KENTUCKY COMBINED SEWER OVERFLOW CONTROL STRATEGY

1997

Preface

Kentucky first developed a combined sewer overflow control strategy in January, 1990. This update incorporates the Federal EPA Combined Sewer Overflow Control Policy published in the Federal Register, April 19, 1994 to ensure consistency with the national strategy. Also, the ORSANCO Strategy for Monitoring Impacts of Combined Sewer Overflows on the Ohio River is included as part of Kentucky's CSO strategy. This is a coordinated effort that Kentucky supports in order to determine and address the CSO impacts on the Ohio River.

Finally, attached is a listing of the Kentucky combined sewer systems(CSS), number of CSO points, and the effective date and expiration date of their permit. This listing is updated periodically as the status of each system changes.

Kentucky Combined Sewer Overflow Strategy

The initial phase of addressing a community's combined sewer impact is to inventory and characterize the existing conditions. The initial goal of the program is to comply with the nine minimum controls of the Federal policy(Appendix I). Basic information such as volume and frequency of overflows needs to be collected. Specific water quality data for indicator parameters should be collected for representative outfalls as well as above and below in-stream data to establish background values. A reliable set of initial data is needed for comparison to future values as system controls are implemented.

Each community is expected to submit a Combined Sewer Operational Plan (CSOP) which will initially address the nine minimum controls and ultimately include a long term plan to implement controls to either eliminate or minimize combined sewer overflow (CSO) impacts in accordance with the Federal policy(Appendix I). Additionally, an annual report is to be submitted which will update the status of the plan implementation and incorporate any necessary revisions. Plans for each CSO community, although addressing the same basic information, will differ relative to specific and detailed information due to the variations of the combined systems. The larger systems by nature are more complex and, therefore, the plans will be more complex. Each community's schedule of implementation and compliance will have to be derived on an individual basis. Prioritization is important and progress is the goal.

Combined sewers by nature are effected by wet weather. Therefore, communities addressing combined sewers by neccessity find they must deal with storm water. This includes not only storm water within the combined sewer system of the community, but storm water infiltration/inflow contributions from separate sanitary portions of the sewer system physically located outside of the combined system, but ultimately connected on its way to the treatment facility. Coordination is very important and is best addressed by one agency or authority responsible for both sanitary and storm water throughout the service area of the community.

Of the seventeen (17) CSO communities, nine (9) directly effect the Ohio River representing 88% of the total CSOs throughout the state. Therefore, coordination with ORSANCO is important and, hence, incorporation of the ORSANCO strategy is included as part of the Kentucky strategy(Appendix II). Communication between the various agencies is critical and cooperation with the wet weather studies along the Ohio River will ensure nonduplicative effort as well as effective results when looking at the impacts of wet weather contributions in the entire basin. This is especially important with the current emphasis toward watershed management.

Performance measures will be incorporated as developed indicating progress of the permittee's plan implementation. Development of these measures must be coordinated with the Federal EPA to ensure consistency with the CSO policy goals and objectives. Communication with the permittees is important to ensure information collected during the plan implementation will adequately reflect the required performance measure(s).

Appendix I
KYCSO Strategy

[Federal Register: April 19, 1994]

Combined Sewer Overflow (CSO) Control Policy

I. Introduction

A. Purpose and Principles

The main purposes of this Policy are to elaborate on EPA's National Combined Sewer Overflow (CSO) Control Strategy published on September 8, 1989 at 54 FR 37370 (1989 Strategy) and to expedite compliance with the requirements of the Clean Water Act (CWA). While implementation of the 1989 Strategy has resulted in progress toward controlling CSOs, significant water quality risks remain.

A combined sewer system (CSS) is a wastewater collection system owned by a State or municipality (as defined by section 502(4) of the CWA) which conveys sanitary wastewaters (domestic, commercial and industrial wastewaters) and storm water through a single-pipe system to a Publicly Owned Treatment Works (POTW) Treatment Plant (as defined in 40 CFR 403.3(p)). A CSO is the discharge from a CSS at a point prior to the POTW Treatment Plant. CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality- based requirements of the CWA. CSOs are not subject to secondary treatment requirements applicable to POTWs.

CSOs consist of mixtures of domestic sewage, industrial and commercial wastewaters, and storm water runoff. CSOs often contain high levels of suspended solids, pathogenic microorganisms, toxic pollutants, floatables, nutrients, oxygen-demanding organic compounds, oil and grease, and other pollutants. CSOs can cause exceedances of water quality standards (WQS). Such exceedances may pose risks to human health, threaten aquatic life and its habitat, and impair the use and enjoyment of the Nation's waterways.

This Policy is intended to provide guidance to permittees with CSOs, National Pollutant Discharge Elimination System (NPDES) permitting authorities, State water quality standards authorities and enforcement authorities. The purpose of the Policy is to coordinate the planning, selection, design and implementation of CSO management practices and controls to meet the requirements of the CWA and to involve the public fully during the decision making process.

This Policy reiterates the objectives of the 1989 Strategy:

1. To ensure that if CSOs occur, they are only as a result of wet weather;
2. To bring all wet weather CSO discharge points into compliance with the technology-based and water quality-based requirements of the CWA; and
3. To minimize water quality, aquatic biota, and human health impacts from CSOs.

This CSO Control Policy represents a comprehensive national strategy to ensure that municipalities, permitting authorities, water quality standards authorities and the public engage in a comprehensive and coordinated planning effort to achieve cost-effective CSO controls that ultimately meet appropriate health and environmental objectives and requirements. The Policy recognizes the site-specific nature of CSOs and their impacts and provides the necessary flexibility to tailor controls to local situations. Four key principles of the Policy ensure that CSO controls are cost-effective and meet the objectives of the CWA. The key principles are:

1. Providing clear levels of control that would be presumed to meet appropriate health and environmental objectives;
2. Providing sufficient flexibility to municipalities, especially financially disadvantaged communities, to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements;

3. Allowing a phased approach to implementation of CSO controls considering a community's financial capability; and
4. Review and revision, as appropriate, of water quality standards and their implementation procedures when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs.

This Policy is being issued in support of EPA's regulations and policy initiatives. This Policy is Agency guidance only and does not establish or affect legal rights or obligations. It does not establish a binding norm and is not finally determinative of the issues addressed. Agency decisions in any particular case will be made by applying the law and regulations on the basis of specific facts when permits are issued. The Administration has recommended that the 1994 amendments to the CWA endorse this final Policy.

B. Application of Policy

The permitting provisions of this Policy apply to all CSSs that overflow as a result of storm water flow, including snow melt runoff (40 CFR 122.26(b)(13)). Discharges from CSSs during dry weather are prohibited by the CWA. Accordingly, the permitting provisions of this Policy do not apply to CSOs during dry weather. Dry weather flow is the flow in a combined sewer that results from domestic sewage, groundwater infiltration, commercial and industrial wastewaters, and any other non-precipitation related flows (e.g., tidal infiltration). In addition to the permitting provisions, the Enforcement and Compliance section of this Policy describes an enforcement initiative being developed for overflows that occur during dry weather.

Consistent with the 1989 Strategy, 30 States that submitted CSO permitting strategies have received EPA approval or, in the case of one State, conditional approval of its strategy. States and EPA Regional Offices should review these strategies and negotiate appropriate revisions to them to implement this Policy. Permitting authorities are encouraged to evaluate water pollution control needs on a watershed management basis and coordinate CSO control efforts with other point and nonpoint source control activities.

C. Effect on Current CSO Control Efforts

EPA recognizes that extensive work has been done by many Regions, States, and municipalities to abate CSOs. As such, portions of this Policy may already have been addressed by permittees' previous efforts to control CSOs. Therefore, portions of this Policy may not apply, as determined by the permitting authority on a case-by-case basis, under the following circumstances:

1. Any permittee that, on the date of publication of this final Policy, has completed or substantially completed construction of CSO control facilities that are designed to meet WQS and protect designated uses, and where it has been determined that WQS are being or will be attained, is not covered by the initial planning and construction provisions in this Policy; however, the operational plan and post-construction monitoring provisions continue to apply. If, after monitoring, it is determined that WQS are not being attained, the permittee should be required to submit a revised CSO control plan that, once implemented, will attain WQS.
2. Any permittee that, on the date of publication of this final Policy, has substantially developed or is implementing a CSO control program pursuant to an existing permit or enforcement order, and such program is considered by the NPDES permitting authority to be adequate to meet WQS and protect designated uses and is reasonably equivalent to the treatment objectives of this Policy, should complete those facilities without further planning activities otherwise expected by this Policy. Such programs, however, should be reviewed and modified to be consistent with the sensitive area, financial capability, and post-construction monitoring provisions of this Policy.

3. Any permittee that has previously constructed CSO control facilities in an effort to comply with WQS but has failed to meet such applicable standards or to protect designated uses due to remaining CSOs may receive consideration for such efforts in future permits or enforceable orders for long-term CSO control planning, design and implementation.

In the case of any ongoing or substantially completed CSO control effort, the NPDES permit or other enforceable mechanism, as appropriate, should be revised to include all appropriate permit requirements consistent with Section IV.B. of this Policy.

D. Small System Considerations

The scope of the long-term CSO control plan, including the characterization, monitoring and modeling, and evaluation of alternatives portions of this Policy may be difficult for some small CSSs. At the discretion of the NPDES Authority, jurisdictions with populations under 75,000 may not need to complete each of the formal steps outlined in Section II.C. of this Policy, but should be required through their permits or other enforceable mechanisms to comply with the nine minimum controls (II.B), public participation (II.C.2), and sensitive areas (II.C.3) portions of this Policy. In addition, the permittee may propose to implement any of the criteria contained in this Policy for evaluation of alternatives described in II.C.4. Following approval of the proposed plan, such jurisdictions should construct the control projects and propose a monitoring program sufficient to determine whether WQS are attained and designated uses are protected.

In developing long-term CSO control plans based on the small system considerations discussed in the preceding paragraph, permittees are encouraged to discuss the scope of their long-term CSO control plan with the WQS authority and the NPDES authority. These discussions will ensure that the plan includes sufficient information to enable the permitting authority to identify the appropriate CSO controls.

E. Implementation Responsibilities

NPDES authorities (authorized States or EPA Regional Offices, as appropriate) are responsible for implementing this Policy. It is their responsibility to assure that CSO permittees develop long-term CSO control plans and that NPDES permits meet the requirements of the CWA. Further, they are responsible for coordinating the review of the long- term CSO control plan and the development of the permit with the WQS authority to determine if revisions to the WQS are appropriate. In addition, they should determine the appropriate vehicle (i.e., permit reissuance, information request under CWA section 308 or State equivalent or enforcement action) to ensure that compliance with the CWA is achieved as soon as practicable.

