement derived from water quality standards. If there is a TMDL for a waterbody, EPA recommends that the pollutant loading cap for point sources in the watershed-based permit be based on the TMDL and consist of the sum of the point source WLAs in the TMDL.

A multisource watershed-based permit does not have to specifically include a pollutant loading cap in addition to facility-specific limitations that meet CWA requirements; however, a cap can be used in combination with facility-specific limitations to provide compliance flexibility. For example, a watershed-based permit might include a provision stating that a facility is deemed to be in compliance with the permit provided that the facility either meets its facility-specific effluent limitations or the group of permittees (e.g., through an association) meets the applicable cap. A pollutant loading cap is most effective when a third party, such as a watershed association, can facilitate and track compliance with the cap. Exhibit 2-3 provides an example of effluent limitations for nutrients in a multisource watershed-based permit and recommends including an appendix in the permit that lists specific mass limitations for each co-permittee and an aggregate limitation (cap) for the group.

Are there other effluent limitations that could be considered for use in a multisource watershed-based permit?

As discussed in Section 1 of this Chapter, a multisource watershed-based permit might be administered as an individual permit issued to multiple permitted entities. Such a watershed-based permit would be administered as a supplement or overlay to the existing individual permits for the covered facilities (e.g., Connecticut's Long Island Sound nitrogen permit). This approach allows the permitting authority to focus the effluent limitations, monitoring requirements, trading provisions, and other special permit conditions that are developed on a watershed basis in a single permit and clearly links the permitted facilities in a way that simply incorporating watershed-based permit conditions into individual permits does not accomplish. Although such a permit might address protection of water quality of a downstream waterbody, such as a lake, reservoir, or estuary, WQBELs for certain dischargers designed to address local criteria (for example in waters that are tributaries to the lake, reservoir or estuary) might be necessary to ensure that the discharge of pollutants is limited to levels that will not cause or contribute to an excursion of any applicable water quality standard.

Regardless of how a multisource watershed-based permit is structured, the effluent limitations section of the permit likely will have the same basic characteristics. If a large number of co-permittees are to be covered under the permit, the permitting authority might consider using an appendix or schedule to display all applicable effluent limitations and other permit conditions (e.g., allocations and delivery ratios if trading is allowed).

Exhibit 2-3 contains an example effluent limitations table for a multisource watershed-based permit. This example addresses nutrients and includes both shorter-term (monthly average) and longer-term (annual loading) effluent limitations. The attachment referred to in Exhibit 2-3, would include a list of dischargers and their effluent limitations. **See Appendix C** of this

Technical Guidance for an example of such an attachment. Location ratios and delivery ratios (if applicable) could be added to the table to facilitate trading.

Exhibit 2-3. Example effluent limitations and monitoring requirements for nutrients

During the period beginning on the effective date of this permit, each <permittee, co-permittee> is authorized to discharge wastewater to <receiving water name(s)> provided the discharge meets the effluent limits and monitoring requirements set forth herein.

Parameter	Units	Effluent Limitations			Monitoring Frequency (C)	Sample Type (D)
		Total Annual	Total Monthly	Average Monthly		
Flow Rate	MGD	NA	NA	Report	Continuous	Meter
Flow Volume	MG	Report	Report	NA	Calculated	Calculated
Total Nitrogen	mg/L	NA	NA	X mg/L	1 / week	8-hour composite
Total Nitrogen (mass) (A)	lbs	(B)	Report	NA	Calculated	Calculated
	lbs/day	NA	NA	Permit writer calculates based on conc. limit and flow		
Total Phosphorus	mg/L	NA	NA	X mg/L	1 / week	8-hour Composite
Total Phosphorus (mass) (A)	lbs	(B)	Report	NA	Calculated	Calculated
	lbs/day	NA	NA	Permit writer calculates based on conc. limit and flow		

Report – monitor only, no limit

NA – not applicable

Total Nitrogen = Total Kjeldahl Nitrogen + Nitrite Nitrogen + Nitrate Nitrogen

Annual Total Nitrogen (N)/Phosphorus (P) Mass Load (lbs/year) = Sum of Jan. through Dec. Monthly Total N/P Mass Loads
(or sum of last 12 months mass loads for a rolling 12-month limit)

Monthly Total N/P Mass Load =

N/P Concentration (mg/L) for Monitoring Period * Total Flow for Monitoring Period (MGD) * 8.34 * # of days in Monitoring Period
(e.g., if monitoring is 1/week, determine total flow for the week and use 7 as the number of days in monitoring period; if more than one sample is taken during a monitoring period, the sample concentrations may be averaged and the average concentration used as the concentration for that monitoring period)

Monthly Average Total N/P Mass Load =

Sum of Daily Discharges of Total N/P / Number of Daily Discharges Measured During the Calendar Month

- (A) Permit writer could express mass limitations in pounds or kilograms.
- (B) Permit writer would insert total annual mass loading limitations for each co-permittee as calculated from a watershed analysis or refer the reader to an attachment (see Appendix C of this Guidance for an example) that might include a list of total annual loading limits for TN and TP for each co-permittee along with an aggregate limit for an association with co-permittees; delivery factors; and corresponding pounds delivered.
- (C) Permit writer determines monitoring frequency by type of discharger and coordinated with existing permits and permitting authority rules.
- (D) Permit writer would determine sample type.

Section Four: Monitoring Requirements

EPA recommends that the monitoring requirements section of a multisource watershed-based permit, like other NPDES permits, detail requirements for pollutant parameter sampling, flow measurement and analytical test procedures. The NPDES regulations at 40 CFR 122.48(b) require that all NPDES permits, at a minimum, specify monitoring requirements that include the type, interval, and frequency of monitoring sufficient to yield data that are representative of the monitored activity (see also 40 CFR 122.41(j)(1)). Further, 40 CFR 122.44(i) specifies that NPDES permit monitoring requirements be established to assure compliance with effluent limitations, and include the following:

- Monitor the mass (or other measurement specified in the permit) for each pollutant limited in the permit
- Monitor the volume of effluent discharged from each outfall
- Establish other measurements as appropriate and needed to implement applicable regulations and requirements
- Require use of approved analytical methods specified at 40 CFR Part 136 of the NPDES regulations
- Generally require reporting of monitoring results at a frequency established through the permit on a case-by-case basis but in no case less than once per year [see Section Five of this Chapter for a discussion of reporting requirements].

