New York State
Department of Environmental Conservation

Division of Water

Oswego River Remedial Action Plan

1996 Update

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OSWEGO RIVER

REMEDIAL ACTION PLAN

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New York State Department of Environmental Conservation
Division of Water
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The Oswego River Remedial Action Plan, 1996 Update, was prepared by the New York State Department of Environmental Conservation in cooperation with the Oswego River Remedial Advisory Committee. Advisory committee members are listed in Appendix A. The content of this Update document was distributed for formal review. All substantive comments have been incorporated into this final publication compiled by Bob Townsend. Copies of Remedial Action Plan documents are available from NYSDEC, Division of Water, Bureau of Watershed Management, 50 Wolf Road, Albany, New York, 12233-3508, phone (518)-457-8960.

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I. EXECUTIVE SUMMARY

A Remedial Action Plan is a pollution identification and abatement action plan that describes the causes and sources of contamination and the remedial activities needed to correct use impairments and to document progress towards restoration. The steps in the RAP process are iterative in that they define remedial strategies, responsible parties, and time frames for implementation; they then evaluate progress and adjust strategies as necessary to achieve the goals. Use impairments identified for the Oswego River harbor and lower river involve fish and wildlife consumption restrictions, degradation of fish and wildlife populations, and loss of habitat. These impaired uses as well as other indicators of impairment require further investigations which involve conducting studies of the benthos, reproductive problems, deformities, aesthetics, and plankton populations. The challenge of implementing the RAP, to restore beneficial uses in times of reduced resources, is one which will require project partnership and stewardship in order to accomplish goals.

NYSDEC initiated public input into the development of the Oswego River RAP in 1987 with the establishment of a Citizen Advisory Committee. The Stage 1 RAP, which includes use impairment definitions and identification of causes and sources, was completed in 1990. The Stage 2 RAP, which identifies remedial and preventive actions to restore water quality in the lower river and harbor and eliminate adverse impacts to Lake Ontario from sources of pollutants carried by the Oswego River, was completed in 1991. Following completion of the Stage 2 RAP, a Remedial Advisory Committee (RAC) was formed as a multi-stakeholder structure to assist NYSDEC in RAP implementation. The membership of the advisory committee includes people from industry, environmental groups, government, academia, private, and sporting interests.

A RAP Update was published in June 1992. A second RAP Update Summary was completed in October 1995 that documents remedial progress and develops remedial strategy tracking. Critical components of the RAP remedial strategies include watershed activities involving the Onondaga Lake cleanup, inactive hazardous waste site remediation, and further investigations to update the causes of use impairments. Results of more recent Oswego River and Harbor water quality and sediment investigations, as well as a fish pathology report, have been evaluated and factored into the use impairment indicator status reassessments that the current comprehensive 1996 Remedial Action Plan update document provides.

The Great Lakes Remedial Action Plan program originated in a 1985 recommendation from the International Joint Commission (IJC) and was formalized in the 1987 amendments to the United States-Canada Great Lakes Water Quality Agreement. The Agreement calls for the federal governments, in cooperation with state and provincial governments, to ensure that RAPs incorporate a systematic and comprehensive ecosystem approach towards restoring beneficial uses, and to ensure that the public is consulted in all actions undertaken pursuant to RAPs. The ecosystem approach accounts for the interactions among land, air, water, and all living things, including humans. RAPs are to apply this approach to implement a comprehensive watershed cleanup and management plan that involves all stakeholders. The 1996 Oswego River RAP Update establishes the format to continue this process towards the ultimate goal of assuring that the beneficial uses are restored and protected so that the Area of Concern (AOC) can be delisted.

II. INTRODUCTION

The purpose of this comprehensive Oswego River Remedial Action Plan Update is to provide not only assistance to those persons involved in the identification, development, implementation and tracking of remedial strategies and priorities, but also a detailed summary of the Stage 1 and Stage 2 documents. This 1996 update document ties together the previous RAP documents and establishes the course for the future success of the Remedial Action Plan.

A. Background:

The International Joint Commission (IJC) identified 43 Areas of Concern (AOCs) in the Great Lakes drainage basin where pollutants are impairing beneficial uses of a waterbody. The Oswego River on the southern shore of Lake Ontario is one of these Areas of Concern because: 1) past industrial and municipal discharges have contaminated the river bottom sediments, and 2) pollutants from the river's drainage basin have traveled through the river and harbor to Lake Ontario, adding to that lake's environmental problems.

The 1987 amendments to the United States/Canada Great Lakes Water Quality Agreement (GLWQA) calls for Remedial Action Plans (RAPs) to be developed by the respective governments and for them to make recommendations for correcting the use impairments in the AOCs. Annex 2 of the GLWQA specifies requirements for developing RAPs. The Annex also provides a list of fourteen indicators of use impairment that serve as a guide for analyzing the pollution problems in each AOC. If any one of the indicators is found to exist or if other related use impairments are identified in the AOC, the causes and sources are to be listed and remedial actions are to be developed and implemented to assure restoration and protection of beneficial uses. The International Joint Commission's guidelines for listing and delisting use impairments from an Area of Concern are delineated in Appendix E with quantitative examples provided. The Remedial Advisory Committee has developed a specific set of use impairment restoration and protection (delisting) criteria for the Oswego RAP that are delineated in Appendix D.

New York State, the other Great Lakes states, and the Province of Ontario, are preparing and implementing Remedial Action Plans for the remediation of the problems in the Areas of Concern under the requirements of the Great Lakes Water Quality Agreement. As a first step in preparing the Oswego RAP, the New York State Department of Environmental Conservation (NYSDEC) formed a Citizens' Advisory Committee (CAC) that included residents of the Oswego River Basin, industry representatives, outdoor sports enthusiasts, environmentalists, research scientists and local government representatives. Their task was to define the use impairments and to identify causes and remedial actions in the development of the RAP. NYSDEC staff and the subsequently formed Remedial Advisory Committee (RAC) are continuing the efforts of the original CAC and are working together to update and to implement the Oswego River RAP.

A RAP embodies an aquatic ecosystem approach to restoring and protecting the biota and water quality in the Area of Concern. Restoration of the beneficial uses in the Oswego River Area of Concern will contribute to the overall improvement of environmental conditions in the river and in the Great Lakes system.

B. Location:

The Oswego River, with its harbor to Lake Ontario, is a valuable natural resource for industry, commerce and recreation in central New York State. The lower Oswego River (and Oswego Harbor) can be characterized as a multiple-use resource: manufacturing plants, commercial storage facilities and locks to accommodate canal navigation line the shore along with charter docks, a marina, restaurants, and services for recreational harbor users and tourists. Tourism and commercial activity generated by the sport fishery are important to the area's economy.

The average water flow into the Oswego Harbor from the Oswego River is 4.2 billion gallons per day. This includes runoff from more than three million acres of urban, rural, and agricultural land. **Figure 1 - The Oswego River Watershed** illustrates the drainage basin with its tributaries that drain a 5,000 square mile watershed, the second largest in New York State. The waters of the Oswego River include the drainage from the hills above the Finger Lakes and treated discharge from sewage treatment plants and industries as far from Oswego as Canandaigua and Ithaca. A dominant urban core (Syracuse and its suburbs) is within the basin, as are eight smaller cities and dozens of villages. There are extensive areas of farmland and forest, and scattered shoreline development.

The health of the entire river system is vital to the more than 1.2 million people who live in the drainage basin. A variety of industries use the river basin's water for processing, cooling, and discharging treated wastes. The waters of the river also provide habitat for a variety of fish and waterfowl. The Oswego River is second in size only to the Niagara River as a tributary to Lake Ontario. Pollutants carried by the Oswego River also affect the health of Lake Ontario's ecosystem.

The focus of the Oswego River Remedial Action Plan is the correction of use impairments within the Area of Concern which includes the harbor area and lower Oswego River below the Varick Dam. **Figure 2 - The Oswego River Area of Concern** illustrates this area. The challenge is to cleanup the causes and sources of these use impairments in the Oswego River AOC watershed, which includes segments of the Oswego-Oneida-Seneca three rivers system, that contribute to the problems in the Area of Concern. The intent is to mitigate and/or eliminate any sources of pollution entering or leaving the Oswego AOC boundaries that cause local impairments.

Inputs of pollutants from the Oswego River and its tributaries upstream of the AOC are identified where they contribute to impairments in the AOC. Use impairments that are determined not to be caused by watershed contributions or in-place conditions but are influenced by the connection to Lake Ontario are to be more appropriately addressed in the Lake Ontario Lakewide Management Plan (LaMP) that is also being developed under the Great Lakes Water Quality Agreement.

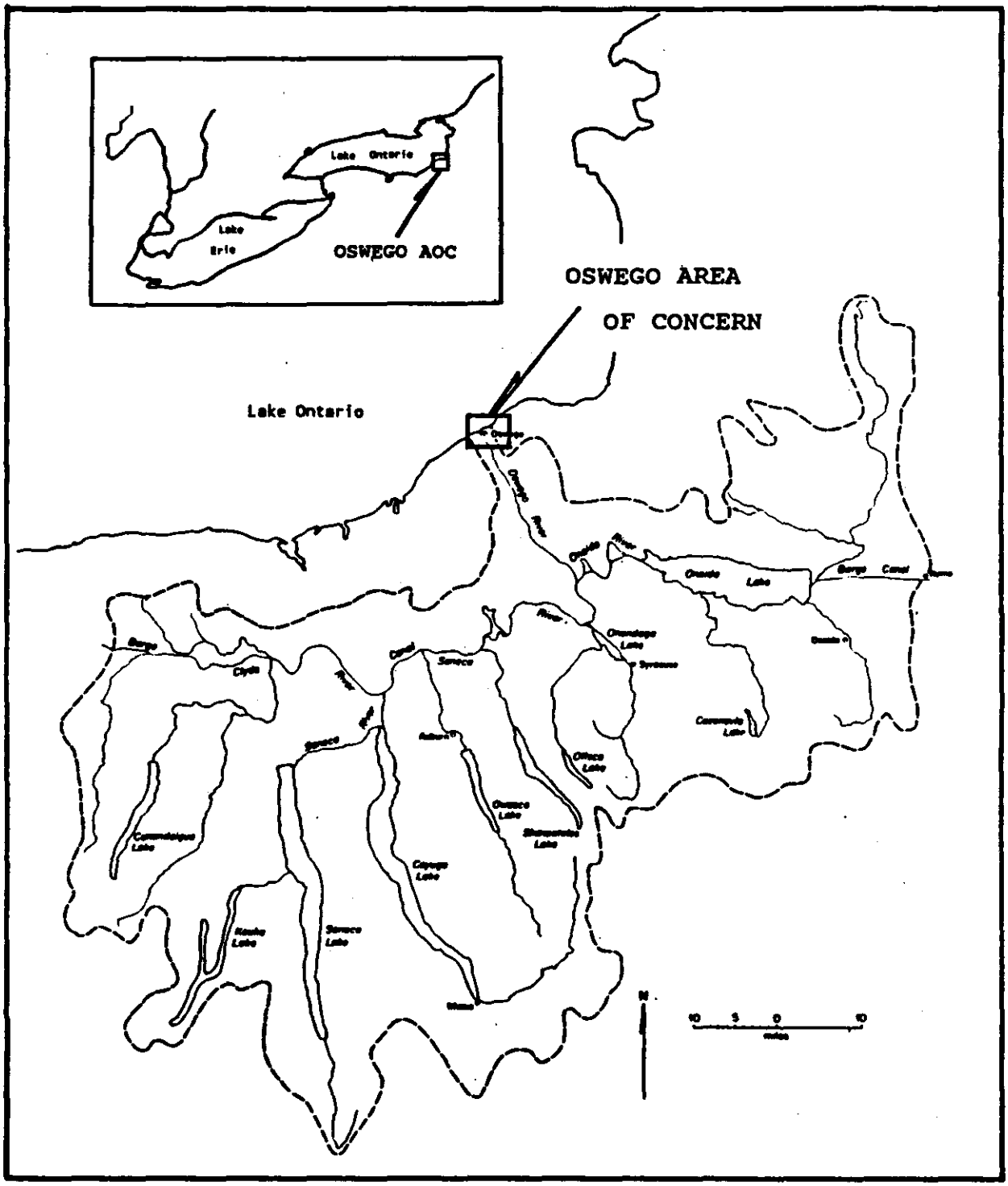


Figure 1 The Oswego River Area of Concern Location and the Seneca-Oswego-Oneida Rivers Basin

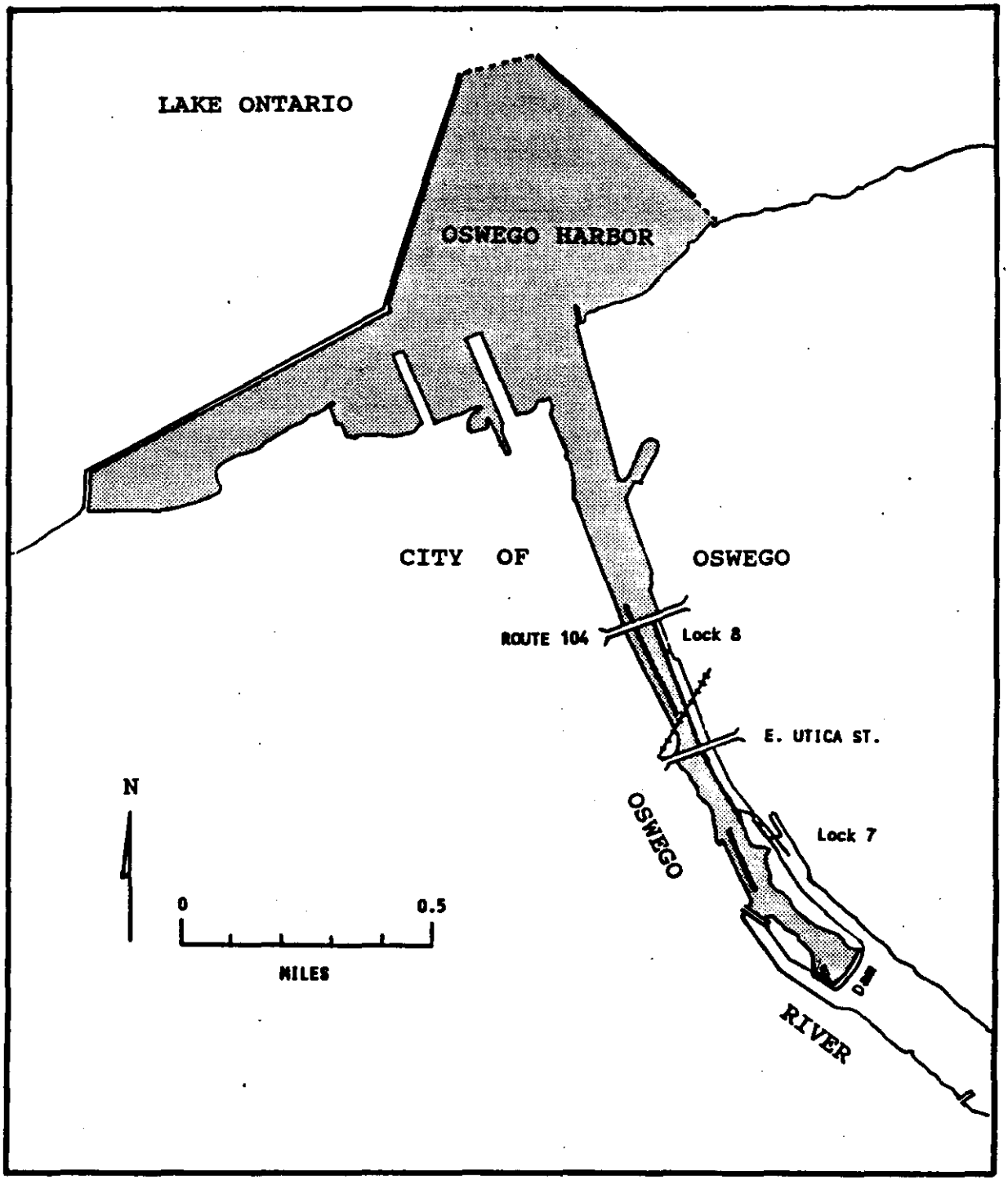


Figure 2 The Oswego River Area of Concern

C. The Remedial Action Plan (RAP) Goal:

The Goal of the Oswego River Remedial Action Plan, as established by the New York State Department of Environmental Conservation (NYSDEC) and the Citizens' Advisory Committee (CAC) is three-fold:

1. To achieve the purposes of the Great Lakes Water Quality Agreement within the Oswego Area of Concern;
2. To restore the water quality of the AOC so that it is capable of supporting swimming and an edible, diverse, and self-sustaining fishery; and,
3. To eliminate adverse impacts to Lake Ontario arising from the Oswego-Oneida-Seneca Rivers basin.

Current New York State (NYS) programs which help meet the RAP goal include: activities under the State Pollutant Discharge Elimination System (SPDES), New York's Water Quality Classifications and Standards, state and federal Hazardous Waste Remediation Programs, the New York Coastal Management Program, nonpoint source pollution management, multi-media and pollution prevention actions, and activities under the federal Clean Water and Clean Air Acts.

D. The Remedial Action Plan (RAP) Process:

The RAP process embodies an aquatic ecosystem approach to restore and to protect the biota and water quality in the Area of Concern. Implementation of remedial activities to correct use impairments and to protect against threats to human health and the environment will contribute to the overall improvement of environmental conditions in the river and in the Great Lakes system. A Remedial Action Plan is a sequence of steps or a phased process that defines problems and their causes, identifies sources of pollution or disturbances, makes recommendations and implements commitments for remedial measures, and then establishes a post-remedial monitoring system to document success. Development of a Remedial Action Plan is a three stage process. Final draft documents for each stage are submitted to the International Joint Commission for comments. Formal Stage 1 and Stage 2 review meetings were conducted for the Oswego RAP. The three stages of a RAP are described below:

* **Stage 1** - Stage 1 describes the environmental problems and the use impairments of the Area of Concern, the pollutants causing the impairments, and the sources of those pollutants. The Stage 1 Oswego RAP was completed in February 1990 by the CAC and NYSDEC. It describes the environmental problems and use impairments of the Area of Concern, the pollutants causing use impairments, and the sources of those pollutants.

* **Stage 2** - Stage 2 in the RAP process describes remedial activities and strategies, recommends remedial actions, makes specific remedial commitments and describes

methods for monitoring remedial progress in the AOC. The Stage 2 RAP was completed in June, 1991. Remedial strategies are then further developed and detailed, and kept current, in the RAP Update. This 1996 update document continues to incorporate an ecosystem approach with the objectives of restoring beneficial uses within the Oswego River AOC and eliminating adverse impacts to downstream areas. The remedial strategies therefore aim to restore the water quality within the Oswego Harbor/River and to prevent adverse impacts to Lake Ontario from pollutants carried by the Oswego River.

Following the completion of the Stage 2 RAP, a Remedial Advisory Committee (RAC) was formed to assist NYSDEC in the remediation process. Much like its predecessor (the CAC), the RAC is representative of concerned groups within the community that have an interest in the Oswego River Area of Concern. In addition to RAC members, agencies at all levels of government will be asked to participate and provide input to RAP implementation as needed.

To track the implementation of the Remedial Action Plan, NYSDEC intends to issue a periodic RAP Update to describe current remedial activities/strategies, to report on remedial progress, and to identify new commitments and resource needs. This 1996 RAP Update document is the third update for the Oswego River RAP.

* **Stage 3** - Stage 3 in the RAP process will occur when significant progress has been achieved in documenting the correction of use impairments. Conducting extensive investigations, studies, and ongoing monitoring activities as well as implementing required remedial actions are all necessary elements of a strategy to achieve the Stage 3 goal of restoring and protecting beneficial uses. As restoration of beneficial uses occurs and as further remedial activities are implemented, a success story will emerge to fulfill a Stage 3 document. The Use Impairment Restoration and Protection (Delisting) Criteria, detailed in Appendix D and summarized in Section VI, will be important as a check list to verify this success and the ultimate recommendation to delist the Area of Concern.

The RAP goal sets the stage for the development and planning of a RAP. The Remedial Action Plan is actually a continuing process to facilitate, track, and report progress on the remediation of known problems and to conduct investigations needed to further identify, characterize, and address the correction of use impairments and their causes. **Figure 3 - The RAP Process Model** illustrates the cycle of the RAP planning and implementation process. Implementation of a Remedial Action Plan continues as long as there is work to be done towards reaching the RAP goal. Monitoring progress in all phases, evaluating actions, and implementing adjustments as part of management planning are each instrumental to RAP success. Therefore, long-term monitoring that documents the implementation of remedial activities is fundamental to providing the information needed to report on the restoration and to make recommendations to delist an Area of Concern. NYSDEC has applied the RAP process to determine priority remedial activities (Section VII), to seek support from funding sources, to commit resources to implement specific remedial actions, and to monitor and report on progress through the RAP Update.

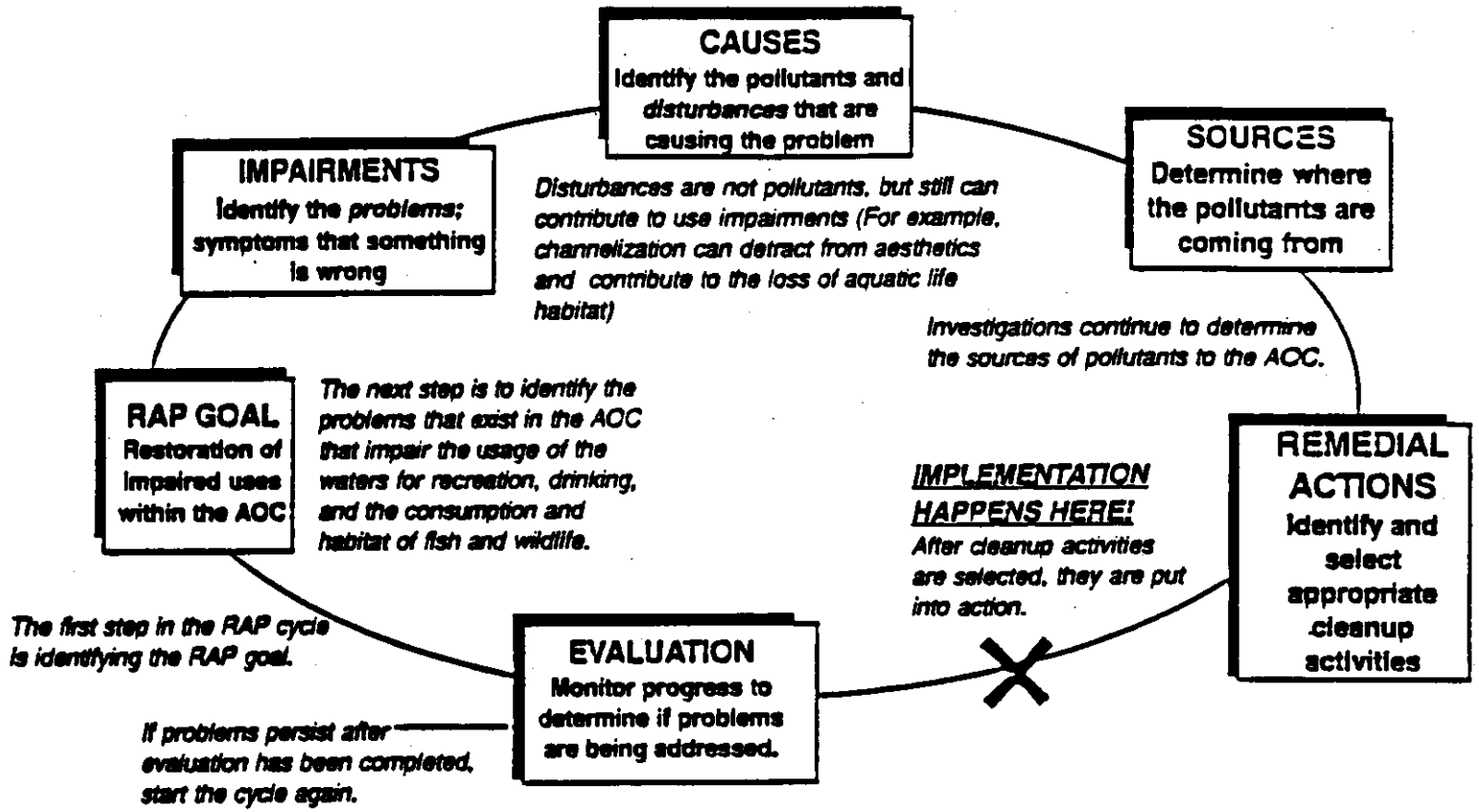


Figure 3 - THE RAP PROCESS MODEL

E. The RAP Update Content Synopsis:

Specific descriptions concerning the basis for use impairment definitions and sources of contamination are presented in detail in the Stage 1 RAP publication. An updated summary of the status of the Stage 1 use impairment indicators, their causes, and the sources of contamination are to be provided in each RAP Update. Details concerning the evaluation and determination of initial remedial activities, environmental control programs, recommendations and commitments are presented in the Stage 2 RAP publication. Similarly, an updated summary of the Stage 2 RAP implementation, showing the current status of ongoing and planned remedial activities and strategies, is also to be provided in each RAP update.