Permittees are responsible for documenting the implementation of the nine minimum controls and developing and implementing a long-term CSO control plan, as described in this Policy. EPA recognizes that financial considerations are a major factor affecting the implementation of CSO controls. For that reason, this Policy allows consideration of a permittee's financial capability in connection with the long-term CSO control planning effort, WQS review, and negotiation of enforceable schedules. However, each permittee is ultimately responsible for aggressively pursuing financial arrangements for the implementation of its long-term CSO control plan. As part of this effort, communities should apply to their State Revolving Fund program, or other assistance programs as appropriate, for financial assistance. EPA and the States will undertake action to assure that all permittees with CSSs are subject to a consistent review in the permit development process, have permit requirements that achieve compliance with the CWA, and are subject to enforceable schedules that require the earliest practicable compliance date considering physical and financial feasibility.

F. Policy Development

This Policy devotes a separate section to each step involved in developing and implementing CSO controls. This is not to imply that each function occurs separately. Rather, the entire process surrounding CSO controls, community planning, WQS and permit development/revision, enforcement/compliance actions and public participation must be coordinated to control CSOs effectively. Permittees and permitting authorities are encouraged to consider innovative and alternative approaches and technologies that achieve the objectives of this Policy and the CWA.

In developing this Policy, EPA has included information on what responsible parties are expected to accomplish. Subsequent documents will provide additional guidance on how the objectives of this Policy should be met. These documents will provide further guidance on: CSO permit writing, the nine minimum controls, long-term CSO control plans, financial capability, sewer system characterization and receiving water monitoring and modeling, and application of WQS to CSO-impacted waters. For most CSO control efforts however, sufficient detail has been included in this Policy to begin immediate implementation of its provisions.

II. EPA Objectives for Permittees

A. Overview

Permittees with CSSs that have CSOs should immediately undertake a process to accurately characterize their sewer systems, to demonstrate implementation of the nine minimum controls, and to develop a long-term CSO control plan.

B. Implementation of the Nine Minimum Controls

Permittees with CSOs should submit appropriate documentation demonstrating implementation of the nine minimum controls, including any proposed schedules for completing minor construction activities. The nine minimum controls are:

1. Proper operation and regular maintenance programs for the sewer system and the CSOs;
2. Maximum use of the collection system for storage;
3. Review and modification of pretreatment requirements to assure CSO impacts are minimized;
4. Maximization of flow to the POTW for treatment;
5. Prohibition of CSOs during dry weather;
6. Control of solid and floatable materials in CSOs;
7. Pollution prevention;
8. Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts; and
9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

Selection and implementation of actual control measures should be based on site-specific considerations including the specific CSS's characteristics discussed under the sewer system characterization and monitoring portions of this Policy. Documentation of the nine minimum controls may include operation and maintenance plans, revised sewer use ordinances for industrial users, sewer system inspection reports, infiltration/inflow studies, pollution prevention programs, public notification plans, and facility plans for maximizing the capacities of the existing collection, storage and treatment systems, as well as contracts and schedules for minor construction programs for improving the existing system's operation. The permittee should also submit any information or data on the degree to which the nine minimum controls achieve compliance with water quality standards. These data and information should include results made available through monitoring and modeling activities done in

conjunction with the development of the long-term CSO control plan described in this Policy.

This documentation should be submitted as soon as practicable, but no later than two years after the requirement to submit such documentation is included in an NPDES permit or other enforceable mechanism. Implementation of the nine minimum controls with appropriate documentation should be completed as soon as practicable but no later than January 1, 1997. These dates should be included in an appropriate enforceable mechanism.

Because the CWA requires immediate compliance with technology-based controls (section 301(b)), which on a Best Professional Judgment basis should include the nine minimum controls, a compliance schedule for implementing the nine minimum controls, if necessary, should be included in an appropriate enforceable mechanism.

C. Long-Term CSO Control Plan

Permittees with CSOs are responsible for developing and implementing long-term CSO control plans that will ultimately result in compliance with the requirements of the CWA. The long-term plans should consider the site-specific nature of CSOs and evaluate the cost effectiveness of a range of control options/strategies. The development of the long-term CSO control plan and its subsequent implementation should also be coordinated with the NPDES authority and the State authority responsible for reviewing and revising the State's WQS. The selected controls should be designed to allow cost effective expansion or cost effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS, including existing and designated uses.

This policy identifies EPA's major objectives for the long-term CSO control plan. Permittees should develop and submit this long-term CSO control plan as soon as practicable, but generally within two years after the date of the NPDES permit provision, Section 308 information request, or enforcement action requiring the permittee to develop the plan. NPDES authorities may establish a longer timetable for completion of the long-term CSO control plan on a case- by-case basis to account for site-specific factors which may influence the complexity of the planning process. Once agreed upon, these dates should be included in an appropriate enforceable mechanism.

EPA expects each long-term CSO control plan to utilize appropriate information to address the following minimum elements. The Plan should also include both fixed-date project implementation schedules (which may be phased) and a financing plan to design and construct the project as soon as practicable. The minimum elements of the long-term CSO control plan are described below.

1. Characterization, Monitoring, and Modeling of the Combined Sewer System

In order to design a CSO control plan adequate to meet the requirements of the CWA, a permittee should have a thorough understanding of its sewer system, the response of the system to various precipitation events, the characteristics of the overflows, and the water quality impacts that result from CSOs. The permittee should adequately characterize through monitoring, modeling, and other means as appropriate, for a range of storm events, the response of its sewer system to wet weather events including the number, location and frequency of CSOs, volume, concentration and mass of pollutants discharged and the impacts of the CSOs on the receiving waters and their designated uses. The permittee may need to consider information on the contribution and importance of other pollution sources in order to develop a final plan designed to meet water quality standards. The purpose of the system characterization, monitoring and modeling program initially is to assist the permittee in developing appropriate measures to implement the nine minimum controls and, if necessary, to support development of the long-term CSO control plan. The monitoring and modeling data also will be used to evaluate the expected effectiveness of both the nine minimum controls and, if necessary, the long-term CSO controls, to meet WQS.

The major elements of a sewer system characterization are described below.

a. Rainfall Records--The permittee should examine the complete rainfall record for the geographic area of its existing CSS using sound statistical procedures and best available data. The

permittee should evaluate flow variations in the receiving water body to correlate between CSOs and receiving water conditions.

b. Combined Sewer System Characterization--The permittee should evaluate the nature and extent of its sewer system through evaluation of available sewer system records, field inspections and other activities necessary to understand the number, location and frequency of overflows and their location relative to sensitive areas and to pollution sources in the collection system, such as indirect significant industrial users.

c. CSO Monitoring--The permittee should develop a comprehensive, representative monitoring program that measures the frequency, duration, flow rate, volume and pollutant concentration of CSO discharges and assesses the impact of the CSOs on the receiving waters. The monitoring program should include necessary CSO effluent and ambient in-stream monitoring and, where appropriate, other monitoring protocols such as biological assessment, toxicity testing and sediment sampling. Monitoring parameters should include, for example, oxygen demanding pollutants, nutrients, toxic pollutants, sediment contaminants, pathogens, bacteriological indicators (e.g., Enterococcus, E. Coli), and toxicity. A representative sample of overflow points can be selected that is sufficient to allow characterization of CSO discharges and their water quality impacts and to facilitate evaluation of control plan alternatives.

d. Modeling--Modeling of a sewer system is recognized as a valuable tool for predicting sewer system response to various wet weather events and assessing water quality impacts when evaluating different control strategies and alternatives. EPA supports the proper and effective use of models, where appropriate, in the evaluation of the nine minimum controls and the development of the long-term CSO control plan. It is also recognized that there are many models which may be used to do this. These models range from simple to complex. Having decided to use a model, the permittee should base its choice of a model on the characteristics of its sewer system, the number and location of overflow points, and the sensitivity of the receiving water body to the CSO discharges. Use of models should include appropriate calibration and verification with field measurements. The sophistication of the model should relate to the complexity of the system to be modeled and to the information needs associated with evaluation of CSO control options and water quality impacts. EPA believes that continuous simulation models, using historical rainfall data, may be the best way to model sewer systems, CSOs, and their impacts. Because of the iterative nature of modeling sewer systems, CSOs, and their impacts, monitoring and modeling efforts are complementary and should be coordinated.

2. Public Participation

In developing its long-term CSO control plan, the permittee will employ a public participation process that actively involves the affected public in the decision-making to select the long-term CSO controls. The affected public includes rate payers, industrial users of the sewer system, persons who reside downstream from the CSOs, persons who use and enjoy these downstream waters, and any other interested persons.

3. Consideration of Sensitive Areas

EPA expects a permittee's long-term CSO control plan to give the highest priority to controlling overflows to sensitive areas. Sensitive areas, as determined by the NPDES authority in coordination with State and Federal agencies, as appropriate, include designated Outstanding National Resource Waters, National Marine Sanctuaries, waters with threatened or endangered species and their habitat, waters with primary contact recreation, public drinking water intakes or their designated protection areas, and shellfish beds. For such areas, the long-term CSO control plan should:

a. Prohibit new or significantly increased overflows;

b. i. Eliminate or relocate overflows that discharge to sensitive areas wherever physically possible and economically achievable, except where elimination or relocation would provide less environmental protection than additional treatment; or

ii. Where elimination or relocation is not physically possible and economically

achievable, or would provide less environmental protection than additional treatment, provide the level of treatment for remaining overflows deemed necessary to meet WQS for full protection of existing and designated uses. In any event, the level of control should not be less than those described in Evaluation of Alternatives below; and

c. Where elimination or relocation has been proven not to be physically possible and economically achievable, permitting authorities should require, for each subsequent permit term, a reassessment based on new or improved techniques to eliminate or relocate, or on changed circumstances that influence economic achievability.

4. Evaluation of Alternatives

EPA expects the long-term CSO control plan to consider a reasonable range of alternatives. The plan should, for example, evaluate controls that would be necessary to achieve zero overflow events per year, an average of one to three, four to seven, and eight to twelve overflow events per year. Alternatively, the long-term plan could evaluate controls that achieve 100% capture, 90% capture, 85% capture, 80% capture, and 75% capture for treatment. The long-term control plan should also consider expansion ofC POTW secondary and primary capacity in the CSO abatement alternative analysis. The analysis of alternatives should be sufficient to make a reasonable assessment of cost and performance as described in Section II.C.5. Because the final long-term CSO control plan will become the basis for NPDES permit limits and requirements, the selected controls should be sufficient to meet CWA requirements.

In addition to considering sensitive areas, the long-term CSO control plan should adopt one of the following approaches:

a. ``Presumption'' Approach

A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the character- ization, monitoring, and modeling of the system and the consideration of sensitive areas described above. These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect WQS.

i. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified below; or

ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or

iii. The elimination or removal of no less than the mass of the pollutants, identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort, for the volumes that would be eliminated or captured for treatment under paragraph ii. above.

