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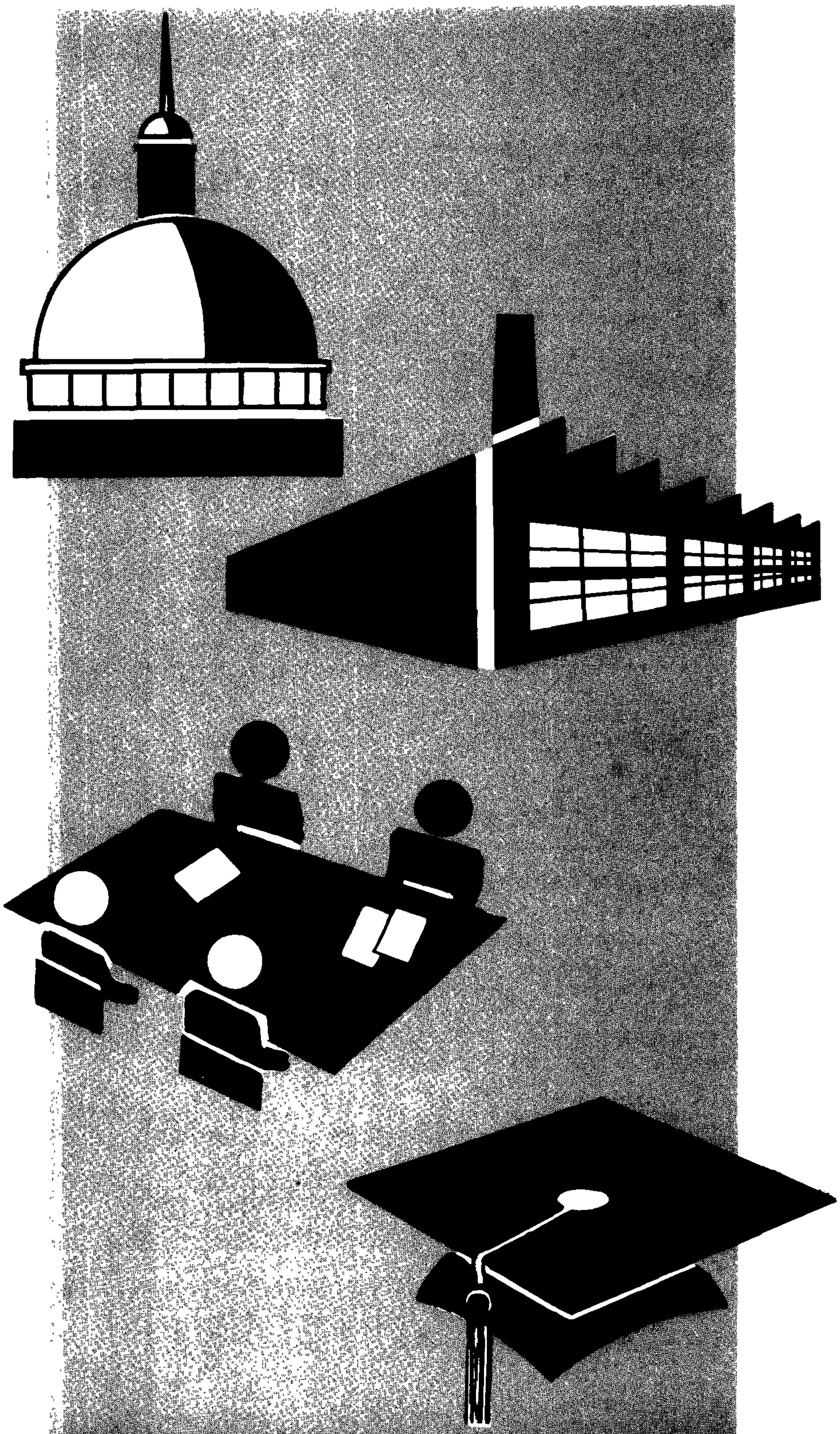
Planning and Managing Cooperative Monitoring Projects



PLANNING AND MANAGING COOPERATIVE MONITORING PROJECTS

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Monitoring Branch

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Office of Water Regulations and Standards

PREFACE

The concept of cooperative monitoring is not new. Cooperative monitoring involves shared efforts by individuals or groups in assessing water quality conditions and developing local water quality-based controls. Cooperative arrangements are encouraged by the Clean Water Act which states in Section 104(a) that EPA "in cooperation with other Federal, State, and local agencies, conduct and promote the coordination and acceleration of...investigations,...surveys, and studies related to the causes, effects, extent, prevention, reduction, and elimination of [water] pollution." Also under Section 104(b), EPA is authorized to "cooperate with other Federal departments and agencies, State water pollution control agencies, interstate agencies, other public and private agencies, institutions, organizations, industries involved and individuals, in the preparation and conduct of...[the] activities referred to [above]."

Cooperative monitoring projects require careful planning and strong management controls. This report describes the factors to be considered in designing and implementing cooperative monitoring projects so that specific provisions are made for the collection and analysis of scientifically valid water quality data and so that the State water pollution control agencies have final review and approval authority for all projects.

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CHAPTER I

INTRODUCTION

The purpose of this document is to explain how local participation in water quality management may be enhanced while ensuring that scientifically valid data is collected and used in decision making. Local participation through cooperative monitoring agreements provides a mechanism for increased cooperation among affected and concerned parties in assessing local water quality and developing water quality-based controls. This guidance document focuses on the incentives for these types of projects and their role in the water quality management process. The guidance also presents institutional options and considerations for project implementation.

MONITORING OBJECTIVES

The objective of cooperative monitoring is to support a particular water quality management activity or process. These could be water quality management planning, reviewing water quality standards, calculating total maximum daily loads/wasteload allocations for water quality-based decisions, making construction grant decisions, or determining permit limits for municipal or industrial dischargers.

ROLE OF MONITORING IN THE WATER QUALITY MANAGEMENT PROCESS

The Clean Water Act provides federal and State regulatory agencies with a variety of tools for water quality management to assure that national water quality goals are achieved. These tools include:

1. Water Quality Planning and Management (including total maximum daily loads/wasteload allocations)
2. Water Quality Monitoring
3. NPDES Permits and Compliance
4. Municipal Treatment Facilities
5. Water Quality Standards

These tools are dependent upon scientifically sound, site-specific water quality data needed to support decision making. In making decisions on the basis of water quality, the specific characteristics of the discharges and the receiving water as well as the constituents to be regulated must all be considered. Site-specific data on the aquatic life present, the physical and chemical characteristics of the water, background conditions, and low flow conditions are often needed for determining which controls are most appropriate and for establishing appropriate water quality-based effluent limitations, i.e., controls more restrictive than technology-based limits. Careful consideration of well documented quality assurance/quality control procedures will help ensure that data collected is representative and scientifically valid.

This guidance document discusses the appropriate role of State and local governments, environmental groups, industries, and others in planning and conducting ambient monitoring with an emphasis on cooperative monitoring agreements for developing water quality-based contols. In light of increased demand for federal and State resources, data resulting from local cooperative monitoring efforts could become an essential factor in resolving questions associated with the development and implementation of water quality-based controls.

CHAPTER II

COOPERATIVE MONITORING - OVERVIEW

APPROACH

Cooperative monitoring is where two or more parties agree to collect water quality data needed to support water quality management objectives. The parties involved may include the State water quality regulatory agency, 208 areawide planning agency, the EPA or other federal agencies, municipal and industrial dischargers, environmental groups, universities, and others who are affected, concerned, or interested in local water quality. Cooperative monitoring is an approach to achieve maximum use of limited public monitoring resources by combining them with other resources in arriving at water quality decisions.

Cooperative monitoring projects have the same elements as other monitoring projects. Data is collected, analyzed, and reported in accordance with accepted scientific procedures and the data is interpreted by the agency responsible for deciding upon the level of controls that may be needed. However, cooperative monitoring projects have several characteristics which distinguish them from other monitoring projects:

1. Part or all of the cost of the monitoring, data analysis, and data interpretation is borne by government(s) or other participants.

2. Oversight of data collection, data interpretation, and acceptance of the results is the responsibility of the State, even though local government and industry may participate in the project. Planning or regulatory decisions influenced by the data are also the State's responsibility.

3. Advanced agreement is obtained by the State regulatory agency and all participants on objectives to be achieved, roles of each participant, scope and duration of the study, quality control procedures, data handling systems and procedures, water quality models to be used, financing arrangements, and other important elements.

INCENTIVES

State regulatory agencies have a number of incentives for encouraging cooperative monitoring agreements. First, the State is able to obtain more site-specific and scientifically supportable data for use in reviewing water quality standards, writing NPDES permits, making municipal treatment decisions, and developing wasteload allocations. Second, decision making will be more readily accepted by the regulated community and concerned public if they are part of the process. Third, State monitoring resources can be conserved and applied to other areas of the State which could not otherwise be assessed. An additional benefit of cooperative monitoring results from the potential reduction in the number of adjudicatory hearings (and additional water quality data collection) requested when water quality-based permits are issued. This alone could save considerable resources of the State regulatory agency.