A chronological summary of highlights of completed remedial activities for the Oswego River Area of Concern, since commitment to RAP development in 1985, is provided in Appendix B of this 1996 RAP Update. In **Sections II and III** of the Update, summaries of the AOC location description, RAP goals and process, use impairment status, causes, and sources are provided. Details of current remedial activity progress are listed in **Section IV** which includes a set of matrices to evaluate remedial actions and investigative needs and identify priorities. Specific strategies developed for the restoration and protection of each beneficial use are developed in **Section V** as well as a recommendations/commitments update and a response to IJC review comments. The resulting RAP "strategy management forms" serve to facilitate the RAP process and document progress towards the restoration. **Section VI** develops specific restoration and protection (delisting) criteria for each use impairment indicator and identifies the status of achieving the requirements for each criteria. **Section VII** summarizes priority remedial activities by identifying investigative, assessment, planning, and physical improvement activities needed to resolve use impairments. **Section VIII** describes various initiatives that support the Remedial Action Plan and addresses issues that complicate the RAP process.

The 1996 RAP Update has a revised format to more specifically address the correction of use impairments and contamination sources. The revised and newly developed tables serve to simplify understanding of the RAP and the priority activities. The effort to identify and incorporate all RAP related program activities towards influencing the success of the Remedial Action Plan embodies the ecosystem approach. This comprehensive approach is needed to achieve restoration of beneficial uses as set forth in the Great Lakes Water Quality Agreement.

III. USE IMPAIRMENT SUMMARY

Table 1 and **Table 2** have been developed to summarize the status, causes, and sources of the use impairment indicators as established in the Stage 1 and Stage 2 documents. These tables have been updated to indicate current status reassessments and appropriate comments. This important and fundamental information is very useful to understanding and implementing the Oswego River Remedial Action Plan.

A. Use Impairment Status:

The waters and river bottoms of the Area of Concern have been affected by industrial and municipal discharges, physical disturbances including dam construction, upstream sources including nonpoint source discharges, and atmospheric deposition. The Stage 1 RAP identified watershed discharges and contaminated sediments as the major sources of contaminants to the AOC. Fourteen use impairment indicators have been developed from a list of beneficial use impairments in Annex 2 of the Great Lakes Water Quality Agreement of 1978. The Oswego River Stage 1 RAP document identifies four of the fourteen use impairment indicators as impaired and five other use impairment indicators that have an unknown or likely status.

Table 1 lists the use impairment indicators and then summarizes their Stage 1 status along with their current status of impairment. This status comparison has been added to the listing of use impairments so that, as the RAP process continues and progress is made, we can obtain a "quick look" of the progress by comparing the original status against any current status changes.

Table 1 also contains a comment for each use impairment relative to establishing restoration and protection of the beneficial use. Key elements and needs to correct the use impairment are summarized in this comment column. As introduced above, from the list of fourteen use impairment indicators to be evaluated for a RAP, four indicators for the Oswego River RAP have been determined to be "impaired"; five others "will require further investigation and assessment"; and, the remaining five are rated as "not impaired". Among the five not impaired indicators, two have been reopened to receive expanded review based on survey data that has become available to address aspects of the indicator not previously assessed. These two indicators involve dredging restrictions and beach closings. For the dredging restrictions use impairment we intend to further assess expanded dredging other than the usual harbor maintenance dredging. For the beach closings use impairment we intend to further evaluate partial-body contact in the open waters of the Area of Concern based on additional water quality survey results.

Together, Table 1 and the Use Impairment Restoration and Protection Strategies (as developed in Section V) provide a remedial activity focus for the restoration of beneficial uses. A strategy management form has been further developed for each use impairment indicator that identifies the needed follow-up activity. In Appendix C there are eleven individual use impairment strategy management forms in all: one for each of the four indicators rated as impaired, one for each of the five indicators rated as needing further study, and one for each of the two indicators under expanded review.

TABLE 1 - USE IMPAIRMENT STATUS

Oswego River Remedial Action Plan

USE IMPAIRMENT	STAGE 1 STATUS	CURRENT STATUS	AREA OF CONCERN COMMENT
Fish and Wildlife Consumption Restrictions	Impaired	Impaired	PCBs are the cause; Need continued study with non-AOC (Lake Ontario) determinations.
Degradation of Fish and Wildlife Populations	Impaired	Impaired	Need to define desired level in the AOC; Need to reassess dry areas below Varick dam.
Loss of Fish and Wildlife Habitat	Impaired	Impaired	Need reassessment following implementation of FERC relicensing requirements.
Eutrophication or Undesirable Algae	Impaired	Reassessing based on Survey	Water Quality Survey in Harbor AOC indicates no impairment.
Degradation of Benthos	Likely	Reassessing based on Study	1995 EPA/DEC sediment study results contain some needed community structure data.
Fish Tumors or Other Deformities	Unknown	Reassessing based on Study	Fish pathology study indicates little impairment evidence, (if further study warranted: look at reproductive health of resident AOC fish).
Bird or Animal Deformities or Reproductive Problems	Unknown	Unknown	Need AOC study to verify existence. Recommend expanding scope of this indicator to also assess fish reproductive health concern.
Degradation of Aesthetics	Unknown	Reassessing based on Survey	1995 Water Quality Survey indicates not impaired.
Degradation of Plankton Populations	Unknown	Reassessing based on Survey	1995 Water Quality Survey indicates not impaired.
Restrictions on Dredging Activities	Not Impaired	Not Impaired; (Expanding Review)	Maintenance dredging not impaired; to review expanded harbor dredging proposals and EPA/DEC 1995 sediment study results.
Beach Closings	Not Impaired	Not Impaired; (Expanding Review)	No beach impairment; Water Quality Survey results support status for partial-body contact in open waters.
Tainting of Fish and Wildlife Flavor	Not Impaired	Not Impaired	Fish pathology study further supports this status.
Drinking Water Restrictions, Taste and Odor Problems	Not Impaired	Not Impaired	Water Quality Survey supports status; additional data useful.
Added Costs to Agriculture or Industry	Not Impaired	Not Impaired	Water Quality Survey supports this status.

The primary use impairment in the Oswego River Area of Concern is "restrictions on fish and wildlife consumption". These restrictions are associated with contaminated sediments and the larger lakewide use impairment of consumption advisories involving Lake Ontario. The primary cause contributing to this impairment is the evidence involving PCBs. Issues involving mirex and dioxin also contribute to this impairment concern. Other use impairments involving "loss of fish and wildlife habitat" and "degradation of fish and wildlife populations" are attributed to watershed discharges, the dry areas below the Varick Dam, and other physical disturbances.

Five use impairment indicators have been selected to be reassessed for an improved status change. The results of the water quality survey, a sediment study, and fish pathology study provide data for the reassessment of the following indicators: eutrophication or undesirable algae, degradation of benthos, fish tumors or other deformities, degradation of aesthetics, and degradation of plankton populations. These reassessments and the remedial strategy identification for each of the eleven use impairments involving corrective actions and expanded review are further discussed and summarized in Section V.D - Use Impairment Strategy Summaries.

B. Use Impairment Causes and Sources:

Table 2 has been developed to identify the specific causes and sources of each use impairment in the Oswego River AOC. This information has been summarized from the content of the Oswego River RAP Stage 1 and Stage 2 documents. Table 2 lists the use impairment indicators (consistent with Table 1) and then summarizes the causes of the impairment and the sources of contamination. The data used to identify sources does not always provide direct evidence with complete certainty. The link between an impairment and a source must therefore be logically inferred in many instances. Where an impairment is indicated in the Area of Concern and its cause is known, the environmental and source evidence data were examined in Chapters 4 and 5 of the Stage I RAP.

Clearly, PCBs are a main cause of use impairments in the Oswego River AOC. Other contaminants of concern include Mirex, dioxin, octachlorostyrene (OCS), and nutrients (phosphorus). Other causes of use impairments include physical disturbances created by the construction of the power dam, periodic dry areas below the dam, natural erosion/runoff of suspended solids, turbidity, and chloride.

The known and potential sources of the causes of the use impairments shown in Table 2 include: upstream point and nonpoint sources, inactive hazardous waste sites, contaminated sediments, erosion, atmospheric deposition, foreign species (zebra mussels), Lake Ontario, and water levels. In the watershed, plans are underway to address the remediation of Onondaga Lake, the remediation of numerous hazardous waste sites, and the relicensing of the Varick power dam in Oswego. These activities are expected to play a major role in beneficial use restoration.

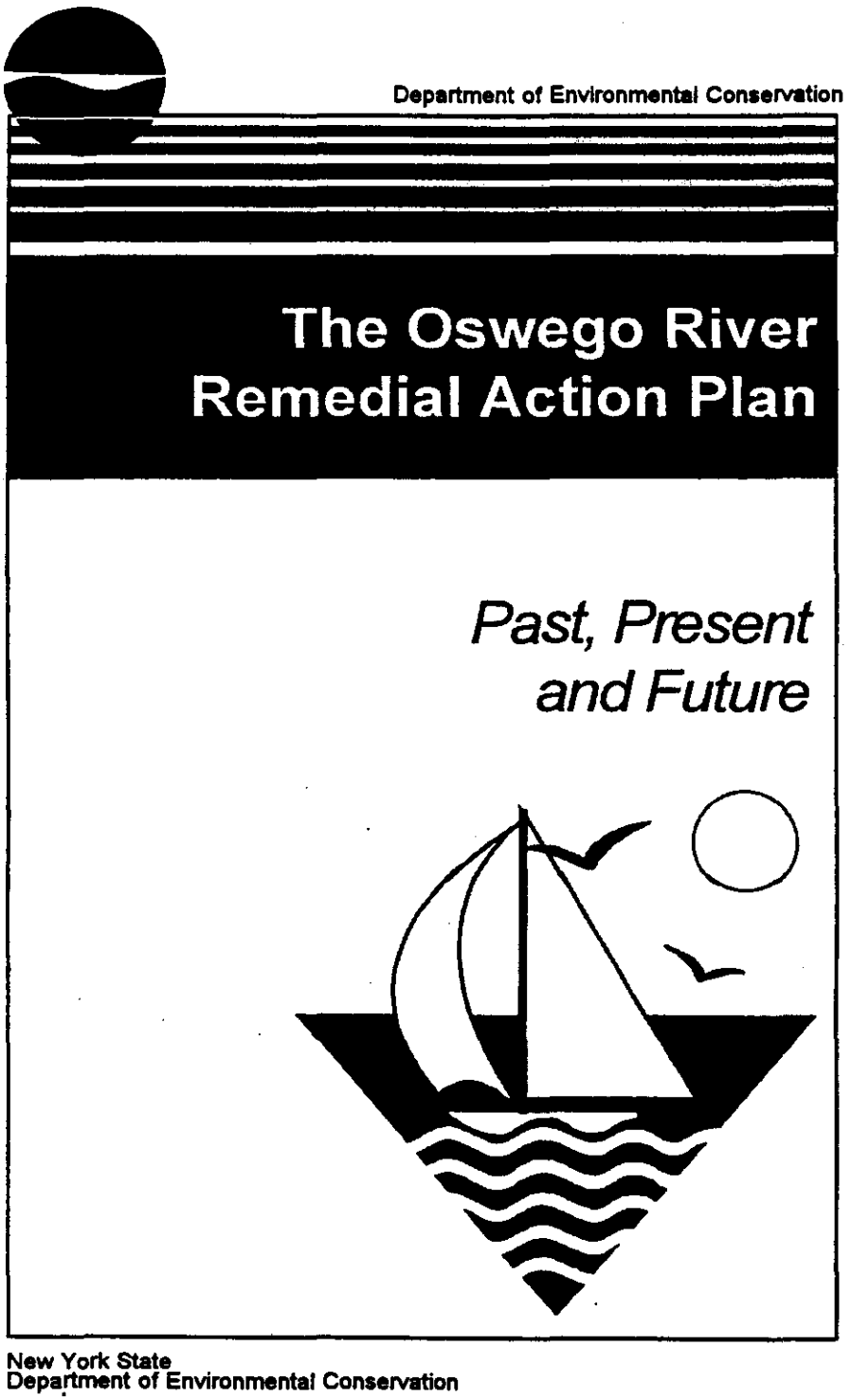
TABLE 2 - USE IMPAIRMENT CAUSES AND SOURCES

Oswego River Remedial Action Plan

USE IMPAIRMENT	CAUSES	SOURCES
Fish and Wildlife Consumption Restrictions	PCBs, Mirex, dioxin	Lake Ontario, Contaminated sediments, Point and nonpoint sources upstream of the Area of Concern.
Degradation of Fish and Wildlife Populations	Periodic dry areas below dam; PCBs, OCS, dioxin	Watershed discharges, haz. waste sites, contaminated sediments, disturbances, water levels.
Loss of Fish and Wildlife Habitat	Dry area below dam; Human development	Watershed discharges, haz. waste sites, contaminated sediments, disturbances, water levels.
Eutrophication or Undesirable Algae	Phosphorus	Point and nonpoint watershed discharge sources, combined sewer overflows, runoff.
Degradation of Benthos	Unknown	Potentially contaminated sediments, past discharges, haz. waste sites, and nonpoint sources.
Fish Tumors or Other Deformities	Recent study indicates no significant impairment	Past discharge and disposal practices, nonpoint sources.
Bird or Animal Deformities or Reproductive Problems	Potentially PCBs, OCS, dioxin	Contaminated sediments, hazardous waste sites.
Degradation of Aesthetics	Turbidity, suspended solids	Stormwater, runoff.
Degradation of Plankton Populations	Potentially nutrients, chloride (no data)	Past waste disposal practices, physical habitat changes.
Restrictions on Dredging Activities		
Beach Closings		Note:Bacterial data is to be considered under the aesthetics impairment for partial-body non-bathing contact.
Tainting of Fish and Wildlife Flavor		
Drinking Water Restrictions, Taste and Odor Problems		
Added Costs to Agriculture or Industry		Potential added cost due to zebra mussels.

Sources of pollutants contributing to use impairments in the AOC can be classified as either 1) point or nonpoint sources within the Seneca-Oneida-Oswego River basin or 2) from Lake Ontario. This is because the waters of the Area of Concern are made up partly of what comes down the Oswego River and partly what enters the AOC from Lake Ontario. Little is known about the dynamics of interchange of Lake and river waters, but that it occurs is certain. Waters entering the AOC from Lake Ontario can carry contaminants with them, as can the fish that swim from Lake Ontario into the AOC. Likewise, waters from upstream can carry contaminants which may effect the AOC and Lake Ontario. Therefore, remedial actions on the sources of pollutants throughout the Oswego River drainage basin must be coordinated and implemented to properly address the problems within the Area of Concern.

Point sources of pollutants include municipal and industrial discharges of wastewater that are regulated by point source discharge permits (SPDES permits). Current point source discharge permitting practices provide extensive control of point source discharge wastewaters. Combined sewer overflows that include stormwater and receive less treatment than normal have been identified for remedial action. Nonpoint sources of pollution are also a focus for remedial and preventive measures that primarily include implementation of improved management practices. Nonpoint pollution is characterized by releases from contaminated sediments, runoff/leachate from hazardous waste sites, erosion and storm flow in developing areas, or poor agricultural land practices.



[Cover of Brochure Described in Section IV.H.3]

IV. REMEDIAL ACTIVITY PROGRESS

The Remedial Action Plan process identifies all resources contributing to the goal to eliminate use impairments. Concurrent with this RAP planning and implementation effort, various New York Department of Environmental Conservation (NYSDEC) and other agency environmental program activities are in place and progressing as part of ongoing environmental protection laws, regulations, and policies. The RAP strives to influence these programs to address local area, watershed, and ecosystem concerns. In turn, these activities do contribute and support progress towards achieving the RAP goal. The RAP strategies, therefore, make use of all resource commitments and related remedial actions and seek to incorporate an ecosystem approach into remedial activities to restore and to protect beneficial uses.

By communicating the RAP process, it is desired that remedial activities take on this ecosystem approach. One purpose of the Remedial Advisory Committee is to assure that all stakeholders' interests and concerns have been satisfactorily investigated and resolved as much as possible. A key to this is securing implementation commitments to achieve RAP objectives. Appendix B provides highlights of a chronology of major remedial activity progress in the Oswego River Area of Concern to date.

Significant remedial activity progress has occurred affecting the implementation of the Oswego River RAP. Details of current programs and remedial activity progress are described below as they are linked or directed by remedial action strategies. To facilitate reporting of remedial activity progress, the RAP subject matter is broken down into nine major program area/remedial activity topics. Current program updates of these nine major environmental program area/remedial activity topics are presented below in the following order:

* Hazardous Waste Site Remediation
* Contaminated River Sediments
* State Pollution Discharge Elimination System (SPDES)
* Nonpoint Source Pollution Control
* Air Pollution Control
* Fish and Wildlife Assessments/Actions
* Health and Environmental Assessments/Actions
* RAP Public Participation and Outreach
* Investigations and Monitoring Activities

As appropriate, when the details of a remedial activity description exceed the scope of one program area, cross-referencing among these nine areas is made in order to avoid duplicate reporting. Reference is also made to other sections in the Update (such as the narratives in Section VIII on Additional Initiatives to Enhance Restoration). This nine program area/remedial activity breakdown is necessary to create an organized and current report that describes the details of RAP progress.

The progress of each of these nine environmental program areas involves multiple interested parties, issues, and concerns that must take on an ecosystem approach to assure success of individual projects. The anticipated effect that implementing a remedial activity will have towards correcting each use impairment indicator is evaluated in the Table 3 matrix contained in Section V.A. Likewise, the identification of ongoing and/or necessary remedial activity strategies, as they are related to the correction of a specific use impairment, is described in the update of the eleven Use Impairment Restoration and Protection Strategy management forms developed in Section V.C. Details of specific remedial activities, involving each of these nine program area/remedial activity topics, are presented below. Remediation activity updates, study and report results, and planned investigations are included.

A. Hazardous Waste Site Remediation (Land-Based):

As experience and expertise have grown in remediation work, a goal of shortening the time and lessening the costs of implementing a remedial program without sacrificing the protection of public health and the environment has been achieved. Steps have been taken to rapidly clean up sites by using Interim Remedial Measures (IRMs) which are actions that can be taken without long, formal investigations. The result has been that the site investigation process has undergone major changes: the former time-consuming Phase I and Phase II Investigations have now been combined into a single, condensed, comprehensive Preliminary Site Assessment (PSA). Built into a PSA are decision points which allow the classification or delisting of a site as soon as enough information exists to evaluate the situation against the state's criteria for defining an inactive hazardous waste site. The number of class "2a" sites (those requiring more information) has been dramatically reduced and of those sites remaining, most are currently under investigation. NYSDEC's priority ranking system, for inactive hazardous waste sites listed as class "2" (those requiring remedial action), contains a RAP component that can raise the priority of implementing remediation based on the relationship to a Remedial Action Plan. Improvements in public interaction have been enhanced by state regulation requiring a citizen participation plan for every hazardous waste site undergoing remediation. Public comment opportunities are also provided prior to site delistings. Useful fact sheets are available that describe the stages of the remediation process.

NYSDEC has issued various Administrative Orders that require land-based hazardous waste site remediation in the Oswego River drainage basin. Implementation of these orders is a key to watershed area rehabilitation and is fundamental to use impairment correction when such remedial activity forms the basis for the initial remedial strategy. Completion and settlement of these remediation activities includes Natural Resource Damage Claims that address recovery for damages and injury to the natural resources. Land-based remedial actions have been required at several large industrial facility sites in the Syracuse area. These are in different phases of implementation. Active remediation is proceeding or planned at a number of sites in the drainage basin; some of these sites have the potential to contribute to use impairments in the AOC. Details of

these remedial activities that may affect the AOC are described below. The delisting of the Armstrong landfills is discussed in Section VIII.U. Remedial activities at other hazardous waste sites within the watershed are believed to be associated with localized problems that have less impact in the Area of Concern.

The sites described below are land-based remediation projects only and are high priorities thought to be likely sources of contaminants contributing to use impairments in the AOC.

1. **Columbia Mills**

   This abandoned manufacturing facility site is located in Minetto, Oswego Co. The 1992 Record of Decision (ROD) requires the consolidation and capping of wastes and site sediments in the drum disposal area, the removal of sediments in the plant sewers, and the treatment of groundwater in a contaminated hot spot area near a former underground storage tank. The three parts of the interim remedial measure (IRM) involving contaminated soils have been completed. A Consent Order for a Remedial Design/Remedial Action was signed; the design has been completed. Construction related to the sewers and underground storage tanks has been completed; landfill capping is expected to be completed in 1996.

2. **Ley Creek PCB Dredgings**

   The site consists of dredge spoils on the banks of Ley Creek over a section approximately 4000 feet long. PCB contamination resulted from discharges at the site of the Fisher Guide Division of General Motors facility along Factory Avenue west of Town Line Road in Salina, Onondaga County. PCBs migrated to the Creek from the GM facility. A Consent Order requires a Remedial Investigation/Feasibility Study (RI/FS). Some contaminated soil has been removed. The RI has been approved and the FS is near approval. A Record of Decision in expected in late 1996 to require implementation of remedial activities.

3. **Miller Brewing**

   A 1991 Consent Order requires Miller to develop, construct, and contribute to the operation of a long-term treatment system for a major portion of the City of Fulton's (Oswego Co.) water supply. Earlier enforcement orders required site remediation work. This work has essentially been completed.

4. **Onondaga Lake**

   A 1992 Federal Consent Decree with Allied Signal requires the development of a RI/FS to determine the best method of lake remediation. Field work for the ongoing Remedial Investigation (RI) began in 1992 and is proceeding on schedule. Earlier investigations discovered that lake sediments contain mercury across the

entire lake bottom to depths of four feet or more. The Lake was added to the federal National Priority List (NPL) in late 1994. NYSDEC is currently reviewing Allied Signal's mercury model, calcite model, earlier investigative field data, and the basis for ecological risk assessment. The restoration of Onondaga Lake is a long term project that many interested parties are striving to achieve. Resolving the Syracuse Metropolitan Wastewater Treatment Facility and associated combined sewer overflow discharges to the lake is fundamental to the project to restore this valuable resource.

5. Volney Landfill

The Record of Decision was issued in late 1987. The selected remedy consists of: 1) installation of a supplemental landfill cap that satisfies the RCRA requirements, 2) installation of a leachate collection system and a slurry wall system around the northern end and southwestern sections of the landfill, 3) treatment of the contaminated leachate in an on-site treatment plant or transport to an off-site facility for treatment, and 4) review of the recommended containment remedial action no less often than each five years after the initiation of the proposed remedy. USEPA and NYSDEC have approved the work and project operation plans. Data for remedial design has been collected; the evaluation report is being finalized. Off-site investigation is planned to determine the extent of contaminant migration from the landfill.

6. Clay Town Landfill

The site was not closed nor capped properly; there is limited groundwater contamination. Citizens have sued the Town for possible health risks due to the landfill. NYSDEC has approved the RI/FS reports; the ROD was issued in late 1994; final plans and specifications were approved in September 1995; construction has commenced.

7. Clothier

USEPA completed removal action in 1988 involving PCB contaminated soil and water. The remediation consisted of the following actions: soil cover replacement, revegetation, soil erosion controls, long-term groundwater/soil and sediment monitoring, air monitoring, and the institution of controls to prevent groundwater use. As a result of successful remediation, the site was reclassed in 1993.

8. Fulton Terminals

USEPA issued a ROD in 1989 addressing groundwater and soil contamination. Remedial activities consisted of the following: excavation and treatment of the

contaminated soil on-site by low temperature thermal extraction, off-site disposal of residuals, replacement of the soil, and the extraction and treatment of contaminated groundwater by air-stripping and carbon absorption. The remedial work was completed in 1996.

B. Contaminated River Sediments:

EPA is proposing a Contaminated Sediment Management Strategy that describes specific actions that EPA plans to take to address environmental and human health risks associated with contaminated sediment. The development of an EPA contaminated sediment criteria guidance document is part of this strategy. Refer to Section VIII.K for additional details of this strategy and criteria development. In addition, NYSDEC's Division of Fish, Wildlife and Marine Resources has produced a document entitled "Technical Guidance for Screening Contaminated Sediments", July 1994. This guidance is applied to sediment decisions in the Oswego River industrial harbor area as well as other potential sediment dredging areas in the watershed. Consideration must be given to the timing of introducing any new criteria as to how they will apply to past and future projects.

Contaminated sediments are present in the lower Oswego River and Onondaga Lake. The maintenance of navigation channels and dam structures require dredging. Because contaminants are involved, the disposal of these sediments can be problematic. Remedial strategies, which include additional study, are being implemented. Hazardous waste site remediation surrounding Onondaga Lake is underway to clean up sources of contamination. In the lower Oswego River, further investigations and assessments are recommended to identify any source(s), to better define the use impairments, and to select courses of action.

