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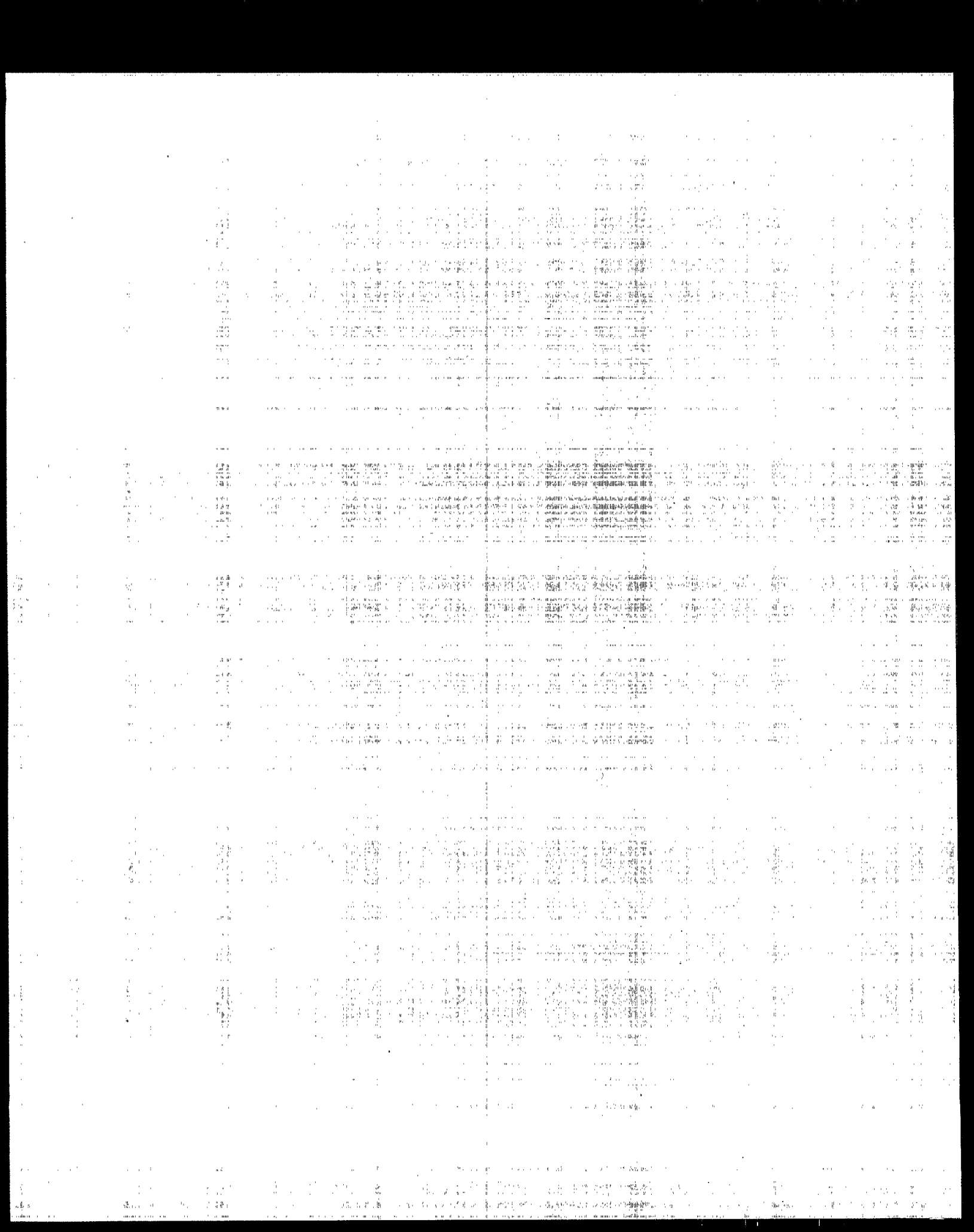
Development Selection and Pilot Demonstration of Preliminary Environmental Indicators for the Clean Water State Revolving Loan Program

Volume 1: Task Force Report



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Executive Summary

Environmental indicators have been under development at the U.S. Environmental Protection Agency (EPA) for more than a decade. Government-wide programs such as the Government Performance Review Act and National Environmental Performance Partnerships, as well as the environmental goals and milestones of EPA's Strategic Plan, establish the need for outcome-based measures like environmental indicators. EPA conducted a feasibility analysis, developed a methodology, and identified available resources for developing environmental indicators and applying them to the Clean Water State Revolving Fund (CWSRF) program in 1998. EPA's Office of Wastewater Management established a federal-state Task Force to propose and oversee the pilot feasibility testing of a series of environmental indicators specific to the CWSRF program. Participating states cooperated in testing a range of environmental indicators to determine the feasibility of the indicators and their applicability to their respective state CWSRF programs.

This report presents the findings of the Task Force, which evaluated a preliminary set of environmental indicators developed for the CWSRF. Pilot testing was used as an approach to evaluate whether data exist to support the selected indicators, and how easy or difficult it is to apply the data to the environmental indicators. Based on the findings of this pilot testing, recommendations are presented on how to proceed with the development and application of environmental indicators to the CWSRF (i.e., to continue with or eliminate one or more of the pilot indicators). California, Ohio, and Texas were selected to conduct environmental indicator pilot projects. Michigan, New Jersey, and Utah also agreed to participate as pilot states. Each state reviewed a subset of its projects funded through the use of the CWSRF and applied environmental indicators to ascertain whether it could measure or otherwise reflect environmental improvement as a result of the implementation of the projects.

Following initial conference calls, the Task Force members revised, developed, and discussed six indicators. The states then conducted pilot projects to test as many of the proposed indicators as they could apply to CWSRF projects in each of their respective states. Next, states modified the indicators resulting in the following suite of final indicators:

(1) Actions funded by CWSRF programs. The Task Force recommends using this indicator as an indirect measure of the contribution state CWSRF programs make to achieving Clean Water Act objectives because this indicator would be useful in situations where there is an absence of any other information regarding CWSRF-financed projects;

(2) Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects (Point source oriented). This indicator is suitable for projects with influent and effluent data available. The indicator may also be used where pollutant loading levels in the receiving stream are quantified and are expected to decrease as a result of the CWSRF-funded project. It has remained consistent in focus throughout the indicator development stages;

(3) Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects. This indicator is proposed as a prevention measure. It is suitable for projects

that aim to reduce loading "to" or within a treatment facility, expand plants to handle increased population, and address nonpoint sources of pollution;

(4) Physical changes to the terrestrial, riparian, or aquatic habitat and hydrology as a result of CWSRF-funded projects. This indicator is proposed for the category of CWSRF-funded projects that cannot be measured by load reduction or projected load prevention. Habitat destruction and hydromodification are major causes of aquatic life impairment, surpassing organic enrichment and dissolved oxygen impacts in some states. This indicator measures changes in land use (such as a change in agricultural tillage practices or restoration of a riparian stream corridor) and other attributes of the physical environment that could affect the aquatic community;

(5) Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now improved or meeting designated uses*, as a result of CWSRF-funded projects. This indicator proposes to measure water quality conditions in terms of designated uses for a distinct subset of waterbodies, impairment is quantified and reported as not meeting water quality standards and designated uses.

(6) Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected* as a result of CWSRF-funded projects. This indicator has a clear focus on protection of unimpaired resources; and

(7) Reduced health risks and/or increased recreational use attributable to CWSRF-funded projects. The indicator is important because it monitors a Clean Water Act objective. The data used for this indicator should be collected by a regulatory agency or collected in a manner that is subject to quality assurance and quality control procedures to ensure their accuracy. Problems in using this indicator occur when sampling is lacking or inadequate to draw conclusions. Ideally, bacteriological samples should be taken during low seasonal flows and at strategic locations, and the sampling should be done before and after project completion.