The incentives for dischargers entering into cooperative monitoring projects with State oversight are also significant. Since the States are obligated to adopt water quality standards that include use classifications and numeric criteria, the States must rely on national criteria documents and other sources to establish water quality standards where site-specific data is lacking. These national criteria often cannot take into account local variations in water quality, aquatic life, background conditions, etc. which may influence the application of the numeric criteria. As a result, national numeric criteria may be more stringent than necessary to protect uses on a specific receiving water. Consequently, controls imposed by the State may be more stringent than are actually necessary.

Local governments, environmental groups, and interested citizens benefit from participating in these efforts by gaining improved water quality and the opportunity to contribute assistance and/or scientific/technical expertise.

Local universities and other learning institutions may also benefit by participating in a local cooperative monitoring effort. Valuable experience in water quality management as well as an appreciation of all participants' needs can be obtained. In addition to active involvement with local governments, universities can benefit by providing real, "hands-on" assistance in the field, in the laboratory, and in data processing/data analysis.

Adjustments in numeric criteria or water quality-based effluent limits to reflect site-specific conditions offer the possibility of substantial savings in capital and operating costs for municipal and industrial dischargers. Site-specific data allow managerial personnel to assure elected and corporate officials that the investments made for pollution control are done on the most cost effective and scientifically supportable basis to achieve the desired water quality.

APPLICATIONS

In order to provide a perspective on the different applications of cooperative monitoring, a distinction is made between short term (relatively low level) cooperative monitoring efforts, and longer term (more intensive and possibly more expensive) cooperative monitoring projects. Short term cooperative monitoring arrangements are generally aimed at filling data gaps to establish effluent limits for permits in a relatively simple, single discharger situation. This could be the setting of effluent limits for a municipal treatment facility or for determining the level of treatment needed for a new facility. The short term cooperative monitoring project is usually characterized by:

1. Simplified institutional arrangements probably involving only a single discharger and the State agency.

2. Limited objectives involving immediate determination of mixing zones, presence or absence of certain species of aquatic life, immediate measurement of the impact of existing treatment facilities on water quality or biota, or other information necessary to determine effluent limits for municipal treatment decisions or for revising permits. Data is necessary for augmentation, clarification, or refinement of decisions.

3. Short duration ranging from one week to three months.

4. Relatively limited resource needs in terms of staffing, analysis, interpretation, and reporting.

5. Use of definitive quality assurance project plans.

Long term cooperative monitoring arrangements may involve data collection for one of (or a combination of) the following objectives:

1. Establishing appropriate water quality standards, including use classifications and numeric criteria, either through an initial review process or a water quality standards update.

2. Developing appropriate wasteload allocations for complex situations and/or multiple dischargers.

3. Determining use attainability.

4. Identifying impacts of both point and nonpoint source discharges on a stream segment.

5. Developing information regarding the economics of implementing various levels of treatment.

6. Follow-on monitoring for determining effectiveness of control levels specified in NPDES permits.

7. Resolving interstate water quality issues which may affect wasteload allocations, permit limits, or water quality standards.

The long term cooperative monitoring project is usually characterized by:

1. Complex institutional arrangements involving more than one discharger, the State regulatory agency, and other concerned, interested, or affected parties.

2. A detailed agreement delineating roles, responsibilities, purposes, financial arrangements, duration of the project, etc.

3. Significant environmental impact possible as a result of the study.

4. Longer duration, usually three months to a year (although this depends on the purpose).

5. Multiple sampling sites for several parameters including physical, chemical, and biological data.

6. Use of data in any one of a number of water quality management activities (standards decisions, permitting decisions, wasteload allocations, point and nonpoint source assessments, economic benefits, follow-on monitoring, resolution of interstate issues, etc.).

7. More extensive resource requirements.

8. Use of definitive quality assurance project plans.

Cooperative monitoring agreements are not appropriate in all situations requiring monitoring. In the case where a short term project involves small dischargers, the States may have to assume the burden for monitoring and application of monitoring data and use State resources to meet these needs. Where local funding is arranged, small dischargers may not be able to provide resources equal to those of larger dischargers. Since they are, or may be, affected by the outcome, they may choose to provide resources-in-kind or participate in an advisory or other capacity.

CHAPTER III

INSTITUTIONAL OPTIONS

IDENTIFICATION OF NEEDS

The need for local water quality data may be identified by persons concerned or involved in the water quality management process including the EPA, States, affected dischargers, environmental groups, water users, and the public. Several considerations may influence the decision to seek additional site-specific information through a cooperative monitoring agreement. Some of these are:

1. Available data is not adequate in terms of frequency, duration, location, or constituents sampled.

2. The potential environmental consequences of the decision in terms of expenditures for pollution control or impacts on the environment are significant.

3. The complexity of the situation (number of dischargers impacted, hydrology, nonpoint sources, biota, etc.) warrants additional data collection.

OPPORTUNITIES FOR INVOLVEMENT

Once the need for additional water quality data has been identified, the next step is to decide who should be involved in a cooperative monitoring project. This can be resolved by considering the following:

1. Who has responsibility for decision making?
2. Who is affected by the decision?
3. Who is interested in the decision?

The responsibility for decision making, whether for municipal treatment (new facility or advanced treatment), revised NPDES permit limits, or for nonpoint source controls (Best Management Practices) rests with the State or EPA if authority has not been delegated to the State. EPA, however, maintains oversight responsibility. Others having responsibilities in the water quality management process may include the regional areawide water quality management planning agency and interstate commissions.

In many cases the parties most directly affected by a water quality management decision will be municipal and industrial dischargers who are discharging into a particular water body. They also have a vital interest in applying the most cost-effective method of protecting uses of the stream to which they are discharging, as well as the impacts on downstream segments. It is important to identify public interest groups who are particularly interested in the control decisions. Interested parties may include recreational groups, water users groups, environmental groups, sportsman associations, and downstream interests. State water rights laws may also need to be considered in determining the potential interested parties. Involvement of public interest groups in the project can provide a valuable source of information and may provide a broader perspective to the project than would otherwise be the case. It facilitates communication and acceptability of results upon completion to have various interest groups participating in the project, rather than simply being informed of the results at the end of the project.

ROLES AND RESPONSIBILITIES

Institutional options that define the roles and responsibilities for cooperative monitoring projects should be explored to support the project's objectives and needs. No one set of institutional arrangements will satisfy all roles in the water quality management process. The institutional options are determined from who is responsible, affected, and/or interested. Specific considerations include:

1. What is the objective?
2. What needs to be done?
3. Who has expertise?
4. Who has data?

Linkages need to be established between what needs to be done and the identified participants in the project. The scope of the study may vary from simple, one-time analyses needed to support a permit or construction grant application to multi-year studies. Once the objectives have been defined, the challenge is to coordinate needs with all participants.

MEETING PROJECT NEEDS

The level of involvement in cooperative monitoring projects will depend upon the complexity, potential impacts, and possible consequences of the decision. The simplest situation involving only the State and a discharger could be the refinement of a specific effluent limitation. The most complex situation could be the potential change of a designated use or the implementation of water quality-based effluent limits for multiple dischargers.

In complex situations, these responsibilities should be clearly described in a written agreement which is approved by all participants.

Project Management - Lead responsibilities for management can be assigned to any or all of the participants. These can include:

1. The State water pollution control agency.

2. The principal affected discharger.

3. The area-wide planning agency.

4. A designated lead agency such as U.S.G.S..

5. A consultant.

6. A committee of those who have responsibilities or are involved and/or affected.

7. A management subcommittee.

Regardless of how project management responsibilities are assigned, a qualified individual or individuals must be made responsible for identifying the specific needs, scheduling, resource management, reviewing interim data, reporting to lead agencies and involved parties, quality assurance and quality control procedures, and overall program coordination.

Water Quality Study Design - The water quality study design defines the analytical tool to be used (e.g., mass balance or mathematical model), the physical, chemical, and biological constituents to be assessed, frequency of monitoring, location of monitoring stations, collection of discharge (effluent) data, monitoring of nonpoint sources, and hydrologic analyses.

A water quality study might involve hydrologists, engineers, biologists, statisticians, chemists, and other technical specialists with adequate technical backgrounds to design the study to meet the project objectives and to assure that integrity of the data base is unquestionable. This is particularly important where a mathematical model is being used to predict water quality and the study design must incorporate data needs at specific sites to calibrate the model. Study design should involve State agencies, since the results of the study must ultimately be interpreted by them. Also, the project design should be approved by the project manager and the State water pollution control agency. A quality assurance project plan should be prepared during this phase and it should be approved by the project manager and State water pollution control agency.

Project Implementation - The implementation phase involves the actual collection of water, sediment, or tissue samples, the storage and transportation of samples, laboratory analysis, and data generation and reporting. Individual assignments may be given to State agencies, technical and laboratory staffs of affected dischargers, State or federal agencies, and/or contractors (including local universities and environmental groups) and others specified in the agreement. The project manager's responsibility in the implementation phase includes assurance that data is being collected in a timely manner, that it is being collected according to the study design, that samples are being processed according to specified procedures, and that the quality assurance plan is being followed.