In September 1994, sediment cores and surficial sediment samples were collected at six sites on the Oswego and Seneca Rivers. The purpose of this monitoring was to evaluate trace metals and organic chemical concentrations. This project also included some toxicity testing and benthic study and was funded by a grant from USEPA's Great Lakes Nation Program Office (GLNPO). Details of the study and results are contained in the referenced report and Quality Assurance Project Plan. A summary is provided below.

The **Oswego River Sediment Study** (Summary Results from 1994 Sampling) was completed in June 1996. All sediment samples (cores and surficial) were collected from depositional areas located outside of navigational channels which are normally dredged. Station #1 is in the harbor, station #2 is above the Varick Dam, station #3 is adjacent to Battle Island which is downstream of the Armstrong World Industries facility, station #4 is at Big Island closer to Armstrong, station #5 is at the Phoenix Dam to define the upstream conditions of the Oswego River, and station #6 is in the Seneca River two miles downstream from the Onondaga Lake outlet. Report conclusions are presented below in a listing of ten study result discussions:

1. Metals

Trace metals exceeded NYSDEC guidance values for cadmium, copper, lead, and mercury. These exceedences occurred with greatest frequency and magnitude at stations #2 and #3. Chromium, nickel, silver, and zinc concentrations also exceeded NYSDEC sediment guidance values, but with less frequency and lower magnitude. The highest concentrations of most metals were encountered at station #3 (Battle Island). Peak concentrations were measured near the middle of the core collected at most of the stations. The pattern suggests that the current levels of trace metal contamination to the Oswego River, as represented by the recently deposited surficial sediments is lower than the historical levels. However, when surface and near surface sediment results are compared to the oldest (deepest) sediments, the most recent sediments were almost always higher than the deepest core sections.

In order to better understand the period in which peak trace metals concentrations occurred in depositional sediments, radionuclide dating was employed. Results indicate that the current rate of sediment accumulation at station #3 is very rapid; on the order of a few cm. per year. There is an observed major depositional event of old sediments (pre-1950s) at the 28 to 48 cm. core depth. It is estimated this event occurred between the mid-1960s and the mid-1980s. Some of the highest concentrations of trace metal observed in the Oswego River occurred above station #3 (Battle Island). The radiodating analysis suggests this peak discharge period occurred in the 1950s.

2. Pesticides

All sediment core samples and surficial samples at stations #1 and #2 were evaluated for PCBs and pesticides. Very few samples collected during the study were found to have pesticide concentrations greater than analytical detection limits. Therefore any presence of DDT and metabolites are considered the result of past application and are not a major or widespread problem.

3. PCBs

Two independent sediment assessment protocols were used: NYSDEC Division of Fish and Wildlife 1993 publication entitled "Technical Guidance for Screening Contaminated Sediments" and the Canadian 1993 publication by Persaud, et.al. entitled "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario". The DEC assessment applies two guidance values; one for human health bioaccumulation and a second for wildlife bioaccumulation and are derived using equilibrium partitioning methodology. The Canadian guidance applies three guidance values; one for a no-effect level, another for a lowest-effect level, and a third for severe-effects.

PCB concentrations were detected in the upper sections of all core sample stations except #6. Larger concentrations were detected in stations #1, #2 and #3 with the highest being at station #3 in the 25-61 cm. section. A detailed discussion with sample results and tables is presented on pages 28 through 52 in the report. Of concern is the presence of PCBs in the top section samples of the lower river and in the surficial samples from the harbor. The report recommends that the Oswego harbor, Lock 6 and Battle Island areas and points in between should receive additional sampling to better define the depth, breadth, and biological impacts of the PCB concentrations.

4. Dioxins and Furans

* Analytical Concentrations

The deep subsamples were very low or non-detect for the dioxin/furan analytes. Only two cores (stations #2 and #3) contained other than low or non-detect concentrations in the subsamples collected near the sediment surface. The concentrations at station #3 likely warrant further investigation to delineate the depths and breadth of the dioxin and furan contamination.

* Toxic Equivalents

Toxic equivalency is a methodology that quantifies the toxicity of substituted dioxin and furan congeners by proportionalizing their toxicities to 2,3,7,8-TCDD. These values can then be added and the total represents the aggregate toxicity of the various substituted congeners. To evaluate these values, they were compared to human health and wildlife bioaccumulation sediment guidance values present in the 1993 DEC publication entitled "Technical Guidance for Screening Contaminated Sediments". The guidance values are based on equilibrium partitioning methodology and are a function of the organic carbon content of the sediment being evaluated.

Results indicate no problem at station #1. At station #2, the upper third of the sample was above the wildlife guidance value. The mid portion of the station #3 sample exceeded the wildlife and human guidance values. Station #4 had low toxic equivalence in the upper half of the sample. Stations #5 and #6 did not indicate a toxic concern. There is likely minimal significant environmental impact from these dioxin/furan concentrations as they are buried by many centimeters of cleaner sediment.

* Percent Abundance Patterns

Percent abundance patterns help characterize the composition of complex compounds. The dioxins are dominated by OCDD and the furans by the HpCDF

and OCDF. The homolog ratios show the furans are more abundant in the lower chlorinated homologs while the dioxins dominate the higher chlorinated. The findings at station #3 suggest additional sampling is needed to delineate the depth and breadth of contamination.

5. **PAHs (Polynuclear Aromatic Hydrocarbons)**

The most apparent pattern observed is the major spike in concentration for most PAH compounds analyzed in the 119 to 140 cm. (middle and below) core section of station #3 (Battle Island). PAH compounds exceeding DOW and DFW guidance include acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene. This may have been caused by a limited historical oil spill. The harbor sediment core sample indicated a slight surface or near-surface presence of PAHs. Station #6 (upstream near the Onondaga Lake Outlet) indicated a PAH presence throughout the core sample.

6. **Mirex**

The highest concentrations of mirex encountered were found in the sub-surface sections (20-74 cm.) of the sediment core collected at station #3 at Battle Island. No mirex was detected in the sample collected immediately upstream of the Armstrong World Industries facility. Mirex was also measured in the surface samples at station #2 collected immediately upstream of Lock 6 on the Oswego River.

7. **Octachlorostyrene**

Octachlorostyrene (OCS) was not detected in any of the samples performed by the independent lab in this study (limit range: 0.27-0.75 ug/kg). The NYSDOH lab reported similar results with some exceptions where only trace amounts of the compound were detected at station #3. These amounts were not quantifiable as only a presence at less than the detection level of 0.5 ng/g was indicated.

Independent of the Oswego River Sediment Study, technical assessment and discussion involving Lake Ontario and the Lakewide Management Plan (LaMP) indicate that analyzing for OCS has been difficult due to the lack of analytical standards over the years, and the fact that other contaminants such as PCBs and pesticides can in some cases give the same instrument response as OCS.

OCS was identified as a contaminant in the Lake Ontario Toxics Management Plan (LOTMP) that exceeded the piscivorous fish standard for wildlife. This result was based on applying piscivorous fish criteria (Newell, A.J., NYSDEC, 1987) to lake trout samples collected in 1988-1990. USEPA lake trout data

(reference #52, Appendix G) for these same years showed fish tissue levels to be below NYSDEC criteria as did chinook salmon, coho salmon, brown trout, white sucker, and smallmouth bass data sets.

Overall, Lake Ontario U.S. and Canadian fish tissue monitoring experts do not regard OCS as a significant problem for Lake Ontario and, as a result, do not include analyses for OCS as part of their routine fish tissue monitoring programs. It should also be noted that lake trout are not considered available as a food source for wildlife. Therefore due to the overall nondetection of OCS in sampling results and the lack of supporting data that raises any research interest involving the detectability of OCS, it is recommended that the concern for OCS as an Oswego River RAP and Lake Ontario contaminant be considered nonsignificant.

8. Sediment Toxicity

Observed results of the acute sediment toxicity testing indicate no statistically significant toxicity to the Daphnia magna (water flea) or Pimephales promelas (flathead minnow). Ten-day solid phase toxicity test results indicate the only statistically significant difference in survival and growth between the Oswego River and control sediment exposures was reduced Chironomus tentans (midge) growth in surficial sediment samples collected at Lock 6 (station #2) and Battle Island (station #3).

9. Microtox

These tests were performed to assess relative toxicity among locations. The pore water and sediment were tested for all stations. All sediment samples elicited a response in the Large Sample Procedure at the detection limit. No relationship between relative toxicity and concentration of contaminants could be established. Pore water elicited low toxicity only at station #3 but with unacceptable confidence.

10. Macroinvertebrate Sampling

This study was conducted to analyze resident communities and assess possible contaminant impact on organisms. Macroinvertebrates are good indicators of environmental quality because they are sensitive to environmental impacts and are less mobile than fish. In the absence of standardized procedures, several criteria are applied to assess the benthic community. Sample assessment ratings range from no impact to severely impacted. The five criteria selected in this study are:

* Species richness - the number of species in a sample (group ranges applied).
* Biotic index - measures an organism's pollution tolerance (uses a scale).
* Species diversity - combines species richness and community balance (range).

* Species dominance - measures the community relationship or balance (a high number of few species means an unstable community).
* Model affinity - measure of similarity in comparison to a model non-impacted community based on a reference using percent abundance (range).

The Oswego Harbor, Battle Island, and Phoenix area benthic community samples were identified as diverse and well balanced and therefore assessed as non-impacted. The lower river and Onondaga Lake outlet samples were assessed as slightly impacted, and the area above Fulton was moderately impacted. Sediment differences (particle size) and the presence of contaminants can also contribute to the identification of impacted areas.

C. State Pollution Discharge Elimination System (SPDES):

With the initiation of the Division of Water's Environmental Benefit Permit Strategy (EBPS) in April 1992, point source discharge permits are now given priority for renewal modifications based on the identification of environmental/water quality benefits. A ranking system has been implemented that provides higher priority for permit modifications based on permit need factors and their impact towards environmental improvements. A Great Lakes Area of concern (AOC) component based on bioaccumulation and persistent toxic chemicals is one element of this priority system. An identification with an AOC based on this bioaccumulative/persistence factor will therefore provide additional weight in the priority ranking system for working on a point source discharge permit renewal/modification. The EBPS is proving to be very successful. Aspects of priority industrial and municipal SPDES permit renewals and modifications in the Oswego River area that are likely to have an impact on the restoration and protection of beneficial uses are discussed below.

In addition, as part of EPA's Contaminated Sediment Management Strategy (described in Section VIII.K), EPA is developing a sediment quality criteria user's guide to assist in interpreting sediment chemistry. The goal is to apply this EPA technical guidance in evaluating dredged material testing, dredged material disposal site selection, and disposal alternatives to ensure continued disposal of dredged material in an environmentally sound manner. At the same time, NYSDEC has developed and is using guidance from a July 1994 publication entitled: "Technical Guidance for Screening Contaminated Sediments". The application of sediment quality criteria can be very useful in making hazardous waste site assessments and proposed sediment dredging and disposal decisions. The criteria could also be adopted as part of state water quality standards and applied to help establish water permit discharge limits.

A significant reduction in the mass of PCBs and other contaminants discharged within the Oswego River drainage basin by area industries (primarily stormwater/site related) has been achieved by the installation of improved wastewater treatment systems,

implementation of best management practices, and hazardous waste site remediation activities. The permit renewal process involving major industrial companies has the goal of achieving non-detectable discharge levels of PCBs, as well as reduced discharges of other contaminants for each water discharge. Resolving the issues concerning PCBs that involve the sampling method and the level of detection are a priority for NYSDEC (current policy uses a detection level of 65 ng/l). Although PCBs are no longer used, past waste disposal practices had so contaminated some facility sites such that stormwater runoff was contaminated. In such cases, site remediation is required to cleanup PCB contamination. Priority concerns for industrial and municipal permits are:

1. Industrial Point Source Permits

The major industries in the Oswego River drainage basin are in various stages of the SPDES permit renewal/modification process (based on a five year cycle). Overall, with the focus on toxic substances and with consideration for the requirements proposed under the Great Lakes Water Quality Guidance, we can expect to see more stringent permit discharge limits with the primary emphasis on parameters identified as bioaccumulative chemicals of concern (BCCs). Process and stormwater discharge management practices require industries to comply with best available technology (BAT) and water quality based effluent limits and controls.

2. Municipal point source permits

Although the municipal permits in the Oswego area tend to not score high on the EBPS ranking system for environmental benefits of permit modifications, there are issues that are forefront in the concern of these discharge permits. These include combined sewer overflow (CSO) controls, stormwater management, and pretreatment program elements. From the major municipal dischargers in this area, the further control of combined sewer overflows is of concern. The City of Oswego is implementing a sewer rehabilitation and separation project on the east side system. Removal of inflow is the first priority; funding has been approved by the Environmental Facilities Corporation (EFC). Stormwater and pretreatment program requirements also need review. Combined sewer overflow improvements are being addressed by Onondaga County under an enforcement action involving municipal discharges to Onondaga Lake.

USEPA and NYSDEC have developed CSO strategies through regulatory negotiation that require the implementation of minimum controls for CSO system operation and maintenance, minimization of overflows, construction of new infrastructure, pollution prevention, prohibition of dry weather discharges, public notification, and monitoring. Long-term plans are to result in compliance with water quality standards and uses. Special attention is being provided to sensitive issues such as endangered species habitat and public drinking water intakes.

Current stormwater management requires municipalities to reduce pollution to the maximum extent practicable, use any controls necessary to comply with water quality standards, and prohibit non-stormwater discharges into storm sewers. Pretreatment program requirements address industrial user and municipal program needs to meet discharge limits and prevent pollution. Along these lines, there is a need for monitoring PCBs in municipal discharge effluent. In regard to the Oswego River AOC, this effort is to ascertain any PCB contribution from the watershed so as to account for all potential inputs of PCBs to the Area of Concern.

D. Nonpoint Source Pollution Control:

Excessive nutrients (phosphorus) and sedimentation (erosion) from agriculture are believed to be the main nonpoint source pollution problems in the Oswego River Drainage Basin. County Water Quality Management Strategies have been developed to address nonpoint source pollution. Implementation of these County Water Quality Management Strategies and related Best Management Practices (BMPs), including improvements to stormwater management, is recommended and is progressing. Various funding programs (grants) now support and are available to assist in the implementation of these nonpoint source pollution control efforts.

Nonpoint sources have been identified as the primary source of water quality problems in more than 1,300 water body segments (90+%) included on New York's Priority Water Problems (PWP) list. NYSDEC maintains descriptive data on each on these PWPs. There are over 40 subcategories of sources that are considered nonpoint sources contributing to water quality problems. These range from sources such as atmospheric deposition and contaminated sediments, that will have to be addressed by state and/or federal level programs, to categories such as on-site wastewater treatment systems and agricultural runoff that are best addressed through local implementation efforts and involve land use decisions.

Nonpoint source pollutants include pathogens, sediments, nutrients, toxics, thermal energy, and oxygen-demanding organics. For example, pathogens have been identified as responsible for the closing of shellfish beds and bathing beaches on Long Island. Sediment can destroy fish habitat through the blanketing of fish spawning and feeding areas and the elimination of certain food organisms. Nutrients contribute to eutrophication in lakes, reservoirs and marine waters.

Within the Oswego River watershed, which drains an area of over 5000 square miles, further evaluation of any nonpoint source causes of use impairments needs to be performed. Physical disturbances, contaminated sediments, land-based hazardous waste sites, and watershed practices concerning fertilizer and pesticide use are examples of sources of nonpoint source pollution causes. For example, when remediation of the inactive hazardous waste sites within the Oswego River drainage basin has been

completed, a reassessment of the impact of this nonpoint source of contamination to the use impairments in the Area of Concern will need to be conducted.

Since 1994, NYSDEC has been identifying projects to address water quality problems in New York State and funding some of these activities using federal funds appropriated under Sections 319 and 604(b) of the Clean Water Act. Over two million dollars has been made available for locally-based nonpoint source pollution control activities. Other funding sources exist that support RAP goals for the development and implementation of specific projects; these funding sources are listed and described in Section VIII.F entitled RAP Financing.

Passage of the federal Water Quality Act of 1987 led New York State to take a more active role in dealing with nonpoint source pollution problems. As required by Section 319 of the Act, NYSDEC coordinated the preparation of a Nonpoint Source Assessment Report and a Nonpoint Source Management Program. In the years since 1989, NYSDEC has: developed guidance materials on source categories and public outreach; joined forces with the USDA Natural Resources Conservation Service (formerly the USDA Soil Conservation Service) to provide technical training; formed cooperative agreements with the Natural Resources Conservation Service and the NYS Soil and Water Conservation Committee; funded aspects of County Water Quality Coordinating Committee efforts; funded specific county-based implementation projects in the Great Lakes Basin; and, supported various other nonpoint source pollution projects including groundwater protection across the state.

Working in conjunction with the NYS Soil and Water Conservation Committee (NYSSWCC), DEC has encouraged the development of county water quality strategies. Grants were made available to each county that completed a strategy; in fact, almost all NYS counties developed strategies. These strategies therefore have become a part of RAP strategies and provide blueprints for actions to address nonpoint source pollution in a particular watershed.

In applying the RAP Process to provide an ecosystem approach to protect and to restore beneficial uses, a watershed approach is necessary to track down sources and to implement remedial and preventive measures. Nonpoint source pollution control is essential to remedial strategies. Much work has been accomplished in the development and implementation of nonpoint source pollution management. Remedial action is continuing based on implementing the plans and guidance that have been established.

Federal guidance has established some fundamental elements that form the basis for the application of best management practices used in a nonpoint source pollution control program. These elements have been incorporated into an EPA guidance document entitled **"The Stream Protection Approach"**. The Stream Protection Approach incorporates the integration of six elements into a cyclic development, planning, implementation and review process. This guidance document provides us with a model that can be applied

to New York State nonpoint source pollution control efforts. The six broad elements encompass the following protection strategies:

* Protect key resource area from development (these include wetlands, floodplains, steep slopes, streams, forests, habitat, and open space).
* Establish buffers to protect resource areas (includes aspects of delineation, construction, and management).
* Provide sediment and erosion control (address clearing, grading, sediments, construction sequence, disturbance limit, and revegetation).
* Reduce site imperviousness (use cluster development, provide infiltration and design requirements such as porous pavement and concrete grid).
* Provide stormwater management (address quantity and quality of runoff, treatment, controls, protection, and BMPs).
* Provide watershed maintenance (employ inspections, enforcement, maintenance, assistance, and restoration activities).

NYSDEC's Division of Water has developed nine guidance document sections for the Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. All of the nine parts of this Management Practices Catalogue have been finalized that deal with: stormwater runoff, agriculture, construction practices, roadway maintenance practices, on-site wastewater treatment systems, silviculture, spills, resource extraction, and hydrologic/habitat modification.

Implementation of the initiatives outlined in the Nonpoint Source Management Program includes many elements and is an ongoing effort of nonpoint source control. Local involvement is essential and Best Management Practices establish fundamental strategies. The cooperative agreements with county districts and the State Soil and Water Conservation Committee are key factors to implementation. Education and training continue to be needed.

E. Air Pollution Control:

The remedial strategy calls for the reduction of contaminant emissions from the major industrial facilities in the AOC. The Clean Air Act Amendments of 1990 require air discharges to comply with Maximum Achievable Control Technology (MACT) limits. When further developed, NYS Air Standards may require treatment beyond MACT to be phased in over a period of time. The Oswego County and Onondaga County waste incinerators are two facilities that will involve further investigation concerning their air discharges involving dioxin. Air toxics discharges are discussed further in item #2 below.

New York State has put together a comprehensive program to improve air quality and to bring the State into compliance with the 1990 federal Clean Air Act Amendments

(CAAA). The amendments address chronic air pollution and require states to bring their air quality into compliance with federal standards by specific dates. Substantial new obligations to control urban smog, acid rain, toxic pollution, and pollution from smokestacks are required to be implemented under meaningful, and often rigorous timetables. States that fail to meet these obligations will be subject to federally-imposed economic sanctions. Major provisions of the 1990 CAAA include:

Title I: Nonattainment - This title classifies geographic areas that do not meet federal standards for particulate matter, nitrogen dioxide, carbon monoxide, lead, sulfur dioxide, and ozone (VOCs and NOx). It also sets acceptable air quality limits, progress requirements, and emissions control guidelines for both mobile sources (cars, trucks) and stationary sources (utilities, industries).

Title II: Mobile Sources - For all types of motor vehicles, this title sets standards for emissions testing, certification, and warranties. It also directs the federal Environmental Protection Agency (EPA) to develop regulations for formulating motor fuels and to set standards for clean alternative fuels.

Title III: Air Toxics - This program lists 189 chemicals to be regulated and includes a procedure for EPA to add and delete chemicals from this list. It directs EPA to identify toxic source categories and to establish emissions limits and siting requirements for municipal waste incinerators.

Title IV: Acid Rain - This title describes plans for reducing emissions of sulfur dioxide and oxides of nitrogen, and it directs EPA to establish limits on electric utility plant emissions of these pollutants.

Title V: Permits for Stationary Sources - States are directed to adopt and implement an air pollution permit program that includes emissions limits and standards, compliance schedules, and reporting requirements. Provisions are made for assistance to small businesses to help them comply. Fees are required to be established and collected for the support of the program. Amendments to NYSDEC air pollution regulations are described at the end of Section IV.E.4 under initiatives.

1. Source Strategies for Air Pollution Control

In order to meet the goals of the CAAA, New York State's air pollution control program will concentrate on mobile sources (cars and trucks), stationary sources (utilities and industries), and area sources (consumer products). Strategies for the implementation of these three air pollution control activities are:

* Mobile Sources

For vehicles, increase the amount of oxygen contained in gasoline sold in areas with carbon monoxide pollution problems; adopt strict emissions standards for new passenger vehicles; enhance the State's motor vehicle inspection and maintenance programs; and, require motor vehicle trip reduction plans for companies that have 100 or more employees and are located in areas with severe air quality problems.

* Stationary Sources

For companies, require the installation of basic air pollution controls that use reasonably available control technologies (RACT). These requirements include offsets for major new sources of air pollution at a ratio which is greater than 1.15 to 1, or 1.3 to 1 in areas of severe nonattainment.

* Area Sources

For products, regulate the amount of solvent in paints, inks, and other consumer products such as hair spray.

2. Air Pollution Programs Affecting Rap Strategies

There are three areas of the air pollution control program that, through improved requirements, can assist in resolving the use impairments in the AOC:

* Air Toxics

The air toxics program is required to set emissions limits for 189 hazardous air pollutants that affect the public health. Provisions call for the use of maximum achievable control technologies (MACT). EPA is required to develop, implement, and enforce regulations establishing requirements for air pollution control technology, pollutant trading, and the assessment of residual health risks caused by pollutants in the air. These requirements apply to stationary sources which discharge specific amounts or types of air pollutants. For major and area sources, the CAAA lists 189 hazardous air pollutants that take into account toxicity, reaction with other substances, and persistence in the environment.

Major sources are any stationary source or group of stationary sources that emit 10 tons per year or more of any single hazardous air pollutant, or 25 tons per year or more of any combination of hazardous air pollutants. Area sources are smaller sources which emit less than either the 10 or 25 tons per year thresholds.

Changes to the hazardous air pollutant list can be made. EPA is required to establish separate standards for municipal waste incinerators that provide maximum reductions in air emissions, taking into account cost, health/environmental impacts, and energy requirements. It is expected that the new control standards will require additional emissions reductions of 75-90 percent below current levels.

After the control technologies are in place, New York State must assess the public health risk which remains and oversee the permit, program modification, and offset programs as required by the CAAA. New facilities are subject to emissions standards that are tighter than those applicable to existing facilities.

NYSDEC has a comprehensive air toxics program that accommodates the 1990 CAAA. State air regulation Part 212 and New York's Air Guide-1 provide the foundation. Air Guide-1 contains specific chemical control guidance for over 240 chemicals categorized as either high, moderate, or low toxicity air contaminants. Stack testing to assure compliance is provided.

* Ozone Transport

Recognizing that a combined and coordinated effort among states would be needed to solve the ozone transport problem in the Northeast, Congress established the Ozone Transport Commission (OTC) as part of the 1990 CAAA. The OTC addresses the regionwide transport of ground-level ozone and its precursor emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx). The OTC includes members from Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and Washington, D.C.

Under the CAAA, the following control measures are required by the OTC states: an enhanced vehicle emissions inspection program in all areas with populations greater than 100,000; basic controls on most stationary sources; new source review for offsets of major stationary sources; and, cleaner fuels.

* Small Business Assistance Program

The Small Business Assistance Program is an opportunity for businesses to obtain the information and technical assistance necessary for compliance with the CAAA. In order to meet the many new air quality standards and to control toxic emissions, which requires installation of air pollution controls and knowledge of complex regulations, Congress ordered EPA and the states to help small businesses by providing technical assistance and compliance information. The three key components of the program are an Ombudsman's Office, a Technical Assistance Program, and a Compliance Advisory Panel.