The Task Force report covers both data and programmatic observations and recommendations. It was observed that some states have suffered budget cutbacks in the area of environmental monitoring, including ambient monitoring. A lack of environmental baseline data undermines a state's ability to directly measure environmental improvements that could be evident as a result of implementing environmental programs and improvements such as the CWSRF. Without ambient monitoring data, states that conduct only limited water quality monitoring would be hardpressed to demonstrate actual environmental improvements as a result of environmental infrastructure improvements through CWSRF funding. In order to document environmental improvement, the Task Force believes that more data are needed to support environmental indicators for nonpoint source (NPS) projects. A broader scope of data types beyond traditional water quality parameters would be appropriate to better demonstrate environmental improvement from CWSRF-funded projects.

Under programmatic issues it was observed that environmental data at the project level are not reported or tracked by most states, and none of the information is reported to EPA. States do not have procedures in place to collect information on environmental outcomes related to CWSRF projects, or on whether they were the result of the combined efforts of many programs. There are

a wide variety of approaches at the state level that could be used to report on environmental improvements associated with CWSRF-funded projects.

The environmental indicators identified in this report represent the start of an evolutionary process. As the states gain experience in trying to measure environmental progress by using those indicators, additional or revised indicators are likely to surface, and use of geographic information systems to detect progress is expected to be expanded. Additionally, determination of total maximum daily loads and other monitoring efforts are likely to increase the amount of information that is available. Because of the diversity among the states, the environmental indicators are presented as a "suite" of indicators to be used at each state's discretion according to its individual needs.

Chapter 1. Introduction

Chapter 1. Introduction

Background

Environmental indicators have been under development at the U.S. Environmental Protection Agency (EPA) for more than a decade. Environmental indicators have been defined in many ways: as biological, chemical, or toxicological constituents of the environment that define risk levels; as trend measurements that describe improving or degrading conditions; and as mechanisms to demonstrate the effectiveness of environmental projects and programs. Initially, EPA environmental indicators were an outgrowth of the need for comprehensive and up-to-date environmental assessment information used for internal planning and budgeting. More recently, indicators have been recognized as an important tool for measuring and communicating environmental progress and for demonstrating progress and accountability. Government-wide programs such as the Government Performance Review Act and National Environmental Performance Partnerships, as well as the environmental goals and milestones of EPA's Strategic Plan, establish the need for outcome-based measures like environmental indicators.

In 1998 EPA conducted a feasibility analysis, developed a methodology, and identified available resources for developing environmental indicators and applying them to the State Revolving Fund (CWSRF) program. This resulted in publication of a draft report, *Environmental Indicators for the Clean Water State Revolving Fund* (EPA 832-D-98-002). One of the recommendations of the report was that EPA should establish a workgroup with significant state and regional participation to continue the development and implementation of indicators. Another recommendation was to adopt a process to shape the development of indicators in a stepwise manner that would clearly articulate EPA's desire for states to shift CWSRF funding toward NPS, estuary, and wetland projects. The report also made the observation that traditional CWSRF projects may employ a set of environmental indicators different from those that pertain to NPS and wetland projects.

In response to these recommendations, EPA's Office of Wastewater Management established a federal-state Task Force to propose and oversee the pilot feasibility testing of a series of environmental indicators specific to the CWSRF program. The Task Force, which consists of representatives from six CWSRF programs, four EPA regions, and eight EPA water program offices, has participated in monthly conference calls since January 1999. In addition to participating in conference calls, participating states cooperated in testing a range of environmental indicators to determine the feasibility of the indicators and their applicability to their respective state CWSRF programs.

The purpose of this report is to present the findings of the Task Force, which evaluated a preliminary set of environmental indicators it developed for the CWSRF. Pilot testing is being used as an approach to evaluate whether data exist to support the selected indicators, and how easy or difficult it is to apply the data to the environmental indicators. Based on the findings of this pilot testing, recommendations are presented on how to proceed with the development and application of environmental indicators to the CWSRF (i.e., to continue with or eliminate one or more of the pilot indicators).

This chapter provides background information on the CWSRF pilot indicator project, discusses the CWSRF program, and summarizes funding. CWSRF indicator development, Task Force membership, and steps for applying the pilot environmental indicators to the projects also are outlined in the chapter. Chapter 2 explains the proposed pilot environmental indicators. Chapter 3 discusses how states were selected to conduct pilot projects and summarizes state approaches. Also included in Chapter 3 are segments written by individual states, detailing their experience and their successes and failures while conducting pilot indicator projects. Finally, Chapter 4 presents succinct findings and recommendations from the states as a result of their work on the CWSRF pilot environmental indicators.

The State Revolving Loan Fund (CWSRF) Program

The Nation has invested billions of dollars on wastewater infrastructure. In 1972 Congress established the Construction Grants Program to provide grants to assist local governments in constructing wastewater treatment facilities. The federal grants constituted a large percentage of the funding for these projects. In 1987 the grant program began a phaseout with a transition to a state revolving loan program. States now receive CWSRF capitalization grants, which are matched at a rate of one state dollar for every five federal dollars. Loans are then made by the states for eligible projects and activities. Repayments on the initial loans are reloaned, thus establishing the "revolving" nature of the CWSRF program.

The states have considerable flexibility to develop and operate CWSRF programs that meet their particular needs. Two types of federal requirements are imposed on state CWSRF programs: "cross-cutting" authorities, which are the environmental, economic, and social policy requirements that apply to all federal grant programs (e.g., equal employment opportunity, participation by minority-owned businesses) and CWA Title II requirements (which include federal wage rate requirements, value engineering, cost-effectiveness requirements, and so forth). Title II requirements apply to only those projects wholly or partially financed before fiscal year 1995 with funds directly made available by federal capitalization grants.

Despite outstanding progress since 1972 in reducing water pollution and restoring our rivers, lakes, and coastal water, serious water pollution problems persist. About 40 percent of the nation's waterways assessed by states are still unsafe for fishing and swimming. A continued federal financial commitment will be necessary to meet the promise of clean, safe water for all Americans. This is particularly true as states continue to expand use of the CWSRF to address estuary, storm water, and NPS pollution management projects to preserve past water quality gains and strengthen our future efforts.

Funding Summary

The EPA Office of Wastewater Management tracks the financial performance of projects funded through the CWSRF. During the period 1988 to 1999, the CWSRF program provided approximately $26.1 billion in assistance to a variety of projects throughout the nation. Of this total, approximately 95 percent of the CWSRF funding was used to support wastewater treatment-related projects for publicly owned treatment works (POTWs), about 4 percent of the funding was directed to nonpoint source projects, and less than 1 percent went to estuary projects (Figure 1). Although the latter two categories of projects represented 20 percent of the number

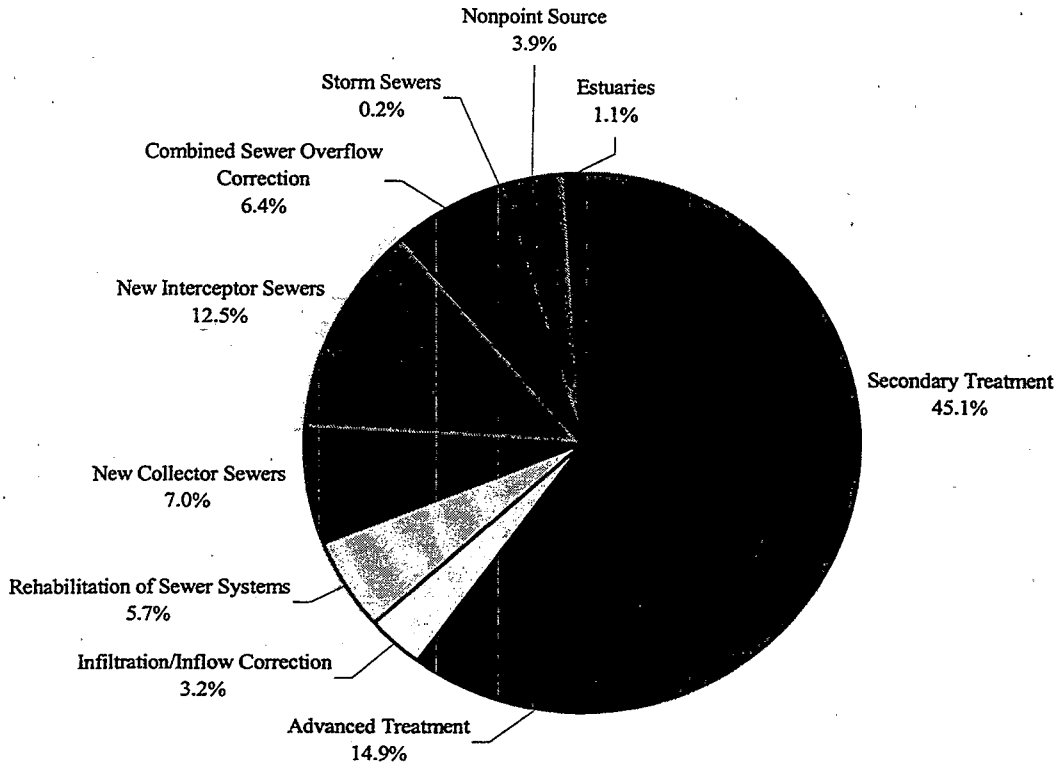

Figure 1. Percent of $26.1 Billion Total CWSRF Assistance (1988-1999) by Category.