Data Review and Interpretation of Results - Review and interpretation of data is both a technical and managerial function. Ultimately, the State water pollution control agency will have to review and evaluate the data as well as any conclusions drawn from the data by the project manager, areawide planning agency, or management committee. Within the process of reviewing and evaluating data throughout the study period, there may be varied interpretations among technical personnel. However, if proper study design and quality assurance procedures have been used in data collection, differences in interpretation will, in many cases, be minimized. Where differences of interpretation may occur, quality control procedures should assure that the integrity and objectivity of the data base is not questionable.

PROJECT AGREEMENTS

Agreements regarding cooperative monitoring projects may range from informal agreements to collect and evaluate additional data to formal written agreements involving two or more parties. A memorandum of understanding signed by various parties may suffice as an informal agreement. For both simple and complex projects, all participants should be encouraged to agree in advance and in writing on all phases of the study.

The type of agreement used should depend upon the complexity of the project, the number of parties involved, and the individual project roles and responsibilities. In complex situations involving the State, municipal and industrial dischargers, public interest groups, contractors, and consultants, a formal written agreement should be developed to establish and assure understanding of the project's objectives as well as the roles and responsibilities for all involved parties. Sample agreements from actual cooperative projects are found in Appendix B.

CHAPTER IV

FUNDING AND RESOURCE OPTIONS

There are several options for funding cooperative monitoring projects. Municipal and industrial dischargers may elect to fund the project directly or provide other resources, such as staffing or in-kind services for sample collection, laboratory analyses, data reporting, and program management. These contributions may be provided by any agency or party involved in the study.

Funding options for a specific study should be arrived at by consensus among all the participants. The variety of funding options (each of which are discussed below) include:

1. Direct funding by dischargers
2. Indirect funding by dischargers
3. Provision of in-kind services by parties involved
4. Joint funding
5. User fees
6. Combined Arrangements

Regardless of the funding mechanism used, it should be noted that final interpretation of data and translating this data into specific controls (including permit limits) remains the responsibility of the State. It is also the State's responsibility to assure that QA/QC procedures are established and followed throughout the course of study and that precision, accuracy, completeness, comparability, and representativeness of data are known and documented.

DIRECT FUNDING

Under the direct funding option the discharger (or dischargers) would directly fund the cost of data collection. This could include contracts with laboratories, consultants, State agencies, or federal agencies for direct provision of services. In the case of multiple dischargers, funding could be pro-rated based on any number of factors (e.g., financial ability, flow, even split, etc.) which would be determined by the project manager and included in the written agreement. Collected data would be reported to the discharger or the lead agency in accordance with the terms of the formal or informal agreement which includes provisions for QA/QC, and to the State agency for review and final decision.

INDIRECT FUNDING

Under the indirect funding arrangement, the dischargers would provide funding to the lead agency (the State, areawide planning agency or other agency) and the lead agency would arrange for and contract with consultants or other agencies to provide the services to meet project needs.

PROVISION OF IN-KIND SERVICES

Provision of in-kind services by dischargers, State agencies, federal agencies or areawide planning agencies could be a fundamental element of practically any kind of cooperative monitoring project whether it is discharger direct funded, discharger indirect funded, or other arrangement. Dischargers, State agencies, areawide planning agencies, universities, and some environmental groups often have capable staff which may provide some of the needs for data collection or analysis. This may include management committee participation, project management, design of the monitoring study, water quality sampling, laboratory analysis, and analysis and reporting of data.

JOINT FUNDING

Given the responsibilities of those involved in the water quality management process, joint funding of cooperative monitoring projects may be appropriate. Under this arrangement, States might provide total or partial funding to local agencies or dischargers for them to obtain data needed by the State. This same arrangement could also be applied to the areawide planning agency. Joint funding arrangements could substantially augment the resources provided by municipal and industrial dischargers and enable additional study detail in key areas of concern.

USER FEES

The States may consider levying fees on all permitted dischargers that are related to the expense of developing permit limits and monitoring for compliance under the NPDES permit program. Under the user fee approach, a portion of the fees collected by the State from a discharger would be allocated to areas where data is required for developing water quality standards, total maximum daily loads, wasteload allocations, and water quality-based effluent limits on a priority basis within the State. The State would then use these funds to finance all or part of the cooperative monitoring project. The user fees would provide the revenue source for conducting these analyses.

COMBINED ARRANGEMENTS

Any combination of the described funding arrangements could work in a given situation. The objective is to find an approach which:

1. Meets the needs of the cooperative monitoring project.
2. Is within the budgetary constraints of the participants.
3. Reflects the environmental and financial stakes involved.
4. Meets the regulatory requirements of the water quality management process.
5. Addresses the concerns of the public and water user groups.

CHAPTER V

PROJECT IMPLEMENTATION

Elements of project implementation to be considered are planning and management and technical considerations. Planning and management considerations assure that all parties -- the regulatory agency, the regulated community, affected parties and public interest groups -- are working towards achieving the established goals and that the appropriate quality control features are being addressed. Technical considerations assure that cooperative monitoring projects provide a scientific approach to determine cause/effect relationships and that State approved procedures are followed.

PLANNING AND MANAGEMENT

The level of effort associated with a project involving several participants will be highly dependent upon the complexity of the situation and the water quality management process or function supported: planning, water quality standards, wasteload allocations, permits, and municipal treatment decisions. To help ensure that the planned goals of the effort are achieved, several planning and management activities associated with the agreement must be considered:

1. Defining the scope of the project
2. Project management and design
3. Project implementation
4. Data review and interpretation
5. Decision making
6. Follow-on monitoring

<u>Project Scope</u>. The key considerations in scoping a cooperative monitoring project include:

1. Defining the purpose and objectives of the project.

2. Identifying participants (who is responsible, interested, affected; who already has data; who has expertise).

3. Identifying hydrologic reaches or impact zones to be considered.

4. Identifying the tributary area impacting the hydrologic boundaries of the study.

5. Determining what point and nonpoint sources will be identified and characterized as part of the study.

6. Identifying the expected output of the project -- wasteload allocations, water quality-based permit limits for specific constituents, recommended water quality standards, or updated 208 areawide management plans.

Project Management and Study Design. From among the participants, a project manager or project coordinator needs to be identified and a management structure for the project must be decided upon. This is usually a management committee, an advisory committee, etc. Management responsibilities in cooperative monitoring projects include:

1. Designing the study.

2. Scheduling activities.

3. Developing a quality assurance/quality control project plan.

4. Defining public participation needs.

5. Identifying funding and other resources needed to carry out the cooperative project.

6. Identifying procedures for data handling and management.

7. Assuring that project objectives are met on a timely basis and within the resource constraints.

One of the most important functions of project management is to design the water quality study. This is particularly critical if a mathematical model is being used to determine wasteload allocations or instream effects since data collected will be used in calibrating the model. Consideration must be given to the following when designing a water quality study:

1. Physical, chemical, and biological constituents (including stream charactersitics for water quality models) to be monitored.

2. Frequency of monitoring for each constituent.

3. Location of ambient monitoring stations.

4. Resource needs in terms of sampling, laboratory equipment, analysis, and reporting.

5. Collection of water quality data on effluent discharges.

6. Monitoring of nonpoint sources and background.

7. Monitoring of flow and hydrologic conditions.

8. Quality assurance procedures

9. Safety considerations

<u>Project Implementation</u>. The project implementation phase may include the following activities:

1. Water quality sampling

2. Stream flow measurements

3. Laboratory analysis and data reporting

4. Biological monitoring (bioassay & biosurvey)

5. Historical hydrologic data analysis

6. Historical water quality data analysis

7. Discharge data analysis

8. Implementation of quality assurance/quality control plan

9. Project coordination

10. Public participation

Responsibilities for all of these activities should be clearly defined in the development of roles and responsibilities for the project. The project manager's or management committee's duties include overseeing all of these activities during the implementation phase.

<u>Data Review and Interpretation</u>. Data review and interpretation should be a continuing process during the program implementation period, particularly if mathematical models are used to predict instream conditions as the basis for

wasteload allocations. It is extremely important that the data be reviewed to ensure that it is sufficient to calibrate the model used. Review and evaluation during the program implementation phase may indicate the need for additional data or different kinds of data. State water pollution control agency personnel should be involved in the ongoing process of reviewing data, particularly where the data is to be used in writing permits, reviewing or revising water quality standards, and construction grants. All final data should be entered into EPA's STORET system and all appropriate water quality data should be reported to EPA in STORET compatible format.

Decision Making. Cooperative monitoring projects support decision making in the water quality management process. Site-specific data from a well designed monitoring project will support conclusions which are incorporated into, or influence, a water quality management decision in the areas of planning, wasteload allocations, water quality standards setting/revisions, permits, or construction grants.