The Ombudsman Office will serve as the representative of small businesses. The office will be located at the New York State Department of Economic Development. The office will handle complaints, provide outreach and help small businesses gain access to program services.

The Technical Assistance Program, located within the New York State Environmental Facilities Corporation, will work independently from NYSDEC. This program will aid small businesses in understanding federal and state requirements, assist in filling out permit applications, and provide technical advice on compliance with the regulations.

A Compliance Advisory Panel will be established to render advisory opinions, determine the overall effectiveness of the technical assistance program, and review information to assure it is easily understood.

Any business which is independently owned and employs less than 100 people and is not a major source of air pollution (as defined by appropriate regulations) will qualify for assistance.

3. Air Pollution Program Investigations

There are several types of investigations involved in the air pollution program that can have an impact on addressing the use impairments in the AOC:

* Ambient Air Monitoring Networks

NYSDEC Division of Air conducts routine air monitoring through two statewide air monitoring networks: air toxics and acidic deposition. The networks provide data to identify New York State air quality in terms of heavy metals and volatile and semivolatile organics. Transport and conversion mechanisms are also better understood from the networks data. In addition a mobile air laboratory, that operates a Trace Atmospheric Gas Analyzer (TAGA), is used to monitor ambient air. Further ambient air study and assessment is needed.

* Fugitive Emissions

Air discharges that are not captured by a pollution control system and thus are released to the atmosphere at the source rather than a stack are fugitive emissions. In some cases such emissions may be a significant source of atmospheric pollution. Therefore, NYSDEC is promulgating a fugitive emission regulation which calls for a 50 percent reduction of all unregulated air releases from a 1987 baseline emission inventory.

* Atmospheric Deposition

EPA intends to apply the results of studies on toxic pollution of the Great Lakes resulting from atmospheric deposition to develop a control strategy and regulations (if necessary) to combat the air toxics problem.

The Great Waters Report (May 1994) provides a discussion of the problems and recommendations relative to the deposition of air pollutants to the Great Lakes. Atmospheric deposition may be a significant nonpoint source of pollution to the Great Lakes basin; however, direct evidence is needed of any effect on water quality by air sources in the Oswego River Area of Concern.

4. Air Pollution Program Initiatives

There are a number of initiatives concerning the air pollution program that can have an impact on addressing the use impairments in the AOC:

* National Urban Air Toxics Strategy

EPA is responsible to propose a national urban air toxics strategy which contains specific actions designated to reduce cancer risks from urban sources by 75 percent. Although development of the strategy is behind schedule, full implementation is called for by 1999. Because the Oswego area is not in a designated national urban area, New York State regulations under the maximum achievable control technology (MACT) requirements will apply.

* Source Category Regulation

EPA is responsible to list sufficient area source categories of air pollution to regulate 90 percent of emissions of the 30 most hazardous area source pollutants. Regulations requiring generally available control technology for the sources must be adopted by the year 2000. Maximum achievable control technology (MACT) requirements are also being developed for various source categories.

* Source Discharge Air Permits Program

The CAAA Title V requires that individual facilities whose emissions of certain contaminants exceed specified thresholds or that are subject to specific federal New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), or other federal standards, obtain facility operating permits under Title V. Individual emission point permits (as currently administered by NYSDEC) are not required, although there are provisions for the control of emissions from individual process operations within a facility. The

intent is to incorporate the federal facility discharge permit strategy into NYSDEC's permitting program while maintaining the state's already enhanced discharge controls. Facilities not required to obtain a facility permit will be regulated by the current emission point program with some major improvements: separate construction permits will not be needed and long term permits will be provided for unchanged processes.

A separate category of facility permit, referred to as a general permit, will also be available for certain facilities through the proposed permit revisions that are intended to integrate the two programs (i.e. facility permit and emission point permits). Under this system, a single permit will be issued to cover a category of operation after the fulfillment of public participation requirements. Facilities within that category wishing to operate under the general permit must submit an application similar to that required for conventional facility permits, but are not required to undergo further public review in most cases. The elimination of this step will simplify the permitting process for these facilities, and relieve some of the administrative burden.

* Facility Specific Air Permits

Some facility permits require an identification, trackdown, minimization, and elimination program for discharge contaminants. Determinations are based on the design of the new air discharge permit to meet Clean Air Act Amendments and NYSDEC implementation strategy. Some facilities need to develop a fugitive emissions plan that outlines best management practices (BMPs) to control fugitive emissions. BMP requirements are expected to be incorporated as special permit conditions in the facility's air discharge permit.

* Amendments to NYSDEC Air Pollution Regulations

In order to meet the requirements of Title V of the federal Clean Air Act Amendments of 1990, NYSDEC will modify its Environmental Conservation regulations parts 200, 201, 231, and 621. These changes are necessary to establish an operating permit program for sources of air pollution as required by USEPA regulations. A number of important reforms to the State air permitting program are in the making: establishment of a registration program, the combining of both construction and operation approval requirements under one permit, and the ability to issue permits with no set expiration date.

Facilities subject to air emissions permitting under Title V are to obtain a "Title V facility permit" while others will need to register or obtain a "state facility permit". A general permit provision is included for source categories subject to common emission control.

F. Fish and Wildlife Assessments/Actions:

Many of the use impairments are based on the status of fish and wildlife conditions and considerations. Some fish and wildlife investigative information has been reported; other investigations remain unfunded. A fish pathology study conducted by Cornell University found little evidence of impairment of fish health by contaminants in the Oswego River harbor. Fish consumption restrictions and habitat impairments are known; however, contaminant levels are below those causing an increase in fish tumors or other abnormalities. Environmental monitoring, as well as further habitat study and assessment, would be needed to establish any required remediation. The results of the Federal Energy Regulatory Commission (FERC) relicensing process involving Niagara Mohawk is expected to address many of the habitat use impairment concerns, especially immediately below the Varick Dam.

Results of fish and wildlife investigation, environmental monitoring, and habitat restoration and protection activities in the Oswego River Area of Concern have been generated as part of remedial actions. Studies have been and, on a limited basis, are continuing to be performed/funded by USEPA, NYSDEC, NYSDOH, Cornell University and other interested organizations such as the Long Point Bird Observatory. Investigative studies concerning deformity and wildlife populations are needs that remain to be funded and evaluated. Habitat assessment also requires closer examination. Below are details of the progress in implementing current fish and wildlife program activities:

1. Investigations

* Fish Pathology

Fish tumor and lesion studies were conducted in cooperation with Cornell University. Results of this fish pathology study, which focused on the Oswego Harbor, indicate that Oswego Harbor fish have not been significantly affected when compared to control groups from uncontaminated areas. Because contaminant levels in the fish were found to be below those causing an increase in tumors or other deformities, little evidence of the impairment of fish health was found. Details of this investigation are further discussed under the monitoring activities in Section IV.I.1.

* Young-of-the-Year Fish Studies

YOY fish data was published by DEC in August 1994 in a document entitled "Identification of and Changes in Chemical Contaminant Levels in Young-of-the-Year Fish from New York's Great Lakes Basin". Assessment of the data in this report, as related to the status of use impairments in the Oswego AOC, needs to be made to determine if any documented changes in fish flesh contamination have

occurred. Trend analyses of future data concerning the contaminant levels in YOY fish studies will also be helpful in making use impairment assessments.

* Fish Flesh Chemical Residue Analyses

a. Alewives and Rainbow Smelt - As part of the special Great Lakes fish contaminant program, supplemental collections of two forage fish species were requested to help provide chemical residue linkages in food web dynamics for salmonids. Data for composites of whole alewives and rainbow smelt collected in Lake Ontario off Oswego in the Spring of 1993 were produced. Results indicate that none of the samples exceed a federal limit for PCB or organo-chlorine pesticides (although these limits do not strictly apply to whole fish data, unless the fish is eaten whole). Mercury was not analyzed in this test. The data do however exceed values for the protection of sensitive piscivorous wildlife for PCBs in both alewives and rainbow smelt. It is apparent that these two species may contribute to the impairment of the well being of sensitive wildlife when these species are a significant part of their diet or when these species and other chemically contaminated fish are a significant dietary component.

b. Channel Catfish - Catfish analyses in the Oswego River were performed in 1986 and 1993. The 1993 data indicates that average values for each class of chemical contaminants are significantly below respective guidelines for human consumption of channel catfish. Only two fish (10%) contained PCB values greater than the 2000 ng/l tolerance whereas only one fish contained total mirex concentrations in excess of the 100 ng/g federal action level. In 1988, a health advisory (eat no more than one meal per month; women of childbearing age and children under 15 years should eat none) was implemented for channel catfish from the Oswego River between the Oswego power dam and the upper dam at Fulton. This action was based on Summer 1986 collections of channel catfish which contained mean concentrations of PCB substantially in excess of the US Food and Drug Administration (USFDA) tolerance. Comparing samples with the 1993 we observe the total PCB (wet weight basis) concentrations are significantly lower in 1993 however the apparent decline appears to be solely due to the significantly lower lipid values. At this time, apparent declines in total PCB values on a wet weight basis are a false indicator of the changes in chemical residue concentrations over time. In this case, a return to higher lipid values would produce a concurrent increase in total PCB residue concentrations and likely more extensive contravention of the Federal tolerance. This data has been provided to the NYSDOH for evaluation in the next round of human health advisory deliberations, while the advisory remains in effect.

c. American Eels - Samples were collected in Lake Ontario off Oswego and in Chaumont Bay during the Spring of 1994. Commercial fisheries in the eastern basin desire a market for eels that includes foreign trade. Results

indicate that total mirex concentrations continue to exceed the federal action level of 100 ng/g. Fifty percent of the thirty fish analyzed had excessive total mirex. Six fish exceeded the Federal tolerance for PCBs of 2000 ng/g. Unfortunately the data suggests it would be inappropriate to reopen the commercial fishery for American Eels at this time.

* Deformity and Populations

Some population data is reported along with the fish analysis noted above. Deformity data is difficult to acquire and will need specific funding beyond the routine deformity notes that are made as part of other investigations and evaluations. Therefore, specific fish and wildlife deformity collection investigations and data development will be needed.

* Fisheries Enhancement Plan

This management plan has been approved by DEC and will serve as a basis for the development and implementation of fishery programs for the Oswego River (the Fisheries Enhancement Plan is referenced in Appendix G). Concerns for the fishery conditions along the Oswego River are not simply focussed on fish species composition and abundance, but also on the physical, chemical, and biological factors affecting fish habitat. Hydropower facilities pose a threat to fishery resources due to increased water temperatures, decreased dissolved oxygen concentration, and drastic fluctuations in flow regime. These factors result in a reduction of aquatic vegetation and limited species composition which are tolerant only to these conditions. Upstream fish migration is hindered by dams. In addition, downstream migration is affected by entrainment at hydropower facilities which can cause mortality of young-of-the-year and juvenile fish species.

The loss of species is of particular concern to natural resource managers. Reasons for loss of species could be the result of habitat degradation due to land use practices and pollution, competition among species, introduction of aquatic nuisance species, overharvest, or a combination of all of these. Challenges to enhancing fisheries include assessing current information gaps and setting ecosystem requirements to improve and to protect the fishery. Enhancement requirements include maintaining minimum instream flow and minimum water quantity criteria, and assuring that adequate habitat and riparian vegetation are available. Information collection, investigation, assessment, and remedial measures are all expected to be requirements of the FERC relicensing process involving the Varick Dam above the Oswego Harbor as well as other dams upstream of the Area of Concern. (This Federal Energy Regulatory Commission relicensing process is further described in Section VIII.S)

2. Environmental Monitoring

As part of implementing remedial activities in the AOC watershed, responsible parties are to be required to perform various monitoring activities. For example, Niagara Mohawk monitoring/sampling activities will be required as part of the FERC relicensing process. Aspects of this monitoring include:

* River sediment sampling/survey
* Water column sampling (local and fixed)
* Biota sampling (resident and caged fish, benthic community)
* Bioaccumulation
* Corrective action analysis (turbidity and visual)

Other monitoring activities are being conducted by interested parties and volunteers, some of which is supported by grant funding:

* The Long Point Bird Observatory Marsh Monitoring Program

The Marsh Monitoring Program is a cooperative project of the Long Point Bird Observatory and Environment Canada, with the current support of the U.S. Great Lakes Protection Fund. The objective of the program is to monitor the health of marshes by surveying indicator species that utilize these habitats during the breeding season. Two groups of vertebrates, birds and amphibians, were chosen as target groups because they are susceptible to environmental deterioration and easily surveyed. Some data is to be collected in the Oswego area and reported on in 1997.

3. Habitat

Habitat protection is a high priority for the Department of Environmental Conservation. Habitat protection includes the implementation of natural resource protection objectives and Best Management Practices involving all environmental quality programs. Localized habitat impairment within the AOC has been identified as part of fish and wildlife management programs. Contamination of sediment is directly related to loss of habitat. Remedial activities being conducted and planned for the hazardous waste sites in the Oswego River watershed are expected to remove significant amounts of contamination so that any contribution to the AOC and Lake Ontario will be essentially eliminated. Achieving the requirements of the power dam relicensing should restore and protect adequate and productive fish and wildlife habitat conditions.

The construction of dams along the Oswego River has dramatically altered fish and wildlife habitat. New and modified habitat areas, outside the immediate AOC

but within the drainage basin, provide an additional remedy to address and improve upon the overall habitat areas within the drainage basin. Some projects may receive federal funding support. For example, the creation and maintenance of the Montezuma National Wildlife Refuge provides over 6,000 acres of habitat. Efforts to restore and to preserve this marsh habitat continue today in cooperation with NYSDEC, corporate sponsors, conservation organizations, and private landowners. Another partnership, known as the Northern Montezuma Wetlands Project, involves an international agreement among the US, Canada, and Mexico. This project provides for the restoration, conservation, and enhancement of wetland habitat and waterfowl populations on over 36,000 acres.

The New York State Coastal Program (described in Section VIII.C) includes some significant habitat areas within the AOC that have been identified for the development of fish and wildlife management plans.

4. Guidance

The EPA reference document entitled "Wildlife Exposure Factors Handbook" provides guidance, data, and references for conducting exposure assessments for wildlife species exposed to toxic chemicals in their environment. A consistent approach to wildlife exposure and risk assessments is fostered.

G. Health and Environmental Assessments/Actions:

Maintaining current and useful contaminated fish consumption advisory information serves to reduce exposure of user groups. NYSDEC in conjunction with NYSDOH is preparing some updated fish consumption advisory pamphlets to assist with public outreach and education. Funding is needed to assist with the implementation of this fish consumption advisory and to continue research necessary to monitor long-term trends in regard to the advisory. Addition funds would be useful to further conduct human health assessments.

Human health and environmental risk assessments and actions, as well as those involving fish and wildlife, have only just begun in the Area of Concern. Implementation strategies designed to restore and to protect beneficial uses need to identify investigative requirement needs to determine the ultimate remedial cleanup levels and the extent to which any risks are acceptable. Below are summaries of some current studies with results and risk assessment determination needs that have been made concerning several remediation projects issues/actions:

1. **Studies/Assessments**

NYSDEC and NYSDOH continue to conduct annual fish flesh sampling and analyses to evaluate fish consumption advisories. Fish study results are provided in Section IV.F above.

2. **Remediation Assessments**

Several health/environmental studies and assessments related to remedial actions have been accomplished (e.g. the Armstrong Cork Landfill Health Consultation and the installation of public water supply near the Miller Brewery site in Fulton). Health considerations and evaluations are an ongoing part of all remedial activities. In the AOC and watershed, requirements for specific studies and assessments need to be further identified as part of project implementation and long-term monitoring. Pursuant to specific remedial activities, the following assessments and needs have been conducted or determined:

* Area Water Wells
* Site Groundwater Contamination
* Site Surface Water Contamination
* Site Soil Contamination

3. **Fish and Wildlife Consumption Advisories**

The presence of contaminants in the Oswego River and Harbor sediments has been confirmed. Bio-accumulation of contaminants in fish and wildlife and the threat this poses to human health are known to exist and are to be routinely monitored by periodic sampling and analyses performed by NYSDOH and NYSDEC. To protect the public, consumption advisories have been placed into effect (refer to the advisories in Section IV.F above). Long-term monitoring, study, and assessment reports will continue to be needed to define the extent of residual contamination and further requirements for health/environmental controls or investigations. The specific type of investigations, remedial activities, and reports that are ongoing, planned and needed are further detailed below in Section IV.I. Priorities are discussed in Section VII-Priority Remedial Activities. These planned and needed remedial activities are also listed as corrective strategies on the Use Impairment Restoration and Protection Strategy management form that addresses the consumption restrictions use impairment (Appendix G; Form #1).

4. USEPA Health Study

USEPA has made the protection of human health one of the cornerstones of its environmental protection activities and has incorporated this into all of its programs. The Agency is particularly concerned with the potential health effects of consuming Great Lakes fish. To address this, a Congressionally mandated study is being conducted by USEPA and the Agency for Toxic Substances and Disease Registry (ATSDR) in the Great Lakes basin. This study will identify human populations residing in the Great Lakes who may be at risk due to contact with chemical contaminants and what to do to prevent adverse health effects. Some of the studies are being conducted in Great Lakes Areas of Concern and the findings are to be disseminated throughout the basin.

5. NYSDOH Health Consultation

The Health Consultation for the Armstrong Cork Landfills was finalized January 12, 1996. The purpose of the health consultation was to evaluate the potential human exposure to contaminants from the landfills. The document was developed by the NYSDOH in cooperation with the US Agency for Toxic Substances and Disease Registry. The main concerns expressed about the landfills were regarding the impact of the site on the Oswego River and how information on the fish consumption advisory is distributed.

The contaminant of concern in fish from the Oswego River is PCBs. Because the past remedial actions involving the Armstrong landfills have addressed possible exposures, and the fish advisory on channel catfish is in place and is believed to be effective, the site poses no apparent public health hazard. Regardless of any association of the Armstrong site, additional investigation of the Oswego River is recommended to determine if contaminant levels in fish are still at levels of public health concern. Mirex did not emerge as an issue in this health consultation. (Refer to Section VIII.N.4 for other health initiative descriptions).

6. Other Health Studies/Assessments

* Inactive Hazardous Waste Sites

Direct contact and inhalation concerns arise involving remedial activities at these sites. Measures are to be taken to minimize exposure before, during, and after remediation. Concerns involve the contamination of surface and groundwater as well as the integrity of the remedial actions. The extent of requiring the dredging of contaminated river sediments vs. approving the in-place remedial capping with follow-up monitoring and assessment is an example of these crucial decisions.

* The Oswego Newborn and Infant Development Project

Preliminary results of a three-year ongoing study by Helen Daly et.al. at the State University of New York (SUNY) at Oswego indicated that a newborn child's behavior is affected by mothers who regularly consume Lake Ontario fish contaminated with a wide range of persistent toxic chemicals including PCBs. Based on a sample group on nearly 700 newborns, it was reported that the greater number of abnormal reflexes, less mature autonomic responses (startles and tremors) and less developed attention to visual and auditory stimuli distinguished babies born to mothers who had eaten high amounts of Lake Ontario fish. These babies also appeared to be over-reactive to stimulation. It is premature to predict whether these babies will continue to show behavioral differences.

The Great Lakes community was saddened to learn of the passing of Dr. Helen Daly on November 23, 1995 after a long struggle with cancer. Dr. Daly presented a keynote address on her research at the IJC Biennial Meeting on Great Lakes Water Quality in Duluth, Minnesota in September 1995.

* Research Initiatives

Descriptions of research initiatives are contained in Section VIII.N. These include virtual elimination, the Great Lakes Information Network, the "Great Lakes Research Review" publication, and human health considerations in RAPs.

H. RAP Public Participation and Outreach:

Regular meetings of the Remedial Advisory Committee (RAC) throughout the implementation of the Stage 2, and documentation of the Stage 3, Remedial Action Plan process will continue to keep stakeholders informed of remedial activities and progress and will continue to provide a means for local concerns to be addressed. Presentation of study and plan results are provided at these meetings. Field trips are to be organized to learn more about the specifics of a remedial activity and to respond to committee members interests as necessary. An informational slide show describing the Oswego River Area of Concern has been prepared to increase public awareness about the restoration and protection activities and needs of this important geographic area. A newsletter, promotional brochure, and RAP display are other examples of outreach activities that have been incorporated into the public participation activities involving the Oswego River AOC. The Remedial Advisory Committee will continue to provide advice and consultation.

The Oswego Remedial Advisory Committee continues to advise NYSDEC during the implementation of Remedial Action Plan recommendations. The ten member committee meets quarterly with DEC staff to discuss RAP related issues and activities. NYSDEC and the Oswego Remedial Advisory Committee continue the commitment to public participation and public outreach for the Oswego River RAP. Below are examples of the public outreach and public participation activities undertaken for the Oswego River Remedial Action Plan.

For additional information, copies of brochures, or to be placed on a mailing list, please contact: Wendy Rosenbach, NYSDEC, Division of Water, Bureau of Watershed Management, Great Lakes and Estuaries Section, 50 Wolf Road, Albany, NY 12233-3508, phone (518) 457-8960.

1. Slide Show

A slide show has been produced for the Oswego River RAP . The purposes of the slide show are to provide information about the Oswego River Area of Concern, local industries, and the cultural diversity of the area, and also, to increase public awareness and involvement in the Oswego River Remedial Action Plan. The slide show is approximately 15 minutes in length and is suitable for community groups, high school classes and other interested organizations and individuals that want to learn more about the Oswego River RAP and how to get involved.

2. New York State RAP Display

NYSDEC's Public Participation Section has produced a New York State RAP display. The purpose of the exhibit is to introduce the public to Remedial Action Plans in New York State and to illustrate what actions are needed and are currently underway to effectively clean up New York's RAP Areas of Concern. The display continues to be used at Great Lakes and Remedial Action Plan functions across the basin.

3. RAP Promotional Publications

* The brochure entitled, *RAPs in Action*, was developed to augment the message of the New York State RAP Display. The brochure provides more detailed information on remedial activities that are being implemented to restore and to protect beneficial uses in New York State's RAP Areas of Concern.

* A promotional brochure entitled, *Getting the Word Out*, was also developed to provide a description of public outreach and educational materials (audiovisuals, brochures, fact sheets, etc.) produced by and/or for the RAPs or the Lake Ontario Lakewide Management Plan (LaMP). The brochure is targeted at RAP coordinators, educators, environmental/advocacy groups and community groups in New York State so they are able to choose among diverse materials when promoting New York State RAPs, the Lake Ontario LaMP, and general Great Lakes issues.

* The brochure entitled, *The Oswego River Remedial Action Plan - Past Present and Future*, was developed to summarize the RAP process as it is being implemented in the Oswego River Area of Concern. The role of citizen committees and public participation activities are provided as well as the status of the Oswego RAP.

4. *Watershed Watch* Newsletter

The *Watershed Watch* is an annual newsletter that is dedicated to increasing awareness about water quality and RAP issues in the Oswego River Area of Concern. To keep people informed, the *Watershed Watch* articles address the plans and progress of remedial activities, local economic development projects, and stewardship initiatives. The newsletter is produced by the New York Department of Environmental Conservation and the Oswego River Remedial Advisory Committee.

5. Fish Consumption Advisory Brochure

NYSDEC in cooperation with NYSDOH has produced an informational handout advising specific limits and prohibitions concerning eating certain Lake Ontario fish. Child bearing women have been identified as a high risk group and should particularly heed these warnings.

6. Remedial Advisory Committee (RAC) Meetings

NYSDEC and the Remedial Advisory Committee hold quarterly meetings to provide updates and gain input on current and planned RAP activities. The meetings also provide an opportunity for the committee to address local concerns as related to remedial activities being implemented in the Area of Concern. Field trips and investigative study presentations, to learn more about ongoing remedial activities in the river basin, are often planned in conjunction with regular committee meetings.

7. Keeping up on RAP Information and Progress

If you would like to receive Remedial Advisory Committee meeting minutes, newsletters, brochures, announcements, and updated reports about the Oswego River RAP, please send your name, address and specific request to: NYSDEC, Division of Water, Bureau of Watershed Management, Great Lakes and Estuaries Section, 50 Wolf Road, Albany, NY 12233-3508.