of projects funded by the CWSRF program, the projects tended to be of much smaller scale than the wastewater treatment-related projects. For example, the average wastewater treatment project used $3.71 million of CWSRF funds, whereas the average nonpoint source project received $1.06 million and the average estuary project only $550,000. It also should be noted that five states—Delaware, Minnesota, Ohio, New Jersey, and Wyoming—accounted for almost 84 percent of all of the nonpoint source projects. Only Washington State used CWSRF funding for estuary projects.

Wastewater treatment-related projects accounted for over half of the CWSRF funding. These monies were allocated among the following eight categories of projects: secondary treatment, advanced treatment, infiltration/inflow correction, rehabilitation of sewer systems, new collector sewers, new interceptor sewers, combined sewer overflow correction, and storm water/storm sewers. Secondary treatment projects accounted for over one-half of the total funding ($11.79 billion), followed by advanced treatment ($3.9 billion) and new interceptor sewers ($3.28 billion). Storm sewer projects accounted for only $46.4 million of the funding compared to approximately $1.5 billion each for combined sewer overflow, new collector sewers, and rehabilitation of sewers. Finally, funding for infiltration/inflow correction totaled approximately $846 million.

Figure 2 presents the change in percentage of total 1988 to 1999 CWSRF funding dollars by year. Figure 3 compares the percentage of CWSRF assistance allocated between treatment (advanced and secondary) and collection (new interceptor sewers and new collector sewers) projects.

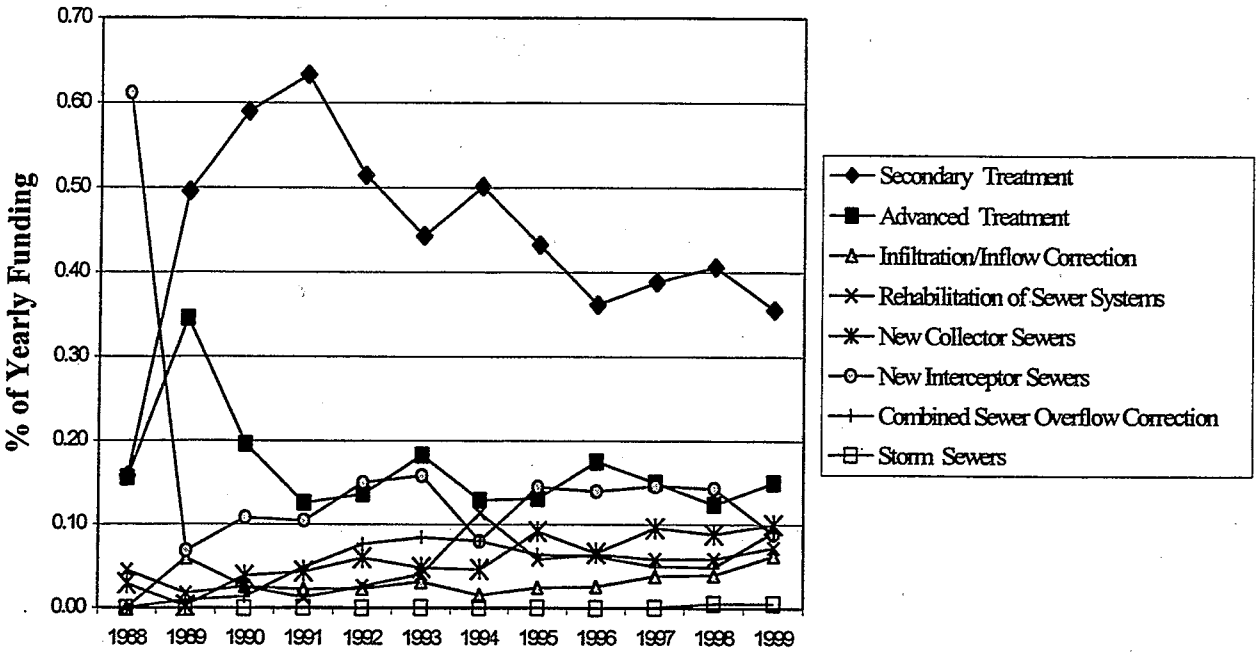

Figure 2. Percent of Yearly Total CWSRF Funding for Eight Categories of Wastewater Treatment.

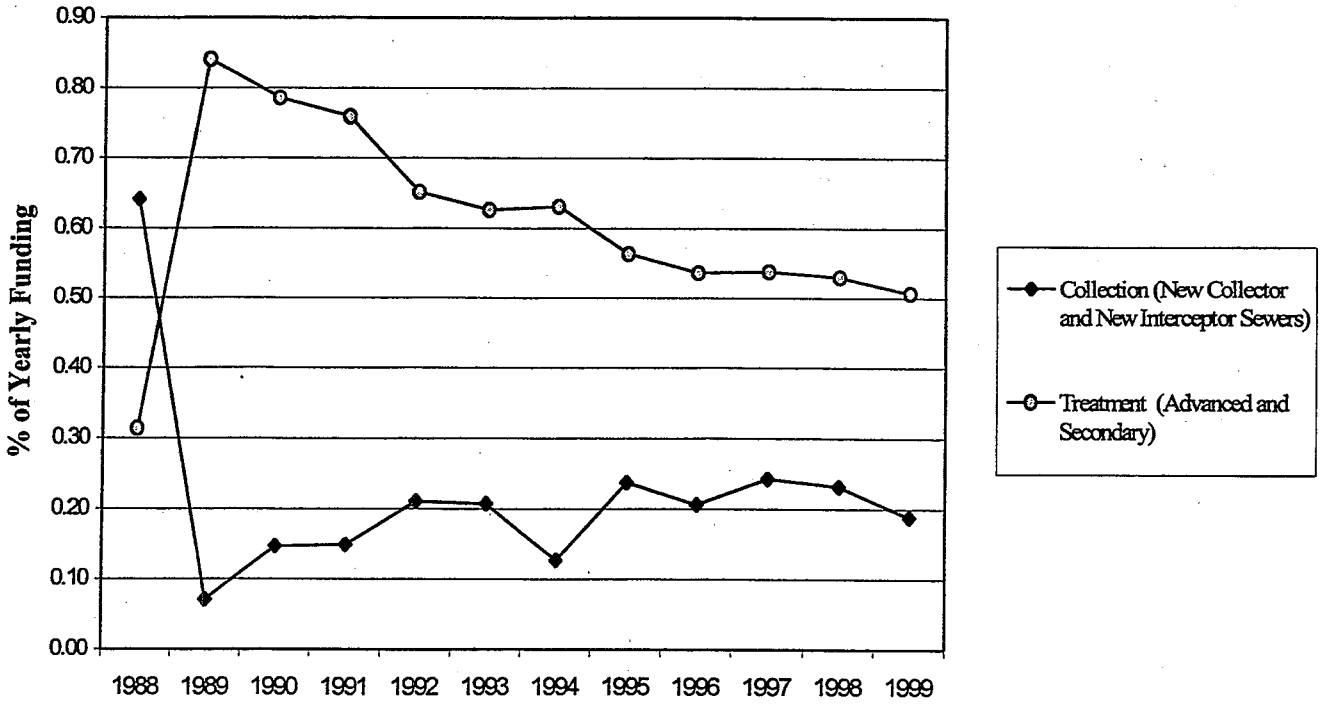

Figure 3. Percent of Yearly Total CWSRF Assistance Funding for Collection and Treatment Projects.