Follow-on Monitoring. Follow-on monitoring (monitoring conducted after controls are in place to ensure effluent limitations are effective and that designated uses are being restored or maintained) is one way of providing a margin of safety and assure the validity of water quality management decisions. Follow-on monitoring can provide assurance to regulatory agencies and the public that classified water uses are being protected, and assurances to dischargers that water quality-based controls are reasonable for the use being protected. Follow-on monitoring projects require the same kinds of activities as the initial cooperative monitoring project. Roles and responsibilities have to be defined, study plans developed, data reviewed and interpreted periodcally, and quality assurance plans developed. Follow-on monitoring may or may not be part of a cooperative monitoring project.

TECHNICAL CONSIDERATIONS

A key objective of cooperative monitoring is to identify cause and effect relationships among pollution sources and conditions which occur in receiving water bodies. Pollution sources may include municipal and industrial discharges or non-point sources such as urban runoff, agricultural return flows, and runoff from construction areas, timber harvesting areas, landfills, etc. Other factors which may affect receiving waters include hydrologic conditions, physical conditions (stream bed and bank), and habitat characteristics. The objective of most monitoring projects is to provide a scientific basis for relating pollution sources affecting receiving waters to observed or expected conditions. Participants in cooperative monitoring projects should follow the State's guidance on approaches and technical procedures. The State will also have access to EPA guidance and recommended procedures which can be made available to cooperative monitoring participants.

There are a number of techniques and procedures available for defining causes and effects in water quality. These include monitoring of the chemical constituents of receiving waters and relating these constituents to specific point and nonpoint sources. Constituents believed to be causing impacts (existing or projected) should be monitored, as well as other related parameters to assure that a logical relationship can be defined.

Flow measurements are commonly recognized as critical since wasteload allocations, water quality standards, and most water quality-based permit limitations are related to flow conditions in the receiving water. Flow measurements make chemical data useable in many cases, and provides an invaluable perspective on the relationship between point and nonpoint dischargers and their chemical impacts on water quality.

Biomonitoring of effluents and receiving waters is a useful tool in defining existing or projected impacts of point and nonpoint source discharges on biological communities, and for relating limitations on biological communities to other factors such as flow, benthic, or bank conditions. Biological monitoring may encompass biosurveys in which the occurrence of fish or benthic life in a stream are quantitatively measured, and subsequently related to pollution levels or habitat characteristics. Another useful biological monitoring tool is the habitat survey in which stream bed and bank conditions are identified and factored into the relationship between the overall characteristics of the stream and the aquatic communities found in that stream. Habitat surveys may be a critical element in defining the attainability of aquatic life uses in many cases.

Another technique is the use of bioassays. Bioassays define allowable levels of pollutants in specific receiving waters, and can be carried to a level of sophistication where they are related to the species which occur in specific receiving waters. Bioassays are usually performed on the effluent from a particular discharger and may be performed in conjunction with biological assessments of the receiving waters.

WATER QUALITY MODELING

Mathematical models are frequently used in assessing water quality and developing water quality-based controls. Water quality models simulate the impact of point and non-point source discharges on the quality of receiving waters, and they can be used to predict water quality under a variety of conditions. Water quality modeling may be done by relatively simple hand calculations or with sophisticated computer systems.

The principal advantages of water quality modeling are:

1. The impact of future wasteloads can be predicted.

2. The sensitivity of the receiving water body to changing waste loading or hydrologic conditions can be analyzed.

3. Critical flow or loading conditions under present and future flows can be identified.

4. The impact of new sources with respect to existing sources can be analyzed.

5. The water quality benefits of potential point and nonpoint source controls can be quantified.

With proper application, water quality modeling provides a means of comparative anlaysis of existing and future conditions, and of the potential benefits of alternative point and nonpoint source wasteload allocations. Having identified the necessary reductions in wasteloads, the ways and means of achieving those reductions can be analyzed and the cost of alternative wasteload allocations can be considered.

QUALITY ASSURANCE/QUALITY CONTROL

A fundamental element of any water quality data collection and analysis effort, and particularly a cooperative monitoring project where several participants are involved, is the quality assurance project plan. A quality assurance project plan establishes scientifically acceptable procedures to be used in sampling, laboratory analysis, and reporting. Developing a plan which is acceptable to the State and EPA at the outset of a project and careful attention by those responsible for ensuring that QA/QC procedures are followed can eliminate much of the debate surrounding interpretation of data.

A combined Work/QA project plan should describe the project and specify the project's organization and management responsibilities. It should also include a thorough description of the following specific items:

1. Quality Assurance Officer
2. Data Quality Requirements and Assessments

3. Sampling Procedures
4. Calibration Procedures and Preventive Maintenance
5. Documentation, Data Reduction, and Reporting
6. Data Validation
7. Performance and System Audits
8. Corrective Action
9. Reports

These and other elements of a Work/QA Project Plan are discussed in Appendix C. If additional information relative to quality assurance and quality control is needed, the State Quality Assurance Officer or the EPA Quality Assurance Officer in the EPA Regional Office may be contacted.

APPENDIXES

APPENDIX A

COOPERATIVE MONITORING CASE STUDIES

Local cooperative monitoring projects have been conducted throughout the nation for various purposes. Two of these projects are included here as case studies to show how State and local governments worked together with dischargers and others in a cooperative effort to achieve common goals.

Selected as cooperative monitoring case studies are the Lower Fox River, Wisconsin, and the Middle Wabash River, Indiana.

LOWER FOX RIVER, WISCONSIN

The Lower Fox River from Lake Winnebago to Green Bay, Wisconsin experienced severe dissolved oxygen depletion problems during several months of the year. Discharges from pulp and paper mills and municipalities in certain areas created major water quality problems including fish kills. This 40 mile stretch of the Lower Fox River also received heavy waste loads from 14 paper mills and six municipalities. The river has relatively low flows compared to most other streams receiving mill wastes and has been extensively dammed for power generation and transportation.

Concerned with the impact of the discharges on the water quality of the Lower Fox River and Green Bay, the Wisconsin Department of Natural Resources (WDNR) used a mathematical simulation model to determine if Best Practicable Technology and secondary treatment systems would be adequate to achieve the desired minimum desolved oxygen standard. Based on the results of the study, the WDNR concluded that categorical effluent limitations would not be sufficient to meet the established standard for recreational use, fish, and other aquatic life in the Lower Fox River. The river was described as having one of the ten worst dissolved oxygen problems in the country. The WDNR requested that the Fox Valley Water Quality Planning Agency (FVWQPA) - designated under Section 208 of the Clean Water Act to conduct areawide water quality management planning - develop wasteload allocation (WLA) and policy recommendations for the Lower Fox River. The philosophy of the WDNR was that once it determined the assimilative capacity of the river, local parties should decide how to manage or allocate the wasteload among dischargers.

As a result of the WLA activity, some of the paper mills along the Lower Fox and Wisconsin Rivers (WLA's were being developed for the Wisconsin River at the same time as those for the Lower Fox) formed a consortum called the Industry Rivers Study Committee (IRSC). Initially, the IRSC was organized because the industries wanted to examine the QUAL III mathematical model used to predict dissolved oxygen levels. The IRSC conducted some independent monitoring, but it also performed monitoring in cooperation with the local 208 Agency and provided useful comments on the modeling process. In addition, the public was actively involved during all stages of WLA development. The FVWQPA held several public meetings to discuss the issues.

The WDNR and the local 208 Agency independently and in cooperation with the USGS, IRSC, Green Bay MSD, University of Wisconsin Sea Grant Program and others, participated in the monitoring activities. Parameters measured for QUAL III included river flow and temperature, headwater biochemical oxygen demand (BOD), nutrient concentrations, algae concentrations, sunlight intensity, and BOD loads from each discharger. Sampling occurred at five continuous monitoring stations and synoptic surveys were done during the critical late spring, summer, and early fall months.

Most laboratory analyses were conducted by the State Hygiene Laboratory in Madison, Wisconsin. Additional analyses were conducted at the University of Wisconsin - Oshkosh, and private laboratories. Any incorrect sampling methods were rectified and U.S. EPA guidance for quality assurance/quality control was followed.

During the first two years of the project, federal grants paid all the costs. The following three years were funded with 75% Federal, 12 1/2% State and 12 1/2% local monies. Subsequently, the WLA effort was financed equally by EPA, WDNR, and the local area. Industries have also provided some monitoring funds on a matching basis with the Fox Valley Agency and local universities. A summary of resources and responsibilities by participants for 1982-1984 is tabulated on the following page.

The wasteload allocations developed were for summer low flows, high river temperatures, and other restrictive conditions. As a means to provide the "real time" temperature and flow information that would be needed to implement variable permits, the paper mills and municipalities along the Lower Fox River formed the Lower Fox River Dischargers Association. The temperature and flow information will be obtained daily by the Association and transmitted to the participating dischargers and the WDNR.

The yearly membership dues in the Association provides each member with the daily readings necessary to meet its permit requirements. Since monitoring has not yet started, operating costs for the Association are not finalized.

All the parties involved in this unique WLA effort are satisfied with the results so far. The dischargers believe the WLAs evolved through the best and most equitable process possible. The only mill to contest its permit has ceased operation. The other dischargers have accepted their effluent limitations.