Combined sewer flows remaining after implementation of the nine minimum controls and within the criteria specified at II.C.4.a.i or ii, should receive a minimum of:

- Primary clarification (Removal of floatables and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification.);
- Solids and floatables disposal; and
- Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary.

b. ``Demonstration'' Approach

A permittee may demonstrate that a selected control program, though not meeting the criteria specified in II.C.4.a. above is adequate to meet the water quality-based requirements of the CWA. To be a successful demonstration, the permittee should demonstrate each of the following:

i. The planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;

ii. The CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment. Where WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation and a load allocation, or other means should be used to apportion pollutant loads; iii. The planned control program will provide the maximum pollution reduction benefits reasonably attainable; and

iv. The planned control program is designed to allow cost effective expansion or cost effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS or designated uses.

5. Cost/Performance Considerations

The permittee should develop appropriate cost/performance curves to demonstrate the relationships among a comprehensive set of reasonable control alternatives that correspond to the different ranges specified in Section II.C.4. This should include an analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. This analysis, often known as knee of the curve, should be among the considerations used to help guide selection of controls.

6. Operational Plan

After agreement between the permittee and NPDES authority on the necessary CSO controls to be implemented under the long-term CSO control plan, the permittee should revise the operation and maintenance program developed as part of the nine minimum controls to include the agreed-upon long-term CSO controls. The revised operation and maintenance program should maximize the removal of pollutants during and after each precipitation event using all available facilities within the collection and treatment system. For any flows in excess of the criteria specified at II.C.4.a.i., ii. or iii and not receiving the treatment specified in II.C.4.a, the operational plan should ensure that such flows receive treatment to the greatest extent practicable.

7. Maximizing Treatment at the Existing POTW Treatment Plant

In some communities, POTW treatment plants may have primary treatment capacity in excess of their secondary treatment capacity. One effective strategy to abate pollution resulting from CSOs is to maximize the delivery of flows during wet weather to the POTW treatment plant for treatment. Delivering these flows can have two significant water quality benefits: first, increased flows during wet weather to the POTW treatment plant may enable the permittee to eliminate or minimize overflows to sensitive areas; second, this would maximize the use of available POTW facilities for wet weather flows and would ensure that combined sewer flows receive at least primary treatment prior to discharge.

Under EPA regulations, the intentional diversion of waste streams from any portion of a treatment facility, including secondary treatment, is a bypass. EPA bypass regulations at 40 CFR 122.41(m) allow for a facility to bypass some or all the flow from its treatment process under specified limited circumstances. Under the regulation, the permittee must show that the bypass was unavoidable to prevent loss of life, personal injury or severe property damage, that there was no feasible alternative to the bypass and that the permittee submitted the required notices. In addition, the regulation

provides that a bypass may be approved only after consideration of adverse effects. Normally, it is the responsibility of the permittee to document, on a case-by-base basis, compliance with 40 CFR 122.41(m) in order to bypass flows legally. For some CSO-related permits, the study of feasible alternatives in the control plan may provide sufficient support for the permit record and for approval of a CSO-related bypass in the permit itself, and to define the specific parameters under which a bypass can legally occur. For approval of a CSO-related bypass, the long-term CSO control plan, at a minimum, should provide justification for the cut-off point at which the flow will be diverted from the secondary treatment portion of the treatment plant, and provide a benefit-cost analysis demonstrating that conveyance of wet weather flow to the POTW for primary treatment is more beneficial than other CSO abatement alternatives such as storage and pump back for secondary treatment, sewer separation, or satellite treatment. Such a permit must define under what specific wet weather conditions a CSO-related bypass is allowed and also specify what treatment or what monitoring, and effluent limitations and requirements apply to the bypass flow. The permit should also provide that approval for the CSO-related bypass will be reviewed and may be modified or terminated if there is a substantial increase in the volume or character of pollutants being introduced to the POTW. The CSO-related bypass provision in the permit should also make it clear that all wet weather flows passing the headworks of the POTW treatment plant will receive at least primary clarification and solids and floatables removal and disposal, and disinfection, where necessary, and any other treatment that can reasonably be provided.

Under this approach, EPA would allow a permit to authorize a CSO-related bypass of the secondary treatment portion of the POTW treatment plant for combined sewer flows in certain identified circumstances. This provision would apply only to those situations where the POTW would ordinarily meet the requirements of 40 CFR 122.41(m) as evaluated on a case-by-case basis. There- fore, there must be sufficient data in the administrative record (reflected in the permit fact sheet or statement of basis) supporting all the requirements in 40 CFR 122.41(m)(4) for approval of an anticipated bypass.

For the purposes of applying this regulation to CSO permittees, ``severe property damage'' could include situations where flows above a certain level wash out the POTW's secondary treatment system. EPA further believes that the feasible alternatives requirement of the regulation can be met if the record shows that the secondary treatment system is properly operated and maintained, that the system has been designed to meet secondary limits for flows greater than the peak dry weather flow, plus an appropriate quantity of wet weather flow, and that it is either technically or financially infeasible to provide secondary treatment at the existing facilities for greater amounts of wet weather flow. The feasible alternative analysis should include, for example, consideration of enhanced primary treatment (e.g., chemical addition) and non-biological secondary treatment. Other bases supporting a finding of no feasible alternative may also be available on a case-by-case basis. As part of its consideration of possible adverse effects resulting from the bypass, the permitting authority should also ensure that the bypass will not cause exceedances of WQS. This Policy does not address the appropriateness of approving anticipated bypasses through NPDES permits in advance outside the CSO context.

8. Implementation Schedule

The permittee should include all pertinent information in the long term control plan necessary to develop the construction and financing schedule for implementation of CSO controls. Schedules for implementation of the CSO controls may be phased based on the relative importance of adverse impacts upon WQS and designated uses, priority projects identified in the long-term plan, and on a permittee's financial capability.

Construction phasing should consider:

a. Eliminating overflows that discharge to sensitive areas as the highest priority;
b. Use impairment;
c. The permittee's financial capability including consideration of such factors as:
    i. Median household income;

ii. Total annual wastewater and CSO control costs per household as a percent of median household income;
iii. Overall net debt as a percent of full market property value;
iv. Property tax revenues as a percent of full market property value;
v. Property tax collection rate;
vi. Unemployment; and
vii. Bond rating;

d. Grant and loan availability;

e. Previous and current residential, commercial and industrial sewer user fees and rate structures; and

f. Other viable funding mechanisms and sources of financing.

9. Post-Construction Compliance Monitoring Program

The selected CSO controls should include a post-construction water quality monitoring program adequate to verify compliance with water quality standards and protection of designated uses as well as to ascertain the effectiveness of CSO controls. This water quality compliance monitoring program should include a plan to be approved by the NPDES authority that details the monitoring protocols to be followed, including the necessary effluent and ambient monitoring and, where appropriate, other monitoring protocols such as biological assessments, whole effluent toxicity testing, and sediment sampling.

III. Coordination With State Water Quality Standards

A. Overview

WQS are State adopted, or Federally promulgated rules which serve as the goals for the water body and the legal basis for the water quality-based NPDES permit requirements under the CWA. WQS consist of uses which States designate for their water bodies, criteria to protect the uses, an anti-degradation policy to protect the water quality improvements gained and other policies affecting the implementation of the standards. A primary objective of the long-term CSO control plan is to meet WQS, including the designated uses through reducing risks to human health and the environment by eliminating, relocating or controlling CSOs to the affected waters.

State WQS authorities, NPDES authorities, EPA regional offices, permittees, and the public should meet early and frequently throughout the long-term CSO control planning process. Development of the long- term plan should be coordinated with the review and appropriate revision of WQS and implementation procedures on CSO-impacted waters to ensure that the long-term controls will be sufficient to meet water quality standards. As part of these meetings, participants should agree on the data, information and analyses needed to support the development of the long-term CSO control plan and the review of applicable WQS, and implementation procedures, if appropriate. Agreements should be reached on the monitoring protocols and models that will be used to evaluate the water quality impacts of the overflows, to analyze the attainability of the WQS and to determine the water quality-based requirements for the permit. Many opportunities exist for permittees and States to share information as control programs are developed and as WQS are reviewed. Such information should assist States in determining the need for revisions to WQS and implementation procedures to better reflect the site-specific wet weather impacts of CSOs. Coordinating the development of the long-term CSO control plan and the review of the WQS and implementation procedures provides greater assurance that the long-term control plan selected and the limits and requirements included in the NPDES permit will be sufficient to meet WQS and to comply with sections 301(b)(1)(C) and 402(a)(2) of the CWA. EPA encourages States and permittees jointly to sponsor workshops for the affected public in the development of the long-term CSO control plan and during the development of appropriate revisions to WQS for CSO-impacted waters. Workshops provide a forum for including the public in discussions of the

implications of the proposed long-term CSO control plan on the water quality and uses for the receiving water.

B. Water Quality Standards Reviews

The CWA requires States to periodically, but at least once every three years, hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. States must provide the public an opportunity to comment on any proposed revision to water quality standards and all revisions must be submitted to EPA for review and approval. EPA regulations and guidance provide States with the flexibility to adapt their WQS, and implementation procedures to reflect site-specific conditions including those related to CSOs. For example, a State may adopt site-specific criteria for a particular pollutant if the State determines that the site-specific criteria fully protects the designated use (40 CFR 131.11). In addition, the regulations at 40 CFR 131.10(g), (h), and (j) specify when and how a designated use may be modified. A State may remove a designated use from its water quality standards only if the designated use is not an existing use. An existing use is a use actually attained in the water body on or after November 28, 1975. Furthermore, a State may not remove a designated use that will be attained by implementing the technology-based effluent limits required under sections 301(b) and 306 of the CWA and by implementing cost-effective and reasonable best management practices for nonpoint source controls. Thus, if a State has a reasonable basis to determine that the current designated use could be attained after implementation of the technology-based controls of the CWA, then the use could not be removed.

In determining whether a use is attainable and prior to removing a designated use, States must conduct and submit to EPA a use attainability analysis. A use attainability analysis is a structured scientific assessment of the factors affecting the use, including the physical, chemical, biological, and economic factors described in 40 CFR 131.10(g). As part of the analysis, States should evaluate whether the designated use could be attained if CSO controls were implemented. For example, States should examine if sediment loadings from CSOs could be reduced so as not to bury spawning beds, or if biochemical oxygen demanding material in the effluent or the toxicity of the effluent could be corrected so as to reduce the acute or chronic physiological stress on or bioaccumulation potential of aquatic organisms. In reviewing the attainability of their WQS and the applicability of their implementation procedures to CSO-impacted waters, States are encouraged to define more explicitly their recreational and aquatic life uses and then, if appropriate, modify the criteria accordingly to protect the designated uses.