State rules might require monitoring conditions in permits that are more stringent than federal regulations.

The NPDES permit establishes monitoring and reporting requirements to implement applicable federal and state requirements and any state monitoring strategies. The permitting authority might consider adjusting or adding monitoring requirements to a facility's individual NPDES permit through permit reissuance or modification or including them in a separate overlay permit that includes monitoring requirements in addition to those in the facility's individual permit. For either approach, EPA recommends that the permit writer carefully consider the existing monitoring requirements in a facility's individual permit and coordinate the type and frequency of the additional monitoring with the existing monitoring requirements. Furthermore, the monitoring location should be consistent with the compliance point specified in the permit in order to be able to accurately measure compliance with effluent limitations and fulfill the requirement that monitoring yield data representative of the monitored activity.

Monitoring conditions for a permit issued to an association with co-permittees or a permit issued to co-permittees not part of an association are similar to those for individual permits because all permitted facilities must conduct monitoring as needed to assure compliance with effluent limitations (40 CFR 122.44(h)(1)). A watershed-based permit might also include ambient monitoring. EPA recommends that monitoring requirements be coordinated with the effluent limitations, reporting, compliance, and trading components of the watershed-based permit and that permitting authorities examine each of the following key technical questions and related options when developing the monitoring requirements for a watershed-based permit.

Key Technical Questions

Who is required to conduct monitoring?

A permit must require representative monitoring to assure compliance with permit limitations (40 CFR 122.41(j)(1)). EPA recommends that the permit make it clear that the individual co-permittees ultimately are responsible for ensuring that effluent monitoring is completed and reported to the permitting authority and that any enforcement actions for failure to monitor and report will be against the individual co-permittee. As required by 40 CFR 122.41, the permitting authority must ensure that monitoring allow permittees and agency compliance personnel to gauge whether dischargers are meeting their individual effluent limitations and any other requirements (e.g., conditions for trading).

With respect to ambient monitoring, EPA recommends that the permitting authority consider only one study or monitoring program per waterbody. The authority could do this by contacting all facilities that discharge into the waterbody and encourage them to jointly work to conduct the study. For further discussion of ambient monitoring consortiums, see EPA's Watershed Academy Information Transfer Series document titled *Monitoring Consortiums: A Cost-Effective Means to Enhancing Watershed Data Collection and Analysis* (USEPA 1997).

What sampling locations are specified in the permit for compliance monitoring?

EPA recommends that the permitting authority consider whether the sampling location for compliance with limitations in a watershed-based permit should be established by reference to the sampling location in each facility's individual permit or whether the watershed-based permit should specifically list the monitoring location for each permittee or co-permittee (see Exhibit 2-4).

Exhibit 2-4. Options for establishing appropriate sampling locations

Sampling Location

Option 1—Example of referencing sampling location in each facility's individual NPDES permit

Monitoring for compliance with effluent limitations must be at a location identical to that used to determine compliance with effluent limits established in its individual NPDES permit:

<list facilities and permit numbers>.

Option 2—Example of establishing sampling location within the multisource permit

Monitoring for compliance with effluent limitations established in the permit is required at the following locations:

<list each facility and monitoring location—e.g., following the effluent flow meter and prior to the point of discharge to the <receiving water name>>.

What additional sampling locations could be specified in the permit?

EPA recommends that the permitting authority consider whether the permit should identify additional sampling locations, such as sampling locations for ambient monitoring or in-plant monitoring. For example, the permit might specify the sampling points to monitor the influent

and effluent to determine treatment efficiency. Ambient monitoring might be considered based on a state's waterbody assessment methodology or, in some cases, a discharger association might propose an ambient monitoring network. For additional discussion of ambient and in-plant monitoring, see Section Six of this Chapter, which addresses Special Conditions.

What monitoring frequency is specified in the permit?

Monitoring frequency in a permit generally is established on the basis of the number of samples needed for adequate monitoring of overall treatment system performance with respect to the parameters of concern. In making a final determination regarding monitoring frequency, EPA recommends that the permitting authority consider the following:

- Characteristics of the treatment system, the effluent, and the receiving stream
- Flow rate and variability
- Seasonality
- Factors unique to sampling, including analytical methods.

EPA recommends that monitoring be coordinated with existing individual NPDES permits, state rules, and any EPA or state guidance or monitoring strategy.

What types of samples are required?

Samples may be collected as grab samples or composite samples as required by the test procedures listed in 40 CFR Part 136 and based on effluent concentration and flow variability. Permits generally require flow monitoring to calculate the mass of a pollutant discharged as authorized by 40 CFR 122.44(i)(1) and 122.48(b). Mass loadings are then used to determine compliance with mass-based limitations. For example, to characterize the total load over a given time period, the sample concentration (or average concentration for multiple samples) is multiplied by the flow volume for the monitoring period. Therefore, accurate flow monitoring for the monitored period is critical.

How are tiered monitoring requirements used?

As an alternative to establishing a single monitoring frequency for all discharges covered by a permit, the permitting authority could incorporate tiered monitoring requirements into a watershed-based permit consistent with state regulations or policy. The tiered monitoring requirements for a watershed-based permit could be based upon the following:

- differences in facility design flows
- industrial and municipal sources
- seasonal variability in flow or discharges
- location of facility in the watershed (e.g., tidal or non-tidal areas).