REFERENCES

William Elman, Executive Director
Fox Valley Water Quality Planning Agency
140 Main Street
Menasha, WI 54952
(414) 725-3343

Dennis Hultgren, President
Lower Fox River Dischargers' Association
Appleton Papers Incorporated
Locks Mill
Combined Locks, WI 54113

Dale J. Patterson
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 267-9352

SUMMARY OF RESOURCES BY PARTICIPANTS

PARTICIPANT	RESPONSIBILITIES	ESTIMATED CONTRIBUTIONS
Fox Valley Water Quality Planning Agency	Serve on Program Steering Committee. Technical Co-ordination and Information Transfer through Sub-Committee of Technical Advisory Committee River Monitoring	$2,800 Cash (Monitoring)-1982 (committed) $30,000 In-Kind (Staff)-1982 (committed)
Green Bay Metropolitan Sewerage District	Assist in Field Program Cordination River and Bay Monitoring Serve on Program Steering Committee Fund UWM and UWGB During Feb.-Sep., 1982	Monitoring Equipment Up to $100,000 Cash-1982 (committed) Up to $100,000 Cash-1983 (expected) Up to $25,000 In-Kind-1982 (committed) Up to $25,000 in-Kind-1983 (expected)
Industry Rivers Study Committee	Sediment Oxygen Demand Field Data Aerial Photography Consulting Serve on Program Steering Committee	Up to $50,000 Cash-1982 (committed) Up to $50,000 Cash-1983 (expected)
Wisconsin Department of Natural Resources	Model Development Field Data Collection and Monitoring Laboratory Analysis of Data Serve on Program Steering Committee	Equipment and Personnel $50,000 In-Kind-1982 (committed) $50,000 In-Kind-1983 (expected)
University of Wisconsin (Sea Grant, Milwaukee, Green Bay)	Chair Program Steering Committee Field Data Collection and Monitoring Laboratory Analysis of Data Adaptation, Calibration, and Verification of model Serve on Program Steering Committee	Equipment and Personnel $50,000 In-Kind-1982 (committed) $50,000 In-Kind-1983 (expected) $50,000 In-Kind-1982,1983 (Sea Grant-requested) $50,000 In-Kind-1983,1984 (Sea Grant-requested)
Bay Lakes Regional Planning Agency	Serve on Program Steering Committee Coordinate with other Green Bay Programs	Up to $5,000 In-Kind-1982 (committed)
		TOTAL 400,000 Cash-1982-1984 280,000 In-Kind-1982-1984

MIDDLE WABASH RIVER, INDIANA

The Middle Wabash River extends approximately 150 river miles from north of Lafayette to Merom, Indiana. Ten major industrial dischargers, four steam electric generating stations, and six municipal wastewater treatment facilities are located along this reach of the River.

The Indiana Stream Pollution Control Board (ISPCB) and the industrial dischargers along the Middle Wabash River disagreed on permit effluent limitations based on wasteload allocations. The WLAs were initially developed from a mathematical model using fixed station monitoring data generated since 1957, and from data collected during comprehensive surveys conducted in 1974 and 1977. Both the State and the Mid-Wabash Industrial Consortium recognized the need for updated information on which to base wasteload allocations that would be used to draft new NPDES permits. The State and the Consortium agreed that a third-party consultant should be employed to review all available data, identify data gaps, recommend a plan of study, evaluate and calibrate the model, and apply the model to the river.

The Mid-Wabash Industrial Consortium agreed to fund the consultant's activities. The State then formed the Mid-Wabash River Technical Committee which included representatives of the State of Indiana, the U.S. EPA, the USGS, Purdue University, and DePauw University.

The Technical Committee is open to industrial, governmental, and political concerns and includes representatives from five industries, two universities, the Indiana Division of Water Pollution Control, EPA, USGS, four local governments, and two environmental consultants. The Technical Committee organized three subcommittees to address specific subject areas, and to evaluate and recommend methods which would be appropriate for the Middle Wabash River. Using the input provided by the subcommittees, the Technical Committee developed a work plan provided through the ISPCB. The work plan was reviewed and approved by EPA, and the survey was implemented in the summer of 1981.

The survey required the participation of a number of organizations and persons to complete the study tasks. The tasks and participants in the survey were as follows:

- Intensive sampling and testing of the Middle Wabash River and the industrial effluents to determine prescribed water characteristics performed by ISPCB, DePauw and Purdue Universities, and the Public Service of Indiana (PSI).

- Diurnal dissolved oxygen determinations by Purdue University from hourly stream samples collected and preserved in the field by the intensive sampling crews.

- Primary productivity and respiration measurements determined by ISPCB and DePauw University using the light and dark bottle method.

- Determination of ultimate BOD using both the inhibited and uninhibited method on filtered and unfiltered samples by Purdue University.

- Proportional analysis of major taxonomic groups of phytoplankton by ISPCB.

- Determination of benthic oxygen demand by ISPCB.

- Bottom contour mapping conducted by DePauw and Purdue Universities and PSI to be used for calibration of the model's hydraulic component.

- Determination of time of travel and reaeration rate coefficients by the USGS and ISPCB.

The field work has essentially been completed, but the model and the final wasteload allocations have not been finalized. To date, the Mid-Wabash Industrial Consortium has spent approximately $280,000; the USGS approximately $50,000; and ISPCB over $120,000 on the study.

Quality assurance/quality control was maintained through the careful outlining of procedures prior to the survey, sample splitting, routine laboratory checks, and continuous communications between all parties involved. Although the final results of the study have not been completed, no major problems have occurred with the methods employed or the quality of the data obtained. The collected data are currently being inputted in the DIURNAL model.

From the State's perspective, this cooperative monitoring effort has been a success. The State believes that through local cooperation, duplication of effort can be largely eliminated and total combined costs reduced. The State plans to foster this cooperative atmosphere through continued communication with the industrial group. Currently, the State is planning a toxics monitoring program for the Middle Wabash and East Fort White Rivers. The ISPCB also anticipates local cooperation with concerned industries in the toxics effort.

Contact

Mr. John Winters
Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206
(317) 633-0719

APPENDIX B

SAMPLE COOPERATIVE MONITORING AGREEMENTS

The basic foundation to achieving a successful cooperative monitoring project is a clear understanding by all participants as to who will be responsible for the variety of activities to be accomplished. These responsibilities should be defined in a carefully organized work plan with commitments specified in formal or informal agreements. To assure the best level of understanding, written agreements are preferable.

Several example agreements between various levels of government and others are included here. These agreements are included solely for example purposes and they are not to be considered as endorsements or recommendations by the EPA.

ILLINOIS EPA WITH CITY OF CHICAGO

MEMORANDUM OF AGREEMENT
BETWEEN THE ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY (IEPA) AND
THE CITY OF CHICAGO DEPARTMENT OF WATER
AND SEWERS (CITY OF CHICAGO)

The purpose of this agreement is to interlink the City of Chicago continuous ambient water quality monitoring network with the State of Illinois network, providing both parties access to the network information of mutual concern, eliminating duplicative monitoring and meeting the following objectives:

1. Characterize and define trends in the physical, chemical and biological condition of Lake Michigan.

2. Establish baselines of water quality.

3. Provide for a continuing assessment of water pollution control programs.

4. Identify and quantify new or existing water quality problems or problem areas.

5. Act as a triggering mechanism for intensive surveys or other appropriate actions.

I. The IEPA agrees to:

A. Provide the City of Chicago with water quality data from any portion of the state-wide ambient monitoring network if so requested by the City of Chicago. This will be performed to the extent available resources permit.

B. Enter the data from the IEPA ambient monitoring network into the STORET system for permanent record and retrieval purposes. Entry to be made within 90 days beyond the month in which the samples are collected.

C. Collect and analyze a split sample from each of the designated National Ambient Water Quality Monitoring Network Stations; parameters to include those indicated below.

All laboratory test results on these samples will be routinely submitted to the City of Chicago for comparative record purposes.

Parameter Name	STORET Numbers
Arsenic	(01002)
Cadmium	(01027)
Chromium	(01034)
Copper	(01042)
Mercury	(71900)
Lead	(01051)
PCBs	(39516)
Aldrin	(39330)
Dieldrin	(39380)
Total DDT	(39327) (39320) (39315) (39310) (39305) (39300)

Chlordane	(39350) (39062) (39065) (39068) (39071)
Endrin	(39390)
Methoxychlor	(39480)
Hexachlorocyclohexane	(39334) (39810)
Hexachlorbenzene	(39700)
Pentachlorphenol	(39032)

D. Furnish the Department a copy of the IEPA quality control manual to serve as a guide in the audit of the procedures for sampling, transporting, and analyzing samples.

II. <u>The City of Chicago Agrees to</u>:

Collect and analyze water column samples from Lake Michigan in the following manner:

A. Samples are to be collected from the locations and frequencies indicated in Appendix A.

(Appendix is not attached)

B. The Lake Michigan monitoring network will consist of 10 (11) stations of the North Shore Lake Survey, the 11 stations of the South Shore Lake Survey, the 23 (33) stations of the James W. Jardine Water Purification Plant Radial Survey, the 22 (32) stations of the South Water Filtration Plant Radial Survey and the 14 stations of the Lake Michigan Open Water Survey. The locations of these stations are shown on Appendix A.