I. Investigations and Monitoring Activities:

The results of conducting various investigations and monitoring activities will be instrumental towards resolving the Oswego River Area of Concern use impairments. Some monitoring plans are part of planned hazardous waste site remediation projects. The development and implementation of these plans are subject to regulatory review and approval. Where use impairments are directly caused by specific chemicals and/or sites, these investigative activities will be closely monitored. The focus of environmental monitoring involving remediation is to minimize the local and downstream impacts resulting from these activities and to comply with cleanup criteria. In addition to the monitoring activities required from industries conducting remediation within the watershed, other environmental assessments will be needed to evaluate the extent of use impairments and the effect that restoration activities have on restoring beneficial uses. These further investigations involve health, fish, wildlife, plankton, and macroinvertebrate studies that will be used to better define a change in status of use impairment indicators under the RAP process. Funding for these additional investigations and assessments is limited and in many cases is subject to specific priorities which may fall short of RAP goals. For example, when some grant funding scopes are defined, only selected aspects may relate to the RAP. Although the goal is to encourage the ecosystem approach, project money may very well have specific requirements attached that limit the benefits to the Remedial Action Plan. Summary results of recent investigative and monitoring studies that do contribute towards resolving use impairment are presented below:

1. Oswego Harbor Fish Pathology Report

This study was conducted by Jan Spitsbergen, a veterinary pathologist from Cornell University, during 1993 and 1994. Brown bullhead, white sucker, and rockbass were selected to study lesions. Very few pollution-associated lesions were observed. The tumor study in the Oswego AOC did not indicate exposure of the studied fish populations to potent anthropogenic carcinogens. The tumors observed were not statistically significant when compared to reference sites.

This study of tumors and other lesions found little evidence of impairment of fish health by contaminants in the Oswego River AOC. Although fish from the Area of Concern and Lake Ontario contain contaminant levels sufficient to warrant an advisory limiting human consumption of fish, these contaminant levels are below those causing an increase in tumors or other abnormalities in the fish.

A variety of factors other than toxicants are known to influence rates of neoplasia in mammals and fish; such factors include diet, genetics, age of the animals studied, natural carcinogens such as radon, metals from bedrock, or naturally-formed cancer-causing agents such as nitrosamines which can occur in rotting plant material in watersheds. Further tumor study was not recommended; however, if funds were available, more sophisticated tests involving the reproductive health of fish would be appropriate. Specialized studies of reproductive hormones, egg and sperm production and quality, and embryo and larval viability would be required in order to properly assess the reproductive health of fish residents of the AOC.

The Remedial Advisory Committee will be reassessing the status of the fish tumor use impairment indicator in the AOC. A "not impaired" status has been recommended concerning the tumors. Any deformity or reproductive issue, although not identified during the pathology study, could be addressed under the bird and animal deformity or reproductive use impairment indicator.

2. Oswego Harbor Water Quality Survey

NYSDEC conducted a water quality survey of the AOC funded by an EPA grant during the summer of 1995. The main objectives were to investigate the causes and status of several use impairment indicators. Eutrophication or undesirable algae, beach closings, and degradation of plankton populations were the main conditions investigated. Data indicates that there are no problems concerning dissolved oxygen, eutrophication, nutrients, coliforms, pathogens, or phytoplankton/zooplankton. All measurements were indicative of a healthy environment; however, toxic effects did occur when conducting BOD and biological toxicity tests.

Follow-up toxicity sampling was conducted using the Ceriodaphnia dubia 7-day subchronic test on four Oswego Harbor water samples and one control. The July results indicated reproductive rates were affected and one sample exhibited significant adult organism mortality. The September 1995 results showed no statistically significant reproductive or survival effects. Further investigation will be necessary to determine the extent and possible cause of this toxicity.

3. Lake Ontario Source Contaminant Study

New York State sources of waterborne contaminants to Lake Ontario were studied and reported on by NYSDEC's Simon Litten. Water quality sampling conducted during 1992-1994 using the "Passive In Situ Concentration-Extraction Sampler" or PISCES indicates no active sources of contaminants in the water column that are currently contributing to use impairments in the Oswego River AOC. Some sample analyses did detect contaminants at low levels in the water column; however, these are not considered problematic nor are they inconsistent with water quality samples of Lake Ontario. At the locations where the passive sampling results indicate a water column presence, follow-up source study is recommended.

PCB sample results obtained from the Oswego Harbor suggest that normal maritime traffic has far more effect on contributing to whole water PCB contaminant concentration than does dredging. Moderate levels of dissolved phase PCBs (10-25 ng/l) were observed in some of the study samples in the lower Oswego River. There was no evidence for a PCB source from the Armstrong facility site.

Of the four primary sites studied for Mercury, concentrations were the lowest in the Oswego River; however, due to high volume of water flow in the Oswego River, mercury loads to Lake Ontario were identified as highest from the Oswego River. In general, wastewater treatment plant influents were observed as relatively high in mercury concentration; this indicates the need for pretreatment program follow-up. Sediment analysis showed evidence of historical mercury contamination of the Oswego River depicted by a display of a pattern of concentrations that increase with core depth (maximum observed at 29 cm.)

The discovery of mirex at Lock 6 and off the lower end of Armstrong property was expected. Mirex (pesticides) detection was, however, rare, at very low levels, and the density of data is insufficient for mapping.

4. Oswego River Sediment Study

Section IV.B on contaminated river sediments contains a summary of the results from this study. Overall, metals and organic contaminants were found in the sediment cores that were mostly attributable to historical practices. Further study of certain river areas is recommended to determine the extent of any current pollutant sources. Dioxins and furans in sediments and suspended solids were not problematic in the lower Oswego River.

5. Mirex Study

"A Screening-Level Mass Balance Analysis of Mirex Transport and Fate in the Oswego River" report was published in the Journal of Great Lakes Research in 1995. The abstract reads "A mass balance approach was used to evaluate the fate of mirex in the Oswego River. The objectives of this research were 1) to assess the magnitude and extent of mirex contamination in the Oswego River, 2) to quantify the transport, fate, and distribution of mirex in the river, and 3) to estimate mirex export to Lake Ontario via the Oswego River. Field data collected as part of a 1990 Oswego River Mirex Study, in addition to other existing data, were used to develop a water quality model describing the transport and fate of chlorides, total suspended solids, and mirex in the Oswego River from Fulton to Lake Ontario. Long-term and short-term loading scenarios were evaluated to assess the possible magnitude of the initial mirex discharge to the Oswego River in 1965 as well as the subsequent export resulting from a given loading. Field data and model results suggest that a short-term mirex discharge occurring in the mid-1960s cannot account for the water column concentrations observed in 1990 or the mirex mass in Lake Ontario sediments attributable to the Oswego River. Similarly, field data and model results suggest that resuspension of the 1990 in-place mirex mass cannot account for the water column mirex concentrations observed in 1990. This suggests that there may be a continuing mirex source to the Oswego River. Based on the 1990 field data, the estimated Oswego River mirex inventory was 10 kg and export to Lake Ontario averaged 42 g/day."

These conclusions were not consistent with the Lake Ontario Source Contaminant Study discussed above in item #3. Further investigation and assessment is needed to resolve this mirex loading issue to Lake Ontario. Both documents are referenced in Appendix G.

6. Other Monitoring to Consider

A monitoring workshop conducted for the St. Lawrence River RAP involved three separate activity sessions where each session identified current monitoring programs, requirements, and recommendations. Highlights of each of the three sessions that identify monitoring activities that can be applied to the Oswego River RAP are presented below:

* Water and Sediment Investigation

  - Determine specific pathways for contaminant uptake by biota.
  - Develop new methods to determine benthos relationships.
  - Survey of bacterial organisms.
  - Perform mass balance assessment.
  - Assess pre-, during and post-remediation.

* Point and Nonpoint Source Investigation

  - Fish and wildlife consumption, population, and deformities data.
  - Groundwater and agriculture impact data.
  - Dredging flux data.
  - Relative loading contributions data.
  - Determinations of the extent of monitoring requirements.

* Biological Investigation

  - Improve standardization of protocols and species.
  - Increase frequency of monitoring.
  - Research: impact of water levels; impact of zebra mussel.
  - Define links of specific chemicals and tumors.
  - Develop management plan for fish habitat; include wetlands.
  - Determine chemical/population relationships.

Therefore, it is very important to define priority investigation and monitoring activities for the Oswego River Remedial Action Plan in order to maintain a focus on the identity and accomplishment of RAP objectives. These activities are further developed and listed in Section VII herein where priorities are identified.

When site remediation is involved, the goal is to design monitoring activities so that adequate before, during, and after remediation information is known, as well as sufficient control data, so that updated use impairment determinations can be made and beneficial use issues can be resolved in the most efficient manner. In the Use Impairment / Remedial Activity Matrix developed in Section V.A (Table 3), investigations, sampling/analysis, and assessment activities are evaluated as to the effects that implementing these activities will have upon restoring beneficial uses. Fourteen investigative need areas were defined in the Stage 2 document (page 9-16). These needs are consistent with the recommendations incorporated into the individual strategies to address use impairments. The ten Use Impairment Restoration and Protection Strategy management forms and the delisting criteria, contained in Appendix C and Appendix D respectively, incorporate these considerations.

Watershed Watch

Stewardship in the Oswego River Basin

Spring 1996

Oswego Harbor Survey 1994

NYSDEC conducted the Oswego Harbor Survey to gather further information about use impairments identified in the Oswego River Remedial Action Plan (RAP). Many of the use impairment assessments defined in the Stage I RAP report were made with limited data; and the Division of Water staff and the Oswego RAP Citizens Advisory Committee identified the need for more data as a priority. The final Oswego Harbor Survey report, completed in the Summer of 1995, will provide much needed baseline data for the RAP.

The Oswego Harbor Survey was funded by a $40,000 grant from the U.S. Environmental Protection Agency. Samples for the survey were collected during June, July and August of 1994 by staff from DEC's Bureau of Monitoring and Assessment. Oswego Harbor was sampled at eight sites and Lake Ontario was sampled at two locations just outside the harbor breakwall.

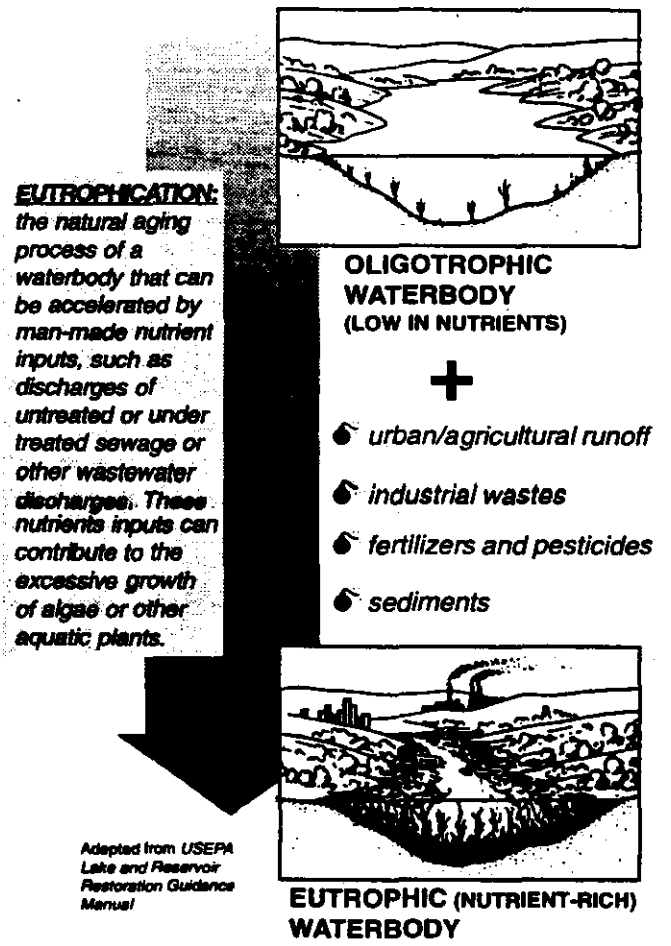
The primary focus of the study was on conventional or nontoxic parameters, including dissolved oxygen, nutrients, coliform bacteria, and plankton populations. Data gathered in the survey will provide information to investigate more fully two of the use impairments defined in the RAP—**eutrophication** (see graphic right) and degradation of phytoplankton and zooplankton populations.

A Possible Toxicity Problem is Detected

The dissolved oxygen concentrations measured in the harbor were near saturation, indicative of a healthy environment. There were no indications of algal or eutrophication problems and

continued on next page

Man-made Eutrophication



Adapted from USEPA Lake and Reservoir Restoration Guidance Manual

New York State Department of Environmental Conservation

George Pataki, Governor — Michael Zagata, Commissioner

[Front Page of Annual Newsletter Described in Section IV.H.4]

V. RESTORATION AND PROTECTION STRATEGIES

Implementation of the Oswego River Remedial Action Plan is proceeding. Highlights of a chronology of major remedial activities since the United States and New York State governments committed to RAP development in 1985 are presented in Appendix B. By applying the RAP process model, we are constantly monitoring and adjusting the strategies needed to accomplish the goals. Details of these restoration and protection strategies that have been developed, revised, and are being implemented are described in this section of the 1996 RAP Update under the following six topics:

* Use impairment / remedial activities matrix (Table 3)
* Summary of sources, impairments, causes, and strategies (Table 4)
* Use impairment strategy management forms
* Use impairment strategy summaries
* Recommendations / commitments update
* International Joint Commission comment review

Implementation of remedial activities are well underway and progressing in the Oswego River watershed and Area of Concern. These activities includes hazardous waste remediation involving physical construction, best management practices, improved regulatory controls, and investigation and monitoring activities. Each of these remedial activities has an effect on, or can cause some effect towards, restoring and/or protecting a beneficial use. In fact, there are a variety of remedial measures that can be listed under each one of the three larger groups of remedial activities (physical construction, plans and controls, investigations).

To evaluate the effect that each remedial activity can have towards restoring/protecting a beneficial use, a matrix is useful to make cross references. Such a matrix has been developed in Section V.A below which describes the effects of implementing these remedial activities on each use impairment. In Section V.B a new table (Table 4) has been developed which summarizes the sources, use impairment concerns, causes and remedial strategies.

In Section V.C, use impairment restoration and protection "strategy management forms" are developed for each use impairment by applying the remedial activities identified in the matrices that are considered to have the most significant effects. By considering the resources involved, commitments made to date, and remedial action needs of each use impairment, we are able to develop these strategy management forms to describe and track a set of restoration and protection strategies for each use impairment.

Following the description of the use impairment strategy management forms (eleven in all contained in Appendix C), a narrative summary of the remedial strategies for each use impairment is provided in Section V.D. This includes nine of the fourteen use impairment indicators for the Oswego River Remedial Action Plan that require the development and implementation of remedial strategies and two others that are under expanded review, for a total of eleven.

In this section then, the use impairment remedial strategies, as applied to each use impairment indicator and to the sources of contamination, are further described by the following: the use impairment / remedial activity matrix, the strategy summary in Table 4, the eleven use impairment strategy narratives, and the eleven use impairment strategy management forms referred to in Appendix C.

In Section V.E, updates are presented on the recommendations and commitments established in the Oswego River Stage 2 Remedial Action Plan. Emphasis is directed at focusing on the key strategy elements and the needs that are identified to accomplish implementation.

In Section V.F, an evaluation of the International Joint Commission's (IJC) Stage 2 review comments (from 1993) is provided. This evaluation and strategy response incorporates the current RAP strategy elements.

A. Use Impairment / Remedial Activities Matrix:

A comprehensive matrix has been developed to assist in evaluating the effectiveness of implementing remedial activities to restore beneficial uses. **Table 3** includes a key with four pages of matrix tables that together describe this evaluation of the array of remedial activities available to address use impairments in the AOC. By separating remedial activities into three major groups: 1) physical construction activities; 2) management practices, plans and controls; and, 3) investigation and monitoring activities; and then, by listing specific remedial activities under each group, an evaluation of the effect that implementing each of these remedial measures would have on restoring and/or protecting a beneficial use has been done. The first page of the matrix table therefore evaluates the physical construction improvement actions; the second page evaluates management practices, plans and controls; and, the third and fourth matrix pages evaluate investigative and monitoring activities.

The assessment of the effect of implementing each remedial activity leads to an improved understanding of RAP priority activities that are needed to address each use impairment. The matrix tables therefore identify priority activities as those having a significant direct effect (indicated by "D") and a significant indirect effect (indicated by "I"). Such activities include: site remediation, removing contaminated river sediments, implementing management plans, conducting investigations, and providing public participation/outreach.

The last two rows on each matrix table have been included to assist in identifying remedial activity focuses (priorities) and the anticipated role public participation can play in implementation. Again, in these last two rows, remedial activities having significant direct "D" and significant indirect "I" effects towards restoring and protecting beneficial uses have been identified and are therefore considered priorities. Many priorities have been identified. Public participation/outreach can have a significant direct effect on facilitating the success of these remedial activities.

HOW TO USE THE MATRIX (TABLE 3): Locate the variety of remedial activities across the top of each matrix. Now, move down the column to determine the evaluated effect that implementing the remedial activity will have towards correcting each use impairment shown in a row. Some examples of matrix use include:

* Direct Significant Effect "D": Construction of new or upgraded point source wastewater treatment facilities (see matrix sheet 1) to improve the quality of a wastewater discharge is expected to have a direct significant effect on addressing fish and wildlife consumption restrictions and restoring the beneficial use.

* Indirect Significant Effect "I": Construction (cleanup) of land-based hazardous waste sites (matrix sheet 1) is expected to have a significant indirect effect on preventing the degradation of benthos and restoring the beneficial use.

* The development and implementation of contaminated sediment controls (e.g. dredging plans and the application of cleanup criteria shown on matrix sheet 2) is expected to have a significant indirect effect on protecting against many use impairments (e.g. tainting, tumors, benthos degradation). It will have no significant effect towards restoring several other beneficial uses such as aesthetics.

* Conducting investigations and assessments that involve bioaccumulation studies, health risks assessments (matrix sheet 3), and fish and wildlife tissue studies (matrix sheet 4) are needed because they are expected to have direct significant effects towards addressing the use impairment of fish and wildlife consumption restrictions. These same investigations and studies are not applicable or will have no significant effects towards addressing the use impairment involving eutrophication or undesirable algae.

The four page Use Impairment / Remedial Activity Matrix identifies numerous remedial activity priorities and needs. In the following sections, these priorities and needs are applied as strategy elements to the restoration and protection of each beneficial use. In other words, the development and implementation of a priority remedial activity has now been linked as it relates to the correction of each use impairment. A step by step implementation plan can therefore be laid out for the restoration and protection of each beneficial use. Because this is a dynamic process, the tracking and documenting of the status of remedial activities will require periodic updating.

TABLE 3 - **Impaired Use Remedial Activity Matrix Key**
Oswego River Area of Concern

Remedial Activity Indicators Key: (Denotes Improvement, Restoration or Protection Expected and/or Knowledge Gained)

D = Direct significant effect
dm = direct moderate effect
ds = direct small effect

I = Indirect significant effect
im = indirect moderate effect
is = indirect small effect

NA = Not Applicable
NS = No Significant effect
1 = visual/odor effect
2 = outside chemically effected area

Impairment Indicators Key: (Denotes Current Rating of Use Impairment Indicator, as noted on the matrix in Column one.)

* = Impaired
L = Impairment likely (need studies/data to determine)
O = No impairment identified
O_u = Not impaired; (under expanded review)
U = Under review

(Note: see text for matrix use instructions)

TABLE 3 - USE IMPAIRMENT/REMEDIAL ACTIVITY MATRIX

Oswego River Area of Concern

Remedial Activity →	Actual Construction Improvements						
↓Impairments↓	Hazardous Waste Site Remediation (Land-based)	Contaminated Sediments Remediation (Dredging)	Pt. Source (SPDES) Discharge Treatment (Includes un-permitted)	Nonpoint Source Structural Control Construction	Air Pollution Treatment	Fish Habitat Remediation/Construct	Wildlife Habitat Remediation/Construct
Restrictions on fish and wildlife consumption *	I	D	D	is	is	NA	NA
Degradation of fish and wildlife populations *	is	D	D	dm	is	D[2]	D[2]
Loss of fish and wildlife habitat *	ds	dm	is	ds	is	D[2]	D[2]
Eutrophication or undesirable algae *	I	ds	D	D	is	NS	NS
Degradation of benthos L	I	D	dm	is	is	NA	NA
Fish tumors or other deformities U	is	D	ds	is	is	NS	NS
Bird or animal deformities or reproduction problems U	is/ds	I	ds	is	is	NS	NS
Degradation of Aesthetics U	NA	NS	NS	NS	NS	NS	NS
Degradation of phytoplankton & zooplankton populations U	I	im	ds	is	is	NA	NA
Restrictions on dredging activities O_a	NA	D	NA	NA	NA	NA	NA
Beach Closings O_a	NA	NS	NS	NS	NS	NS	NS
Tainting of fish and wildlife flavor O	NS	NS	NS	NS	NS	NS	NS
Drinking water consumption restrictions or taste and odor problems O	NS	NS	NS	NS	NS	NS	NS
Added costs to agriculture or industry O	NA	NS	NS	NS	NS	NA	NA
↓Activity Focus:↓							
Restoration/Protection Priority	I	ds	dm	D	im	D	D
Public Participation/Outreach	dm	ds	dm	D	dm	D	D

Table 3 - USE IMPAIRMENT/REMEDIAL ACTIVITY MATRIX - Oswego River AOC

Remedial Activity →	Development/Implementation of Plans & Improved Controls												
↓Impairments↓	Pt. Source SPDES (add'l control)	Contaminated Sediments	Runoff Controls Stormwater BMPs	Water Conservation	Agricultural BMPs	Industrial, Municipal, Pretreatment BMPs	Air Pollution	Pollution Prevention	Fish/Aquatic Management Plans	Wildlife Management Plans	Human Health Management Strategy	Land Use Controls	Hazardous Waste Sites BMPs
Restrictions on fish and wildlife consumption *	D	I	is	is	is	is	is	is	I	I	D	im	D
Degradation of fish and wildlife populations *	D	I	dm	dm	dm	dm	is	is	I	I	NA	I	D
Loss of fish & wildlife habitat *	is	I	ds	ds	ds	ds	is	is	dm	dm	NA	D	D
Eutrophication or undesirable algae *	D	I	D	ds	D	D	im	is	im	im	im	D	D
Degradation of benthos L	dm	I	is	is	is	is	is	is	I	I	NA	im	is
Fish tumors or other deformities U	ds	I	is	is	is	is	is	is	I	I	NA	NA	is
Bird or animal deformities or reproduction problems U	ds	I	is	is	is	is	is	is	I	I	NA	im	is
Degradation of aesthetics U	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	dm	NS
Degradation of phytoplankton and zooplankton populations U	ds	im	im	im	im	is	is	is	NS	NS	NA	dm	im
Restrictions on dredging activities O_u	NA	D	NA	NA	NA	NA	NA	NA	NS	NS	NS	NS	is
Beach Closings O_u	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	D	dm	D
Tainting of fish and wildlife O	NS	I	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	is
Drinking water consumption restrictions or taste and odor problems O	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	D	dm	D
Added costs to agriculture or industry O	NS	NS	NS	NS	D	D	NS	NS	NS	NS	NS	D	D
↓Activity Focus↓:													
Restoration/Protection Priority	D	I	D	im	im	im	im	I	D	D	D	D	im
Public Participation/Outreach	dm	dm	D	dm	D	dm	dm	D	D	D	D	D	dm

Table 3 - USE IMPAIRMENT /REMEDIAL ACTIVITY MATRIX - Oswego River AOC

Remedial Activity →	Investigations & Sampling/Analyses/Assessment									
↓Impairments↓	Health Risk Assessment	High Volume Air	Mobile Air Lab	Remediation Site Air	Remediation Site Soil	Contaminated Sediment	Toxic Test Bio Assay	Bioaccumulation	Ambient Water	DO - Eutrophic
Restrictions of fish and wildlife consumption *	D	is	is	is	is	I	I	D	I	NS
Degradation of fish and wildlife populations *	NA	is	is	is	is	I	D	D	I	I
Loss of fish and wildlife habitat *	NA	is	is	NS	NS	I	D	D	D	D
Eutrophication or undesirable algae *	NA	is	is	NS	NS	I	NS	NS	D	D
Degradation of benthos L	NA	is	is	is	I	I	D	D	D	NS
Fish tumors or other deformities U	NA	is	is	is	is	D	D	D	D	NS
Bird or animal deformities or reproduction problems U	NA	ds	dm	is	is	I	D	D	D	NS
Degradation of aesthetics U	im	is	ds	NS	NS	im	NA	NS	D	D
Degradation of phytoplankton and zooplankton populations U	NA	is	is	NS	NS	I	D	D	D	D
Restrictions on dredging activities O_u	NA	NA	NS	NS	NS	D	D	D	NA	NS
Beach closings O_u	D	NA	NS	NS	NS	is	NA	NS	D	NS
Tainting of fish & wildlife flavor O	NA	is	is	NS	NS	I	I	D	I	NS
Drinking water consumption restrictions or taste and odor problems O	D	is	ds	ds	ds	I	D	I	D	NS
Added costs to agriculture or industry O	NA	ds	ds	NS	NS	NS	D	dm	D	NS
↓Activity Focus↓:										
Restoration/Protection Priority	D	im	im	im	im	D	D	D	D	D
Public Participation Outreach	D	ds	ds	dm	dm	D	D	D	D	D

Table 3 - USE IMPAIRMENT/REMEDIAL ACTIVITY MATRIX - Oswego River AOC

Remedial Activity →	Investigations & Sampling/Analyses/Assessment										
↓Impairments↓	Vegetation	Point Sources (SPDES)	Groundwater	Fish Tissue	Fish Survey	Fish Deformity	Wildlife Tissue	Wildlife Survey	Deformity Wildlife	Plankton	Macro-invertebrate
Restrictions of fish and wildlife consumption *	NS	I	is	D	NA	D	D	NA	D	im	im
Degradation of fish and wildlife populations *	D	I	is	I	D	I	I	D	I	I	D
Loss of fish & wildlife habitat *	D	D	is	D	D	I	I	D	D	D	I
Eutrophication or undesirable algae *	dm	D	NS	NA	NA	NA	NA	NA	NA	D	dm
Degradation of benthos L	ds	I	is	is	NA	NA	NA	NA	NA	I	D
Fish tumors or other deformities U	is	I	is	D	NA	D	NA	NA	NA	NS	NA
Bird or animal deformities or reproduction problems U	im	I	is	D	NA	NA	I	D	D	ds	NA
Degradation of aesthetics U	D	D	NA	NA	NA	NA	NA	NA	NA	D	NA
Degradation of phytoplankton and zooplankton populations U	D	dm	ds	NA	NA	NA	NA	NA	NA	D	D
Restrictions on dredging activities O_u	is	I	NA	NA	I	I	NA	NA	NA	NA	NA
Beach closings O_u	D	D	NA	NA	NA	NA	NA	NA	NA	D	D
Tainting of fish & wildlife flavor O	NS	I	is	D	NA	NA	D	NA	NA	ds	is
Drinking water consumption restrictions or taste and odor problems O	D	D	D	NA	NA	NA	NA	NA	NA	D	NA
Added costs to agriculture or industry O	I	I	dm	D	NA	D	NA	NA	NA	D	NA
↓Activity Focus↓:											
Restoration/Protection Priority	ds	im	is	D	D	D	D	D	D	dm	D
Public Participation Outreach	ds	ds	ds	dm	dm	dm	dm	dm	dm	ds	ds

B. Table 4 - Summary of Sources, Impairments, Causes, and Strategies:

Remedial strategies that are established to address the sources of contamination and that will restore and protect beneficial uses involve three areas of work: 1) conducting investigation and assessment activities, 2) the development/implementation of plans, controls, and physical construction improvement activities, and 3) the documentation of the progress and the ultimate success story that needs to be communicated as part of the Stage 3 RAP document. Table 4 is a newly developed table that summarizes the contamination sources and use impairment concerns, describes their causes, and identifies these needed remedial strategies.