For example, facilities with high actual or design flows (e.g., facilities with a flow of 10 MGD or greater) might be required to monitor more frequently than facilities with lower actual or design flows (e.g., facilities with flows less than 10 MGD). This approach would afford the permitting authority more data to adequately characterize the pollutant loads from the largest dischargers.

Which analytical methods are used to measure various pollutants?

According to 40 CFR 122.44(i)(1)(iv), samples collected as part of a self-monitoring program required under an NPDES permit must be analyzed in accordance with EPA approved analytical methods specified in 40 CFR Part 136 (*Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*) or other method specified in the permit where approved methods are not available.

Section Five: Reporting and Recordkeeping Requirements

This section of a multisource watershed-based permit includes the requirements for reporting and recordkeeping and would be similar to the corresponding section of an individual permit. Federal regulations at 40 CFR 122.41(l)(4) require permitting authorities to include in permits requirements for permittees to submit self-monitoring results at intervals specified in the NPDES permit. Further, 40 CFR 122.41(l)(4)(i) requires that monitoring results be reported using the Discharge Monitoring Report (DMR) or other form specified by the NPDES permitting authority.

The NPDES permitting authority will determine the appropriate content and frequency for reporting and recordkeeping requirements consistent with any state requirements. Furthermore, EPA recommends that the permit coordinate reporting and recordkeeping requirements with effluent limitations, monitoring, compliance, and trading requirements. In developing reporting and recordkeeping requirements for watershed-based permits, EPA recommends that permit writers consider several key technical issues.

Key Technical Questions

How should monitoring results be reported?

EPA recommends that the permitting authority consider whether to require the facility to submit a modified DMR that incorporates watershed-based effluent limitations or to submit a separate DMR for the watershed-based permit that is independent of the DMR required by the existing individual NPDES permit. Requiring a modified DMR is recommended only where watershed-based permit limitations are incorporated into an existing individual NPDES permit.

Submitting a separate DMR is recommended for multisource watershed-based permits that replace or overlay existing individual permits. These permits will have different permit numbers than the existing individual NPDES permits. The DMR required by an additional or overlay permit would be independent of the DMR submitted in compliance with existing individual NPDES permits, so overall compliance and enforcement would be tracked separately for each permit. EPA's Permit Compliance System (PCS) and Integrated Compliance Information System (ICIS) do not have the capability to track compliance for an existing individual NPDES permit and an overlay permit that would be submitted on the same DMR form. Example supplemental DMR forms for nutrient effluent limitations accommodating trading are provided in **Appendix D**.

What is the appropriate reporting frequency?

The NPDES regulations at 40 CFR 122.48 state that permits should specify monitoring types, intervals, and frequency sufficient to yield data representative of the monitored activity and

reporting requirements determined on the basis of the impact of the regulated activity. EPA recommends that multisource watershed-based permits require monthly reporting at a minimum. The permitting authority can require more frequent reporting depending on the nature and effect of the discharge (40 CFR 122.48(c)). The permitting authority should establish a reporting frequency consistent with existing individual NPDES permit requirements or develop reporting requirements on the basis of how effluent limitations, monitoring, and compliance determinations are expressed. There are exceptions to this recommendation, however. For example, even if effluent limitations are established as annual limitations, such as annual loading limitations, EPA recommends that the permitting authority strongly consider requiring monthly reporting of monitoring results to ensure timely review of progress toward achieving the total annual limitation. In addition to monthly reporting, the watershed-based permit could include a requirement for an annual summary or for reporting cumulative (year-to-date) loading to facilitate evaluating compliance with total annual loading limitations. Exhibit 2-5 provides example permit text for reporting requirements.

What are the recordkeeping requirements for a watershed-based permit?

As required by 40 CFR 122.41(j)(2), permits must include requirements for permittees to retain records for at least three years. The permitting authority may extend this time period by request and might wish to do so in some cases (e.g., where a trading agreement lasts for a full five-year permit term). Monitoring records must be representative of the discharge (40 CFR 122.41(j)) and include the following:

- Date, place, and time of sampling
- Individual(s) who performed the sampling
- Date of analysis
- Individual(s) who performed the analysis
- Analytical methods used
- Analytical results.

If trading is allowed and occurs within the scope of a permit, what effect will that have on reporting?

In addition to the standard reporting and recordkeeping requirements for monitoring results, EPA recommends that the NPDES permitting authority consider whether to include reporting and recordkeeping requirements specifically related to trading in the permit. For example, the permitting authority might consider requiring a permittee to submit a supplemental trading form when trades are conducted. For further discussion of recommended reporting and recordkeeping requirements for trading and an example of a trade reporting form, see *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007).

Exhibit 2-5. Example permit text for reporting requirements

Standard Reporting Requirements

Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms approved by the permitting authority. [40 CFR 122.41(l)(4)(i)]

DMRs must be submitted monthly to the permitting authority, signed and certified as required by the standard provisions. If trading was conducted during the month, a trading report must also be submitted (see reporting requirements for trading).

Monthly reports are due on the 1st day of the second month following the end of each calendar month of monitoring. Annual compliance reports are due on February 1 following each calendar year.

For each measurement or sample taken pursuant to the requirements of this permit, the following information shall be recorded:

- The date, exact location, and time of sampling or measurements
- The name of the individual who performed the sampling or measurements
- The date(s) analyses were performed
- The name of the individual who performed the analyses
- The analytical techniques or methods used, including the current method detection limit (MDL)
- The results of the analyses

The **<permittee or co-permittees>** must arrange all reported data in tabular form so that the specified information is readily discernible. The data must be summarized in such a manner as to clearly illustrate whether the facility is operating in compliance with discharge requirements.

Calculations for all limits that require averaging of measurements must use an arithmetic mean unless otherwise specified by the permitting authority.