Another option is for States to adopt partial uses by defining when primary contact recreation such as swimming does not exist, such as during certain seasons of the year in northern climates or during a particular type of storm event. In making such adjustments to their uses, States must ensure that downstream uses are protected, and that during other seasons or after the storm event has passed, the use is fully protected.

In addition to defining recreational uses with greater specificity, States are also encouraged to define the aquatic uses more precisely. Rather than ``aquatic life use protection,'' States should consider defining the type of fishery to be protected such as a cold water fishery (e.g., trout or salmon) or a warm weather fishery (e.g., bluegill or large mouth bass). Explicitly defining the type of fishery to be protected may assist the permittee in enlisting the support of citizens for a CSO control plan.

A water quality standard variance may be appropriate, in limited circumstances on CSO-impacted waters, where the State is uncertain as to whether a standard can be attained and time is needed for the State to conduct additional analyses on the attainability of the standard. Variances are short-term modifications in water quality standards. Subject to EPA approval, States, with their own statutory authority, may grant a variance to a specific discharger for a specific pollutant. The justification for a variance is similar to that required for a permanent change in the standard, although the showings needed are less rigorous. Variances are also subject to public participation requirements of the water quality standards and permits programs and are reviewable generally every three years.

A variance allows the CSO permit to be written to meet the ``modified'' water quality standard as analyses are conducted and as progress is made to improve water quality.

Justifications for variances are the same as those identified in 40 CFR 131.10(g) for modifications in uses. States must provide an opportunity for public review and comment on all variances. If States use the permit as the vehicle to grant the variance, notice of the permit must clearly state that the variance modifies the State's water quality standards. If the variance is approved, the State appends the variance to the State's standards and reviews the variance every three (3) years.

IV. Expectations for Permitting Authorities

A. Overview

CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality-based requirements of the CWA. CSOs are not subject to secondary treatment regulations applicable to publicly owned treatment works (Montgomery Environmental Coalition vs. Costle, 646 F.2d 568 (D.C. Cir. 1980)).

All permits for CSOs should require the nine minimum controls as a minimum best available technology economically achievable and best conventional technology (BAT/BCT) established on a best professional judgment (BPJ) basis by the permitting authority (40 CFR 125.3). Water quality-based requirements are to be established based on applicable water quality standards.

This policy establishes a uniform, nationally consistent approach to developing and issuing NPDES permits to permittees with CSOs. Permits for CSOs should be developed and issued expeditiously. A single, system-wide permit generally should be issued for all discharges, including CSOs, from a CSS operated by a single authority. When different parts of a single CSS are operated by more than one authority, permits issued to each authority should generally require joint preparation and implementation of the elements of this Policy and should specifically define the responsibilities and duties of each authority. Permittees should be required to coordinate system-wide implementation of the nine minimum controls and the development and implementation of the long-term CSO control plan.

The individual authorities are responsible for their own discharges and should cooperate with the permittee for the POTW receiving the flows from the CSS. When a CSO is permitted separately from the POTW, both permits should be cross-referenced for informational purposes. EPA Regions and States should review the CSO permitting priorities established in the State CSO Permitting Strategies developed in response to the 1989 Strategy. Regions and States may elect to revise these previous priorities. In setting permitting priorities, Regions and States should not just focus on those permittees that have initiated monitoring programs. When setting priorities, Regions and States should consider, for example, the known or potential impact of CSOs on sensitive areas, and the extent of upstream industrial user discharges to the CSS.

During the permittee's development of the long-term CSO control plan, the permit writer should promote coordination between the permittee and State WQS authority in connection with possible WQS revisions. Once the permittee has completed development of the long-term CSO control plan and has coordinated with the permitting authority the selection of the controls necessary to meet the requirements of the CWA, the permitting authority should include in an appropriate enforceable mechanism, requirements for implementation of the long-term CSO control plan, including conditions for water quality monitoring and operation and maintenance.

B. NPDES Permit Requirements

Following are the major elements of NPDES permits to implement this Policy and ensure protection of water quality.

1. Phase I Permits--Requirements for Demonstration of Implementation of the Nine Minimum Controls and Development of the Long-Term CSO Control Plan

Appendix I
KYCSO Strategy

In the Phase I permit issued/modified to reflect this Policy, the NPDES authority should at least require permittees to:

a. Immediately implement BAT/BCT, which at a minimum includes the nine minimum controls, as determined on a BPJ basis by the permitting authority;

b. Develop and submit a report documenting the implementation of the nine minimum controls within two years of permit issuance/ modification;
c. Comply with applicable WQS, no later than the date allowed under the State's WQS, expressed in the form of a narrative limitation; and
d. develop and submit, consistent with this Policy and based on a schedule in an appropriate enforceable mechanism, a long-term CSO control plan as soon as practicable, but generally within two years after the effective date of the permit issuance/modification. However, permitting authorities may establish a longer timetable for completion of the long-term CSO control plan on a case-by-case basis to account for site-specific factors that may influence the complexity of the planning process.

The NPDES authority should include compliance dates on the fastest practicable schedule for each of the nine minimum controls in an appropriate enforceable mechanism issued in conjunction with the Phase I permit. The use of enforceable orders is necessary unless Congress amends the CWA. All orders should require compliance with the nine minimum controls no later than January 1, 1997.

2. Phase II Permits--Requirements for Implementation of a Long-Term CSO Control Plan

Once the permittee has completed development of the long-term CSO control plan and the selection of the controls necessary to meet CWA requirements has been coordinated with the permitting and WQS authorities, the permitting authority should include, in an appropriate enforceable mechanism, requirements for implementation of the long-term CSO control plan as soon as practicable. Where the permittee has selected controls based on the ``presumption'' approach described in Section II.C.4, the permitting authority must have determined that the presumption that such level of treatment will achieve water quality standards is reasonable in light of the data and analysis conducted under this Policy. The Phase II permit should contain:

a. Requirements to implement the technology-based controls including the nine minimum controls determined on a BPJ basis; b. Narrative requirements which insure that the selected CSO controls are implemented, operated and maintained as described in the long-term CSO control plan;
c. Water quality-based effluent limits under 40 CFR 122.44(d)(1) and 122.44(k), requiring, at a minimum, compliance with, no later than the date allowed under the State's WQS, the numeric performance standards for the selected CSO controls, based on average design conditions specifying at least one of the following:
i. A maximum number of overflow events per year for specified design conditions consistent with II.C.4.a.i; or
ii. A minimum percentage capture of combined sewage by volume for treatment under specified design conditions consistent with II.C.4.a.ii; or
iii. A minimum removal of the mass of pollutants discharged for specified design conditions consistent with II.C.4.a.iii; or
iv. performance standards and requirements that are consistent with II.C.4.b. of the Policy.
d. A requirement to implement, with an established schedule, the approved post-construction water quality assessment program including requirements to monitor and collect sufficient information to demonstrate compliance with WQS and protection of designated uses as well as to determine the effectiveness of CSO controls.
e. A requirement to reassess overflows to sensitive areas in those cases where elimination or relocation of the overflows is not physically possible and economically achievable. The reassessment should be based on consideration of new or improved techniques to eliminate or relocate overflows or changed circumstances that influence economic achievability;
f. Conditions establishing requirements for maximizing the treatment of wet weather flows at the POTW treatment plant, as appropriate, consistent with Section II.C.7. of this Policy;

g. A reopener clause authorizing the NPDES authority to reopen and modify the permit upon determination that the CSO controls fail to meet WQS or protect designated uses. Upon such determination, the NPDES authority should promptly notify the permittee and proceed to modify or reissue the permit. The permittee should be required to develop, submit and implement, as soon as practicable, a revised CSO control plan which contains additional controls to meet WQS and designated uses. If the initial CSO control plan was approved under the demonstration provision of Section II.C.4.b., the revised plan, at a minimum, should provide for controls that satisfy one of the criteria in Section II.C.4.a. unless the permittee demonstrates that the revised plan is clearly adequate to meet WQS at a lower cost and it is shown that the additional controls resulting from the criteria in Section II.C.4.a. will not result in a greater overall improvement in water quality. Unless the permittee can comply with all of the requirements of the Phase II permit, the NPDES authority should include, in an enforceable mechanism, compliance dates on the fastest practicable schedule for those activities directly related to meeting the requirements of the CWA. For major permittees, the compliance schedule should be placed in a judicial order. Proper compliance with the schedule for implementing the controls recommended in the long-term CSO control plan constitutes compliance with the elements of this Policy concerning planning and implementation of a long term CSO remedy.

3. Phasing Considerations

Implementation of CSO controls may be phased based on the relative importance of and adverse impacts upon WQS and designated uses, as well as the permittee's financial capability and its previous efforts to control CSOs. The NPDES authority should evaluate the proposed implementation schedule and construction phasing discussed in Section II.C.8. of this Policy. The permit should require compliance with the controls proposed in the long-term CSO control plan no later than the applicable deadline(s) under the CWA or State law. If compliance with the Phase II permit is not possible, an enforceable schedule, consistent with the Enforcement and Compliance Section of this Policy, should be issued in conjunction with the Phase II permit which specifies the schedule and milestones for implementation of the long- term CSO control plan.

V. Enforcement and Compliance

A. Overview

It is important that permittees act immediately to take the necessary steps to comply with the CWA. The CSO enforcement effort will commence with an initiative to address CSOs that discharge during dry weather, followed by an enforcement effort in conjunction with permitting CSOs discussed earlier in this Policy. Success of the enforcement effort will depend in large part upon expeditious action by NPDES authorities in issuing enforceable permits that include requirements both for the nine minimum controls and for compliance with all other requirements of the CWA. Priority for enforcement actions should be set based on environmental impacts or sensitive areas affected by CSOs.

As a further inducement for permittees to cooperate with this process, EPA is prepared to exercise its enforcement discretion in determining whether or not to seek civil penalties for past CSO violations if permittees meet the objectives and schedules of this Policy and do not have CSOs during dry weather.

B. Enforcement of CSO Dry Weather Discharge Prohibition

EPA intends to commence immediately an enforcement initiative against CSO permittees which have CWA violations due to CSOs during dry weather. Discharges during dry weather have always been prohibited by the NPDES program. Such discharges can create serious public health and water quality problems. EPA will use its CWA Section 308 monitoring, reporting, and inspection authorities, together

with NPDES State authorities, to locate these violations, and to determine their causes. Appropriate remedies and penalties will be sought for CSOs during dry weather. EPA will provide NPDES authorities more specific guidance on this enforcement initiative separately.