C. Water column samples are to be analyzed for the following minimum parameters:

Parameter Name	STORET Number
pH	(00400)
Temperature	(00010)
Conductivity	(00095)
Dissolved oxygen	(00300)
Total suspended solids	(00530)
Total volatile suspended solids	(00505)
Turbidity	(00076)
Total ammonia nitrogen	(00610)
Total organic nitrogen	(00625)
Nitrite - nitrate nitrogen	(00630)
Chemical oxygen demand	(00335)
Fecal coliform	(31616)
Total coliform	(31503)
Orthophosphate (total)	(70507)
Total phophorus	(00665)
Chloride	(00940)
Sulfate	(00945)
Plankton	(60050)
Actinos	( )
Odor threshold	(00086)

D. Perform bottom sediment monitoring in accordance with the Lake Michigan sediment monitoring program of the City of Chicago.

E. Perform benthos monitoring in accordance with the Lake Michigan Benthic monitoring program of the City of Chicago.

F. Enter the data from the monitoring described in this agreement into the national STORET system for permanent record and retrieval purposes; entry to be made within 90 days beyond the month in which the samples are collected.

Additionally, the City of Chicago will enter all other data collected, such as more complete parametric coverage, sediment and benthos surveys and other special studies, into the national STORET system within the 90 day time period.

III. The City of Chicago and IEPA jointly agree to:

A. Maintain a program of quality control and custody of sample acceptable to the United States Environmental Protection Agency (USEPA) and the United States Geological Survey (USGS) with coordination by the representative designated by IEPA. A single coordinated quality control program bringing together all participants will be a goal of this agreement.

B. Participate in a training program including field and classroom training to ensure that proper collection procedures are followed.

C. Cooperate with each other as well as USEPA and USGS to provide a laboratory quality control program. Such program will be coordinated by the designated representative of the IEPA.

D. All differences or discrepancies will be negotiated vigorously to a mutually satisfactory solution.

E. The effective date of this agreement is October 1, 1977.

F. If either party to this agreement for any reason wishes to cancel or modify its involvement, at least ninety (90) days advanced notice to the other party shall be provided.

date ______________________________

signed by ______________________________

for the City of Chicago

date ------------------------------

signed by ______________________________

for the Illinois Environmental Protection Agency

FOX VALLEY WATER QUALITY PLANNING AGENCY

INTERAGENCY AGREEMENT
for
SUPPLEMENTAL FUNDING OF 1982 RIVER/BAY MONITORING PROJECT
between
FOX VALLEY WATER QUALITY PLANNING AGENCY
and
GREEN BAY METROPOLITAN SEWERAGE DISTRICT

This AGREEMENT is made by and between the Green Bay Metropolitan Sewerage District (hereinafter referred to as "METRO") and the Fox Valley Water Quality Planning Agency (hereinafter referred to as "AGENCY") and entered into this 24 day of September, 1982.

WHEREAS the AGENCY has been designated as an areawide waste treatment management planning agency by the U.S. Environment Protection Agency pursuant to Section 208 of the Federal Water Pollution Control Act Amendments of 1972, (33 U.S.C. 1251 et. seq.); and

WHEREAS the METRO is a Wisconsin municipal corporation organized to perform regional wastewater treatment services under Wis. Stats. 66.20; and

WHEREAS the AGENCY has received a grant pursuant to Section 208 of the Federal Act to do areawide waste treatment management planning within its planning area and desires to contribute a portion of this grant toward a project known as the 1982 River/Bay Monitoring Project; and

WHEREAS METRO is voluntarily functioning as coordinator for the various federal, state, and regional and industrial organizations that are voluntarily contributing personnel, financial, and equipment support towards the said project; and

WHEREAS the Agency shall be a member of the 1982 River/Bay Monitoring Project Steering Committee;

NOW THEREFORE, by and in consideration of the covenants hereinafter expressed, the AGENCY and the METRO mutually agree as follows:

1. PROJECT - The Project referred to herein is known as the 1982 River/Bay Monitoring Project which consists of voluntary cooperative efforts by numerous federal, state, regional, industrial, and consulting engineer organizations to establish existing water quality characteristics such as currents, temperatures, dissolved oxygen, pH, sediment oxygen demands, and other parameters in the Lower Fox River and waters of Green Bay.

2. COMPENSATION - (a) The AGENCY desires to contribute and will contribute the sum of $2,800.00 to METRO as a contribution toward the costs of completing the said project.
(b) The stated $2,800.00 will be paid to METRO and METRO will apply this sum to a separate fund which has been established within the METRO accounting system for purposes of isolating and recording all monetary contributions by METRO and others, including the $2,800.00 from the AGENCY.
(c) Disbursements by METRO from this separate fund are for the sole purpose of financially supporting River/Bay Monitoring Project expenses such as hardware, salaries, services, and expendables as are approved by METRO and the other contributors.
(d) The $2,800.00 contributed by the AGENCY will be disbursed from the separate fund only for those purposes approved by the AGENCY prior to disbursal and as shown on the attached Budget Summary.

3. TIME OF PERFORMANCE - The portion of the project supported by the AGENCY is scheduled to run from September 1, 1982 to December 30, 1982. This Agreement will terminate December 30, 1982.

4. METHOD OF PAYMENT - The AGENCY will forward payment of the entire sum of $2,800.00 to METRO within ten (10) days of execution of this Agreement, to be deposited in the METRO separate fund as specified herein. It is expressly understood and agreed that in no event will the AGENCY contribution exceed the $2,800.00 stated.

5. RESPONSIBLE STAFF MEMBERS - William Elman of the AGENCY and Robert W. Bues of METRO will be directly responsible for interagency coordination and the proper conduct of this Agreement.

6. TERMINATION OF AGREEMENT - If for any cause, METRO or the AGENCY shall fail to fulfill their obligations, or if METRO or the AGENCY violate any part of this Agreement, the aggrieved party may notify the alleged violator of their intent to terminate this Agreement. If the violation has not been corrected within thirty (30) days of the notice, the aggrieved party shall have the right to terminate this Agreement by given written notice to the party who has allegedly violated terms of the Agreement at least ten (10) days prior to the date of the termination.

7. INTEREST OF MEMBERS OF THE AGENCY AND OTHERS - No officer, member, or employee of the AGENCY or METRO and no members of their governing bodies shall participate in any decision relating to this Agreement which affects their personal interests or the interest of any corporation, partnership, or association in which said persons are directly or indirectly interested or have any personal or pecuniary interest, direct or indirect, in this Agrsement or the proceeds thereof.

8. OFFICIALS NOT TO BENEFIT - No members of or Delegate to the Congress of the United States of America, and no Resident Commission, shall be admitted to any share or part hereof or to any benefit to arise herefrom.

9. U.S. EPA FUNDING AND PARTICIPATION - This Agreement is funded in part by a grant from the U.S. Environmental Protection Agency. This Agreement is subject to regulations contained in 40 CFR Subchapter B and particularly Part 33 thereof. Neither the United States nor the U.S. Environmental Protection Agency is a party to this Agreement.

10. RIGHTS TO DATA - It is understood by all parties contributing personnel, equipment, supplies, personnel or financial support to the project, that all data, tapes, recordings, logs, or any information collected, stored, evaluated, printed, or otherwise acquired during the completion of the project shall be public property, including the public right to use, duplicate, and disclose in whole or in part, in any manner for any purpose, or to have others do so. METRO or the AGENCY do not claim any exclusive rights, privileges, or access to said data acquired during the term of the project. METRO does not have nor will it have responsibility to copy, transfer, store, collect, or file any project data, nor does METRO accept or assume any responsibility for representing or organizing the project data in any form suitable for use on any subsequent study, survey, or filing other than to preserve raw field data with reasonable diligence and care, and to transfer said raw field data to the custody of a duly designated depository.

IN WITNESS WHEREOF, the AGENCY and METRO have caused this Agreement to be executed as of the date first written above.

GREEN BAY METROPOLITAN SEWERAGE DISTRICT

Robert W. Bues
Project Director

Fred Whiting
Project Coordinator
River/Bay Study

9/21/82
Date

FOX VALLEY WATER QUALITY PLANNING AGENCY

Kathleen Propp
Chairman

William R. Elman
Executive Director

9/24/82
Date

BUDGET SUMMARY
1982 River/Bay Monitoring Project

Item	GBMSD	FVWQPA	IRSC	Other	Total
Hardware	$37,500.00			8,000.00	$45,500.00
Independent Water Quality Analysis			40,500.00		40,500.00
Service Contracts					
USGS	3,850.00				3,850.00
UW-Mil-Lee	70,850.00				70,850.00
UW-GB-Harris	17,460.00				17,850.00
UW-GB-Sager	2,300.00				2,300.00
Green Bay Western Railroads	160.00				160.00
Development of Data Library	3,777.00	2,800.00			6,577.00
	$135,897.00	$2,800.00	$40,500.00	$8,000.00	$187,197.00

MONMOUTH COUNTY HEALTH DEPARTMENT AND

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

COOPERATIVE MONITORING AGREEMENT

between

Monmouth County Health Department

and

New Jersey Department of Environmental Protection

The rapid expansion and increasing complexity of water monitoring needs in New Jersey necessitates improved coordination and planning among all agencies involved. In recognition of this need, the Monmouth County Health Department and the New Jersey Department of Environmental Protection hereby agree to cooperate in the most effective and efficient use of their respective water monitoring, laboratory analysis, and data management resources.