Special Reporting Requirements *(example for annual limits included in a permit)*

In addition to regular monthly reporting, at the end of the calendar year, **<permittee or co-permittees>** will submit an annual compliance summary report to **<name of permit issuing agency>**. In this report, the facility's **<pollutant>** loadings will be presented as monthly, quarterly, and total annual loads. If the annual load discharged is greater than the annual load limit for **<pollutant>**, **<permittee or co-permittees>** will provide a description of the specific additional actions or activities that will be undertaken during the next quarter to achieve compliance. **<When trading program is available: <permittee or co-permittees> will describe the means by which credits will be acquired to achieve compliance.>**

Plans required by this subsection must be submitted to the permitting authority with the DMR for the last month of the quarterly reporting period.

If trading is being conducted in accordance with Section **<X>** of this permit, **<permittee or co-permittees>** must submit, along with the DMR, a trade summary for the period covered by the DMR using the **<state>** Trade Summary Table.

Section Six: Special Conditions

There are a number of requirements, such as BMPs or preventive requirements, that are addressed through special conditions in NPDES permits. These conditions are not included in the effluent limitations section of this discussion of multisource watershed-based permits because they are not specific numeric limitations. They may, however, be related to or impact the effluent limitations section of the permit. This section addresses considerations for NPDES permit writers developing special conditions for watershed-based permits.

Key Technical Questions

What programs or unique circumstances require special conditions in the permit?

EPA recommends that the special conditions section of an NPDES watershed-based permit include additional conditions such as trading requirements and specific provisions that allow the permit to be reopened. The permitting authority might also consider whether to add special conditions to account for growth in the watershed by specifying requirements for adding new facilities to the watershed-based permit or expanding existing facilities. Each of these potential types of special conditions is discussed below.

Trading. A watershed-based permit that authorizes trading might provide a flexible and cost-effective means of protecting water quality and maintaining loading provisions in a TMDL or other watershed plan. For example, a permit condition might say that, to meet the effluent limitations, dischargers may employ treatment technologies, pollution prevention, or operational measures at their facilities or buy credits. For some facilities in a watershed, incorporating new technology to meet WQBELs might not be as cost-effective as buying credits. The basic premise of trading is simple: within a specified geographic area, a pollutant loading cap is distributed among dischargers as facility WLAs, which are translated into effluent limitations in an NPDES permit. The dischargers within the geographic area then buy or sell credits from each other or from another source (e.g., nonpoint source or through a credit exchange) to meet their effluent limitations, provided they do not, as a group, exceed the cap.

EPA recommends that the permitting authority consider whether trading provisions in watershed-based permits should be relatively simple statements authorizing trading among specified trading partners or more complex permit conditions that include equations for calculating credits, conditions for trading with nonpoint sources, the timing of credit use and generation, special reporting requirements, and other details. EPA recommends that permitting authorities without a formal trading program incorporate as many specific trading provisions that the permitting authority deems necessary in the permit itself. For permitting authorities with a formal trading program, the authority might consider referencing the trading program in the permit instead of including detailed trading provisions. EPA recommends that trading requirements identify the legal authority to conduct trades; potential trading partners; the types of trades that may be conducted; how credits may be generated, bought and sold; how trades are reported and tracked; and provisions for compliance and enforcement. The specifics of how trading is conducted and reflected in NPDES permits may vary. For more detailed information on incorporating trading provisions in NPDES permits, see *Water Quality Trading Toolkit for Permit Writers* (USEPA 2007).

New or Expanded Facilities. EPA recommends that a watershed-based permit account for growth in the watershed from the construction of new dischargers or expansions of existing dischargers. In some cases, a TMDL or watershed plan may have a point source load reserve. The permitting authority might also consider whether to incorporate provisions to address growth in a watershed by reducing WLAs to existing dischargers or requiring a new or expanded discharge to offset the new or increased load through mitigation. For example, the permit might require new or expanded facilities to offset their new or increased loads by acquiring facility credits from one or more permitted facilities in the same tributary or from nonpoint sources generating credits through the use of BMPs.

Reopener. Under 40 CFR 122.41 and 122.62, an NPDES permit may be modified, revoked and reissued, or terminated for cause. NPDES permitting authorities might wish to include a reopener condition to address unique situations potentially posed by a watershed-based permit. Such situations may include adjustments to the WLA specified in the permit on the basis of new or revised water quality modeling results, or revisions to a TMDL or watershed plan that affect the overall loading requirement for the waterbody and the individual requirements on the covered facilities. Although a reopener condition might not be required to modify a watershed permit focused on a limited number of pollutants, such a permit condition may be useful to specifically identify those contingent conditions where changes may be warranted. Exhibit 2-6 presents example permit text for a permit reopener.

Exhibit 2-6. Example permit reopener

The issuance of this permit does not prohibit the permit issuing authority from reopening and modifying, revoking and reissuing, suspending, or terminating the permit as authorized Title 40 of the *Code of Federal Regulations*, Parts 122 and 123 **<or the state equivalent of these provisions>**, as applicable.

This permit may be reopened **<specify date or timing>** to adjust the WLA and corresponding effluent limit(s) specified in **<specify section and or appendix>** on the basis of **<new water quality modeling results; revisions to a relevant TMDL or watershed plan>**.

What special monitoring requirements might be included in the permit?

EPA recommends that the permitting authority consider whether to include in the special conditions any requirements for ambient monitoring or other special monitoring it deems necessary in order to gather data for use in other watershed activities or to ensure that trading is not causing localized exceedances of water quality standards. This monitoring is separate from, and in addition to, the routine compliance monitoring required by an NPDES permit. EPA recommends that the permitting authority carefully assess the need for such requirements. Factors to consider include what needs would be fulfilled by the data gathered and the potential burden on permittees.

Ambient monitoring. In addition to traditional discharge monitoring requirements, the permitting authority might consider whether ambient monitoring should be used to determine if water quality standards and pollutant reduction requirements and goals are being achieved. Ambient monitoring might be considered for certain dischargers at specific locations throughout the watershed or could be coordinated with existing watershed ambient monitoring efforts. Permitting authorities might

want to refer to EPA's 1996 *Interim Guidance for Performance-based Reductions of NPDES Monitoring Frequencies* (USEPA 1996b) to explore how to reduce monitoring burden. This document can be found at <http://www.epa.gov/npdes/pubs/perf-red.pdf>. Exhibit 2-7 presents sample permit text for ambient monitoring.