C. Enforcement of Wet Weather CSO Requirements

Under the CWA, EPA can use several enforcement options to address permittees with CSOs. Those options directly applicable to this Policy are section 308 Information Requests, section 309(a) Administrative Orders, section 309(g) Administrative Penalty Orders, section 309 (b) and (d) Civil Judicial Actions, and section 504 Emergency Powers. NPDES States should use comparable means.

NPDES authorities should set priorities for enforcement based on environmental impacts or sensitive areas affected by CSOs. Permittees that have voluntarily initiated monitoring and are progressing expeditiously toward appropriate CSO controls should be given due consideration for their efforts.

1. Enforcement for Compliance With Phase I Permits

Enforcement for compliance with Phase I permits will focus on requirements to implement at least the nine minimum controls, and develop the long-term CSO control plan leading to compliance with the requirements of the CWA. Where immediate compliance with the Phase I permit is infeasible, the NPDES authority should issue an enforceable schedule, in concert with the Phase I permit, requiring compliance with the CWA and imposing compliance schedules with dates for each of the nine minimum controls as soon as practicable. All enforcement authorities should require compliance with the nine minimum controls no later than January 1, 1997. Where the NPDES authority is issuing an order with a compliance schedule for the nine minimum controls, this order should also include a schedule for development of the long-term CSO control plan.

If a CSO permittee fails to meet the final compliance date of the schedule, the NPDES authority should initiate appropriate judicial action.

2. Enforcement for Compliance With Phase II Permits

The main focus for enforcing compliance with Phase II permits will be to incorporate the long-term CSO control plan through a civil judicial action, an administrative order, or other enforceable mechanism requiring compliance with the CWA and imposing a compliance schedule with appropriate milestone dates necessary to implement the plan.

In general, a judicial order is the appropriate mechanism for incorporating the above provisions for Phase II. Administrative orders, however, may be appropriate for permittees whose long-term control plans will take less than five years to complete, and for minors that have complied with the final date of the enforceable order for compliance with their Phase I permit. If necessary, any of the nine minimum controls that have not been implemented by this time should be included in the terms of the judicial order.

D. Penalties

EPA is prepared not to seek civil penalties for past CSO violations, if permittees have no discharges during dry weather and meet the objectives and schedules of this Policy. Notwithstanding this, where a permittee has other significant CWA violations for which EPA or the State is taking judicial action, penalties may be considered as part of that action for the following:

1. CSOs during dry weather;
2. Violations of CSO-related requirements in NPDES permits; consent decrees or court orders which predate this policy; or
3. Other CWA violations.

EPA will not seek penalties for past CSO violations from permittees that fully comply with the

Phase I permit or enforceable order requiring compliance with the Phase I permit. For permittees that fail to comply, EPA will exercise its enforcement discretion in determining whether to seek penalties for the time period for which the compliance schedule was violated. If the milestone dates of the enforceable schedule are not achieved and penalties are sought, penalties should be calculated from the last milestone date that was met.

At the time of the judicial settlement imposing a compliance schedule implementing the Phase II permit requirements, EPA will not seek penalties for past CSO violations from permittees that fully comply with the enforceable order requiring compliance with the Phase I permit and if the terms of the judicial order are expeditiously agreed to on consent. However, stipulated penalties for violation of the judicial order generally should be included in the order, consistent with existing Agency policies. Additional guidance on stipulated penalties concerning long-term CSO controls and attainment of WQS will be issued.

Paperwork Reduction Act

The information collection requirements in this policy have been approved by the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq and have been assigned OMB control number 2040-0170.

This collection of information has an estimated reporting burden averaging 578 hours per response and an estimated annual recordkeeping burden averaging 25 hours per recordkeeper. These estimates include time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Chief, Information Policy Branch; EPA; 401 M Street SW (Mail Code 2136); Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked ``Attention: Desk Officer for EPA."

[FR Doc. 94-9295 Filed 4-18-94; 8:45 am]

BILLING CODE 6560-50-P

A STRATEGY
FOR MONITORING THE IMPACTS
OF
COMBINED SEWER OVERFLOWS
ON THE OHIO RIVER

OHIO RIVER VALLEY WATER SANITATION COMMISSION
5735 Kellogg Avenue
Cincinnati, Ohio 45228-1112
August 1996

ORSANCO Work Group on Monitoring CSO Impacts

Gordon R. Garner
Executive Director, Louisville & Jefferson County Metropolitan Sewer District
ORSANCO Commissioner, Kentucky

Ron Evaldi
U.S. Geological Survey
Louisville District

Phillip C. Morgan
Director, Danville Sanitary District
ORSANCO Commissioner, Illinois

John Colletti
U.S. Environmental Protection Agency
Region V

Clyde Baldwin
Kentucky Division of Water

Peter Swenson
U.S. Environmental Protection Agency
Region V

Paul Novak
Ohio Environmental Protection Agency

David P. Clement
Metropolitan Sewer District of Greater Cincinnati
POTW Advisory Committee

R. B. Patel
Pennsylvania Department of Environmental Resources

J. Gregory Menniti
Huntington Sanitary Board
POTW Advisory Committee

Pravin Sangani
West Virginia Division of Environmental Protection

Derek Guthrie
Louisville Metropolitan Sewer District

David Tennis
Indiana Department of Environmental Management

TABLE OF CONTENTS

BACKGROUND..... 1
COMBINED SEWER OVERFLOWS ON THE OHIO RIVER..... 1
ORSANCO ROLE IN CSO ABATEMENT..... 1

EXISTING CSO CONTROL STRATEGIES..... 3
OHIO RIVER CSO MONITORING STRATEGY OBJECTIVES..... 5

STRATEGY OVERVIEW..... 7
I. The Short Term: Building the Data Base - Implementation Baseline Controls..... 7
II. The Long Term: Assessing the Success of First Phase CSO Controls - Implementing Additional Controls Where Needed..... 8

CSO DISCHARGER RESPONSIBILITIES..... 10

STATE AGENCY RESPONSIBILITIES..... 11

ORSANCO RESPONSIBILITIES..... 12

TABLE 1: Combined Sewer Overflows along the Ohio River..... 13

TABLE 2: Receiving Water Monitoring Parameters..... 15

APPENDIX - RECOMMENDATIONS FROM PUBLIC WORKSHOPS

Work Group I___Role of Modeling

Work Group II___Biological Approaches

Work Group III___Sediments

Work Group IV___Water Column Sampling

BACKGROUND

Combined Sewer Overflows on the Ohio River

Combined sewer systems - those which carry both storm water and waste water - are found in most older cities in the United States. Such systems were designed to convey waste water to a central point under dry weather conditions, and to discharge at multiple points when carrying large quantities of storm water (rainfall or snow melt). Because the Ohio River Valley was a site of rapid development in the nineteenth century, it is not surprising that many of its cities have combined sewer systems. The national inventory of combined sewer overflows (CSOs) compiled by U.S. EPA indicates that there are 10,770 individual CSOs; 7250, or 67 percent, are located within the eight member states of the Ohio River Valley Water Sanitation Commission (ORSANCO). Many of these are located in portions of the states which are outside the Ohio Valley, such as Chicago, IL, Cleveland, OH and New York City. Nevertheless, it is clear that CSOs constitute a significant concern in the Valley. Over 1300 overflows have been identified in cities along the main stem of the Ohio River.

Table I contains a listing of the cities and districts along the Ohio River with CSOs. It shows that CSOs are located all along the river, from the most upstream city (Pittsburgh, PA) to the most downstream (Cairo, IL). There are 51 cities and districts with CSOs. Over 75 percent of the overflows, however, are located in 10 large cities. Nine of these cities lie in interstate urban areas with CSOs on both sides of the river. In those areas, the Ohio River serves as a boundary between states and U.S. EPA Regions.

ORSANCO Role in CSO Abatement

In recognition of the significant CSO problem in the Ohio Valley, and of the interstate nature of CSO impacts on the Ohio River, ORSANCO established a work group in 1992 to determine its role in pollution abatement from CSOs. The work group consisted of three ORSANCO Commissioners, three members of ORSANCO's Technical Committee representing state regulatory agencies, a member of the Commission's Publicly Owned Treatment Works (POTW) Advisory Committee, and a representative of U.S. EPA. After consideration of control efforts by the states and U.S. EPA, the work group recommended revision of the Commission's Pollution Control Standards to address CSOs, and identified eight activities which ORSANCO should undertake in support of state and local efforts. The eight activities were adopted as part of the Commission's programs. They are:

Review state CSO control strategies and identify any conflicts.
An initial review was completed in the fall of 1992; subsequent reviews have been carried out as states have revised their strategies to bring them in line with the National CSO Policy, which was adopted in 1994. ORSANCO staff has reviewed and commented on all draft revisions completed by the Ohio River main stem states. Areas of special concern to ORSANCO include timing, receiving water monitoring requirements, consideration of bypasses caused by river stage, provision of treatment to the maximum possible amount of flow, and wet weather water quality standards.

Provide a forum for states to report to each ***other on CSO control.***
This is accomplished at regular meetings of ORSANCO's Technical Committee and its NPDES Subcommittee, both of which include members representing U.S. EPA and each state's environmental regulatory agency. In addition, ORSANCO regularly convenes meetings of state

and federal CSO personnel. Since 1992, five such meetings have been held.

Coordinate water quality impact studies by commenting on study proposals and, when requested, conducting studies on a contract basis.
Commission staff has provided comments on preliminary plans of study: there have not been any detailed work plans submitted to date. If such plans were received at present, it would be difficult for staff to provide definitive comments because of the number of uncertainties regarding CSO impacts on the Ohio River. The Commission has recently completed an investigation of strategies for monitoring CSO impacts on the Ohio River in Huntington and Wheeling, WV, and has undertaken a two-year wet weather demonstration project in the Greater Cincinnati area.

Review results of CSO impact studies, integrate results from opposite sides of the river.
Two instream monitoring projects have been initiated; however, only preliminary results are available. Results of impact studies are reviewed as they are received by Commission staff.

Participate in the national dialogue on CSO control.
Commission staff have served on advisory panels to U.S. EPA headquarters efforts regarding CSOs. In addition, staff has presented Ohio River CSO issues of concern at regional and national CSO conferences.

Develop recommendations for monitoring CSO impacts.
This strategy was undertaken to address this activity.

Identify sensitive areas where CSOs are especially harmful.
ORSANCO has received environmentally sensitive information from all six main stem state Heritage Programs and has entered this information into a Geographical Information System (GIS) data base, which contains over 5,000 records. Information compiled to date represents the single most comprehensive data base for "environmentally sensitive areas" along the Ohio River.

Convene a regional meeting on CS0s.
An initial public meeting on CSOs and storm water was held in 1991. A workshop on monitoring the impacts of CSOs on the Ohio River was held in June, 1993 as part of the development of this strategy. Subsequent workshops have been held in 1994 and 1995 to facilitate the sharing of monitoring results by the cities, states and ORSANCO. Workshops will be held each year for this purpose for at least another two years.