Most CWSRF agreements have focused on areas where the population served is less than 10,000, although these projects represent only 21 percent of the total CWSRF funds provided. Projects in large population centers (areas with population greater than 100,000), on the other hand, represent only 12 percent of the agreements but received 44 percent of the funding.

Although the CWSRF is a loan program, not a grant program, it provides a substantial subsidy to communities through discounted interest rates on the assistance provided. The loan principal repayments and interest payments are made available for future projects and represent approximately 14 percent of the total funds available.

CWSRF Indicator Development and Implementation

A Task Force (subgroup of the State/EPA Clean Water State Revolving Fund Work Group) was created to investigate the development of environmental indicators for potential use in the CWSRF program. The Task Force includes 15 to 20 participants (listed in Appendix A) who have worked on this assignment one or two days per month since January 1999. Members were drawn from states, EPA regions, and EPA headquarters. Their objective was to develop a set of indicators mostly drawn from a preliminary list developed by Tetra Tech, Inc., and as contained in *Environmental Indicators for the Clean Water State Revolving Fund*, and to pilot test a set of environmental indicators for the CWSRF program.

California, Ohio, and Texas were selected to conduct environmental indicator pilot projects. Michigan, New Jersey, and Utah also agreed to participate as pilot states. Each state reviewed a subset of its projects funded through the use of CWSRF and applied environmental indicators to measure environmental improvement as a result of the implementation of the projects. Information also is included from an effort to gather data from several other states for use in testing the feasibility of the indicators. This effort met with only limited success. The environmental indicators for the CWSRF program selected to be pilot tested are presented below. Note that these environmental indicators are not ranked, and their presentation in this order does not reflect relative priorities.

- Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects.
- Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.
- Increase in biophysical benefits or reduction in biophysical stressors by changing land use practices and resource harvesting and extraction practices through CWSRF-funded projects.
- Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses* as a result of CWSRF-funded projects.
- Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected or improved* as a result of CWSRF-funded projects.
- Benefits of reduced health risks and/or increased recreational use attributable to CWSRF-funded projects.

The Task Force used the first four meetings (conference calls) to review, revise, and comment on the environmental indicators as they could be applied to the CWSRF program. An informal rating and evaluation format was produced and applied by each Task Force member to the six proposed environmental indicators to do this preliminary evaluation. Ultimately, however, it was agreed that further refinements to this language should await the states' experience during the actual pilot testing phase. Chapter 2 provides a more detailed discussion of each proposed environmental indicator.

The objective of this pilot phase was to examine more closely the feasibility of measuring environmental outcomes and making linkages back to the CWSRF program activity with the proposed environmental indicators. The pilot states investigated and reported on the availability of data and the mechanisms (systems) to provide those data. States received a generic scope of work (Appendix B), which was intended to help establish consistency among the pilot projects and allow the results to be compared more consistently.

The steps of the generic scope of work included the following:

1. Identification of Type and Scope of Projects to Evaluate
States determined the type and number of CWSRF projects to be evaluated. Each state used a consistent methodology to identify its own projects, although this methodology differed between states.

2. Data Collection
States searched electronic and paper databases and project files to collect baseline data on each CWSRF project. The purpose of this task was not only to collect the necessary data to apply each indicator, but also to document the ease or difficulty of collecting the data. Data collected for each selected project would encompass project-specific information as well as the environmental data related to the project. Water quality conditions before and after project implementation are critical environmental data sets.

The states were asked to document data collected using data source criteria, including

- Availability/accessibility of data (ease of acquiring information; were data out there?)
- Temporal coverage (period of time the data covered?)
- Spatial coverage (latitude/longitude, watershed, stream length)
- Technical credibility (quantity, diversity, robustness; comfort level with the data)

One tool used for managing collected project data was a questionnaire, which was available to states online and in hard copy (Appendix C). The web-based questionnaire was presented in three successive pages entitled Project Information, Indicator Information, and Data Information. A respondent could enter information for one project at a time, continuing through the three pages for each project. Upon entry of the last input screen, the data were stored in a database.

3. Data Synthesis and Analysis
All data collected were synthesized in tabular or other format for display and analysis. Types of CWSRF-funded projects were tallied along with water quality and environmental condition data.

The analyses of the results are presented in brief written descriptions from New Jersey, Michigan, California, Ohio, Utah, and Texas, with discussions on validity/accuracy, data comparability, and scope/applicability. Finally, results of assessing the data from the states that Tetra Tech evaluated (Delaware, Maryland, and Washington) also are presented.

4. Indicator Evaluation

The environmental indicators applied in each state were evaluated. A brief narrative is presented about the application of the environmental indicator against the following evaluation criteria:

- Data sources
- Data quality/quantity
- Data availability (how available; how long did it take to evaluate and compile the data?)
- Data accessibility
- Representativeness
- Comparability
- Cost-effectiveness
- Ease of implementation

5. Reports

Each state prepared and submitted a written report on its findings. Recommendations about how to best incorporate data requirements and identification of any barriers to using or accessing data were included in the narrative. Chapter 3 presents a summary of results of the states' participation in the environmental indicator pilot project. Appendix D provides a more detailed summary of states' projects and the full state reports are presented in Appendix E and F.

Chapter 2. Environmental Indicators for the Clean Water SRF Program

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Introduction

This chapter presents, in tabular format, the environmental indicators identified in the 1998 EPA Report "Environmental Indicators for the Clean Water State Revolving Fund" and describes the environmental indicators, based on this report, that were developed by the Task Force for pilot testing by the participating states. The results for each state's experience with the pilot set of indicators are presented in Chapter 3. The final set of environmental indicators is found in Chapter 4.

Table 2-1. Evolution of CWSRF Indicators from Draft 1998 Report to Pilot Testing

October 1998 Indicators	April 1999 Pilot Indicators
1. Pounds of pollutants removed from the environment through CWSRF-funded projects.	1. Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects. (Point source oriented)
2. Pounds of pollutants prevented from entering the environment through CWSRF-funded projects.	2. Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects. (Oriented toward NPS or no discharge)
3. Reduction in biophysical stressors by changing land use practices, resource harvesting practices, and resource extraction practices through CWSRF-funded projects.	3. Increase in biophysical benefits or reduction in biophysical stressors by changing land use practices, and resource harvesting and extraction practices through CWSRF-funded projects.
4. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses*, as a result of CWSRF-funded projects	4. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses*, as a result of CWSRF-funded projects.
5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects.	5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects.
	6. Benefits of reduced health risks or increased recreational use attributable to CWSRF-funded projects.

Indicator Development

1. Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects.

This indicator is suitable for projects where influent and effluent data is widely available. It may also apply where loading levels in a receiving stream are quantified and are expected to decrease as a result of the CWSRF-funded project.

2. Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.

This indicator is proposed as a prevention measure. It is suitable for projects that reduce loadings either to or by a treatment facility, expand plants to handle increased flows, and prevent nonpoint sources of pollution.

3. Increase in biophysical benefits or reduction in biophysical stressors by changing land use practices, and resource harvesting and extraction practices through CWSRF-funded projects.

In October 1998 this indicator read, "Reduction in biophysical stressors by changing land use practices, resource harvesting practices, and resource extraction practices through CWSRF-funded projects." The Task Force revised the indicator in 1999 by adding the possibility of an increase in biophysical benefits as another measure of the land use and resource extraction practices.