Exhibit 2-7. Example permit text for ambient monitoring

<Permittee or co-permittees> must conduct ambient monitoring to ensure that reductions in <pollutant> discharged to <waterbody> are producing the expected reductions at <point of concern in the watershed.> Sampling must be conducted as follows: <sample type, frequency, etc.> Sampling must be conducted at the location approved by the permitting authority.

<Permittee or co-permittees> also must conduct ambient monitoring at designated locations in the <downstream waterbody> to determine whether water quality standards are being met. Sampling must be conducted as follows: <sample type, frequency, etc.>. Sampling must be conducted at monitoring locations approved by the permitting authority.

In-plant monitoring (if applicable). The permitting authority should consider whether in-plant monitoring should be required to ensure the proper operation and maintenance of the facility and its controls. Such monitoring is especially useful for permits that allow trading between a facility's outfalls (i.e., intraplant trading). Monitoring results could be used to detect changes in waste loads, characterize effluent, and assess treatment efficiency.

BMP Monitoring. Finally, the permitting authority should consider whether BMP monitoring requirements should be specified for point sources employing BMPs or trading with nonpoint sources that use BMPs to generate credits purchased by point sources. Such monitoring results would be used to measure BMP effectiveness and ensure proper installation, operation, and maintenance of the BMP.

Section Seven: Public Notice

The public notice is an important part of the NPDES permitting process and is required by law at 40 CFR 124.10. It is the primary method of advising all interested parties of a proposed action with respect to an NPDES permit or the contents of a draft NPDES permit. The goal of the public notice of a draft permit is to solicit public review and comments on the draft permit. The permitting authority may decide to hold a public hearing if there is significant public interest expressed during the 30-day comment period following issuance of the draft permit or if an issue needs to be clarified during the permitting process (40 CFR 124.12(a)(1),(2)).

The federal regulations at 40 CFR 124.10 require the public notice to contain the following, at a minimum:

- Name and address of the office processing the permit action
- Name and address of the permittee or applicant and, if different, of the facility regulated by the permit
- A brief description of the business conducted at the facility and activity described in the permit application or the draft permit

- Name, address, and telephone number of a contact from whom interested persons may obtain additional information
- A brief description of the comment procedures
- For EPA-issued permits, the location and availability of the administrative record
- A general description of the location of each existing or proposed discharge point and the name of the receiving water and the sludge use disposal practices
- Any additional information considered necessary.

In many ways, a multisource watershed-based permit can help streamline the public notice process by grouping the public notice process for many facilities under one public notice action. NPDES permitting authorities also may consider using innovative outreach approaches in conjunction with traditional public notice methods to ensure that all affected stakeholders have the opportunity to comment on a draft permit. The geographic scope and type of permit will generally drive the decision on which public notice methods are most appropriate. EPA recommends that the permitting authority consider the following technical issues when developing a public notice for a watershed-based permit.

Key Technical Questions

When must public notice be provided?

The federal regulations at 40 CFR 124.10 require public notice of a proposal to issue a permit. The notice should be given within the geographic area of the proposed or existing discharge following completion of a draft permit. The permitting authority must allow at least 30 days for the public to submit comments on the draft permit. If public interest warrants a public hearing or other public meeting, the permitting authority must also provide public notice of the hearing or meeting as specified at 40 CFR 124.10. States should already have public notice procedures in place that comply with NPDES regulatory requirements.

States should anticipate significant public interest when issuing a multisource watershed-based permit, especially if the permit allows trading as a means to comply with effluent limitations. EPA recommends that states consider using aggressive outreach approaches for watershed-based permits and seek to ensure meaningful stakeholder involvement during the comment period. For example, the permitting authority could hold a series of meetings before, during, and after the public comment period. The meetings could be open to the public, but targeted to reach key stakeholder groups in the watershed. See **Appendix A** for more detailed information on stakeholder involvement.

How should permitting authorities effectively and efficiently provide public notice of a watershed-based permit?

Public notice of watershed-based permits must meet the minimum federal requirements. EPA recommends that permitting authorities go beyond those minimum requirements to get the state's stakeholders (private and nonprofit organizations, local government units, and citizens) involved in the process. To effectively and efficiently provide notice, in addition to the traditional legal notice in a newspaper, the permitting authority could use its existing database lists of stakeholders. The permitting authority might also identify and partner with organizations that

currently conduct outreach in the watershed to improve involvement among stakeholders. Furthermore, the permitting authority could identify the most commonly used channels of communication among stakeholders and select the most appropriate method for providing an effective public notice of permit actions. EPA recommends that the permitting authority be prepared to use a variety of communication tools to ensure that all stakeholders are notified of the watershed-based permitting actions and have the opportunity to provide meaningful input to the process.

Will the type of permit affect the public notice process?

The type of permit used and the geographic scope could have a direct impact on the procedures for public notice. For example, if the permit is being issued to multiple co-permittees, the permitting authority could issue one public notice for the permit. If separate individual permits with watershed-based provisions are used, public notices would have to be issued for each permit. To streamline the public notice process and increase stakeholder involvement, the permitting authority could coordinate issuance of the individual permits and then group the public notices for each permit under one public notice action.

What additional information should a public notice for a watershed-based permit contain?

In addition to the minimum requirements at 40 CFR 124.10, EPA recommends that the public notice contain the following to facilitate watershed-based permitting:

- Description of the geographic scope of the permit
- Explanation of the concept of a watershed-based permit
- Description and explanation of any planned trading activities
- Where to obtain additional information on the watershed-based permitting process
- Graphics to illustrate the relationship of the watershed and facilities to local jurisdictional boundaries and other familiar landmarks.