The role spelled out for the Commission involves monitoring of CSO impacts to a large extent. In order to carry out those activities, staff set about compiling information on CSO impacts monitoring in the Ohio River Valley and on other large rivers. It was found that very little information existed. Most CSO impact studies have apparently been conducted on estuaries or lakes. It was therefore decided that a strategy for monitoring CSO impacts on the Ohio River would need to be developed.

EXISTING CSO CONTROL STRATEGIES

Prior to 1989, control of CSOs received varying priorities among the U.S. EPA Regions and the states. Region V and the states therein (Illinois, Indiana, and Ohio in the Ohio River Basin) placed a relatively high priority on CSO control—all had control strategies in place by the mid 1980s. Early emphasis of their efforts was on the Great Lakes. Region III (Pennsylvania, Virginia, West Virginia) placed a lesser priority; CSOs were addressed on a case-by-case basis, with an apparent emphasis on coastal areas. Region IV (Kentucky) contains far fewer CSOs than the other Regions, and so assigned their control a low priority.

In August of 1989, U.S. EPA headquarters published a CSO Control Strategy. The Strategy had three objectives:

To ensure that if CSO discharges occur, they are only as a result of wet weather.
To bring all wet weather CSO discharge points into compliance with the technology-based requirements of the Federal Clean Water Act and applicable state water quality standards.
To minimize water quality, aquatic biota, and human health impacts from wet weather overflows.

The strategy called for all CSOs to be covered by NPDES permits including compliance schedules for installation of at least technology-based limitations. Such limitations were to include:

proper operation and regular maintenance programs for the sewer system and combined sewer overflow points;
maximum use of the collection system for storage;
◊ review and modification of pretreatment programs to assure CSO impacts are minimized;
maximization of flow to the POTW for treatment;
◊ prohibition of dry weather overflows; and
◊ control of solid and floatable materials in CSO discharges.

States were required to adopt their own CSO control strategies by January 15, 1990, with approval by the Regions no later than March 31, 1990.

All of the states along the Ohio River either developed strategies or updated their existing strategies to conform to the national strategy. The states' strategies were basically similar in that they called for each CSO discharger to complete a management study of the combined sewer system, attain the minimum controls set forth in the national strategy, and, where necessary, to implement any additional controls needed to meet water quality standards in the receiving waters.

In April 1994, U.S. EPA published the National CSO Control Policy. This revised policy built on the 1989 strategy but added several new features, including three additional minimum controls:

pollution prevention programs that focus on contaminant reduction activities;
◊ public notification of CSO occurrences and impacts; and
◊ monitoring to characterize CSO impacts and the efficacy of CSO controls.

The policy calls for CSO communities to develop and implement long-term CSO control plans that

will ultimately result in compliance with the requirements of the Clean Water Act. The policy provides communities with two options in terms of long term CSO control. A permittee may demonstrate that a selected control program is adequate to meet water quality-based requirements of the Clean Water Act, or, in lieu of demonstrating compliance with receiving water quality standards, a CSO could be presumed to be in compliance if certain target reductions in overflow frequency or pollutant discharge were attained. Regardless of the approach taken, selected CSO controls must include a water quality monitoring program adequate to verify compliance with water quality standards and protection of designated uses.

OHIO RIVER CSO MONITORING STRATEGY OBJECTIVES

The need for a consistent strategy for monitoring the impacts of CSOs on the Ohio River was recognized by ORSANCO and its member states on the basis of the interstate "clusters" of overflows. Because routine ambient monitoring of the Ohio River and assessment of resulting data have been delegated to ORSANCO by the member states, it was a logical step to utilize the Commission to develop such a strategy and to coordinate its implementation.

As initial development of the strategy proceeded, it became clear that there are many unknowns to be addressed before a fully-detailed monitoring strategy can be completed. The unknowns concern methodologies. Monitoring techniques for assessing impacts of continuous waste water discharges on small streams are well defined. Such studies are usually performed at low flow conditions. In order to determine CSO impacts on the Ohio River, techniques are needed for monitoring and assessing large rivers and impacts of intermittent discharges upon them under varying flow conditions.

At the present time, the only impact of wet weather discharges which has been demonstrated on the Ohio River is increased bacteria levels which often exceed criteria for contact recreation This is a significant impact in that it has led local health departments along the river to issue advisories against contact recreation in the river. Other impacts associated with CSOs, such as increases in BOD, solids, and nutrients, have not been observed on the Ohio. Dissolved oxygen levels have essentially met criteria routinely since all major POTWs achieved secondary treatment. Some of the water quality problems that do exist on the Ohio—elevated concentrations of certain metals and volatile organics, pesticides and PCBs in fish tissue, and reduced aquatic life diversity at certain locations—could conceivably be due in part to CSOs, but there is no clear indication from existing data that this is the case.

An underlying objective of this strategy is therefore to identify appropriate monitoring and assessment "tools" for the task at hand. It is for this reason that the strategy calls for continuous sharing of results among dischargers, the states, and ORSANCO. It is anticipated that as data are collected, some of the unknowns will be addressed.

The primary objectives of this strategy are as follows:

Identify appropriate monitoring and assessment approaches to address impacts of wet weather discharges on the Ohio and other large rivers.
ORSANCO will compile data from its own monitoring activities, from studies conducted by other groups, including CSO dischargers, state agencies, health departments and others, and data from other large rivers in order to assess the success of the methodologies employed. Monitoring activities will presumably need to be adjusted as results are assimilated.

Define the impacts of CSOs on Ohio River water quality.
A variety of approaches will be employed to determine CSO impacts. ORSANCO will conduct special studies of heavily impacted areas on the main stem while CSO dischargers determine the loadings from their systems. The combined results should provide satisfactory answers.

Determine the adequacy of the nine minimum CSO controls in meeting water quality

standards on the Ohio River and its tributaries.
While the strategy has been developed to address the Ohio River, the fact that most of the CSO dischargers have overflows to both the Ohio and its tributaries cannot be ignored. Indeed, it is assumed that receiving water monitoring by the dischargers will probably be concentrated on the tributaries since that is where the impacts should be greatest.

Provide documentation of water quality improvements resulting from CSO controls.
There is a considerable concern that available data on receiving waters are not adequate to show water quality improvement resulting from the construction and operation of wastewater treatment facilities. One reason for this is that adequate monitoring networks were not in place prior to construction of the treatment facilities. ORSANCO has learned, through successful application of trend analysis techniques to its monitoring data, that well designed, consistent monitoring networks are needed in order to properly assess the impacts of water pollution control activities on receiving water quality. Given the potential expense of CSO control, it is important that adequate data be available to demonstrate resulting improvements to water quality. This will only occur if monitoring is initiated at the beginning of the control effort and pre-control baseline conditions have been defined.

STRATEGY OVERVIEW

The Short Term: **Building the data base**
Implementing baseline controls

CSO dischargers will conduct studies of their systems as required under state CSO control strategies. Potential information to be collected in those studies, on a case by case basis, are:

locations of all CSOs, including latitude, longitude and receiving stream;
"Plan of Actions" to address CSOs;
characterization of overflow frequency, volume and pollutant loading; and
instream CSO impact monitoring for priority CSO's.

As this information becomes available from each discharger, ORSANCO will compile it on a river-wide basis, utilizing its GIS capability. At the same time, ORSANCO will compile information on environmentally sensitive areas along the Ohio River; this information will also be made available for GIS use. The combined data on CSO discharges and sensitive areas will then be assessed to identify critical areas on the main stem—those sensitive areas most likely to be affected by CSOs—for special monitoring and priority abatement.

ORSANCO will work with appropriate state agencies and CSO dischargers to identify local monitoring locations. Although the exact number of instream monitoring locations will vary from one city to another, monitoring locations should generally be paired above and below a CSO (or group of CSOs). In addition, monitoring locations should bracket all discharges from a combined sewer system, with at least one location placed above the influence of any CSO discharges from the sewer system and one downstream of all discharge points.

The parameters to be monitored and the frequency with which they are monitored will be dependent upon the characteristics of the permittee's collection system, the receiving stream and other factors. However, CSO discharges should follow basic guidelines when developing an instream monitoring program, including:

monitoring during dry as well as wet weather in order to determine background conditions;
sampling during varying stream flow conditions;
increasing the frequency of sampling when determining impacts on environmentally sensitive areas;
◊monitoring instream bacteria levels and other parameters for which problems have been demonstrated in the receiving stream in question; and
◊establishing an adequate rain gauge network to link water quality impacts with wet weather events.

In addition to bacteria levels, CSO communities should examine the need to monitor other parameters of concern, particularly for Ohio River tributaries which receive CSO discharges. A list of parameters for which consideration should be given is shown in Table 3. This list will be subject to revision as the database accumulates and provides indications that parameters should be added or deleted.

ORSANCO will continue its program of bacterial sampling on a five times per month frequency during the contact recreation season (May 1 through October 31) at Ohio River locations downstream of CSO "clusters". Results from this effort are posted on the Commission's electronic bulletin board and are sent to state agencies and local health departments (who have the responsibility for issuing local water contact advisories) on a weekly basis. ORSANCO will conduct periodic intensive sampling in the areas where the routine sampling is conducted and will seek to involve local agencies in order to expand the effort.

ORSANCO will also conduct intensive river surveys on segments of the Ohio River with high concentrations of CSOs in order to determine the presence or absence of receiving water quality standards violations due to CSOs. Results of these efforts will be assessed to determine the need to revise the list of parameters for the dischargers' monitoring efforts.

On an approximately annual basis, ORSANCO will convene a public workshop on monitoring CSO impacts. CSO dischargers, their contractors, state and federal agency personnel, and Commission staff will present the results of their monitoring efforts. This will facilitate the exchange among the dischargers and regulatory agencies, and should also be of interest to persons involved with CSO control on other large rivers.

The short term phase of this strategy will conclude when a CSO discharger has achieved the nine minimum controls set forth in the National Policy. The date of this attainment will vary among the dischargers, but should in no case be later than January 1997.

The Long Term: Assessing the success of first phase CSO controls Implementing additional controls where needed

When CSO dischargers have achieved the nine minimum controls, state agencies will review the available data to determine if water quality standards are being met on the affected tributaries. ORSANCO will do likewise for the Ohio River. Before these determinations can be made, states should meet with ORSANCO staff and determine what, if any, modifications to current water quality standards are necessary to accommodate wet weather considerations.

If it is determined that a segment of the Ohio River is not meeting water quality standards after the achievement of the nine minimum controls, ORSANCO, the appropriate state agencies and the CSO dischargers involved will determine the succeeding course of action.