This indicator is proposed for the category of CWSRF-funded projects that cannot be measured by load reduction or projected load prevention. This indicator can help quantify the wide variety of nonpoint source, restoration, and preservation activities funded by the CWSRF.

4. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses*, as a result of CWSRF-funded projects.

This indicator proposes to measure water quality conditions for a distinct subset of waterbodies where impairment is quantified and reported as not meeting water quality standards and designated uses. This indicator focuses on waterbodies that were determined to be degraded to some extent by a cause or source attributable to a problem that was remedied by a CWSRF

project(s). The criteria that are used to determine the degradation may be the same as those used to establish a state's 303(d) list. These data could include chemical, physical and/or biological criteria, but will vary from state to state. Information should be available in each state's 305(b) water quality report as to the condition of waterbodies with respect to their designated aquatic life habitat uses. The problems addressed by the CWSRF project should be clearly described in the environmental assessment for that project.

5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects.

This indicator is a more comprehensive measure of ambient water quality conditions than Indicator 4. This indicator, as proposed, initially would be less precise by not having an established baseline of impairment against which to measure progress (unless the CWSRF project quantifies the level of impairment prior to the start of the project).

With the current emphasis through the Total Maximum Daily Load (TMDL) process on impaired waters, the group wanted to identify the importance of keeping fully attaining surface waters from becoming impaired. The CWSRF program should address problems that will cause impairments to water quality before the problems become apparent and before enforcement action is required. This indicator serves to focus attention on areas of attainment and the importance of using CWSRF resources to ensure maintenance of attainment.

6. Benefits of reduced health risks or increased recreational use attributable to CWSRF-funded projects.

The indicator is important because it monitors a Clean Water Act objective. The data used for this indicator should be collected by a regulatory agency or collected in a manner that is subject to quality assurance and quality control procedures to ensure their accuracy. Although it may be difficult to establish distinctions as to the degree of human health risk posed by different sources of pollution, the presence of indicator bacteria (e.g., *E. coli,* fecal coliform) associated with fecal matter at levels above established threshold concentrations indicates the presence of health risks from pathogens. If an CWSRF project addressed a source of this problem, then reduction of bacterial concentration subsequent to project completion would indicate that the CWSRF project contributed to reducing risks to human health.

Chapter 3. State Pilot Projects to Test the CWSRF Environmental Indicators

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Selection of States

California, Ohio, Texas, New Jersey, Michigan, and Utah participated as pilot states for the testing of CWSRF environmental indicators. Tetra Tech also contacted other states, including Delaware, Maryland, and Washington, to test the data collection process.

Analysis Type

Projects were selected by the pilot states on a program-wide, project-specific, or watershed/subwatershed-level basis. California originally proposed to evaluate a randomly selected number of projects (approximately 20 to 30) that were completed during the 1992 to 1993 period. Ohio proposed to identify all projects funded through the CWSRF and then select for evaluation only those projects for which water quality and other project-specific data were available and could be applied to the six pilot environmental indicators. Texas employed a subwatershed or stream segment approach and evaluated all projects completed within each subwatershed. Table 3-1 gives a brief summary of state project analyses.

Table 3-1. Partial Summary of State Pilot Projects

Pilot States	Type of Analysis	No. of Relevant CWSRF Projects Reported
California	program-wide	4
Ohio	project-specific	15
Texas	watershed-level	22
Michigan	program-wide	0
New Jersey	project-specific	9
Utah	project-specific	8
Other States		
Delaware	project-specific	0
Washington	project-specific	0
Maryland	project-specific	4

State Pilot Projects

This report reflects the state evaluations of the April 1999 indicators[1] and subsequent information collected from the states.

See Appendix A for the state contacts and Appendix D for a detailed summary of project data for each state. Appendix E contains individual state write-ups of their projects.

California

From a program-wide perspective, California evaluated a total of 10 to 12 projects, some of which were nonpoint source projects. California has collected information on four projects to date, all of which were related to publicly owned treatment works (POTWs) (Table 3-2). Different people involved in the CWSRF projects filled out questionnaires by hand to submit the data to Tetra Tech. Data came from the project files, health departments, regional water quality districts, and self-monitoring data. To date, only the self-monitoring data from POTWs are easily available. These types of data satisfy Indicators 1 and 2 (loadings-related indicators). A cursory search for information on nonpoint source projects was not productive.

Table 3-2. Partial Summary of California Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
1, 2	Secondary treatment	2
None	New interceptor sewers	1
5	Advanced treatment; infiltration/inflow correction	1

Ohio

The state of Ohio has a wealth of in-stream monitoring data, including biological, physical, and chemical data. A total of fifteen projects were evaluated using Ohio's Water Quality Inventories, technical and permit support documents, Water Pollution Control Loan Fund (Ohio's CWSRF) environmental assessments and project records, water quality standards, and field notes from the monitoring staff (Table 3-3). These projects consisted of predominantly wastewater treatment plant (WWTP) improvements. In general, project evaluation reflected a reduction of one or more chemical or bacteriological pollutants to the receiving streams and a corresponding response in the biological communities.

[1] In February 2000 two additional indicators were suggested–Indicators A and B. Ohio and New Jersey evaluated these indicators.

Table 3-3. Partial Summary of Ohio Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
A, 1, 4, 5, 6	WWTP improvements	10
A, 1, 2, 4, 5, 6	WWTP improvements	1
A, 1, 4, 5	Landfill; new interceptor sewers/WWTP improvements	2
A, 1, 2, 4, 5, 6, B	WWTP improvements	1
A, 4, 5	Centralized collection system	1

Texas

Texas used a subwatershed or stream segment approach to identify its pilot projects. Texas focused on comparing the current 303(d) list to 305(b) data from 1983-1987. Texas used these as a before-and-after picture to identify three types of waterbodies: (1) waters previously impaired that are no longer impaired, (2) waters previously impaired and still impaired, and (3) waters previously unimpaired and currently unimpaired.

Texas submitted data to Tetra Tech on faxed questionnaires describing waters previously impaired that are no longer impaired. Although the state listed the project indicator as Indicator 1 (Number of pounds of pollutants removed from the environment through CWSRF-funded projects), the actual data are qualitative. For example, loadings from nutrients might have been a reason a stream segment was listed as impaired on the 305(b) report, and when it was listed on the 303(d) list as no longer impaired, it was assumed the nutrient loadings had been reduced in the stream segment.

Texas later evaluated approximately 22 projects in various CWSRF project categories, ranging from wastewater treatment plant expansions to nonpoint source pollution projects (Table 3-4).

Table 3-4. Partial Summary of Texas Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
1, 2, 4	Texas did not explicitly distinguish project type.	22

New Jersey

New Jersey provided information on nine projects completed in 1993 and 1994, six of which were POTWs (Table 3-5). None of the projects addressed nonpoint source pollution. New Jersey also reviewed information on other projects that received CWSRF loans to determine if other means to establish quantitative or qualitative information were available to support the six pilot indicators. New Jersey also provided support for the new indicator A by evaluating state and CWSRF funds as an indirect indicator of potential water quality improvement.

Tetra Tech retrieved data from EPA's Storage and Retrieval (STORET) database system to evaluate some of the New Jersey projects. Trends before and after projects could be identified in

only two cases for some pollutant parameters. However, the state could not directly link the CWSRF as a cause of the changes, as opposed to other factors involved.

Table 3-5. Partial Summary of New Jersey Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
1	Secondary treatment	5
2	Advanced treatment	1
None	Sewer replacement/rehabilitation	1
2	New collector sewers	1
None	Pump station rehabilitation/replacement	1

Michigan

Michigan did not provide project-specific information, but did produce a detailed description of its Priority Listing Procedure for ranking projects for which CWSRF funding has been requested. The system relies on measures of environmental needs. Modeling is used to estimate in-stream conditions resulting from existing discharges and those expected after project completion. The differences between these two simulations are used to assign funding priority to projects.

Historically, Michigan maintained an ambient monitoring network of surface water quality sampling sites, but nearly all of these efforts have been eliminated over the past 15 years. Discharge Monitoring Report (DMR) data are available only for permitted point source dischargers, and no reliable sampling record of nonpermitted discharges or discharges to groundwater is available. Hence, although the Michigan priority models simulate pre-project conditions, they can be used for Indicators 1 and 2.