What other permit-related actions might trigger the need for public notice?

If trading is allowed and occurs within the context of the watershed-based permit, the permitting authority may have to provide public notice of certain actions (i.e., if incorporating a trade requires more than a minor modification, such as a trade that results in changes to effluent limitations). Public notice may also be required for other actions, such as addition of facilities to or removal of facilities from a multisource watershed-based permit.

Chapter 3: Watershed-based Permitting Case Studies

In watersheds across the country, permitting authorities and other watershed stakeholders have constructed a variety of NPDES watershed frameworks to address specific pollutant or stressor types and water quality concerns. EPA has developed a series of watershed-based permitting case studies to highlight real-world examples of implementing an NPDES watershed framework and to illustrate the concepts presented in Chapters 1 and 2.

There are currently eight case studies highlighted in this Chapter. Others are under development and will be added as they are completed. The case studies are available in their entirety on EPA's NPDES Web site at <http://www.epa.gov/npdes/watersheds>. These case studies illustrate a variety of approaches implemented as part of an NPDES watershed framework including, in some instances, development of a multisource watershed-based permit.

A brief description of each completed case study is provided below, and the full text of each of these case studies is available at the above EPA Web site.

Big Darby Creek Watershed, Ohio: Construction Watershed-based General Permit

The Big Darby Creek watershed is in central Ohio, draining agricultural areas and suburbs to the northwest and west of Columbus. The Big and Little Darby Creeks have been designated as State and National Scenic Rivers, and the watershed is known to provide habitat for several state and federally listed endangered species. Two major policy and planning documents justified the need for a construction general permit in the Big Darby watershed: the Big Darby Creek TMDL, approved by EPA on March 31, 2006, and the regional 208 Water Quality Management Plan (i.e., *Central Scioto Plan Update* or CSPU). The state issued a construction general permit for the Big Darby watershed on September 12, 2006 (effective October 27, 2006).

This case study focuses on using a watershed general permit to require control measures and BMPs for construction stormwater that address recommendations from the TMDL.

Chesapeake Bay Watershed, Virginia: Watershed-based General Permit for Nutrient Discharges and Nutrient Trading

In March 2003, the Chesapeake Bay Program (CBP) adopted new nutrient reduction goals as part of the Chesapeake 2000 Agreement. The CBP established nutrient allocations for each of the eight tributary basins (i.e., subwatersheds), and each state within the Chesapeake Bay drainage then developed tributary strategies to achieve the nutrient reduction goals for each subwatershed. To facilitate meeting the nutrient load reduction goals of the Chesapeake Bay Agreement in Virginia, on March 24, 2005, the Governor of Virginia signed legislation authorizing the creation of the Chesapeake Bay Watershed Nutrient Credit Exchange Program (Exchange Program).

Virginia's Exchange Program requires Virginia Pollutant Discharge Elimination System (VPDES) permitted facilities on the CBP Significant Discharger List as well as new and expanding facilities, to register for coverage under a new associated General Permit to collectively meet annual nutrient allocations established for the Chesapeake Bay subwatersheds. The General Permit establishes annual effluent loading limits for nitrogen and phosphorus for all

dischargers and establishes the conditions by which credits (the difference in pounds between the facility's limit and the mass actually discharged) may be exchanged. In addition, nutrient credits may be purchased by existing facilities whose proposed expansion would otherwise cause the facilities to exceed their allocation or by new and expanded facilities that do not have an assigned WLA. Facilities can make these nutrient credit transactions through the Nutrient Credit Exchange Association or independently with facilities located in the same subwatershed.

This case study focuses on the tributary strategy components of the General Permit issued to significant and new/expanding dischargers as part of Virginia's Exchange Program.

Lake Lewisville Watershed, Texas: City of Denton Watershed Protection Program

The Lake Lewisville watershed has been experiencing significant development pressures, so in 2001, the City of Denton, Texas, the largest city in the watershed, developed several watershed-based programs to address water quality concerns and storm water permitting requirements. While Lake Lewisville is not currently listed as impaired under the state's CWA section 303(d) list, the city has taken some proactive measures to protect the water quality of the lake. The city has leveraged multiple funding sources for this. Specifically, Denton has implemented a water quality monitoring program, employed land use planning and management tools, and disseminated critical information to the public aimed at changing residential land use practices.

This case study focuses on an overall watershed approach in the Lake Lewisville watershed that affects implementation of the NPDES program for municipal and industrial sources. The program also provides information and analysis for future watershed-based permitting efforts such as development of a multisource watershed-based permit and water quality trading.

Michigan Statewide Watershed-based MS4 Stormwater General Permit

For approximately 20 years before implementing a watershed-based permitting approach in the Rouge River watershed, the Michigan Department of Environmental Quality (MDEQ) had been seeking ways to bring communities together under either a voluntary or regulatory approach to achieve water quality goals. Using a watershed-based permitting approach in the Rouge River as a test case, MDEQ learned that a watershed-based regulatory program could be achieved if it were offered as an alternative to some other regulatory mechanism. The voluntary, watershed-based permit developed in the Rouge River was reissued as a statewide, watershed-based National Pollutant Discharge Elimination System (NPDES) general permit for stormwater Phase II in 2002 and was renamed the Watershed-based Permit.

The goal of the statewide permit is to provide a watershed-based approach for implementing and coordinating stormwater Phase II compliance efforts. Municipal Separate Storm Sewer Systems (MS4s) regulated under Phase II may choose to participate in the watershed approach under the general Watershed-based Permit, or they may opt to seek coverage under MDEQ's more traditional MS4 stormwater general permit, called the Jurisdictional Permit.

This case study focuses on development of the Rouge River watershed-based stormwater permit and its adaptation for use as a statewide permit. The discussion includes the process for adapting requirements to address watershed-specific needs.