Appendix II
KYCSO STRATEGY

Two courses are set forth in the National Policy:

the **presumptive approach**, which involves a specific reduction in CSO frequency or discharge loading as an endpoint, and,

the **demonstration approach**, in which a permittee may demonstrate that a selected control program, though not meeting the criteria of the presumptive approach, is adequate to meet water quality standards.

Regardless of the approach taken, the National Policy states that the selected control program should include a monitoring program to verify compliance with water quality standards. Where a segment of the Ohio is affected by CSO discharges from more than one municipality, those responsible will be encouraged to all utilize the same approach.

If a main stem discharger chooses the demonstration approach, the design of the instream survey will be subject to review by affected states and ORSANCO. Approval of the instream design will rest with the appropriate state agency. Those parties will also review results to determine that the discharger's course of action does indeed result in attainment of water quality standards.

Discharger monitoring initiated in the short-term phase should continue as established in the municipality's NPDES permit until adequate records have been compiled to allow valid trend analysis. Bacterial monitoring of CSO-impacted segments of the Ohio River during the contact recreation season should also continue on a long-term basis due to public concern over the suitability of the river for recreational use.

CSO DISCHARGER RESPONSIBILITIES

All requirements of the appropriate state's CSO control strategy apply. The ORSANCO strategy only addresses issues relating to monitoring and assessing CSO impacts on the Ohio River.

The discharger shall complete a management study of the combined sewer system, as required by its state's CSO control strategy and its NPDES permit.

The discharger's management plan should include information on the location including latitude, longitude, and receiving stream, frequency of discharge, and characterization of pollutant loadings for each CSOs. In certain situations it may be considered unreasonable or impractical to monitor each outfall. In such cases, the state or ORSANCO may allow the use of "representative" overflows to provide the necessary information. As this information becomes available, it should be supplied to the states and ORSANCO.

The discharger will achieve the nine minimum controls of the National CSO Policy by January 1, 1997, and if the state deems it necessary, will participate in water quality studies to determine attainment of water quality standards in the receiving waters.

The discharger will conduct such additional monitoring as may be necessary to demonstrate the adequacy of any additional CSO controls.

STATE AGENCY RESPONSIBILITIES

State agencies retain the primary responsibility for implementation of the National CSO Policy through the NPDES permit program.

State agencies will carry out their responsibilities through their own CSO control strategies.

State agencies retain review and approval authority for CSO management plans and control measures proposed by individual CSO dischargers.

Because of the interstate nature of the Ohio River CSO situation, **state agencies** recognize the need to work collectively through ORSANCO to reach an agreement concerning:

Appropriate techniques for monitoring and assessing the impacts of CSOs on the Ohio River;

Wet weather considerations in water quality standards for the Ohio River;

◊Determination of compliance with Ohio River water quality standards in CSO affected segments;

In cases where additional measures beyond the nine minimum controls are needed, the approach to be used by CSO dischargers should be consistent on opposite sides of the river;

The need for small communities with CSOs discharging only to the Ohio River main stem to meet all requirements of this strategy and the National CSO Policy;

◊Special aspects of CSO operation on the Ohio River, such as the impacts of river control for navigation on the hydraulics of combined sewer systems.

State agencies will review and approve recommendations by ORSANCO for local receiving water monitoring locations.

State agencies will determine individually if water quality standards are being met on tributary streams. They will utilize ORSANCO to share information on and the results of such determinations for stream segments adjacent to the Ohio River.

State agencies will share information on monitoring and assessment of CSO impacts from their waters outside of the Ohio Valley as may be appropriate.

ORSANCO RESPONSIBILITIES

ORSANCO will utilize its GIS capability to compile and analyze data on CSO locations, frequency of discharge, pollutant loadings, receiving streams, and locations of environmentally sensitive areas.

ORSANCO will utilize the above to develop recommendations for receiving stream monitoring locations for each Ohio River main stem CSO discharger, and provide these recommendations to both CSO municipalities and state agencies.

ORSANCO will compile monitoring information collected by CSO dischargers, states and ORSANCO and, with the state agencies, assess it to determine the validity of the approaches utilized as well as the collective portrayal of CSO impacts.

ORSANCO will continue monitoring bacteria levels five times per month during the contact recreation season (May 1 through October 31) at Ohio River locations downstream of CSO clusters.

ORSANCO will conduct intensive surveys of Ohio River segments with high concentrations of CSOs to determine the presence or absence of impacts on Ohio River water quality attributable to CSOs.

ORSANCO will compile information on monitoring and assessing CSO impacts on large rivers which may become available from sources outside the Ohio Valley.

ORSANCO will convene meetings with state agency representatives as needed to allow collective determinations on CSO issues of interstate concern.

ORSANCO will host public workshops on an annual basis to allow exchange of information and results from CSO monitoring efforts.

ORSANCO will issue periodic reports on the results of analyses of data from its own monitoring efforts as well as those by CSO dischargers.

Appendix II
KYCSO STRATEGY

TABLE 1 SUMMARY
COMBINED SEWER OVERFLOWS ALONG THE OHIO RIVER
August 1996

There are an estimated total of 1097 CSOs along the Ohio River.

There are 51 facilities with a total of 1050 permitted CSOs. In addition, there are nine known unpermitted CSOs, excluding the ALCOSAN service area. Approximately 38 unpermitted CSOs in the ALCOSAN system discharge directly to the Ohio River.

There are 11 facilities with expired NPDES permits, shown in italics and bold print. Of these, draft permits have been issued to four facilities.

Latitude and longitude information are available for 40 municipalities and 895 CSOs (and over 300 diversion structures in the ALCOSAN system).

CSO Operational Plans have been completed and submitted to their respective states by 30 municipalities, of which 12 have been approved. In addition, the submittal dates for nine facilities have passed, and their plans are now overdue.

TABLE 2

RECEIVING WATER MONITORING PARAMETERS

*Ohio River Main Stem**

Precipitation
Bacteria (Fecal Coliform/*E. coli*)
Metals
Biological Monitoring

*Ohio River Tributaries**

Precipitation
Stream Flow
Bacteria (Fecal Coliform/*E. coli)*
Biochemical Oxygen Demand
Total Suspended Solids
Dissolved Oxygen
Chloride
Nutrients
Metals
Bottom Sediment Samples
Biological Monitoring

**It is important to note that monitoring for each of the parameters listed above may not be appropriate for every community. Each combined sewer system and its associated overflows will be unique in various ways, and as a result, different monitoring strategies will need to be developed. This table provides a list of parameters that CSO dischargers should consider when developing strategies for monitoring CSO impacts on the Ohio River or its tributaries.*

WORK GROUP I

ROLE OF MODELING

THE ROLE OF MODELING

The modeling work group addressed three main questions:
What modeling needs are implied by the National CSO policy?
What features of a receiving water quality model are required to meet the modeling needs as defined in the previous question?
◊ What modeling approaches are suitable to simulate instream pollutant loadings? The work group also held a brainstorming session to develop an inventory of data and informational resources.

WHAT MODELING NEEDS ARE IMPLIED BY THE NATIONAL CSO POLICY?

The work group considered the National CSO Policy. Modeling needs were identified for sections including EPA objectives for permittees concerning implementation of the nine minimum controls and long-term CSO control plans. One of the nine minimum controls—monitoring to characterize CSO impacts and the efficacy of controls—had modeling needs. Concerning the evaluation of alternatives under the long-term CSO control plan, both the presumption approach and the demonstration approach implied some level of modeling.

Monitoring to characterize CSO impacts and the efficacy of controls

Model the sewer system, not the receiving stream, and infer that receiving stream impacts will be reduced if overflows are reduced in terms of frequency, quantity and pollutant loading.

The sewer system should be evaluated using limited monitoring supplemented by modeling. This evaluation should characterize the frequency, quantity and quality of overflows.

Sewer system evaluations should commence ASAP in order to define baseline conditions.

Long-term Control Plan: Presumptive Approach

Concerning four or five overflows per year, use sewer system hydraulic models to define the frequency of overflows. Use the model to simulate only the quantity aspects of the overflows. Continuous simulation over multiple years is the most rigorous approach to define the quantity aspects, while single event simulation for design storms may be a feasible alternative for some control strategies. Event simulation should be limited to the evaluation of system conveyance/ treatment or storage options.

Concerning the 85 percent by volume capture requirement, continuous simulation of the system should be used to model the percent of capture. The capture of pollutant mass equivalent to an 85 percent volume capture can be accomplished by continuous simulation of volumes used in conjunc-tion with observed/monitored concentrations. This simulation would be required for one or more years to define an average annual mass reduction achievable by capture and treatment controls.

Long-term Control Plan: Demonstration Approach

Modeling may be used to evaluate both the sewer system and the receiving stream. The overall approach will be dictated by individual states' standards and requirements. It is important that all pollutant sources be considered, not only those resulting from combined sewer overflows. Modeling

should be used in conjunction with preliminary monitoring to narrow the scope of a monitoring plan. Stochastic, Monte Carlo or continuous simulation models can be used to address receiving stream water quality and standards compliance; however simulation of a single, critical condition such as drought flow should be avoided.

WHAT RECEIVING WATER QUALITY MODEL FEATURES ARE NEEDED TO MEET THE ABOVE DEFINED NEEDS?

The work group determined that this question should be considered separately for large and small streams, and that water quality modeling should be conducted at two levels including mixing zone impacts and larger scale river-wide impacts.

Ohio River and Major Tributaries

Synoptic, basin-wide water quality modeling is not necessary. Rather, modeling should focus on more localized impacts occurring between urban areas.

Modeling should be conducted to determine both mixing zone impacts as well as far field effects.

The U.S. Corps of Engineers' FLOWSED reservoir model can be used to define flow inputs to water quality models.

Mixing zone models, supported by U.S. EPA or similar, should be used to define near-field, plume and shore-hugging effects of overflows. Water quality degradation and pollutant decay in the mixing zone may be important considerations for input to far field models, particularly with regard to shore-hugging effects.

Far-field (or river-wide) modeling should be used to evaluate the cumulative effects of discharges between urban areas. Pollutant loadings from upstream sources should be defined through monitoring, not simulation.

First-cut models should be conservative in nature, using a simple mass balance approach with no losses. If, based on this initial modeling approach, the long term control plan is overly burden-some, then a more rigorous approach should be dynamic in nature, one dimensional, unidirec-tional, use previously defined hydrodynamic inputs, and account for degradation and losses.

A model with the same general characteristics as described above should be applied to minor tributaries.

WHAT MODELING APPROACHES ARE SUITABLE TO SIMULATE POLLUTANT LOADINGS?

Concerning urban storm water, simple approaches such as the Rational Method are suitable to estimate quantities. The complexity of estimation techniques will necessarily increase with decreasing urbanization to include unit hydrograph or SCS computations.

Monitoring is required to define pollutant concentrations from rural storm water and other upstream

sources while flows may be modeled.