Utah

Utah originally worked with eight CWSRF projects (all point sources—treatment plants and interceptors, as well as new systems replacing failed on-site disposal systems [septic systems]) (Table 3-6). They investigated loading reductions to support Indicators 1 and 2, but faced challenges different from those posed to surface water discharges. As data sources Utah relied on DMRs (referred to as Monthly Operating Reports in Utah), STORET data, and self-monitoring reports from POTWs. Loadings extrapolated from septic systems were also evaluated, but the data are less obvious than discharges to a receiving waterbody.

Utah reported on projects by using the on-line questionnaire. They provided specific loading numbers for Indicators 1 and 2. Utah also compared a 1987 (pre-CWSRF) 303(d) list of impaired water to the most recent list. No information was evident to support water quality improvement identifiable under indicators 4 and 5.

Table 3-6. Partial Summary of Utah Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
None applicable	Secondary treatment (biosolids)	1
2, 4	Advanced treatment	1
2	Secondary treatment; new collector sewers; new interceptor sewers	2
2	Secondary treatment; new interceptor sewers	2
2	New interceptor sewers	1
2	New collector sewers; new interceptor sewers	1

Other States

Delaware

To obtain past CWSRF project information from Delaware, Tetra Tech contacted the Department of Natural Resources and Environmental Control (DNREC). In response to questions about the number, type, and location of projects funded by CWSRF loans, the program manager of the DNREC Division of Water Resources, Financial Assistance Branch, stated that most of the information was related to individual homeowners and septic system replacement/repair. Because this is proprietary information, Tetra Tech did not pursue the information, which might have violated the involved parties' privacy.

Next, Tetra Tech contacted the U.S. EPA Region 3 office in Philadelphia, Pennsylvania. EPA said it did not have quantitative information on specific projects because that kind of decision is made only at the state level. Qualitatively, EPA added that the CWSRF projects in Delaware were funded on a first-come, first-served basis, and not according to any priority system based on water quality needs. EPA had access to the total amount that Delaware loaned out in its CWSRF program, but any information on specific projects (location, description, type) was maintained at the state level.

Because Tetra Tech was able to obtain information on only one project (City of Seaford sewer system upgrade) and information on the majority of the projects was not available, the Delaware data were not particularly useful.

Washington

Tetra Tech developed a list of 12 specific completed CWSRF projects in Washington State. The list consisted of a combination of the three types of projects (point, nonpoint, estuary) to be evaluated using the indicators. Target projects were chosen based on date of completion and project type.

The Washington Department of Ecology stated that in-depth project information was not housed at state headquarters and suggested that the regional office or specific project managers in the cities or counties where projects were completed be contacted. Contacts in the regional office of the Washington Department of Ecology informed Tetra Tech that it is likely that project information for completed CWSRF projects is archived off site. Access to on-site files in the regional office was limited due to a recent fire in the office. Attempts to contact project managers at the city level were largely unsuccessful.

Maryland

Tetra Tech visited the Maryland Department of the Environment to gather information on CWSRF projects. This effort was intended to test the data collection process, including the use of the CWSRF indicator questionnaire. Tetra Tech collected data on two POTW projects and two nonpoint source projects (Table 3-7). STORET data were used to evaluate ambient (receiving water) pollutant parameter trends for the point source projects. For one nonpoint source project, the Safe Drinking Water Information Database was used to represent a reduced potential health risk, which would be applicable to Indicator 6.

The Maryland Department of the Environment also provided information on its CWSRF Application process, which uses an environmental information document, preliminary environment screening checklist, and financial loan application. The environmental information document requests information on the water quality/public health problems being corrected and the potential impacts of the project on water quality, water supply, biology, wetlands, and biosolids management.

Table 3-7. Partial Summary of Maryland Analysis

April 1999 Indicator Used	CWSRF Project Type	Number of Projects
1, 2	Advanced treatment	2
5	Nonpoint source: agriculture	1
6	Secondary treatment; new collector sewers	1

Chapter 4. Evolution of Environmental Indicators

Chapter 4. Evolution of Environmental Indicators

This chapter describes the final set or suite of environmental indicators as they have evolved based on the states' experience in testing them on a pilot basis.

Table 4-1. Evolution of CWSRF Indicators from Draft 1998 Report Through Pilot Testing Process and Final Proposed Indicators

October 1998 Indicators	April 1999 Pilot Indicators	September 2000 Final Indicators
Administrative indicators • EPA/State Actions • Actions by Regulated Community	February 2000 Indicator A. Actions funded by CWSRF programs. (Evaluated by Ohio only)	1. Actions funded by CWSRF programs.
1. Pounds of pollutants *removed* from the environment through CWSRF-funded projects.	1. Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects.	2. Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects.
2. Pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.	2. Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.	3. Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.
3. Reduction in biophysical stressors by changing land use practices, resource harvesting practices, and resource extraction practices through CWSRF-funded projects.	3. Increase in biophysical benefits or reduction in biophysical stressors by changing land use practices, and resource harvesting and extraction practices through CWSRF-funded projects.	4. Physical changes to the terrestrial, riparian, or aquatic habitat and hydrology resulting from CWSRF-funded projects.
	February 2000 Indicator B. Changes in habitat of a waterbody as a result of an CWSRF-funded project. (Changes in ambient habitat) (Evaluated by Ohio only)	
4. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses*, as a result of CWSRF-funded projects.	4. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now meeting designated uses*, as a result of CWSRF-funded projects.	5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now improved or meeting designated uses*, as a result of CWSRF-funded projects.
5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects.	5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects.	6. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected* as a result of CWSRF-funded projects.
	6. Benefits of reduced health risks or increased recreational use attributable to CWSRF-funded projects.	7. Reduced health risks and/or increased recreational use attributable to CWSRF-funded projects.

Final Indicator Development

1. Actions funded by CWSRF programs.

Although the October 1998 version of indicators included administrative indicators, they were dropped from the April 1999 pilot testing stage, which focused specifically on "environmental" indicators. Indicator 1 was re-proposed after the other pilot indicators were tested. The Task Force recommends using this indicator as an initial indicator of the contribution state CWSRF programs make to achieving Clean Water Act objectives. This indicator would be useful in situations where there is an absence of any other evidence regarding environmental improvements brought about by CWSRF-financed projects.

The issue of measuring some CWSRF projects that did not fit under the April 1999 list of pilot environmental indicators arose in February 2000. Some categories of CWSRF projects could be measured only by Indicator A (final Indicator 1). This indicator is the most basic measure of actions to improve the environment because it counts the number of funded projects. It is the minimal reporting indicator, and it assumes project initiations result in environmental benefits. The number as well as the total dollar amount funded for projects by type may also provide useful information for some CWSRF projects.

2. Number of pounds of pollutants *removed* from the environment through CWSRF-funded projects.

This indicator is suitable for projects where influent and effluent data is available. It is also suitable where loading levels in a receiving stream are quantified and are expected to change as a result of the CWSRF-funded project. Indicator 2 may also be used for projects that convert failing septic systems to centralized sewer systems.

3. Number of pounds of pollutants *prevented* from entering the environment through CWSRF-funded projects.

This indicator is proposed as a prevention measure. It is suitable for projects that prevent loadings either to or by a treatment facility, expand plants to handle increased flows, and prevent NPS pollution.

- This indicator is expected to be derived from load reductions reported by states, by using the Permit Compliance System database or the actual monthly Discharge Monitoring Reports. Load reduction projections would most likely be estimated through established engineering practices using modeling tools.

4. Physical changes to the terrestrial, riparian, or aquatic habitat and hydrology as a result of CWSRF-funded projects.

In October 1998 this indicator read, "Reduction in biophysical stressors by changing land use practices, resource harvesting practices, and resource extraction practices through CWSRF-funded projects." The Task Force revised the indicator in 1999 by adding the possibility of an increase in biophysical benefits as another measure of the land use and resource extraction practices. In February 2000 the Task Force agreed to add Indicator B— "Changes in habitat of a waterbody as a result of an CWSRF-funded project. (Changes in ambient habitat)"— to complement the language of the previous April 1999 indicator 3.