Neuse River Watershed, North Carolina: Neuse River Compliance Association Watershed-based Permit

The Neuse River is classified as a Nutrient Sensitive Water because of the long-term eutrofication of its estuary. In 1996, the North Carolina General Assembly passed House Bill 1339, which set a goal of reducing nitrogen loads to the estuary by 30 percent by 2003 (with 1995 as the baseline year). In 1997, the Neuse River Nutrient Sensitive Waters Management Strategy (Strategy) was developed to meet this goal and included a set of permanent rules (the Rules) to support implementation of the Strategy and meet the reduction goal.

One of the Rules passed by the General Assembly, the Wastewater Discharge Rule (Rule T15 NCAC 2B.0234), establishes specific nutrient control requirements for point source dischargers in the watershed and includes a provision which allows point sources to form a compliance association to work collectively to meet the combined TN WLA [1.64 million pounds of total nitrogen (TN) per year at the estuary]. This WLA was established in a Phase I TMDL (1999). In 2002, the North Carolina Department of Environment and Natural Resources Division of Water Quality issued a watershed-based permit to a group of dischargers organized as the Neuse River Compliance Association to regulate the discharge of total nitrogen into the Neuse River.

This case study focuses on the components of the watershed-based permit issued to the Association and the group compliance mechanisms used by the co-permittees.

North Carolina Statewide Approach: Basinwide Planning and Permitting

The North Carolina Division of Water Quality (DWQ) employs a basinwide approach to protecting the state's water resources; it undertakes planning, monitoring, modeling, permitting, and compliance assessment activities at the basin scale. DWQ prepares basinwide plans on a 5-year cycle. The purposes of the plans are to frame a number of water quality factors, including current conditions, potential and existing threats, short- and long-range protection goals, and management options for both point and nonpoint sources of pollutants.

This case study focuses on the history of North Carolina's basinwide planning program and the planning process used along with the benefits of implementing that process.

Sand Creek Watershed, Colorado: Watershed-based Selenium Standard

Suncor Energy (U.S.A.), Inc., formerly Conoco Denver Refinery, convened the Selenium Stakeholder Group to discuss the scientific merit and feasibility of implementing Colorado's proposed lower selenium standard for point sources discharging to the South Platte River and its tributaries, specifically Sand Creek. Members of the group predicted that applying the lower standard would result in Sand Creek being inappropriately placed on Colorado's CWA section 303(d) list of impaired waters because ambient background selenium concentrations would exceed the lower standard.

The dischargers worked with state and federal agencies to develop a proposal in which the dischargers would collect the biological, chemical, and physical data necessary to justify a higher selenium standard for western plains stream ecosystems. Pending the results of the study, the Colorado Department of Public Health and Environment granted a temporary modification of the selenium standard for Sand Creek and Segment 15 of the South Platte River. The goal of the

program is to develop a science-based water quality standard for selenium that is protective of, and appropriate for, western plains stream ecosystems. The approach allows for adaptive implementation in which stakeholders work cooperatively and proactively to solve problems outside the regulatory arena.

This case study focuses on NPDES dischargers in the Sand Creek watershed working together using a watershed approach to develop a site-specific water quality criterion.

Tualatin River Watershed, Oregon: Clean Water Services Integrated Municipal Permit

Clean Water Services (CWS) is a public utility (special services district) that operates four municipal wastewater treatment facilities, each with its own permit under the National Pollutant Discharge Elimination System (NPDES). CWS also, has two industrial stormwater permits and is a co-permittee in a Municipal Separate Storm Sewer System (MS4). The Tualatin River is the receiving stream for each of the above permitted discharges. Oregon's Department of Environmental Quality (OR DEQ) issued TMDLs for the Tualatin River for ammonia, phosphorus, temperature, bacteria, and tributary dissolved oxygen (DO). In February 2004, OR DEQ issued a single watershed-based, integrated municipal permit to CWS. This permit incorporates the NPDES requirements for all four of CWS's advanced wastewater treatment facilities, its two industrial storm water permits, and its MS4 permit. A significant feature of the integrated permit is its inclusion of provisions for water quality credit trading involving temperature (thermal load), biochemical oxygen demand (BOD), and ammonia.

The watershed-based permit has resulted in various benefits to CWS, the permitting authority, and the environment. For both CWS and OR DEQ, one permit is easier to administer and implement. The integrated permit provides economies of scale for both CWS and OR DEQ in terms of resource use. Both organizations are now better able to focus their resources on the most critical resource problems, and the integrated permit provides greater protections for the environment than what might have been realized under the previous array of permits. Since the integrated watershed based permit was issued, CWS has planted nearly 10 miles of riparian shading, preventing 101 million kilocalories (Kcal) per day of thermal energy from impacting the Tualatin River.

This case study focuses on the components of the watershed-based permit issued to CWS. It also summarizes key components of CWS's thermal load trading program.

References

The following are referenced in this document. Links to publications with electronic versions available have been provided and were last accessed July 6, 2007.