It is hereby agreed that the attached delineation of responsibilities and summary of respective agency water monitoring activities accurately describes the cooperative program for the year 1983, and represents the most effective utilization of the combined resources available to the participants.

1983

COOPERATIVE WATER MONITORING PROGRAM

The following information represents the planned contributions from the respective agencies for water monitoring during the year 1983. It is understood that resource availability and program emphases may shift during the period of the agreement. Accordingly, the program shall be reviewed jointly on a quarterly basis, and revisions made on notification of the cooperating agency.

I. Routine Surface Water Monitoring

A. Monmouth County Health Department agrees to monitor and analyze samples from 47 stations throughout the county for bacteriological and chemical parameters as per Appendix 1. Stations will be sampled on a monthly basis. Data will be maintained in paper files and made available to DEP on a request basis.

B. N.J.D.E.P. agrees to monitor and analyze samples from 13 stations throughout the county for bacteriological and chemical parameters as per Appendix 2. Data will be stored on STORETand made available to the county on request.

C. N.J.D.E.P. agrees to provide technical assistance to the county in designing and evaluating monitoring networks, training and evaluating field procedures, and developing and implementing computer compatible data management practices.

II. Recreational/Bathing Area Monitoring Network

A. The county health department agrees to monitor recreational and bathing area waters ($\simeq$19 locations) for bacteriological quality during the period May 15 - September 15 on a weekly basis. Data will be stored on file and made available to DEP for incorporation into the C.C.M.P. report.

B. N.J.D.E.P. agrees to provide technical assistance in network design, field procedures, and data management.

C. N.J.D.E.P. agrees to include county data in its annual C.C.M.P. Report, and forward a copy of the report to the health department on an annual basis.

III. Potable Water Network

A. The county health department agrees to monitor potable water supplies at seventeen (17) locations identified in Appendix 3, for Safe Drinking Water Act compliance on a quarterly basis.

B. N.J.D.E.P. agrees to provide technical assistance in evaluating data.

IV. Landfill Monitoring

A. The county health department agrees to monitor ovservation wells at the Howell Municipal Landfill on a quarterly basis for those parameters required by the Division of Waste Managemnt. Data will be submitted to the Department of Environmental Protection in accordance with regulation requirements.

B. N.J.D.E.P. agrees to provide technical assistance in data evaluation and problem identification.

V. Intensive Surface Water Surveys

A. The county health department agrees to conduct streamwalk surveys on sixteen stream segments.

B. N.J.D.E.P. agrees to provide technical assistance and follow-up evaluation on problems identified in these surveys.

IV. Laboratory Services/Quality Assurance

A. The county health department agrees to develop laboratory capabilities consistent with monitoring program needs and available resources. Quality assurance practices in field procedures, laboratory analysis, and data management will be employed to insure the integrity and validity of generated data.

B. NJDEP agrees to provide technical support guidance, and training as requested by the county to assist in the development and implementation of appropriate laboratory, data management, and field monitoring capabilities and procedures.

APPENDIX C

GUIDANCE FOR PREPARATION OF COMBINED WORK/QUALITY ASSURANCE PROJECT PLANS FOR ENVIRONMENTAL MONITORING

(ORWS QA - 1)

OFFICE OF WATER REGULATIONS AND STANDARDS
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

May, 1984

FORMAT AND DESCRIPTION FOR WORK/QA PROJECT PLAN

Title Page (With Project Officer, QA Officer and Agency/Division Director Signatures.)*

1. Project Name

2. Project Requested By

3. Date of Request

4. Date of Project Initiation

5. Project Officer

6. Quality Assurance Officer

7. Project Description

The purpose of the project description is to define the objectives (goals) of the project and describe how the project will be designed to obtain the information needed to accomplish the project goals. The project description should consist of the following:

A. Objective and Scope Statement

This section should consist of a comprehensive statement addressing the project's objective (purpose) and an overview of the project's scope (activities). Background information pertaining to the project (i.e., reconnaissance information) should be included.

* The exact format of this page will vary according to specific State organizations and their designated responsible individuals.

B. Data Usage

This section should consist of a comprehensive statement outlining the intended data usage. It is important to clearly indicate this usage so that suitable sampling, analytical and QA/QC protocols are selected. When applicable, secondary uses of the data should be identified. The following are examples of data uses:

- verify self-monitoring data;
- verify compliance with NPDES permit;
- support permit reissuance and /or revision;
- support other program elements such as water quality standards; and
- possible usage in an enforcement action.

C. Monitoring Network Design and Rationale

This section should address the design of the overall monitoring system, the specific locations of the sampling sites, and the justification for the overall monitoring network design. As discussed in Section II, data representativeness, comparability, and completeness should be considered an integral part of the monitoring design. Other relevant factors which influence the design of the monitoring network should also be considered and reflected in the plan (e.g., homogeneity of the system under investigation, accessibility of the sampling area, stream flow conditions, tidal fluctuation, weather conditions).

D. Monitoring Parameters and Frequency of Collection

This section should discuss the types of parameters to be collected at the various sampling sites. This may be done in tabular form provided the following information is listed:

- sampling site location (e.g. latitude/longitude, River Mile Index, Depth);
- type of sample (e.g.. grab sample, cross-sectional stream composite sample);
- sample matrix (e.g., stream surface water, river bottom sediment);
- parameters to be analyzed (e.g., copper, lead); and
- sampling frequency.

"Type of sample" should be only a brief description. A detailed description of the sample collection method will be addressed in Item 12.

E. Parameter Table

This table should provide the following information for each parameter analyzed:

- sample matrix;
- analytical method reference; and
- sample holding time.

The analytical method reference must correspond to that specific procedure which is followed in the laboratory for the analysis of that parameter in that matrix. If an EPA-approved method is used, a citation of the method's reference is sufficient. If no EPA-approved method is available or if the method to be used is a modification of an EPA-approved method, the method must be validated and documented in detail. The documented method should be made part of the project plan by either incorporation into the laboratory's Standard Operating Procedures (SOP's) or by becoming an attachment to the project plan.

8. Project Fiscal Information (Optional)*

To aid in the planning, control, and the allocation of existing resources and to assist in the documentation and justification for future resources, the financial requirements/expenditures for travel, per diem, mileage, salaries and benefits, clerical services, expendable supplies, laboratory services and any outside contractual arrangements should be delineated. In addition, major equipment items such as automobiles, trucks, boats, helicopters, drilling equipment, special safety equipment, etc., required to implement the study plan for the project, should be specified and the source and cost of each item identified. A factor for administrative overhead cost may also be computed to complete the fiscal picture.

9. Schedule of Tasks and Products

The progress of the project from conception to implementation should be followed. It is necessary to plot each phase of the project contained in the project schedule, from initial request to final project report.

* This section is optional depending on existing State procedures.

This includes:

- the date of the request which initiates the project;
- the date by which the project plan will be submitted to all interested parties;
- the date by which comments on the plan are to be received by the project officer;
- the date(s) of the field reconnaissance;
- the date(s) of the field sampling activities;
- the date(s) the samples will be submitted to the laboratory for analysis;
- the date(s) by which all analyses are to be completed and the data submitted to the project officer;
- the date(s) the data will be entered into STORET or other computerized systems;
- the date of the completion of the draft interim/final project report;
- the date by which the reviewers' comments on the report(s) must be received;
- the date for completion of the peer review process; and
- the date for the issuance of the final project report.

Each step in this process should be scheduled in an objective and realistic time frame to assure that adequate attention is devoted to the minimization of effort and the maximization of information.

10. Project Organization and Responsibility

In order for a monitoring study to proceed smoothly and yield valid and useable data, it is essential that all individuals are clearly informed.

of their responsibilities. The Project Organization and Responsibility Section of the Work/QA Project Plan should, at a minimum, identify key individuals responsible for:

- sampling operations
- sampling QC.
- laboratory analyses
- laboratory QC.
- data processing activities
- data processing QC.
- data quality review
- performance auditing
- systems auditing (on-site evaluations)
- overall QA
- overall project coordination

It is often useful on a project to indicate how these individuals relate in the organization(s). An organizational chart is a convenient way of illustrating this.

For each key individual named, a brief sentence or two explaining that individual's responsibility should suffice. Telephone numbers should be listed with the key individuals in order to facilitate communications.

Where there are several different monitoring institutions or subcontractors involved, complete addresses should be provided.