Other sources of pollutant loadings include atmospheric deposition and sediment resuspension. The importance of these sources was undefined by the group.

INVENTORY OF INFORMATION/DATA RESOURCES

Hydrology

U.S. Geological Survey
ORSANCO
U.S. Corps of Engineers
State GIS data
REACH File

Water Quality

Water treatment plant intakes
FERC data
Local Universities
STORET
Municipal studies
Consultant studies
305(b) reports
Bureau of Mines studies
U.S. Corps of Engineers
U.S. Geological Survey

CSOs and Other Pollutant Sources

Municipal facility plans and studies
ALCOSAN
Discharge monitoring reports (DMRs)
NURP reports

WORK GROUP II -

BIOLOGICAL APPROACHES

Biological Approaches

The objective of this work group was to answer the following questions:
Can populations studies of aquatic organisms supplement or replace physical and chemical monitoring?
What types of studies are appropriate?
◊ What level of effort is necessary?
◊ What data are available?

OVERVIEW OF BIOASSESSMENT

Biological assessment
can serve as a complimentary tool to physical and chemical monitoring.
◊ is by nature a long-term, ongoing, dynamic process.
◊ could serve to document impairment early in the assessment process, indicating whether additional physical and chemical monitoring is warranted.

When using bioassessment, it is important to distinguish between ambient and effluent monitoring.

TYPES OF STUDIES

Appropriate suite of indicators to be used in Ohio River bioassessment must be determined by monitoring results.

Information on appropriate methods of bioassessment could be drawn from the Interagency Task Force on Monitoring Water Quality (ITFM), EMAP, and National Water Quality Assessment (NAWQA).

Biological monitoring provides basic information on ambient water quality conditions, and should support a variety of programmatic needs, including monitoring CSOs.

LEVEL OF EFFORT

CSOs are clustered around municipalities, leaving large stretches of relatively untouched areas, which ORSANCO should study to determine ambient conditions.

A two-tiered monitoring approach would be most appropriate, with the first stage being a river-wide assessment using a consistent screening method developed by ORSANCO, and the second stage comprising more in-depth monitoring in areas in which a problem is indicated.

It should first be determined what level of bioassessment effort is needed. The budget assigned to that effort would dictate the details of a biological monitoring program, such as the number of sites.

DATA AVAILABILITY

It is important to determine what types of biological information are currently being collected by various entities and agencies.

Data from various sources may be collected using different SOPs and may be of variable quality.

DEFINING ROLES IN BIOASSESSMENT

There was a consensus that leadership of a river-wide effort for ambient biological monitoring should come from ORSANCO.

WORK GROUP III

SEDIMENTS

SEDIMENTS

This work group addressed whether river bottom sediments provide a useful means to monitor CSO impacts.

Since CSO pollutants generally are attracted to fine-grained sediment, CSO impacts should most likely be found in such sediment. This type of sediment is usually found at the mouths of tributaries, on river banks, and near lock and dam structures. However, hydrological and granulometric characteristics of the Ohio River prevent practically achievable identification of sediment impacts attributable to CSOs. The reasons for this conclusion are as follows:

Fine-grained sediment remains in suspension for great distances.
Improved water quality of the Ohio River is such that segregation and identification of significant CSO impacts is inherently difficult.
It is practically impossible to distinguish the source of most sediment pollutants.
Ohio River sediment is highly mobile and dynamic because high proportions of surficial bottom materials are replaced with every storm event.

After concluding that Ohio River sediments may not show CSO impacts, the work group addressed the role of tributary sediments in defining CSO impacts.

The approach to understanding the role of tributary sediment should proceed in three phases.

Phase I would be determining what the CSOs are discharging in order to identify what pollutants could be causing a problem.
Phase II would be to look for potential areas that may show CSO impacts on a case-by-case basis. This would involve a historical data review, preliminary calculations, and modeling.
◊ In the unlikely event that an area is identified as a good candidate for showing CSO impacts, Phase III would proceed by assembling a panel of experts to develop an appropriate sampling and interpretive methodology.

The work group identified a need to scrutinize other relevant studies to identify how impacts may manifest themselves in sediment. Pathways of contaminants must be determined as well as the ultimate fate of lesser-known contaminants.

Finally, the work group identified several other sources of information, including the following:
EPA dioxin survey
◊USGS NAWQA program
◊USGS NASQUAN studies
◊Contributors to pollution (i.e. power generators, manufacturers)

◊C.O.E. (Data specific to Ohio River Basin/R&D groups)
◊Toxic release inventory
Academic institutions

WORK GROUP IV

WATER COLUMN SAMPLING

WATER COLUMN SAMPLING

The objective of this work group was to develop the details of efforts involved in water column sampling to determine the impacts of combined sewer overflows on the Ohio River. The original title of this work group was "Traditional Sampling Approaches," but participants decided that "Water Column Sampling" was more appropriate. The group was charged with answering the questions "where," "when" and "how" to sample and addressed these questions along with two additional ones—"why" and "what." Throughout the discussion, a number of questions were raised by the group. These are listed at the end of this summary.

WHY MONITOR?

The group believed that monitoring was necessary in order to determine if there are measur-able impacts attributable to CSOs and to determine if there are water quality violations associated with wet weather in general.

WHEN TO MONITOR?

Monitoring programs should be wet weather event-related and designed to capture a wide range of events. EPA guidance for antecedent moisture requirements should be utilized in the implementation of the monitoring program.

WHAT PARAMETERS?

The work group recommended monitoring for the following list of parameters:

TSS
BOD *
Oil & Grease *
pH
Hardness
Ammonia
Metals (Cd, Cu, Pb, Hg, Zn)
Fecal
E. Coli *
DO

*indicates that questions were raised about the usefulness of monitoring a specific parameter

WHERE?

The work group recommended targeting major urban areas for the conduct of these studies (i.e. Pittsburgh, Cincinnati, or Louisville). The program should be designed to monitor conditions above and below the following locations:

the city
- ◊ areas of CSO concentrations
- ◊ POTWs

By bracketing each of these areas with sampling sites, it will be easier to determine impacts attributable to specific sources of pollution. Another suggestion of the group was to attempt to find a location further upstream from the city which is least impacted by urban/suburban development to determine true background conditions of the river prior to passing the city.

HOW?

The work group suggested that to make determinations about overall water quality, cross-sectional composite sampling should be utilized. The group also pointed out the importance of the development of consistent sampling protocol and QA/QC throughout the monitoring program. It was noted that it would be beneficial to coordinate this program with local monitoring efforts to minimize duplication of effort and maximize the usefulness of the data.

A number of questions raised by the work group are as follows:

What's affordable?
- ◊ Who will pay for the monitoring?
- ◊ What's the cost for monitoring three major cities?
- ◊ Will the regulatory agencies buy into this monitoring approach?
- ◊ Will the cities buy into this monitoring approach?

Can we or should we use low-flow water quality conditions to check compliance with CSO discharges at high flows?

What do current water quality standards require in relation to the above question?

What data are available (i.e. Europe, TVA)?

Ohio River Valley Water Sanitation Commission

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate water pollution control agency, established in 1948 by the signing of a compact among the states of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia, and the federal government. Under the terms of the Compact, the states pledge to cooperate in the control and abatement of water pollution within the Ohio River Basin.

A guiding principle of the Compact is that pollution originating in one state shall not injuriously affect the waters of another state. ORSANCO, focusing mainly on the Ohio River main stem and lower reaches of major tributaries, operates a variety of programs which include water quality monitoring and assessment, emergency response, pollution control standards, and public information and education. The Commission also conducts special studies and undertakes projects to increase understanding of Ohio River water quality.

Ohio River Description

The Ohio River begins in Pittsburgh, Pennsylvania at the confluence of the Allegheny and Monongahela Rivers and flows 981 miles in a generally southwest direction to join the Mississippi River near Cairo, Illinois. The first 40 miles are within Pennsylvania. The remaining 941 miles form the state boundaries between Ohio, Indiana and Illinois to the north and West Virginia and Kentucky to the south.

The Ohio River drains 203,940 square miles, or approximately five percent of the contiguous United States. More than 25 million people reside in the Ohio River Basin, or approximately 10 percent of the U.S. population, with an estimated six million people living within the 72 counties bordering the River. In addition, the Ohio River provides drinking water to more than three million people, and is used extensively for transportation, recreation, and as an industrial water supply. It also is home to a diverse and abundant aquatic community.

ORSANCO Commissioners*

Illinois

Richard S. Engelbrecht, Ph.D., Professor of Environmental Engineering, University of Illinois at U-C
Mary A. Gade, Director, Illinois Environmental Protection Agency
Phillip C. Morgan, Director, Danville Sanitary District

Indiana

Joseph H. Harrison, Sr., Bowers, Harrison, Kent & Miller
Michael O'Connor, Commissioner, Department of Environmental Management

Kentucky

James E. Bickford, Secretary, Natural Resources & Environmental Protection Cabinet
Roy Mundy, Vice President & Manager, Kentucky-American Water Company
Stephen L. Henry, M.D., Lieutenant Governor

New York

Douglas E. Conroe, Director of Operations, Chautauqua Institution
Thomas A. Erlandson, Ph.D., Professor of Biology & Geology, Jamestown Community College
Michael D. Zagata, Commissioner, Department of Environmental Conservation

Ohio

Keith Harshman, G.E. Aircraft Engines
Richard Miller
Donald R. Schregardus, Director, Ohio Environmental Protection Agency

Pennsylvania

James M. Seif, Secretary, Department of Environmental Protection
Melvin E. Hook, R&D Engineering P.C.
William M. Kudaroski, Operations Manager/Production, Pennsylvania-American Water Company

Virginia

Henry O. Hollimon, Jr., Ph.D., State Water Control Board
W. Bidgood Wall, Jr., State Water Control Board

West Virginia

L. Eli McCoy, Ph.D., Director, Department of Commerce, Labor & Environmental Resources, Division of Environmental Protection
Ronald R. Potesta, President, Terradon Corporation

United States

Valdas V. Adamkus, Regional Administrator, U.S. Environmental Protection Agency, Region V
Robin Corathers, Executive Director, Rivers Unlimited Mill Creek Restoration Project
Phillip J. Shepherd, Attorney

Officers:

Richard Miller, Chairman
William J. Kudaroski, Vice Chairman
Phillip C. Morgan, Secretary
Richard L. Herd, Jr., Treasurer
Alan H. Vicory, Jr., Executive Director and Chief Engineer

Appendix II
KYCSO STRATEGY

Legal Counsel
Thomas D. Heekin, Taft, Stettinius & Hollister

As of August 1996

Copies of this publication can be obtained by contacting ORSANCO at:

5735 Kellogg Avenue, Cincinnati, Ohio 45228-1112
513/231-7719