Indicator B was proposed in February 2000 after other pilot indicators had been reviewed. This indicator would allow measurement of CWSRF project accomplishments in terms of habitat improvement. It would be particularly useful for those projects (mainly nonpoint source) whose main benefit is to provide habitat restoration. The Task Force acknowledged that various types of physical habitat measures, such as the Qualitative Habitat Evaluation Index (QHEI) and Zig-Zag Pebble Count, might be useful with this indicator.

The Task Force decided to combine Indicator B and the interim version of Indicator 4 to reach the June 2000 version. The final version of Indicator 4 reflects a move to categorize biophysical benefits or reduction in biophysical stressors as "physical changes" and move away from the potentially misunderstood language of "land use practices." Physical changes to terrestrial and in-stream habitat types now may be reported under Indicator 4.

This indicator is proposed for the category of CWSRF-funded projects that cannot be measured by load reduction or projected load prevention. Habitat destruction and hydromodification are major causes of aquatic life impairment, surpassing organic enrichment and dissolved oxygen impacts in some states. This indicator measures changes in land use (such as a change in agricultural tillage practices or restoration of riparian stream corridor) and other attributes of the physical environment (such as biosolids entering the stream from a POTW) that could affect the aquatic community.

- This indicator can help quantify the wide variety of nonpoint source, restoration, and preservation activities funded by the CWSRFs. Coupled with Indicator 5, this indicator can show the effectiveness of CWSRF-funded activities.

- Biological monitoring will show effects of increased sedimentation. Macroinvertebrate populations decline when substrates become embedded. Absent biological data, it is possible to track sediment embeddedness. Used alone or in combination with biological data, embeddedness can indicate the success of various types of activities/best management practices on aquatic habitat improvement.

- After much discussion by the states, it was decided that this indicator is valuable because of the correlation between habitat quality and attainment of Clean Water Act goals.

- States are encouraged to further investigate the techniques (field surveys, Zig-Zag Pebble Count Method), tools (QHEI, geographic information systems), and units (acres, river miles, degree of embeddedness) used to measure progress under this indicator (See Appendix G and H).

5. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *previously impaired, now improved or meeting designated uses*, as a result of CWSRF-funded projects.

This indicator focuses on waterbodies that were determined to be degraded to some extent by a cause or source attributable to a problem that was remedied by a CWSRF project(s). The criteria that were used to determine the degradation may be the same as those used to establish a state's 303(d) list. These data could include chemical, physical, and/or biological criteria, but this will vary from state to state. Information should be available in each state's 305(b) water quality report as to the condition of waterbodies with respect to their designated aquatic life habitat uses. The problems addressed by the CWSRF project should be clearly described in the environmental assessment for that project.

By comparing the miles impaired and degree of impairment before and after the completion of a CWSRF project, changes in the degree of use attainment can be correlated with CWSRF-funded projects within the range of river miles that the project influences. In some cases, the major source of impairment will not be related to the CWSRF project, and so a minor improvement in stream condition will be seen. In other cases, the problem that was addressed by the CWSRF project may have been the only source of impairment, and so the subsequent restoration of that waterbody segment will be entirely attributable to the CWSRF-funded activities. In still other situations, a number of causes may have contributed to impaired water quality, all of which were addressed, but only some of which were CWSRF-funded, and so only a portion of the improved water quality will be attributable to CWSRF financing.

- EPA and the states have developed an up-to-date, comprehensive list of impaired waters (303(d)). Ideally, this proposed Indicator 5 could measure progress against this nationally established "baseline" of impaired waters. At the state and project levels, the indicator can be developed using state or locally generated information on water quality conditions without necessarily aggregating it with other states' results. Often, water data exist at the state or local level which might be more useful in demonstrating results.

- It was decided that showing improvements in the environment is important even if designated uses were not met. The indicator now includes measuring improved waterbodies that may have partially attained designated uses.

6. Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected* as a result of CWSRF-funded projects.

This indicator originally read, "Waterbodies, expressed as river and riparian miles, lake acres, estuary square miles, and wetland acres, *protected, improved, or restored* as a result of CWSRF-funded projects." It was determined that with the original wording there was too much overlap between Indicators 5 and 6. Rather than combining the two indicators into one, the group decided to keep improvement of impaired waters in Indicator 5 and put protection activities in a different category, Indicator 6. With the current emphasis through the TMDL process on impaired waters, the group wanted to identify the importance of keeping fully attaining surface waters from becoming impaired. The CWSRF program should address problems that will cause impairments to water quality before the problems become apparent and before enforcement action is required. This indicator serves to focus attention on areas of attainment and the importance of using CWSRF resources to ensure maintenance of attainment.

- The Task Force felt that Indicators 5 and 6 would (1) measure key environmental objectives of all water protection programs, (2) help establish stronger linkages with other federal water programs with similar indicators and objectives, and (3) encourage the development of data sets that document before-and-after conditions.

- Data from EPA's 305(b) reports, STORET, and other data systems can be used to support this indicator. Project-specific information, where available, could also support the use of this indicator.

- Indicator 6 provides a means to capture some of the less traditional CWSRF activities that contribute to the protection and preservation of unimpacted resources, such as land acquisition, easement purchase, and riparian stream corridor restoration.

The final indicator 6 removed the words "improved" and "restored." Indicator 5 will address improvements in waterbodies, as well as cases where waters meet designated uses. Indicator 6 has a clear focus on protection of unimpaired resources.

7. Reduced health risks and/or increased recreational use attributable to CWSRF-funded projects.

The indicator is important because it monitors a Clean Water Act objective. Although it may be difficult to establish distinctions as to the degree of human health risk posed by different sources of pollution, the presence of bacteria (e.g., *E. coli,* fecal coliform) associated with fecal matter at levels above established threshold concentrations indicates the presence of health risks. If a CWSRF project addressed a source of this problem, then reduction of bacteria concentration subsequent to project completion indicates that the CWSRF project contributed to reducing risks to human health.

Sampling upstream and downstream of a POTW outfall can provide information regarding the plant operations with respect to bacterial contributions. If the project addressed failing septic systems or sewer bypasses, health department records of bacterial concentration violations in pools, ditches, basements, and water wells should be used if available to document the problems addressed. Such locations are not considered official waterbodies, but would nonetheless pose a threat to human health. Frequently, these data are not in any known database or report, but are often gathered on an individual project basis from local health departments. Some ambient stream data may be available at the state level to determine recreational use attainment.

Problems in using this indicator occur when sampling is lacking or inadequate to allow drawing conclusions. Ideally, bacteriological samples should be taken during low seasonal flows and at strategic locations, and the sampling should be done before and after project completion.

Chapter 5. Observations and Recommendations

Chapter 5. Observations and Recommendations

This project was conducted at the state level for the purpose of developing and testing a range of environmental indicators that could assist states in both setting priorities for project selection and demonstrating CWSRF program and project success. Accordingly, the six environmental indicators identified in Chapter 2 were tested and evaluated for use by several states through the formation of a Task Force, which met monthly during this phase of the project. Based on the review, revision, and pilot testing of the environmental indicators, the Task Force submits the following observations and recommendations grouped broadly under the categories of "data" and "programmatic issues."

Observations Related to Data

- Access to environmental monitoring data and other sources of information that could help support the use of environmental indicators is difficult and at best time-consuming when data are available. Many of the states discovered through this pilot project that identifying and accessing environmental data related to CWSRF-funded projects ranges from problematic to extremely difficult. Discharge Monitoring Reports submitted monthly by National Pollutant Discharge Elimination System permit holders. They cover treatment facilities and would account for a majority of CWSRF project funds. Sources of monitoring data are usually collected and maintained by agencies, offices, or programs other than the state CWSRF lead agency, resulting in problems and time delays in accessing data for indicator analysis.