- Claytor, Richard A., and Whitney E. Brown. 1996. Environmental Indicators to Assess Stormwater Control Programs and Practices. Prepared by the Center for Watershed Protection, Silver Spring, Maryland, in cooperation with the U.S. Environmental Protection Agency.
- Davenport, Thomas. 2002. *The Watershed Project Management Guide*. CRC Press, Boca Raton, Florida.
- Grumbles, Benjamin H. 2007. *Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs*. U.S. Environmental Protection Agency, Office of Water Memorandum. March 5, 2007. Washington, DC. http://www.epa.gov/npdes/pubs/greeninfrastructure_h2oprograms_07.pdf.
- Hanlon, James. 2004. *Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its Tidal Tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System*. U.S. Environmental Protection Agency, Office of Wastewater Management Memorandum. March 3, 2004. Washington, DC. http://www.epa.gov/reg3wapd/npdes/pdf/ches_bay_nutrients_hanlon.pdf.
- Mehan, G. Tracy, III. 2002. *Committing EPA's Water Program to Advancing the Watershed Approach*. U.S. Environmental Protection Agency, Office of Water Memorandum. December 3, 2002. Washington, DC. <http://www.epa.gov/owow/watershed/memo.html>.
- Mehan, G. Tracy, III. 2003. *Watershed-based NPDES Permitting Policy Statement*. U.S. Environmental Protection Agency, Office of Water Memorandum. January 7, 2003. Washington, DC. <http://www.epa.gov/npdes/pubs/watershed-permitting-policy.pdf>.
- North Carolina Department of Environment and Natural Resources. 2002. Neuse River Compliance Association NPDES Permit No. NCC000001. <http://h2o.enr.state.nc.us/NPDES/documents/00001nrcapermit-pt1mod200401.pdf>.
- Thomann, R.V. and J.A. Mueller. 1987. *Principles of Surface Water Quality Modeling and Control*. Harper Collins Publishers, New York, NY.
- USEPA (U.S. Environmental Protection Agency). 1991. *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/npdes/pubs/owm0264.pdf>.
- USEPA (U.S. Environmental Protection Agency). 1994a. *NPDES Watershed Strategy*. U.S. Environmental Protection Agency, Washington, DC.
- USEPA (U.S. Environmental Protection Agency). 1994b. *Combined Sewer Overflow Control Policy*. U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/npdes/pubs/owm0111.pdf>.

- USEPA (U.S. Environmental Protection Agency). 1995. *Watershed Protection: A Statewide Approach* (EPA 841-R-95-004). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/owow/watershed/statewide/>.
- USEPA (U.S. Environmental Protection Agency). 1996a. *EPA Watershed Approach Framework*. U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/OWOW/watershed/framework.html>.
- USEPA (U.S. Environmental Protection Agency). 1996b. *Interim Guidance for Performance-based Reductions of NPDES Monitoring Frequencies*. U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/npdes/pubs/perf-red.pdf>.
- USEPA (U.S. Environmental Protection Agency). 1997a. *Monitoring Guidance for Determining the Effectiveness of Nonpoint Source Controls* (EPA 841-B-96-004). U.S. Environmental Protection Agency, Washington, DC.
- USEPA (U.S. Environmental Protection Agency). 1997b. *Monitoring Consortia: A Cost-Effective Means To Enhancing Watershed Data Collection And Analysis* (EPA 841-R-97-006). U.S. Environmental Protection Agency, Washington, DC. http://www.epa.gov/owow/watershed/wacademy/its03/mon_cons.pdf.
- USEPA (U.S. Environmental Protection Agency). 1999a. *Protocol for Developing Sediment TMDLs* (EPA 841-B-99-004). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/owow/tmdl/sediment/pdf/sediment.pdf>.
- USEPA (U.S. Environmental Protection Agency). 1999b. *Protocol for Developing Nutrient TMDLs* (EPA 841-B-99-007). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/owow/tmdl/nutrient/pdf/nutrient.pdf>.
- USEPA (U.S. Environmental Protection Agency). 2001. *Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002). U.S. Environmental Protection Agency, Washington, DC. http://www.epa.gov/owow/tmdl/pathogen_all.pdf.
- USEPA (U.S. Environmental Protection Agency). 2002a. *National Water Quality Inventory 2000 Report*. U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/305b/2000report/>.
- USEPA (U.S. Environmental Protection Agency). 2002b. *A Review of Statewide Watershed Management Approaches*. U.S. Environmental Protection Agency, Washington, DC. www.epa.gov/owow/watershed/approaches_fr.pdf.
- USEPA (U.S. Environmental Protection Agency). 2002c. *Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003*. U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/owow/nps/Section319/319guide03.html>.
- USEPA (U.S. Environmental Protection Agency). 2002d. *Draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria* (EPA-823-B-02-003). U.S. Environmental

- Protection Agency, Washington, DC.
<http://www.epa.gov/waterscience/standards/bacteria/bacteria.pdf>.
- USEPA (U.S. Environmental Protection Agency). 2003a. *Water Quality Trading Policy*. U.S. Environmental Protection Agency, Washington, DC.
<http://www.epa.gov/owow/watershed/trading/finalpolicy2003.pdf>.
- USEPA (U.S. Environmental Protection Agency). 2003b. *Clean Watersheds Needs Survey 2000 Report to Congress*. U.S. Environmental Protection Agency, Washington, DC.
<http://www.epa.gov/owm/mtb/cwns/2000rtc/toc.htm>.
- USEPA (U.S. Environmental Protection Agency). 2003c. *Watershed-based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance* (EPA 833-B-03-004). U.S. Environmental Protection Agency, Washington, DC.
http://www.epa.gov/npdes/pubs/watershedpermitting_finalguidance.pdf.
- USEPA (U.S. Environmental Protection Agency). 2004. *Water Quality Trading Assessment Handbook* (EPA 841-B-04-001). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/owow/watershed/trading/handbook/>.
- USEPA (U.S. Environmental Protection Agency). 2005a. *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (EPA 841-B-05-005). U.S. Environmental Protection Agency, Washington, DC. http://www.epa.gov/nps/watershed_handbook/.
- USEPA (U.S. Environmental Protection Agency). 2005b. *Stormwater TMDLs – Region I*. Draft February 16, 2005. U.S. Environmental Protection Agency, Washington, DC.
- USEPA (U.S. Environmental Protection Agency). 2006b. *National Water Program Fiscal Year 2007 Guidance*. U.S. Environmental Protection Agency, Washington, DC.
http://www.epa.gov/ocfopage/npmguidance/owater/2007/2007_ow_npmguide.pdf.
- USEPA (U.S. Environmental Protection Agency). 2007. *Water Quality Trading Toolkit for Permit Writers* (EPA 833-R-04-007). U.S. Environmental Protection Agency, Washington, DC. <http://www.epa.gov/waterqualitytrading/WQTToolkit.html>.