Table 4 has been developed to summarize the remedial activity strategies needed to address the sources, causes, and use impairment concerns and to show their interrelationship. For example, a specific cause (e.g. PCBs) may contribute to more than one contamination source or impairment concern. Similarly, specific remedial strategies (e.g. investigation, management plan, or physical improvement) may contribute to addressing more than one contamination source, use impairment concern, or cause of an impairment.

In addition to providing a summary description of the remedial strategies needed to address the sources and use impairment concerns, Table 4 also identifies the needed documentation and provides an overall status of the remedial strategies for each source or impairment concern. These strategies and needs have been identified by the RAC committee and NYSDEC as necessary steps to restore and to protect beneficial uses and to work towards the delisting of the Area of Concern. Table 4 is closely linked to Section VII which identifies and lists priority remedial activities. Section VII is designed to be expanded to include specifics for the implementation of physical remedial activities, improved controls and plans, and investigation/assessment activities that are needed for the coming year. For example, certain investigations and long-term monitoring plans are needed to provide the documentation that the restoration of beneficial uses has been achieved and the satisfaction that the contamination sources are no longer contributing to the impairments in the Area of Concern. Table 4 summarizes this information on the next two pages:

TABLE 4 - SUMMARY OF SOURCES, USE IMPAIRMENTS, CAUSES, AND REMEDIAL STRATEGIES
Oswego River Remedial Action Plan

Source or Use Impairment	Cause	Remedial Activity Strategies			Status
		Investigation/Assessment	Plans/Improvements	Documentation	
Land-based Hazardous Waste Sites (Nonpoint source)	Mirex and photomirex, PCBs, Dioxin, Mercury, Octachlorostyrene (OCS).	Determine contaminant release to AOC.	Assess investigation and study results for sources of contaminants. Continue Onondaga Lake work.	Conduct long-term monitoring; document remedial cleanups and any downstream effect.	I,U
Contaminated Sediments (Mirex below Fulton, Mercury in Onondaga Lake)	Mirex and photomirex. PCBs, Dioxin, Mercury,	Evaluate sediment data. Determine contaminant release to AOC. Determine need for criteria.	Define restoration goals. Assess investigation and study results for sources of contaminants.	Conduct long-term monitoring; document remedial cleanups and any downstream effect.	U
Eutrophication, algae and other Non-point sources. (AOC & Watershed)	Agricultural runoff, Spills (Haz. sub.), Bottom Sediments, Erosion, Phosphorus.	Evaluate water qual. data. Assess AOC impact. Weed harvester needed? Conduct toxicity testing. Reassess use impairment.	Define restoration goals. Define investigations. Define needed BMPs. Implement nonpoint controls.	Conduct long-term monitoring; document remedial effect. Reassess use impairment.	U
Point Source (Industrial and Municipal SPDES-stormwater related)	PCBs, dioxin, Mercury, Octachlorostyrene.	Determine contaminant release to AOC. Evaluate parameter controls and reduced loading trends.	Complete SPDES renewals. Define any new controls. Implement permit measures.	Conduct long-term monitoring; document remedial effect.	I,U,N
Combined Sewer Overflows (stormwater related)	Phosphorus	Determine contaminant release to AOC and cause/need for controls.	Evaluate CSOs as causes. Determine additional controls. Implement/monitor Onondaga Lake/County activities.	Conduct long-term monitoring; document remedial effect.	I,U,N
Other Point Sources or unaccounted loadings	None identified	Identify any sources. Perform loading assessment. Mirex evaluation needed.	Develop based on new information and/or mass balance discrepancy.	Conduct long-term monitoring; document remedial effect.	U,N
Lake Ontario	PCBs, Dioxin, Mirex, Octachlorostyrene.	Transport study. Conduct water column analyses and assess source load contributions.	Encourage added source control and pollution prevention practices.	Conduct long-term monitoring; document remedial effect.	N

Source or Use Impairment	Cause	Remedial Activity Strategies			Status
Air Deposition	none identified	Transport study. Conduct air pollution analyses and assess source load contributions.	Encourage added source control and pollution prevention practices.	Conduct long-term monitoring; document remedial effect.	I,N
Fish & Wildlife Consumption Restrictions	PCBs, dioxin	Continued update on fish advisory. Contaminant analysis. Evaluate human health data/ (Daly) behavior work.	Implement BMPs/controls. Apply criteria to determine further needs and any containment of haz. waste or needed management plans.	Conduct long-term monitoring; Observe fish advisory.	U,N
Fish & Wildlife Habitat Loss and Impairment	Dam construction and resulting dry areas below; Possible contaminated sediments. PCBs, dioxin, octachlorostyrene. Introduced species.	Survey existing habitat. Develop non-indigenous and non-AOC habitat use plans. Assess cause impacts. Assess Zebra Mussel impact Evaluate FERC relicensing impact. Inventory of F&W habitat.	Develop habitat improvement plan & implement plan. Define restoration goals. Define controls for causes. Apply FERC req'ts to restore habitat.	Conduct long-term monitoring; document remedial effect.	U,N
Other possible impairments: [Degraded Benthos, Fish Tumors or Deformities, Fish/Wildlife/Bird Problems of Reproduction or Population.	PCBs, Dioxin, Mercury, Mirex.	Evaluate W.Q. & Fish data. Abnormal conditions inquiry Link impairment to source. Define Benthic study needs. Assess remedial action.	Complete watershed hazardous waste remediation. Develop/implement BMPs. Perform studies to find and eliminate any impairment.	Conduct long-term monitoring; document remedial effect.	I,N

STATUS KEY:

C	=	Completed
P	=	Planned
D	=	Deferred
I	=	Implementation progressing
U	=	Under development/assessment/investigation
N	=	Needs development/assessment/investigation
R	=	Required by enforcement/permit/agreement

C. Use Impairment Strategy Management Forms:

With the actions that have been taken or are in progress or planned, we have developed an integrated strategy for managing each use impairment indicator to assure the restoration and protection of beneficial uses as described below.

The development of the remedial strategies for each use impairment was initiated by identifying the specific actions and needs that should restore and protect the beneficial uses. Further, the current status of these remedial strategies is defined as well as a projected completion date and an identification of a responsible party (as much as possible). This information for each use impairment indicator is then consolidated on a single page form entitled the "Use Impairment Restoration and Protection Strategy" management form. These strategy management forms are contained in Appendix C and are to be updated periodically to document the status of remedial activity progress and any strategy modifications.

Each Use Impairment Restoration and Protection Strategy management form therefore targets a specific use impairment and provides impairment descriptive data, a remedial strategy plan with status, and narrative comments. Summary descriptions of the remedial strategies for the nine use impairments identified as impaired or as requiring further investigation, as well as the two impairments under expanded review, for the Oswego River Area of Concern are presented next. Each use impairment strategy management form in Appendix C describes its use impairment indicator status as either impaired, likely impaired, unknown impairment, or reopened for further assessment. The eleven use impairments and their status are:

1. Fish and wildlife consumption restrictions	-impaired
2 Degradation of fish and wildlife populations	-impaired
3. Loss of fish and wildlife habitat	-impaired
4. Eutrophication or Undesirable Algae	-impaired
5. Degradation of benthos	-likely
6. Fish tumors or other deformities	-unknown
7. Bird and animal deformities/reproductive prob.	-unknown
8. Degradation of Aesthetics	-unknown
9. Degradation of plankton populations	-unknown
10. Restrictions on dredging activities	-expanded assessment
11. Beach closings	-expanded assessment

[To assist in the problem definition of a use impairment and the description of the desired restored condition, Use Impairment Restoration and Protection (delisting) Criteria have been developed in the next Section VI. Further, Appendix D contains details of these criteria for each of the fourteen Oswego River RAP use impairment indicators.]

D. Use Impairment Strategy Summaries:

The narrative summaries for each Use Impairment Restoration and Protection Strategy management form for the Oswego River Area of Concern are described below. The eleven use impairment strategy management forms are contained in Appendix C. The development and implementation of the remedial strategies to achieve the restoration targets, as defined by the criteria in Appendix D, is essentially the goal of the Remedial Action Plan. These remedial strategies seek to restore and to protect the beneficial uses involved with each of the use impairment indicators. Narrative summaries describing the status of each Use Impairment Restoration and Protection Strategy management form for the Oswego Area of Concern are presented below:

1. Fish and Wildlife Consumption Restrictions

This use impairment was previously identified as caused by PCBs, mirex, and dioxin. The sources include upstream industrial discharges, inactive hazardous waste sites, contaminated sediments, air deposition, and Lake Ontario. Following the implementation of the municipal and industrial corrective actions associated with Onondaga Lake, investigations and long term monitoring will be needed to evaluate the extent of any remaining impairment. The land-based inactive hazardous waste site remediation and the modification of point source discharge permits will contribute to the restoration and protection of the beneficial use. The establishment and implementation of additional Best Management Practices (BMPs) for fish, aquatic, and wildlife as well as human health will also benefit the restoration and protection of this and other beneficial uses addressing a number of the use impairment indicators.

[Note: The Stage 1 and 2 documents for the Oswego River RAP identified PCBs, mirex, and dioxin as likely causes of this use impairment. In New York State, dioxin (and mercury) have not contributed to health advisories on fish. Therefore, dioxins should be considered for deletion as a cause of the fish and wildlife consumption restriction use impairment.]

2. Degradation of Fish and Wildlife Populations

This use impairment is due to dry river areas created below the Varick Dam. Chemical causes are associated with PCBs, dioxin, and possibly octachlorostyrene (OCS). For more discussion on OCS, see Section IV.B.7. This impairment is linked to the habitat loss impairment discussed below . Studies are needed to confirm the role of contaminants and the extent of this use impairment in other parts of the Area of Concern.

3. **Loss of Fish and Wildlife Habitat**

This use impairment is due to physical disturbances (e.g. those resulting from human development). Loss of fish and wildlife habitat involves the presence of elevated levels of PCBs and dioxin that are most likely impacting the benthos as well as the known dry areas created below the Varick Dam. Long-term monitoring and reassessment of this use impairment indicator will be needed following the implementation of requirements imposed by the pending Federal Energy Regulatory Commission (FERC) relicensing process and the resulting needed investigative work and remedial activities. Surveys are needed to establish the present conditions and the extent of this use impairment in other parts of the Area of Concern.

4. **Eutrophication or Undesirable Algae**

This use impairment has been identified as caused by excessive phosphorus attributable to wastewater treatment facilities, combined sewer overflows, and urban/rural land runoff. Investigative needs include a quantification of upstream nonpoint sources and collection of recent data on phytoplankton. The status of this use impairment has reportedly been improved by the introduction of the zebra mussels in the Three Rivers System. Zebra mussels filter the water and improve water clarity although they can lower dissolved oxygen content. The 1994 water quality survey found no impairment in the harbor; however algae has been reported in certain upstream river segment waters. Further assessment of this data is planned.

5. **Degradation of Benthos**

Toxicity tests carried out on sediments in 1987 suggested benthic macroinvertebrate populations may be impaired. The 1995 Oswego Harbor Water Quality Survey indicated no problems with dissolved oxygen, eutrophication, nutrients, bacteria, and plankton. The 1996 results of the Oswego River Sediment Study indicate no impact to the benthic community in the harbor or upstream at Battle Island and Phoenix. The lower river, Onondaga Lake outlet, and Fulton area sediments did have some benthic impacts identified. Further assessment of this data is needed to better quantify the status of this use impairment indicator and determine if further investigations are needed to resolve this "likely" impairment.

6. **Fish Tumors or Other Deformities**

A final report regarding a fish lesion study was completed by Cornell University for the Oswego Harbor AOC using samples from 1993 and 1994. The results indicate no significant occurrence of tumors and little evidence for impairment of

fish health by anthropogenic contaminants in the AOC. In this study, some difficulty was encountered in finding resident fish, which underscores the close link of fish in the harbor area to Lake Ontario. Based on this study, the status of this "unknown" use impairment indicator needs to be reevaluated; a change in the use impairment status to "not impaired" is to be considered by the Remedial Advisory Committee. Fish reproductive health concerns and deformity issues are recommended for consideration under the "Bird and Animal Deformity/Reproductive Problems" use impairment indicator discussed next.

7. Bird and Animal Deformities or Reproductive Problems

The "unknown" status of this use impairment, if present, is probably caused by PCBs from contaminated river sediments as well as dioxin and possibly octachlorostyrene. Investigative surveys and longer term monitoring will be needed to define the existence and extent of any use impairment. Additional fish/aquatic/wildlife management plans may also be needed.

8. Degradation of Aesthetics

The current "unknown" status of this use impairment is probably due to the observance of excessive algae (refer to the eutrophication and undesirable algae impairment above) in certain upstream river areas. Physical disturbances that cause sedimentation, runoff, and excess nutrients such as phosphorus all contribute to cause such color and odor associated problems. The 1995 harbor water quality survey identified no impairment. Longer term monitoring and reassessment of this use impairment by the RAC is needed to define the existence and extent of any use impairment in the Area of Concern in its relationship to any upstream river conditions. If necessary, a management plan may need to be developed.

9. Degradation of Zooplankton and Phytoplankton

The current "unknown" status of this use impairment is due to the lack of data. The 1995 water quality survey in the harbor found no use impairment. If present in upstream areas of the river, the impairment would most likely be due to nutrients and chloride presence caused by runoff, wastewater treatment plants, combined sewer overflows and industry. Pending the results of any further plankton sampling in the river, the Remedial Advisory Committee is to reassess the status of this use impairment indicator for the Area of Concern. Further upstream river analysis would be needed to establish the existence and extent of any river use impairment. Given such degradation data, a river management plan would need development/refinement.

10. Restriction on Dredging Activities

Maintenance dredging in the Area of Concern has been determined to be not impaired. However, there is a need to assess expanded harbor dredging proposals. Therefore, this use impairment indicator has been reopened to evaluate the results of recent harbor and river sediments analyses results and the possible need for any restrictions concerning dredging proposals.

11. Beach Closings

Because there are not beaches within the Area of Concern, this impairment indicator has been evaluated as not impaired. However, there is a need to assess partial-body contact of the AOC waters. Recent water quality survey data supports this no impairment for partial-body contact. Therefore, this use impairment indicator has been reopened to evaluate the recent water quality data and verify the "not impaired" status.

E. Recommendations / Commitments Update:

Stage 2 of the Oswego River RAP contained twenty-three recommendations that were updated in the 1992 RAP Update report and are further updated here. Development of the Use Impairment Restoration and Protection Strategy management forms for each use impairment and the implementation of these strategies will lead to improved tracking and facilitation of the recommendations and commitments. These current strategies, as defined in this 1996 Update, have been incorporated into updating the recommendations and commitments listed below. A paraphrase of the original recommended action (Rec.Action) is included prior to the update of each recommendation status description:

1. Mirex Sediment Investigation

(Rec.Action: Determine the location and loading of mirex contaminated Sediments)

Several investigations have been conducted on water column analyses which do not produce consistent conclusions. NYSDEC found that mirex was not a problem in the water column; however, a study done by SUNY at Oswego and Buffalo suggests a loading of mirex to Lake Ontario via the Oswego River may be active. Investigations are described in Section IV.I; the results indicate that additional investigative work is needed.

2. Area of Concern Sediment Investigation

(Rec.Action: Determine nature/extent of contaminants in AOC)

The results of the Oswego River Sediment Study (dated 1996) are discussed in Section IV.B. Historical practices have contributed to the presence of contaminated sediments; the concern is whether pollutants are moving to the AOC and Lake Ontario. Again, further study is recommended to define the extent of contaminated sediment impact on the AOC and the use impairment indicators.

3. **Point Source (SPDES) Discharges**
(Rec.Action: Continue to lower limits and apply new technology)

The recommendation and ongoing process to continue to require lower allowable discharges in SPDES permits (especially for RAP critical pollutants) is proceeding as discussed in Section IV.C. Advancements in discharge permit drafting strategies, guidance and policy have resulted in very comprehensive final effluent limits and requirements for point source dischargers. When public noticed, these discharge permits may receive numerous comments which can lead to an administrative hearing. Negotiations to resolve permit requirement issues and to develop compliance schedules to achieve the desired discharge conditions can result in a delay of the final issuance of SPDES permits. Therefore, in the interim, current permit requirements and any related amendments remain in full force. The effect of implementation of the final rule of the Great Lakes Water Quality Guidance is expected to result in some stricter discharge requirements for point source dischargers as discussed in Section VIII.L of this Update document. The focus of the Guidance will be on bioaccumulative chemicals of concern.

4. **Best Available Technology (BAT) Guidelines**
(Rec.Action: Continue to develop/update for industries)

Best Available Technology requirements and guidelines are continuing development and periodic updating. The effect of the implementation of the Great Lakes Water Quality Guidance is expected to result in some stricter discharge requirements as discussed in Section VIII.L. Emphasis will be on bioaccumulative chemicals of concern (BCCs).

5. **Municipal Wastewater Improvements / CSO Elimination**
(Rec.Action: Implement upgrades based on data and models)

Upgrades of municipal wastewater treatment facilities and the elimination of combined sewer overflows (CSOs) are objectives pursued by NYSDEC. The effect of implementing the Great Lakes Water Quality Guidance is discussed in Section VIII.L. Further development and implementation of pretreatment program requirements is needed to improve pollutant reduction and to prevent the discharge of toxics by industrial users to municipal wastewater treatment systems.

6. **Additional Pretreatment Monitoring**
(Rec.Action: Expand for selected parameters)

Phosphorus, mercury, and PCBs were identified in the Stage 2 document as likely to be found being discharged to many municipal facilities. Enhanced monitoring is needed to assure against these parameters of concern being discharged into the municipal wastewater systems and/or the waters that lead to the Area of Concern.

7. **Reduced Mercury Discharge from Syracuse**
(Rec Action: Pursue methods to reduce permitted loads)

As discussed in Section IV.C on SPDES permits, permit renewals for mercury discharge contain stricter loading requirements based on improved analytical detection levels. Reductions in influent loads to municipal facilities are being achieved through the pretreatment program. The Syracuse Metropolitan Treatment Plant SPDES renewal addresses the reduction of the mercury discharge.

8. **Incinerator Scrubber Discharge (Mercury Control)**
(Rec.Action: Examine municipal discharges for pretreatment needs at Auburn and Oswego)

Incineration of municipal refuse, municipal sludge, or combination thereof can contain mercury in the wastewater generated by air pollution control wet scrubber systems. Evaluation of these facilities has determined that no additional mercury control is needed at this time.

9. **Nonpoint Source Management**
(Rec.Action: Implement program; problem area focus)

Some progress is being made in the implementation of New York State's Nonpoint Source (NPS) Management Program with emphasis on areas identified by NYSDEC's Priority Water Problem List (PWP). A progress report is contained in Section IV.D. Significant funding has become available for nonpoint source (NPS) and agricultural projects. Descriptions of grant funding programs for nonpoint source management projects are in Section VIII.F. Examples of sources of grant money would include the NYS Environmental Protection Fund and EPA section 319 CWA grants.

10. **County Water Quality Strategies**
(Rec.Action: Establish local roles to address nonpoint source pollution)

Local water quality strategies should be linked to the goals of the RAP and the Great Lakes Water Quality Agreement. The need for the development and implementation of County Water Quality Strategies has been recognized and supported by grant funding. A description of this initiative under the nonpoint source (NPS) management program is contained in Section VIII.M.

11. **Education and Training (BMPs)**
(Rec.Action: Increase opportunities; BMP and NPS focus)

There has been some increase in the education and training opportunities for local land owners and governments to learn best management practices (BMPs). Efforts

have been directed at areas with nonpoint source (NPS) problems. Two examples of resources are: completion of the nine sections of the Best Management Practices Catalog and communications provided through local County Water Quality Coordinating Committees. (See Section VIII.M)

12. **New Development Guidelines / Policies**
(Rec.Action: Local adoption of NYSDEC urban runoff control guidelines)

NYSDEC Division of Water has developed guidelines to control stormwater management, erosion, and sediment for new development as part of its Technical and Operations Guidance Series (TOGS). Local governments and planning boards in the Oswego River basin are encouraged to adopt these practices in the review of new development to protect the ecosystem in the watershed.

13. **Pesticide Management**
(Rec.Action: Apply sound approaches to manage pesticide use)

Local governments need to use environmentally safe practices to manage pesticides. Educational programs and local ordinances assist to minimize any threat or damage to human health or the environment. Revised NYSDEC Restricted Pesticides regulations (Part 326; dated October 1993) and revised Circular 865, relating to the application of pesticides (dated April 1993), provide for improved control involving the certification and use of pesticides in New York State.

14. **Evaluate Modeling Applicable to Oswego Basin**
(Rec Action: Expand Niagara River loading model effort to Oswego)

USEPA's development of computer modeling to estimate nonpoint source loading to the Niagara River is incomplete. This large undertaking is envisioned to make use of existing information and models to compile NPS loads from four source categories: surface water runoff, groundwater infiltration, contaminated sediments, and atmospheric deposition. Ongoing remedial activities are updated in Section IV and Section VIII.

15. **Hazardous Waste Site Remediation**
(Rec.Action: Give high priority to likely contaminant sources)

In December 1992, a priority ranking system was defined in a technical guidance memorandum by NYSDEC's Division of Environmental Remediation (DER). This guidance states that for all class "2" inactive hazardous waste sites for which the remedial action process has not yet begun, there will be three levels of priority to establish where remedial actions should be implemented. (Class 2 sites present a significant threat to human health or the environment and require remedial

action.) Within this priority system, there are factors that may enhance a site's rank one whole level. These factors include the identification of a site as part of an IJC Remedial Action Plan (RAP). This RAP component can therefore raise the priority of taking remedial action. Determining the extent of the remedial cleanup needed and whether the criteria of restoring and protecting a beneficial use has been satisfied are now the issues that need to be addressed. Answering these questions is a fundamental part of assessing whether remedial activities have achieved RAP considerations. The revised Update format that focuses on beneficial use restoration will assist in meeting these RAP goals. Descriptive updates of hazardous waste site remedial activities are provided in Section IV.A.

16. Onondaga Lake Action Plan (MCP/DEIS Update)
(Rec.Action: Continue Onondaga Lake remedial projects)

The remedial strategy for Onondaga Lake has been a focus for a variety of interested stakeholders. Although the management plan for Onondaga Lake is being developed independent of the RAP process, there are downstream concerns involving the Oswego River, Harbor, and Lake Ontario that must be addressed in lake remedial actions. The RAP Process includes the activities affecting Onondaga Lake and strives to have an influence on these activities towards restoring beneficial uses. Progress has been made on the Municipal Compliance Plan (MCP) for the Syracuse Metro wastewater treatment facility and the Draft Environmental Impact Statement (DEIS) that addresses impacts on Onondaga Lake. Onondaga Lake is further discussed in Section VIII.R.