- Applying environmental indicators to CWSRF-funded projects other than wastewater treatment upgrades or expansions is difficult at the present time. This is due, in part, to the fact that many states have not funded a large number of nonpoint source (NPS) projects, as well as the fact that there are fewer data available for NPS pollution than for point sources. Lack of data to evaluate the effects of some CWSRF NPS projects may be a temporary problem, because as more projects are funded, one would expect the effects to eventually show up in water quality monitoring information. Further, because it takes several years after project implementation before the benefits of NPS projects are realized, there will be an additional time lag in having the benefits reflected through physical, chemical, and biological monitoring.

- Substantial modeling would be necessary to apply final Indicator 3 (Pounds of pollutants prevented from entering the environment from CWSRF-funded projects). This approach would be costly, controversial, and time-consuming to develop. In the alternative, nationally accepted estimation approaches might be able to establish load reductions by estimating reductions in loads. Estimations may be possible. The objective should be to get general indicators of CWSRF contributions to water quality improvement.

- Chapter 3 contains documentation on the experience from each of the state pilot projects. Each state presented its findings and individual recommendations. Variability between states was observed, with the major problem being the availability of data to support each environmental indicator.

Observations Related to Programmatic Issues

- The CWSRF Program information tracking system traditionally has used fiscal measures (e.g., number of loans initiated per year) to evaluate program performance. The current CWSRF information tracking system contains a significant source of information regarding the amount of capitalization funds provided to states and, together with states' matching funds, the funds available for projects. Environmental data at the project level are not reported or tracked by most of the states, and none of the information is compiled and submitted to EPA.

- Within a state, decisions on funding of projects through the CWSRF are often driven by factors other than environmental protection or improvement. The projects on a state's priority list are included on the list because of the state's objective to improve or expand wastewater treatment or otherwise achieve water quality benefits. Projects often receive loans regardless of their location on a state's priority funding list, however, because of their "readiness to proceed." Although EPA has encouraged states to keep the funds moving and to initiate as many projects as possible, use of CWSRF indicators provides an opportunity to integrate environmental outcomes into the state priority ranking process.

- Measurement or collection of data to document environmental improvements directly related to CWSRF projects does not follow a standard operating procedure. States do not have procedures in place to collect information on environmental outcomes related to CWSRF projects, or whether they were the result of the combined efforts of many programs. In defense of the states, they have not been requested or required to collect such data in the past.

- Although some states can correlate trends with CWSRF projects, currently available environmental monitoring data collected by many states do not necessarily help to assess CWSRF outcomes because the monitoring was not designed for such purposes. However, it may be possible to correlate water quality changes with CWSRF projects when states have monitoring data (biological, chemical, bacteriological, and/or physical). Even though the monitoring was not designed to evaluate the success of the CWSRF program, much of the 303(d) and 305(b) data can be used directly or indirectly for that purpose.

- This project has demonstrated that there is a wide variety of approaches at the state level that could be used to report on environmental improvements associated with CWSRF-funded projects. Most of the pilot states agreed that loading reductions from CWSRF-funded treatment projects could be either directly measured or estimated. The states also agreed that connecting these load reductions to actual stream improvements in the absence of the other indicators does not necessarily provide evidence of improvement in the attainment of designated uses by waterbodies. The Task Force has discussed using the environmental indicators together as a "suite" of indicators to get a complete picture, when possible, of how the water quality and the aquatic organisms have responded to the changes brought about the CWSRF projects. Indicators 1-3 used in combination with indicators 4-7 give the most complete picture of environmental outcomes. For example, Indicator 1 in conjunction with Indicator 6 might show the relationship between load reduction and improvement in biological quality.

- There are many factors relating to stream water quality, and habitat conditions that might or might not be affected by improvements in a wastewater discharge. Load reductions from one POTW could have a major beneficial effect on a stream or could be lost completely given the many other sources of pollution or stream degradation. The states emphasized that the indicators should be used together. It is important to keep in mind the nature of the information that each indicator provides, and not to extrapolate beyond the limits of each indicator. It is important to realize the limitations of individual indicators in order to avoid making invalid assumptions regarding water quality and aquatic community condition.

- Because most of the current CWSRF funding is directed to POTW upgrades, expansions, or improvements to maintain operational reliability, pilot states reported difficulty in attributing incremental pounds of pollutant removed due to CWSRF funding. Clear, specific, and uniformly applied guidance would need to be developed if all states were to calculate load reduction benefits. An alternative to measuring load reduction might be to measure reduction in concentration of pollutants. Also, the addition of the administrative indicator measuring project types funded helps to address the issue of measuring financing of improvements to existing, complying facilities. In addition, gains in treatment might be offset by additional influent flows when a plant is upgraded because of increased overall loadings if the plant also is expanded. Some states reported that despite POTW projects providing treatment upgrades, such projects often concurrently involve expansion to provide capacity to serve 20-year needs, rendering post-project loads larger than pre-project loads. Discharge monitoring report data could be used to calculate these load variations.

- Most states predict that establishing confirmed links between CWSRF funding and specific reduced health risks (Indicator 7) will be very challenging. In addition to POTW discharges, there are many potential point and nonpoint sources of disease and health risks in watersheds and coastal estuaries that are attributable to sources such as storm water, combined sewer overflows, contaminated sediment removal, wildlife, and livestock. However, establishing links between CWSRF funding and specific reduced health risks (Indicator 7) is possible if bacteriological data are available from project areas during periods before and after project completion. Although it may be very difficult to establish distinctions as to the degree of human health risk posed by different sources of pollution, the presence of pathogenic indicator bacteria (e.g., *E. coli*, fecal coliform, etc.) with or without a water-borne disease outbreak in an area, is something than can be monitored. If a CWSRF project addressed a source of this problem, then the lack of high levels of potentially pathogenic bacteria subsequent to the project completion would indicate that the CWSRF project had contributed toward reducing human health risk.

Recommendations Related to Data

- Many states have suffered budget cutbacks in the area of environmental monitoring, including ambient monitoring. This lack of environmental baseline data undermines a state's ability to directly measure environmental improvements that may be evident as a result of implementing environmental programs and improvements such as the CWSRF. Without ambient monitoring data, states that conduct only limited water quality monitoring would be hard-pressed to demonstrate actual environmental improvements as a result of environmental infrastructure improvements through CWSRF funding.

- More data are needed to support environmental indicators for NPS projects. A broader scope of data types beyond traditional water quality parameters should be included for NPS projects, such as biological and habitat indices (e.g., the zigzag count). Documenting environmental changes attributable to a NPS project funded by the CWSRF Program may require a longer period of time in order for the funded best management practices to be reflected in improvements to water quality and aquatic biota. Indicators such as final Indicator 4 may need more development and refinement in order to accurately capture the benefits resulting from NPS activities.

- Several states suggested that they will collect data during the determination of TMDLs and develop loading assumptions that could help support final Indicator 5 (waterbodies previously impaired and now meeting designated uses as a result of CWSRF projects).

Recommendations Related to Programmatic Issues

- Measuring environmental outcomes requires data. All states must report on the status of their water to EPA through their water quality inventories, but the criteria for assessing these waters vary greatly because of differing monitoring strategies, assessment techniques, and program budgets. Consequently, the data available to use for the CWSRF environmental indicators are inconsistent between the states. In many cases this may not be due to a lack of water quality data, but rather to a lack of a system for assembling and reporting the data. While some states may have biological data that directly measure the response of the aquatic community to environmental changes, other states simply have chemical data from the end of a pipe. States should be supported in their efforts to monitor the environment in a manner that accurately portrays the condition of their aquatic resources and the changes to these resources attributable to activities such as the CWSRF Program. Until this is done, only a few states will have the data to accurately use the indicators developed by this Task Force.

- Implementation of environmental indicators by the states should be discretionary and should be viewed as an evolutionary process.

- The environmental indicators should be considered as a "suite" of indicators to be used at each state's discretion and according to each state's individual needs.

- The environmental indicators would need to be accompanied by appropriate guidance materials and concrete examples of successful application by the states prior to implementation.