11. <u>Data Quality Requirements and Assessments</u>

It is important in project planning that a cooperative effort be undertaken by the project officer, sampling, and analytical personnel to define what levels of quality shall be required for the data. These data quality requirements shall be based on a common understanding of the intended use of the data, the measurement process, and availability of resources. Once data quality requirements are clearly established, QC protocols shall be defined for measuring whether these requirements are being met during the study.

As a minimum, requirements should be specified for detection/quantitation limits, precision, and accuracy for all types of measurements, where these are appropriate. A procedure for determining method detection limits is covered in "Methods for Organic Chemical Analysis for Municipal and Industrial Wastewater," EPA 600/4-82-057.

Customarily, laboratory personnel provide the project officer with method options covering a given parameter and type of sample. These options are accompanied by respective detection/quantitation limits and statements of precision and accuracy. Once the method options are selected, the detection/quantitation limit, precision, and accuracy requirements should be incorporated into the Work/QA Project Plan. Along with each requirement, there should be a protocol for monitoring whether these requirements were met. For example, intralaboratory precision can be monitored by using replicate samples. Accuracy can be monitored with the use of field and method blanks, spikes, surrogate spikes, National Bureau of Standards' Standard Reference Materials (SRM's), EPA QC reference samples, etc.

Wherever possible criteria should be set for the "total measurement." This could be accomplished, for example, with the use of field replicate samples.

Frequency of QC sample analysis and statistical reporting units shall be defined in the Work/QA Project Plan.

When discussing data quality requirements, consideration should also be given to data representativeness, comparability, and completeness.

- Representativeness is a quality characteristic. For most water monitoring studies, it should be considered a goal to be achieved rather than a characteristic which can be described in quantitative terms. An example of the need for representativeness is in the planning for the collection of surface water samples from a stream and the subsequent use of the data for determining wasteload allocations. The question to be addressed is how the sample will be collected to ensure its relationship to the stream characteristics (i.e., the taking of grab samples in a restricted zone of the stream compared to a complete transect sampling).

- Comparability is also a quality characteristic which must be considered in study planning. Depending on the end use of data, comparability must be assured in the project in terms of sampling plans, analytical methodology, quality control, data reporting, etc. For example, a comparability question would be whether analysis based on different portions of fish are comparable (i.e., whole versus edible portions).

- Completeness is a measure of all information necessary for a valid scientific study. A useful way to evaluate completeness is to carefully compare project objectives with the proposed data acquisition and resulting potential "short falls" in needed information. Generally, it is not useful to try and measure this in quantitative terms for most water monitoring projects.

12. Sampling Procedures

For each environmental parameter or parameter group to be measured, a complete description of the sampling procedure must be documented. Included as vital elements in the sampling documentation should be: inclusion of specific sampling procedures (by reference to Standard Operating Procedures or by detailed descriptions of state-of-the-art methods, where used); flow diagrams or tracking mechanisms to chart sampling operations; and descriptions of sampling devices, sampling containers, preservation techniques, sample holding times and sample identification forms.

13. Sample Custody Procedures

Sample custody is a vital aspect of any monitoring program generating data which may be used as evidence in a court of law. In this regard, proper procedures for the acquisition, possession, and analysis of samples for documenting violations of State and/or Federal regulations and/or statutes are vital to the acceptance of such data in court. This area is generally referred to as the "chain-of-custody of samples".

If the intended use of the data generated from this monitoring project is enforcement related (see Item 7B), then a detailed description of the sample handling procedures utilized in the field, as well as the laboratory, must be documented. This procedure may be made part of the project plan or, if documented in the Standard Operating Procedures (SOP) manual (both sampling and laboratory SOP's), it may be incorporated by reference.

When documenting the sample chain-of-custody procedures, the following information should be included:

1. Since chain-of-custody begins with the cleaning of the sample containers to be used, a written record of the laboratory's source and manner of preparation of all sample containers should be referenced. This should include the laboratory's quality control procedures for assuring that the "cleaned" containers are truly decontaminated.
2. A detailed description of how sample containers are handled (in both the field and laboratory) to prevent either inadvertent contamination or potential opportunities for tampering.
3. An example of the chain-of-custody form should be included with an explanation of the signing procedure.

14. Calibration Procedures and Preventive Maintenance

The purpose of this section is to document, by describing in detail or referencing the appropriate SOP, methods which are utilized to assure that field and laboratory equipment are functioning optimally. The frequency of application of these methods should also be appropriately recorded.

Exhibits 14.1 and 14.2 are examples of check lists for field and laboratory equipment.

An equipment log book is to be maintained in addition to the check list. The equipment log book should remain with the piece of equipment except when the equipment is sent out for repairs. The log book should contain records of usage maintenance, calibration, and repairs.

Exhibit 14.1

Field Equipment Check List Example

Automatic Sample	Task	Frequency
Battery	Clean and charge	After each sampling
Pump Tubing	Soak, scrub, rinse	After each sampling
Discharge Tube	Soak, scrub, rinse	After each sampling
Splash Shield	Scrub, rinse	After each sampling
Bottles	Clean, rinse, dry	After each sampling
Intake Nozzle	Disassemble, clean, rinse	After each sampling

Exhibit 14.2

Laboratory Equipment Check List Example

Absorption Spectrophotometer	Frequency	Identify Each Sample Number and Date
Calibrate against standard	Each nth determination	Standard number 5. 11/10/82

15. Documentation, Data Reduction and Reporting

The purpose of this section is to describe documentation, data reduction, and reporting:

A. Documentation - There must be adequate documentation available with all data. This is necessary to help in fully interpreting the data as well as to protect it against legal and scientific challenges. Records must be legible, complete and properly organized. In some cases, they must be protected, using a document control system.

In the Work/QA Project Plan, SOP's should be referenced or included which define the type of record to be maintained as well as indicating where and how records will be stored.

B. Data Reduction and Reporting - "Paper work" errors are commonly found in the calculations, reductions and transfer of data to various forms and reports and transmittal of data into data storage systems. Quality control procedures should be carefully designed to eliminate errors during these steps. Calculation procedures should be described, to the extent possible, in analytical SOP's. SOP's should be referenced in the Work/QA Project Plan which describe review and cross-check procedures for calculations. Also, the SOP's should completely cover the step-wise procedures for entering data onto various forms and into computer systems. In addition to handling data, procedures should cover routine data transfer and entry validation checks. Where data forms are used, they should be included in the SOP's.

16. Data Validation

Each program must establish technically sound and documented data validation criteria which will serve to accept/reject data in a uniform and consistent manner.

Data validation can be envisioned as a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use.

Data validation is, of necessity, conducted "after the fact." It requires that the techniques utilized are applied to the body of the data in a systematic and uniform manner. The process of data validation must be close to the origin of the data, independent of the data production process, and objective in approach.

Criteria for data validation must include checks for internal consistency, checks for transmittal errors, checks for verification of laboratory capability, etc. These criteria involve utilization of techniques such as interpretation of the results of: external performance evaluation audits; split sample analyses; duplicate sample analysis (field and laboratory); spiked addition recoveries; instrument calibrations; detection limits; intra-laboratory comparisons; inter-laboratory comparisons; tests for normality; tests for outliers; and data base entry checks.

17. <u>Performance and System Audits</u>

Performance and systems audits are an essential part of every quality control program. A performance audit independently collects measurement data using performance evaluation samples. A systems audit consists of a review of the total data production process which includes on-site reviews of a field and laboratory's operational systems and physical facilities for sampling, calibration and measurement protocols.

To the extent possible, these audits should be conducted by individuals who are not directly involved in the measurement process. Audits serve three purposes:

(1) to determine if a particular group has the capability to conduct the monitoring before the project is initiated;

(2) to verify that the QA Project Plan and associated SOP's are being implemented; and

(3) to detect and define problems so that immediate corrective action can begin.

A Work/QA Project Plan should specify who will conduct the audit, what protocol will be used, what the acceptance criteria will be and to whom the audit reports will go. Generally, the dates for conducting the audits should be listed unless it is decided to conduct these unannounced. Performance evaluation samples produced by EPA can be used as a type of performance audit. These samples can also be obtained from the National Bureau of Standards, United States Geological Survey commercial sources or in-house sources. Generally, it should not be necessary to conduct these audits if the group being tested has successfully performed within the last 6 months for the particular parameters in question.

18. Corrective Action

A corrective action program, which must have the capability to discern errors or defects at any point in the project implementation process, is an essential management tool for both project coordination and Quality Assurance/Quality Control activities.

A plausible corrective action scheme must be designed to identify defects, tally defects, trace defects to their source, plan and implement measures to correct identified defects, maintain documentation of the results of the corrective process, and continue the process until each defect is eliminated.

Each organization must develop a corrective action protocol which is technically effective as well as administratively compatible.

19. Reports

Formal reports must be issued to inform appropriate management personnel of progress in the execution of the work plan. The reports should include an assessment of the status of the project in relation to the proposed time table. The reports should also address any results of ongoing performance and systems audits, data quality assessments and significant quality assurance problems with proposed corrective action procedures.

The final report shall be issued, consistent with the rationale for executing the Work/QA Project Plan. The report shall also include appropriate data quality assessment.