17. Routine Monitoring in the Area of Concern
(Rec.Action: Continue monitoring different media)

Routine monitoring of the water column, sediment, and biota is necessary to demonstrate restoration and protection of beneficial uses in the Oswego River Area of Concern. Remediation of upstream sources of contamination should be conducted prior to downstream remedial activities to prevent recontamination by downstream transport of pollutants. Additional monitoring activities are needed to further investigate and assess use impairment indicators and provide documentation for the Stage 3 RAP.

18. Contaminated Sediment Criteria
(Rec.Action: Develop criteria to assist in sediment evaluation)

The extent of a cleanup activity and whether the needs of restoring and protecting a beneficial use have been achieved are issues that need to be addressed as part of RAP considerations. The development and application of reliable criteria for the evaluation of contaminated sediments is instrumental in making sediment cleanup decisions.

NYSDEC's Division of Fish, Wildlife and Marine Resources has produced a document entitled "Technical Guidance for Screening Contaminated Sediments", July 1994, that is being used to assist in sediment decisions. Consideration must be given to the timing of introducing any new criteria as to how this guidance will apply to past and future projects.

EPA is proposing a Contaminated Sediment Management Strategy that describes specific actions that EPA plans to take to address environmental and human health risks associated with contaminated sediment. The development of an EPA contaminated sediment criteria guidance document is part of this strategy. Refer to Section VIII.K for additional details of this strategy and criteria development.

19. Air Toxics Monitoring
(Rec.Action: Develop lower Oswego River monitoring station)

Initiatives under the Clean Air Act amendments of 1990 (as discussed in section IV.E) are to address the concerns for the reduction of air pollution emissions from facilities in the AOC to assure standards (including ambient air and discharge permits) are met. To address the concern for the control of air transport of contaminants during remediation (e.g. PCBs), proposals have been submitted that base monitoring activities on the measurement and control of particulate matter. Protocols are to be established.

20. Habitat Improvements (Fish and Wildlife)
(Rec.Action: Complete FERC relicensing of hydroelectric dams)

A combination of minimum flow, habitat modification and appropriate flow release point(s) (based upon adequate flow and habitat studies) are needed to permit fish survival at the Varick dam when the bypass reach flow drops to a minimum in the Area of Concern. The Federal Energy Regulatory Commission's (FERC) relicensing of the dam is expected to address these concerns. Refer to Section VIII.S for further description of current activities.

The Oswego Harbor provides habitat for large numbers of wintering waterfowl and has therefore been designated as a New York State significant coastal fish and wildlife habitat. Harbor development and shoreline disturbances have greatly reduced the area suitable to such wildlife. The North American Waterfowl Management Plan (NAWMP) has four focus areas in the Oswego River Basin. The Lake Shore Marshes area includes the harbor AOC.

21. **Restricted Fish Passage**
(Rec.Action: Explore the feasibility of fish passage at dams)

If fish passage is determined to be feasible, fish could be allowed to upstream areas by providing functional fish ladders at the Oswego facility. It may also be demonstrated that alternative fish passage (i.e., through navigation locks) could be effective. Improving fish passage is a concern under the FERC relicensing process that is to be further addressed in the update of Section VIII.S.

22. **Benthic Macroinvertebrates Monitoring**
(Rec.Action: Monitor benthic community biennially)

Benthic organisms act as integrators of chemical inputs to an aquatic ecosystem and can be used as an index of aquatic community health. By analyzing for abundance and diversity as well as for the presence of contaminants, we can compare the benthic community to control sites and upstream sites for impact assessment. Macroinvertebrate monitoring is part of the Rotating Intensive Basin Studies (Section VIII.I). Macroinvertebrate sampling results are included in the Oswego River Sediment Study of April 1996 (Section IV.B.10). The AOC was assessed as not impacted. The lower Oswego River, river section above Fulton, and Onondaga Lake outlet had some observed impact.

23. **Pollution Prevention Practices**
(Rec.Action: Incorporate practices as much as possible)

In order to implement pollution prevention practices to the maximum extent practicable at all sources in the Oswego River drainage basin, a partnership among industries and governmental agencies is needed and is under development. Although expanded pollution prevention regulations have been determined unnecessary, the strategy for implementing pollution prevention embraces a cooperative partnership effort by industries and government to reduce and to eliminate toxics, particularly persistent ones.

Congress passed the Pollution Prevention Act of 1990 which established a hierarchy of waste reduction and disposal practices. Pollution prevention initiatives are well underway to accomplish the strategies and principles of pollution prevention implementation. These include the federal goal to reduce the overall discharges of specific toxic chemicals 50 percent by 1995, the New York State goal to reduce hazardous waste generation 50 percent by 1999, emphasis on multimedia methods, use of the Toxic Release Inventory (TRI) data, and providing technical assistance. In addition, the review, approval, and implementation of required hazardous waste reduction plans for industrial generators, as well as the review and implementation of currently voluntary reduction plans for water and air dischargers, provides a structure and the cooperative effort needed to achieve

reductions. Additional details of these pollution prevention initiatives are described in Section VIII.E.

24. **Investigations** (New recommendation)
(Rec.Action: Complete needs for use impairment assessments)

Fourteen investigations are listed in the Stage 2 document that are needed to provide a more thorough definition of use impairments. These are:

* Mirex investigation
* AOC sediment investigation
* PCB source investigation
* Dioxin investigation
* Municipal systems toxic investigation
* Toxic sediment deposition
* Dissolved oxygen survey
* Nonpoint source loading study
* Fish tumor investigation
* Benthos investigation
* Bird and animal deformity/reproduction investigation
* Fish or wildlife tainting survey
* Phytoplankton/zooplankton investigation
* Aesthetics survey

Progress has been made on implementing many of these investigations (some in combined studies). Progress updates for investigation and monitoring activities are provided in Section IV.I. Updated investigation and assessment activity recommendations are listed in the Priority Remedial Activities (Section VII.A) of this 1996 Update document.

25. **Water Quality Enhancement and Protection Policy** (New recommendation)
(Rec.Action: Develop/implement)

Some progress has been made in the development and implementation of this policy which includes discharge restriction categories, antidegradation, and substance bans. Two new discharge restriction categories have been added to the surface and groundwater classification system concerning new dischargers and new discharges of a specified substance. The antidegradation policy is under development and will be linked closely to the antidegradation requirements to be established under the recently promulgated Great Lakes Water Quality Guidance (GLWQG) regulation. NYSDEC is studying the regulatory impacts of substance bans with technical support from EPA before any provisions are considered under the Water Quality Enhancement and Protection Policy (WQEPP). Section VIII.H provides a description of the three major elements addressed under the WQEPP.

F. International Joint Commission Review - Evaluation and Strategy Response:

The International Joint Commission's (IJC) review of Oswego River Stage 2 Remedial Action Plan was completed on April 20, 1993. Individuals with a wide range of technical backgrounds performed the review. The Oswego River Stage 2 RAP was the first document submitted as a Stage 2 RAP for review by IJC.

The text of the comments or "points of emphasis" from the International Joint Commission's review of the Stage 2 document is referenced in Appendix G as document 8. The IJC points of emphasis have been summarized into the thirteen points listed below as items F.1 through F.13. A response that describes the actions taken and/or the remedial activity strategy planned to address the concerns of each IJC point of emphasis follows.

IJC recommends consideration be given to certain subject matter in the RAP process planning. Among these is the application of the ecosystem approach. RAPs need to identify ways in which human activities within a community can be reintegrated with ecological processes to achieve the permanent restoration of beneficial uses and yet maintain sustainable economic benefits. If the boundaries of an AOC are too narrowly interpreted, difficulty can arise in the planning and implementation of remedial measures. AOC planning must include sources from outside (upstream) of the AOC; and likewise, the planning and implementation of upstream remedial measures must include downstream impact assessment. The Oswego River RAP strategy responses to the thirteen IJC points of emphasis follow:

1. Based on IJC's recommendation for ecosystem considerations, it is essential that the RAP include remedial actions and strategies to address sources upstream of the AOC.

Response: Because the goal of the RAP is to restore, protect, and maintain the chemical, physical and biological integrity of the Area of Concern and to eliminate adverse impacts to Lake Ontario arising form the Oswego-Oneida-Seneca drainage basin, the decision making process must employ both an ecosystem and watershed approach. This means upstream drainage basin causes and sources are being considered as to their contribution to the Area of Concern and Lake Ontario use impairments. Use impairments that are actually part of a larger Lake Ontario problem will need to be addressed under the Lake Ontario Lakewide Management Plan (LaMP).

The format of the 1996 Oswego RAP Update has been revised to facilitate the watershed approach to focus on the resolution of use impairments. The development of the Use Impairment / Remedial Activity Matrix provides an assessment of the effect of alternative remedial activities towards restoring and protecting beneficial uses. The link of this matrix assessment to the development and implementation of specific remedial strategies is provided by the "Use Impairment Restoration and Protection Strategy" management form developed for each use impairment. Upstream / downstream considerations are key elements of the RAP process.

2. Future RAP updates need to address the reported loading of mirex from the AOC to Lake Ontario. NYSDEC has undertaken studies and appropriate next steps are needed.

Response: Recent NYSDEC studies indicate that there is no significant loading of mirex from upstream sources into the AOC. Sediment studies indicate the AOC is not loading Lake Ontario. Historical loadings are known; however, because of an independent research modeling report that concluded an active source is likely, additional data may be needed to resolve this issue.

3. The Remedial Advisory Committee needs to reconsider the issues associated with the open lake disposal of dredge spoils from the AOC. Currently open lake disposal is utilized for material dredged from within the AOC.

Response: Open lake disposal of shipping channel dredge spoils is subject to an impact statement and water quality certification reviews. These assessments include a broad analysis of sediments for contaminants. The U.S. Army Corp of Engineers has scheduled a maintenance dredging of the Oswego harbor for 1997 that includes an approval for open lake disposal.

4. Each RAP document needs a description of surveillance and monitoring processes to track the effectiveness of remedial measures and the eventual confirmation of the restoration of uses.

Response: As noted in response #1 the format of the RAP update has been revised to address remedial strategies for each use impairment. Surveillance and monitoring activities are key elements of these strategies. Measuring the effectiveness is being accomplished under Stage 2 implementation and will be documented as progress is made. Ultimately, Stage 3 will document RAP success.

5. The location and frequency of sampling at the water quality station above the AOC is not adequate to monitor the effectiveness of remedial measures within the AOC. A station within the AOC with increased monitoring is needed.

Response: The station above the AOC provides data on the upstream remedial activities and the results of any contribution to use impairments in the AOC. Necessary monitoring within the AOC, which may be increased based on a use impairment and/or restoration documentation need, is to be determined on a case by case basis as part of the remedial strategy defining the restoration of the beneficial use.

6. Data needs defined in the Stage 1 document have not been completed. The Stage 2 document identifies many mechanisms to address these needs, however commitments and completion dates have not been fully developed.

Response: NYSDEC recognizes that data gaps and investigative needs exist. These needs are specifically identified in the Priority Remedial Activities (Section VII.A) of this 1996 RAP Update as investigative and assessment activity needs. Resources continue to be an issue. Specific remedial activity strategies designed to restore beneficial uses are intended to address the degree and extent of impairments in order to document restoration. In the revised format of the 1996 Update, commitments and dates are outlined on individual use impairment strategy management forms.

7. Precise objectives that could be used as targets for the achievement of the RAP goals are lacking at this time.

Response: IJC has developed a very useful listing/delisting criteria table for the use impairments (contained in Appendix E). Each RAP needs to use this format to define quantitative objectives for the restoration and protection of each beneficial use. The Oswego RAP has developed delisting criteria to guide the RAP progress towards the Stage 3 document (see Update Section VI, Table 5, and Appendix D). The restoration goals for each use impairment are to be included as part of each use impairment's management strategy.

8. Evaluation of existing and alternative remedial measures is needed to establish priorities.

Response: The revised format of the 1996 Update addresses this concern. The development of the Use Impairment / Remedial Activity Matrix provides an assessment of the effect of alternative remedial activities towards restoring and protecting beneficial uses. The link of this matrix assessment to the development and implementation of specific remedial strategies is provided by the "Use Impairment Restoration and Protection Strategy" management form developed for each use impairment. Priority remedial activities are further assessed in Section VII.

9. Remedial measures need to be aimed at specific use impairments. Resource commitments, the effects of remedial activities, and the implementation status of activities need improved descriptions in regard to the restoration and protection of beneficial uses.

Response: As discussed in the response to item F.8, the revised format of the 1996 Update addresses these concerns. In addition, specific delisting criteria for each use impairment have been developed in Section VI of the 1996 Update.

10. Public participation and citizen involvement in the RAP has improved since Stage 1. A local RAP coordinator and a point of contact in Albany would further improve this process.

Response: A point of contact in Albany has been in place throughout the RAP process and currently remains. A local RAP coordinator has been identified. Other activities to enhance public outreach are described in Sections IV.H and VIII.B of the 1996 RAP Update.

11. The periodic publication of the newsletter "Watershed Watch" is a good information tool; stewardship activities are highlighted. The Remedial Advisory Committee (RAC) is a good coordination mechanism and should be encouraged to have greater involvement, such as actually writing parts of the RAP. Partnership agreements to address upstream/downstream relationships and concerns can provide a mechanism for enhanced involvement and problem solving.

Response: The RAC committee is continually encouraged to take a more active role in RAP participation and writing parts of the RAP document. A subcommittee approach (e.g. technical, public participation) is being discussed to provide a focus on certain aspects of long-term RAP implementation.

12. The role of the Remedial Advisory Committee includes assessing RAP accomplishments, recommending actions, and advising on public outreach. Important additions to the RAC committee would include government agencies and academic institutions.

Response: The Remedial Advisory Committee is always open to interested new members and seeks to develop and maintain a diverse membership. Recently, two individuals from the State University of New York at Oswego, have attended various RAC meetings. We seek additional government agency as well as private sector representation on the committee.

13. In conclusion, the IJC suggests a RAP activity focus around the impaired uses. A specific monitoring plan to document and track the restoration of beneficial uses is recommended. The Remedial Advisory Committee should be expanded to include representatives from the federal Environmental Protection Agency and Fish and Wildlife Service.

Response: As described in the above responses (specifically F.9 and F.12), these concerns are being addressed.

GETTING THE WORD OUT

Public Outreach and Informational Materials
Available for New York State Remedial Action Plans

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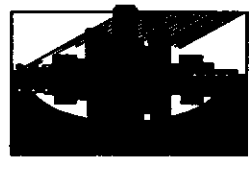

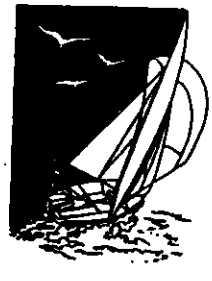

New York State Department of Environmental Conservation

Mario M. Cuomo, Governor **Langdon Marsh, Commissioner**

[Cover of Brochure Described in Section IV.H.3]

VI. RESTORATION AND PROTECTION (Delisting) CRITERIA

In addition to defining specific delisting criteria for each use impairment indicator, this section will expand on defining the goal(s) and beneficial uses for the Oswego River Area of Concern.

A. Goals and Beneficial Uses for the Oswego River AOC:

The Goal of the Oswego River Remedial Action Plan, as previously established by the New York State Department of Environmental Conservation and the Oswego River RAP Citizen Advisory Committee is three-fold:

* To achieve the purposes of the Great Lakes Water Quality Agreement within the Oswego River Area of Concern;

* To restore the water quality of the AOC so that it is capable of supporting swimming and an edible, diverse, and self-sustaining fishery; and,

* To eliminate adverse impacts to Lake Ontario arising from the Oswego-Oneida-Seneca basin.

The implementation of current environmental programs that serve to directly achieve this RAP goal include: the Federal Clean Water Act, New York State DEC's Water Quality Classifications and Standards, State and Federal Hazardous Waste Remediation Programs, New York State DEC's State Pollutant Discharge Elimination System (SPDES), the New York Coastal Management Program, nonpoint source pollution management, and the Pollution Prevention program.

In order to implement this multi-faceted goal statement for the Oswego River RAP, the Remedial Advisory Committee has expanded on these RAP goals and defined beneficial uses that describe the desired water quality, AOC conditions, and stakeholders' uses. This expanded breakdown of the RAP goal(s) and the beneficial uses are listed below:

1. Expanded RAP Goals

* Water quality in the Oswego River and harbor that achieves best use standards and is not adversely affected by tributary rivers and streams.

* River and harbor waters aesthetically pleasing so as to encourage active and passive recreation.

* Fish and wildlife levels in the AOC that are sustained and free of consumption restrictions.

* Remedial activities that provide for the restoration of use impairments and the long term protection of beneficial uses.

2. Beneficial Uses

* Commercial uses include shipping, normal marine traffic, and business activities such as tourism and trade including related recreational uses.

* Recreational uses include boating, sport and ice fishing, nature observation, public marinas, charters, sightseeing, and stewardship activities.

* Municipal and public uses include drinking water, recreational activities, educational opportunities, and treated wastewater disposal.

* Industrial uses include transportation and treated wastewater disposal.

* Non-human uses: fish and wildlife habitat for resident and migratory species, food production for fish and wildlife, the preservation of natural resources, and the protection of watershed ecology uses.

To evaluate the extent to which the Area of Concern will support these RAP goals and beneficial uses, the Remedial Advisory Committee has developed restoration and protection criteria for each use impairment indicator. These criteria will provide the definition of the goal or restoration target that is desired to satisfy each use impairment and ultimately lead to the delisting of the Area of Concern. The following section describes these criteria:

B. Beneficial Use Restoration and Protection (Delisting) Criteria:

For each of the fourteen use impairment indicators, restoration and protection criteria have been developed. Together, these criteria provide the necessary evaluation mechanism to define the extent to which a beneficial use has been restored and protected against future impairment. By evaluating the status of each of these criteria (restoration targets) and by providing a discussion of the rationale and supporting data, the specific needs have been determined for each use impairment. Achieving these delisting criteria is necessary to accomplish the RAP goals, to assure the beneficial uses are restored and protected, and to document the Stage 3 delisting of the Oswego River Area of Concern.

Appendix D provides a detailed description of the restoration and protection (delisting) criteria for each use impairment indicator. In Appendix D, the use impairment indicators are separated into three groups based on the current status evaluated for each use impairment: Group 1) indicators have a status of impaired; Group 2) indicators need further study; and, Group 3) use impairment indicators are rated as not impaired. A description of the rationale and supporting data needed to address the individual criteria for each use impairment indicator is included.

Table 5 - Restoration and Protection (Delisting) Criteria

This table has been developed as a descriptive summary of the delisting criteria necessary to restore and protect each use impairment indicator. For each use impairment, a number of restoration targets (criteria) are listed. The table also identifies the status of each delisting criteria as impaired, not impaired, or further information needed. Table 5 is displayed on the next two pages. Each criterion listed as a "tick" on Table 5 under a use impairment is a summary statement of the fully developed narratives for the delisting criteria that are contained in Appendix D. The quantification of the delisting criteria, their status, and their supporting data needs are all subject to progress updates and modifications based on recommendations by the Remedial Advisory Committee as coordinated by NYSDEC.

Also, to assist in the problem definition of a use impairment and the description of the desired restored condition, the International Joint Commission has developed a very useful table for defining the fourteen use impairment indicators. This table that describes the indicator criteria is presented in Appendix E and serves as an additional guideline for recommending the listing and delisting of use impairments in an Area of Concern. An attempt has been made to list specific quantitative criteria which should be useful as we apply and refine the specific Oswego River RAP restoration and protection (delisting) criteria.

TABLE 5 - RESTORATION AND PROTECTION (Delisting) CRITERIA

Oswego River Remedial Action Plan

USE IMPAIRMENT	RESTORATION (Delisting) CRITERIA	STATUS
Fish and Wildlife Consumption Restrictions	* No AOC restrictions due to inplace or watershed sources. * Compliance with fish and wildlife tissue standards. * Other upstream sources addressed by LaMP. * Attain sediment criteria and waste site standards.	* Impaired * Need data * Need to verify * Need data
Degradation of Fish and Wildlife Populations	* Attain desired level of healthy and self-sustaining communities. * AOC consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. * In the absence of community structure data, bioassays confirm no significant toxicity from the water column or sediments. * Attain quantitative fishery targets (biomass, percent, richness)	* Impaired * Need to verify * Need data * Need data
Loss of Fish and Wildlife Habitat	* Habitat (amount and quality) exists; is protected to meet goals. * Amount and types of wetlands and riparian vegetation are adequate and have beneficial uses protected. * Management plans are in place to restore and to protect habitat. * FERC relicensing requirements are met.	* Impaired * Need data * Need to verify * License Pending
Eutrophication or Undesirable Algae	* No persistent water quality problems due to cultural eutrophica. * Ambient water quality standards, criteria, guidelines attained. * Beneficial goals are achieved and maintained (boating, fishing)	* Not Impaired * Not Impaired * Need to verify
Degradation of Benthos	* Macroinvertebrate structure similar to unimpacted control sites. * Mesotrophic species present where suitable substrates are located * Absent community data, toxicity of sediments parallels controls. * Resident fauna do not have elevated contaminants.	* Need data * Need survey * Need data * Need data
Fish Tumors or Other Deformities	* Incidence rates do not exceed rates in unimpacted control sites. * No neoplastic or preneoplastic liver tumors in bullheads/suckers. * Attain IJC, state, and federal tissue standards/objectives.	* Not Impaired * Not Impaired * Not Impaired +
Bird or Animal Deformities or Reproductive Problems	* Attain IJC, state, and federal tissue standards/objectives. * Attain appropriate sediment quality criteria. * Deformity or reproductive incident rates less than inland controls * Wetlands support healthy communities of significant species. * Biomonitoring results better than unimpacted control sites.	* Need data * Need to verify * Need data * Need survey * Need data
Degradation of Aesthetics	* AOC waters devoid of substances producing aesthetic problems. * No increase in turbidity causing a visible contrast to natural. * No visible residue of oil or floating substances. * Acceptable response to spills with preventive measures.	* Not Impaired * Not Impaired * Not Impaired * Not Impaired +

TABLE 5 - RESTORATION AND PROTECTION (Delisting) CRITERIA - continued

Degradation of Plankton Populations	* Plankton community structure similar to unimpacted control sites * Absent community data, no plankton bioassay toxicity impact. * Healthy fish communities present in the AOC.	* Not Impaired * Not Impaired * Need to verify
Restrictions on Dredging Activities	* AOC sediments (metals, organics, nutrients) meet stds./criteria. * Restrictions not due to AOC watershed; beneficial use protected. * Dredge spoil disposal does not contribute to use impairments, activities registered and approved, beneficial uses protected.	* Need to verify * Not Impaired + * Not Impaired +
Beach Closings	* Waters do not exceed standards, guidelines, or objectives of use. * For beaches: no toxic irritants, numerical and clarity standards attained, and free from public health advisories. * For beaches: daily geometric mean for fecal coli < 100 colonies. * Attain ambient water quality standards for total and fecal coli. * Demonstrate stormwater CSO areas present no threat.	* Not Impaired * Not Impaired * Not Impaired * Not Impaired * Not Impaired +
Tainting of Fish and Wildlife Flavor	* No complaints about fish tainting. * Survey results confirm no tainting. * Ambient water quality standards and criteria not exceeded	* Not Impaired * Not Impaired + * Not Impaired
Drinking Water Restrictions, Taste and Odor Problems	* No taste and odor problems for treated drinking water supplies. * Attain treated drinking water health standards and criteria. * Drinking water treatment requirements not excessive.	* Not Impaired * Not Impaired * Not Impaired
Added Costs to Agriculture or Industry	* No add'l costs to treat water due to AOC or spill conditions. * No downstream impact due to watershed/AOC contamination.	* Not Impaired * Not Impaired

NOTE: Achieving all criteria would indicate the preparation of a Stage 3 document is appropriate.

+ = Additional survey data may be appropriate to verify and assure protection.

Eating Sportfish

Health Advice
for Lake Ontario
and Syracuse Area
1995-1996

Prepared By:
New York State
Department of Environmental Conservation
and
Department of Health

[Cover of Fish Consumption Advisory Brochure Described in Section IV.H.5]

VII. PRIORITY REMEDIAL ACTIVITIES

Based on the use impairment restoration and protection strategies and the (delisting) criteria developed in the preceding two sections, Sections V and VI respectively, necessary priority remedial activities can be identified and listed. In order to accomplish the RAP goals and to restore beneficial uses, these priority remedial activities are fundamental to continuing progress with remedial strategies that involve each use impairment. Priority remedial activities will be most important to keep in mind as "next step items" for 1997 and beyond. These activities are essential to addressing the restoration and protection (delisting) criteria and will be most useful towards affecting use impairment status considerations and reassessments.

The summary of the remedial activity strategies contained in Table 4 is linked to this section and highlights the priority strategies which consist of the following types of activities: investigation/assessment, plans/improvements, and documentation. These priority remedial activities form the elements of the individual use impairment restoration and protection strategy management forms provided in Appendix C.

By updating the status of remedial activities and by including current study results with current strategy components, the priorities or next step remedial activities to resolve RAP use impairments have been identified. A separate listing of the investigative and assessment activity needs and then a listing of the planning and improvement action needs are presented below to assist in the identification of priority remedial activities:

A. Investigative and Assessment Activities:

Each Use Impairment Restoration and Protection Strategy management form lists the remedial strategies identified to address a use impairment, its contamination sources, and the causes. Below are excerpts of the remedial strategies that call for certain investigative and assessment activities that have been identified as needed to restore and protect beneficial uses:

1. Assessment of the upstream contaminant release associated with the required remedial work (ongoing and post inactive hazardous waste site remediation).
2. Verification of achieving site cleanup standards.
3. Assess sediment analysis study and compare to sediment criteria (as developed).
4. Evaluate fish pathology study (tumors/deformities) and reassess use impairment indicator.
5. Document fish tissue standards/objectives achieved.
6. Establishment of fish and wildlife habitat and community structure baselines; may need to conduct quantitative analyses of selected species.
7. Define desired fish and wildlife populations and balance goals.
8. Assessment of the quantity, quality, and balance of habitat areas.
9. Verify/document acceptable fish and wildlife population levels present.
10. Verify/document fish and wildlife management goals achieved.

11. Confirm wetlands support a healthy community.
12. Obtain/assess additional plankton community structure data.
13. Further verification of achieving ambient water quality standards.
14. Further investigation and confirmation of no significant toxicity in AOC water and/or sediment.
15 Reassess AOC water quality for support of partial body contact beneficial use.
16. Further investigate and document any deformity or reproduction impairment, assure any occurrence less than inland controls.
17. Monitoring and assessment of additional fish/wildlife consumption data.
18. Conduct benthic community structure studies.
19. Verify populations of mesotrophic species acceptable.
20. Conduct and document biomonitoring study results that are better than controls.
21. Verify flora/fauna health criteria achieved.
22. Conduct aesthetics survey to assure beneficial uses intact.
23. Nonpoint source study and impact assessment.
24. Dioxin source study (incineration) and impact assessment.
25. Determine weed harvesting needs to address any eutrophication/aesthetics impairment (focus on AOC).
26. Evaluate H. Daly work and determine the next step for human health assessment in the Area of Concern.

B. Planning and Improvement Actions:

As noted above, each Use Impairment Restoration and Protection Strategy management form lists the remedial strategies identified to address a use impairment, its contamination sources, and the causes. Below are excerpts of the action items that call for the development of certain plans or the implementation of specific physical improvements that have been identified as needed to restore and protect beneficial uses:

1. Obtain/implement FERC relicensing (Re: Niagara Mohawk) and determine applicability of specific projects towards resolving use impairments and protecting beneficial uses.
2. Continue the Onondaga Lake remediation activities (Re: Syracuse Metro discharge, combined sewer overflows, in-place toxics) and evaluate contribution to use impairments and protection in the Area of Concern.
3. Continue/proceed with industrial hazardous waste site cleanups surrounding Onondaga Lake as well as in other watershed locations and evaluate contribution to use impairment correction and use protection in the Area of Concern.
4. Continue the SPDES permit renewal/modification process; evaluate toxic control and reduced loadings to the AOC.
5. Monitor/pursue the development of contaminated sediment criteria or other guidelines for in-place toxics decisions.
6. Implement BMPs associated with specific remedial projects. Develop/implement any additional BMPs to address use impairments and protection of beneficial uses.

7. Verify LaMP addresses Lake Ontario effects on the AOC and interactions.
8. Define the extent or span of the AOC dredge area (Re: dredge restrictions)
9. Assure needed dredging restrictions are safe/approved to protect beneficial uses.

C. Long Term Strategy:

Implementation of the Oswego River Remedial Action Plan is a dynamic process that will incorporate improvements, identify use impairment changes and provide periodic update reports as knowledge of the use impairments, location of sources, and effectiveness of remedial action implementation advances. Ultimately, the RAP must develop and implement a comprehensive water quality and use surveillance plan to evaluate and to verify restoration and protection of beneficial uses.

Because of the nature of the Oswego River Remedial Action Plan, remedial activities involving physical construction have not been identified as needs in the immediate Area of Concern. The FERC relicensing requirements for the power dam are expected to play a large role in addressing the fish and wildlife habitat and population impairments. Other watershed activities such as cleaning up the known sources of pollutants in the Oswego River drainage basin and instituting and incorporating nonpoint source management practices as well as pollution prevention practices are fundamental to restoring and protecting the beneficial uses. The Remedial Action Plan will continue to assess and document the success of these remedial activities in reclaiming and maintaining the valuable resource of the Oswego River and Harbor Area of Concern.

A comprehensive RAP Update document can again be produced when significant progress has been made in the improvement of use impairment status and/or significant details of remedial activity implementation have been accomplished that address contamination sources. In the interim, summary update status reports will be produced. Ultimately, Stage 3 will require documentation of the resolution of all use impairments and satisfactory evidence that contamination sources are no longer impacting beneficial uses in the Area of Concern.

RAPs in Action:

How Remedial Action Plans are Implemented in New York State

RAPS

New York State Department of Environmental Conservation

George E. Pataki
Governor

Michael D. Zagata
Commissioner

[Cover of Brochure Described in Section IV.H.3]

VIII. ADDITIONAL INITIATIVES TO ENHANCE RESTORATION

There are a number of ongoing environmental program initiatives that are driven by local, state, and federal interests. Although these initiatives are implemented independently from the RAP, they do embrace the RAP Process and serve to enhance the restoration and protection of beneficial uses in the Area of Concern.

A. Local Initiatives:

A number of local initiatives are ongoing and/or have the potential to implement remedial activities that benefit Remedial Action Plan goals and objectives:

1. Local Repository

Information concerning the RAP is located at the Oswego Public Library; this provides educational opportunity for local residents.

2. Not-For-Profit Organization

Although the Oswego RAP does not have a sponsoring nonprofit organization to foster remedial action, the RAC is recommended to consider such a sponsor. The Remedial Action Plan could benefit greatly by having a supportive nonprofit organization in the Oswego area that is capable of receiving grant funds to conduct investigations and communicate educational material about the RAP.

3. Citizen Stream Monitoring

In the past some citizens have assisted in local stream monitoring. This important activity does help in establishing a database. Government resources are limited, and therefore many of the desired monitoring activities are not able to be conducted at all or to the desired extent.

4. Education Materials

Improvements to public information materials are needed to communicate local health advisories (e.g. fish consumption restrictions) and event schedules that relate to the Oswego River/Harbor and RAP activities.

5. RAP Award

Although the Oswego RAP does not now conduct a RAP award program, this concept has been discussed to foster concern for the AOC. An award for the best contribution to the goals of the RAP (i.e. restoring beneficial uses) is recommended for consideration.

6. Local Waterfront Revitalization Program

The City of Oswego and cooperating state and federal agencies have invested considerable resources in the development of a program to restore and to redevelop waterfront areas within the Oswego Harbor for commercial, industrial, cultural, recreational, and other compatible uses. The City of Oswego Local Waterfront Revitalization Program was developed in consultation with an advisory committee consisting of elected officials, public agencies, private groups, and citizens. Oswego's waterfront revitalization program was adopted by the New York State Secretary of State in 1986. This program identifies potential sites for water dependent or water related activities, proposes specific projects, and identifies techniques for local implementation. It also describes policies and provisions to protect coastal fish and wildlife habitats, including protection from hazardous wastes and other pollutants which threaten fish and wildlife resources.

The RAP Area of Concern lies entirely within the City of Oswego's waterfront revitalization area. Therefore, changes that occur in the AOC as a result of the waterfront revitalization program will affect the RAP, and vice versa. During implementation, both the Waterfront Revitalization Program and the RAP must fully consider the consequences of any changes in relation to each programs objectives in order to successfully integrate environmental enhancement/protection with economic development.

7. Harborfest

This annual summertime Oswego River harbor event is conducted to promote local business interests and to celebrate the valuable resources and benefits of the harbor. It is hoped that the RAP can be an important contribution to the Harborfest.

8. Pesticide Collection

This program is mentioned as a local initiative that may be applicable for county government implementation. In the Fall of 1993, Erie County conducted such a program. NYSDEC and USEPA have provided support to county governments to conduct an amnesty collection of ineffective, unusable or unwanted agricultural pesticides. The purpose of such a "Clean Sweep" program is to provide county farmers, agribusinesses and owners of former farmland the opportunity to dispose of a variety of agriculture pesticides in an environmentally sound manner without fear of liability. By proper disposal of these chemicals, a potential threat to the watershed is removed. Phase II multi-county pesticide collection programs are being planned for several western New York State county areas.

B. Other Public Participation, Education, and Training:

1. Site Specific Citizen Participation Guidebook

NYSDEC's Division of Environmental Remediation (DER) is revising/tailoring the statewide Citizen Participation Plan (CPP) that was adopted by the state in 1988 to improve the effectiveness of site-specific citizen participation programs. State regulation requires a citizen participation plan for every hazardous waste site undergoing remediation. Detailed citizen participation activities must be provided that will be carried out for a specific site. The revised CPP includes a guidebook that is in draft form. The objectives of the plan are to: ensure opportunities for involvement, create flexibility during scoping of all major remedial stages, foster confidence and trust through communication, provide a systematic structure, and ensure effective implementation through accountability and tracking. For more information contact DER Citizen Participation Section (1-800-342-9296).

2. Best Management Practices Catalogue

NYSDEC's Division of Water has completed the nine sections of the Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. The nine parts of this guidance document have been finalized that deal with: stormwater runoff, agriculture, construction practices, roadway maintenance practices, on-site wastewater treatment systems, silviculture, spills, resource extraction, and hydrologic/habitat modification.

3. New York State's "LaMP-Light" Publication

The LaMP-Light is a brochure published by NYSDEC that describes what a Lakewide Management Plan (LaMP) is, summarizes the development of the Lake Ontario LaMP, and describes the relationship of the LaMP and RAPs. A review of the fourteen IJC use impairment indicators as assessed for Lake Ontario is provided. Also included in the LaMP-Light is a description of the projects conducted by the Great Lakes Water Quality Coordinating Committees and a summary of Erie County's "Clean Sweep" program that addressed an agriculture pesticide collection event.

C. New York State Coastal Program:

As pollution from point sources is controlled, pollution from diffuse sources, such as runoff, becomes a greater portion of the remaining problem. In fact, NYSDEC estimates that 90 percent of the water quality impairments in NYS are primarily due to pollutants from nonpoint sources rather than the traditional (and more easily managed) point sources. As the focus shifts to nonpoint source pollution control, new programs provide assistance and establish requirements. Among these is the federal Coastal Zone Act Reauthorization Amendments of 1990 (CZARA).

Under the federal Coastal Zone Act Reauthorization Amendments of 1990, Section 6217, the restoration and protection of coastal nonpoint pollution is addressed which requires states with approved coastal management programs, such as New York, to develop and implement programs to control nonpoint pollution from a wide range of sources. At the federal level, the program is administered jointly by the USEPA and NOAA (National Oceanic and Atmospheric Administration), the federal water quality and coastal management agencies. This joint approach is echoed at the state level where NYSDEC and the Department of State (DOS) Division of Coastal Resources are responsible for coastal program development and implementation.

The most significant change which Section 6217 represents (to the federal Coastal Zone Management Act of 1972) is that the program must now be "enforceable"; states must go beyond traditional voluntary approaches to address nonpoint pollution. Congress required EPA and NOAA to develop guidelines to address the various types of nonpoint pollution. EPA and NOAA divided nonpoint pollution into six categories: agriculture, forestry, marinas, hydromodifications (dredging, dams), urban (includes roads, buildings, and onsite waste disposal systems), and wetlands. Management measures are defined within each category. These management measures include enforceable goals specific to each source of pollution. For example, spill cleanup measures are defined for marinas.

Because the nonpoint source management goals are to be made requirements, specific management measures and practices are defined as possible ways to achieve these goals. Flexibility is provided by allowing different courses of action to achieve the same goal. The federal guidance lists 57 management measures within the six nonpoint source pollution categories. NYSDEC and DOS have determined, after a review of existing programs, that approximately two-thirds of the management measures are already in place in New York State. For example, state waste oil recycling and wetland protection programs achieve many of the goals of the 6217 program.

The Center for the Great Lakes (an Illinois nonprofit organization) concluded that while the federal coastal zone management program could do more to assist Area of Concern (AOC) cleanups, state coastal programs lacked the jurisdictional and authority needed to fully implement Remedial Action Plan (RAP) objectives. Despite this, coastal programs can assist in RAP development and implementation by:

- **Funding RAP Objectives** - Funds from state coastal programs can make up a key part of the financing that assists RAP objectives.

- **Providing Public Education** - RAPs depend on successful public education and stewardship programs to build support for AOC cleanup and to motivate residents to do their part to reduce harmful runoff and pollution.

- **Creating Demonstration Projects** - Provisions that create successful projects involving setback requirements, stormwater control, wetland protection, and erosion controls set good examples that can spread throughout a watershed as beneficial effects are recognized.

- **Building Networks and Establishing Consistency** - Cooperative partnerships and consistency are needed to make RAPs succeed. RAPs can use already well established networks to further develop partnerships to implement a watershed/ecosystem approach.

The New York State Coastal Program, administered by the Department of State, was established pursuant to the federal Coastal Zone Management Act and the State Waterfront Revitalization and Management Act of 1981. This coastal program includes local initiatives involving waterfront improvements, such as the Oswego Harbor Local Waterfront Revitalization Program discussed in Section VIII.A.6 above, that are overseen by the Department of State.

The City of Oswego is pursuing funding to further implement its waterfront revitalization program. In addition the State Coastal Management Program contains a policy to protect fish and wildlife habitats of statewide significance. There are a number of designated "Significant Fish and Wildlife Habitat" areas in the Oswego River drainage basin. What is needed is the further development of policies and the implementation of management plans to protect these habitat areas.

D. Natural Resource Damage Assessment:

1. Trustees for Natural Resources

For a given area where natural resource damages have occurred and now need to be assessed by a number of state and local entities, a Trustee Council is to be formed to facilitate this review. The Trustee Council for the natural resources is then required to act on behalf of the public to assess damages (injury) to natural resources, recover the damages from responsible parties, and implement a plan to restore, rehabilitate, or acquire the equivalent of the injured natural resources.

2. Legal Basis for Natural Resource Damage (NRD) Claims

State and Federal law, as applicable, provide that Trustees may recover damages for the injury to, loss of, and/or destruction of natural resources caused by a release or discharge of hazardous substances, petroleum products, or other substances. "Natural Resources" include, but are not limited to, land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources belonging to, managed by, controlled by, or appertaining to the State of New York. Damages include (among others) the monetary value of resource injury, the residual injury following remediation, as well as the costs of restoring the injured resources.

3. The Natural Resource Damage Program

To meet the Natural Resource Damage program objectives, the Commissioner, as Trustee, established a Natural Resource Damage Unit within NYSDEC and charged this NRD Unit to undertake a variety of tasks designed to establish a NRD Program for New York State. Pursuant to Organization and Delegation Memorandum #94-28, the NRD Unit is now located in the Division of Fish, Wildlife and Natural Resources, Bureau of Environmental Protection. Generally, the NRD Unit recommends systems and procedures for the strategic, organizational and logistical operation of the NRD Program within the NYSDEC. Additionally, the NRD Unit enhances communication among programs concerning Natural Resource Damages, coordinates agency activities, secures participation from appropriate program specialists, facilitates the pursuit of potential NRD cases, and coordinates the pursuit of all major NRD cases.

4. Assessment Plan Development for the Oswego Area

The resolution of the Onondaga Lake cleanup will ultimately involve a natural resource damage assessment. A public review and comment period of the draft Onondaga Lake NRD assessment plan was initiated in February 1996. The comment period ended May 15, 1996. A response to comments is being developed by NYSDEC for expected release in late 1996. The plan will provide guidance on how a NRD assessment of the lake and its environs should proceed.

E. Pollution Prevention:

Congress passed the Pollution Prevention Act of 1990 which established a hierarchy of preferred waste reduction strategies to minimize waste generation and disposal. Today, new dynamic methods are being advanced by a government and industry partnership. Multi-media pollution prevention approaches are being implemented to solve pollution

problems and reduce risks to human health and the environment. It is the policy objective of the Department to require the reduction in the generation of toxic substances that are discharged, disposed or emitted into the environment to the maximum extent technically feasible and economically practicable consistent with state and federal laws. In order to do this, a hierarchy approach to achieve reduction in the generation and release of hazardous substances calls for pollution prevention and recycling practices to be implemented prior to treatment and disposal methods as follows:

* Prevention or reduction of pollution at the source wherever feasible (includes process changes, equipment changes, chemical substitution and reduction strategies);
* Recover, reuse and recycle wastes in an environmentally safe manner (on-site practices first and then off-site);
* Treatment of wastes in an environmentally safe manner where feasible and where prevention or recycling cannot be achieved; and
* Disposal or other release/discharge as a last resort conducted in an environmentally safe manner (disposal of wastes, other than treated and safe residual, is to be phased out).

Numerous multi-media pollution prevention initiatives and strategies are taking place to achieve program objectives. These include:

1. EPA Strategies

Five themes or organizational principles have been laid out around which national pollution prevention efforts will occur:

a. Make pollution prevention the first choice in all work and the preferred means to enhance environmental stewardship. Incorporate multi-media aspects in all activities including rulemaking, enforcement, training and grants. The focus will be on the statutorily mandated regulations for 17 industrial categories.

b. Build and facilitate a network of prevention programs among states and local governments. Provide assistance through grant funding and technology transfer.

c. Generate and share information to promote prevention, track progress for measurement systems, and recognize successes.

d. Pioneer new environmental programs that emphasize cross-media pollution prevention and that represent new models for government and industry interaction.

e. Develop partnerships and technological innovation with the private sector. These voluntary partnership programs between government, industry and the public allow environmental results to occur more rapidly than by regulation alone, and in the most cost effective manner. Examples of these voluntary programs are described here:

* **The 33/50 Program** - seeks a national reduction of 33% in 1992 and 50% in 1995 of the environmental releases and transfers of 17 pollutants reported in the Toxic Releases Inventory (TRI). Using the 1988 TRI baseline of toxic wastes, reported reduction commitments were nearly 40% achieved by 1992 and over 50% by 1995.

* **WastewiSe** - promotes cost-effective steps to reduce solid waste from businesses. To participate, companies commit to reducing waste generation, recycling and buying and making recycled products. Company reports are encouraged to trend success.

* **Climate-Wise** - is designed to stimulate greenhouse gas reductions across all sectors of the economy. Participants are challenged to identify and implement creative methods to reduce, limit, or mitigate greenhouses gases.

* **WAVE** - the Water Alliance for Voluntary Efficiency is designed to focus attention on the value of water and the need for efficient use of this important natural resource. The lodging industry is encouraged and expected to reduce water use and pollution by 15 to 30 percent or more.

* **Energy Star Buildings** - energy saving are to be achieved by planning and implementing commercial and industrial building upgrades to heating and ventilation equipment.

* **Energy Star Computers** - is designed to reduce air pollution emissions from electricity generation for computers. Automatic computer "power-down" features are to be incorporated into desktop computers and printers.

* **Green Lights** - reduces air pollution by promoting energy efficient lighting.

* **Design for the Environment (DfE) Program** - works with businesses to facilitate information exchange and research on pollution prevention techniques. DfE is administered by EPA's Office of Pollution Prevention and Toxics. The program involves industry, trade groups, and environmental groups in cooperative projects to identify and incorporate alternative products and processes. Current projects include the printing

industry, the dry cleaning industry, and computer workstation manufacturing.

2. Integrated Facility Management

To achieve the appropriate level of pollution prevention and control with a more efficient use of resources, we need to focus on the multi-media aspects of a facility. This requires providing consideration to many functions that can no longer be viewed independently but must be intertwined to achieve Multi-media Pollution Prevention Integrated Facility Management (M2P2 IFM) objectives. These components include an integrated technical review and coordination of requirements of regulations, permitting, enforcement, data systems, training, and other regulatory elements. NYSDEC's Pollution Prevention Unit facilitates these efforts. Four hundred (400) facilities that generate and release 95% of the toxic chemicals to the air and waters of New York State, as identified from the Toxic Release Inventory (TRI), are to be the primary focus of the integrated facility management approach. Being included on the "400/95" list means a company warrants a proactive effort to reduce releases. The approach actually considers all facilities and is initiated by selecting facilities as multi-media inspection candidates. Industries have the responsibility to consider methods to reduce waste generation and releases and to conduct environmental audits of their facilities to assure compliance. Implementation of source reduction, waste minimization, and remediation activities is encouraged and may be required by a formal enforcement action. In the Oswego River drainage basin, a number of facilities have been selected as a candidate for multi-media evaluation. A comprehensive inspection should provide opportunities for pollution prevention, permit coordination, and remediation initiatives.

3. Toxic Chemical Reduction Plans

New York State's hazardous waste reduction statute of 1990 requires those who generate and release hazardous wastes into the environment to reduce the volume and toxicity of such wastes. Decreasing thresholds have been phased in over a five year period that lowered the generation level at which reduction plans are required. Plans are to be implemented using the hierarchy of waste management practices presented above to the maximum extent technically feasible and economically practicable. The rulemaking process for the proposed Part 378 regulations, that were designed to assist in the implementation of this law and to expand the application of reduction thresholds to the other environmental media of air and water discharges has been terminated given the successful pollution prevention measures achieved through other initiatives including the coordinated integrated facility management approach.

4. Technical Assistance

Various program assistance activities are available and play increasingly more important roles in implementing the multi-media pollution prevention approach. Below are descriptions of some technical assistance and guidance available to the regulated community. For additional information on these subjects contact the Pollution Prevention Unit at 518-457-7267.

a. Pollution Prevention Guidance for Local Governments - This November 1993 NYSDEC publication is available from DEC as a guide to localities in developing approaches for pollution prevention. Summary information on regulations and techniques is provided.

b. The Environmental Self-Audit for Small Businesses - This January 1994 publication provides a quick and easy guide to evaluate a small business's environmental compliance.

c. Fact Sheets - Success stories describing implementation of pollution prevention practices and technologies at specific facilities.

d. New York State Pollution Prevention Information Clearinghouse - Over 15,000 new pollution prevention related documents have been received from the Great Lakes Technical Resource Library (GLTRL) and other sources and added to the library. A "NYSPPIC" brochure is available.

e. Commercial Printing and Pollution Prevention - A chart has been developed that summarizes the types of printing process wastes, waste minimization, and pollution prevention methods that can be implemented. A team made up of Great Lakes regulatory and economic development agencies including EPA, printing business members, and environmental groups has made recommendations to make pollution prevention a standard practice in the printing industry (The Great Printers Project).

g. Department of Economic Development (DED) Programs - An Industrial Effectiveness Program (IEP) has been created to assist small manufacturers to become more efficient in their operations. Some grants are available to identify improvement opportunities in plant layout, processes, quality control, and human resources. An Industrial Technology Extension Service (ITES), administered by the NYS Science & Technology Foundation uses local ITES field specialists to determine company needs for the IEP. (Contact DED at 518-474-1131).

h. Small Business Assistance Program (SBAP) - This technical assistance unit located in the NYS Environmental Facilities Corporation at NYSDEC

assists small businesses in understanding federal and state requirements, filling out permit applications, and providing pollution prevention advice. This unit is part of the larger NYS Small Business Stationary Source Technical and Environmental Compliance Assistance Program. Contact SBAP at 1-800-882-9721. DEC has been awarded grants by EPA under the Pollution Prevention Incentives for States (PPIS) to support small business projects.

i. New York Manufacturing Extension Partnership (NYMEP) - This program is provided by the New York Science & Technology Foundation to assist small businesses to achieve increasingly higher standards. NYMEP works with DED's IEP program. An Environmental Services Program (ESP) is currently under development. Contact the NYMEP program at (518)283-1010.

j. Directory of New York State Pesticide Programs - This February 1993 publication describes pesticide programs and where to refer inquiries (includes the Departments of Environmental Conservation, Health, Labor, Agriculture & Markets, Law and Public Service). Contact NYSDOH (800)458-1158 (#402).

5. Proceedings of the Annual Pollution Prevention Conference

This annual conference and the proceedings document provide an opportunity to stay abreast of the current initiatives in multi-media pollution prevention. Details of presentations, panel discussions and case studies are contained in the proceedings. Key topics include:

a. Integrated Facility Management - As discussed above implementation of this multi-media pollution prevention approach is creating many opportunities and beneficial challenges. The improved business service and overall improved positive industrial relationship are recognized. This topic will continue to be a focal point for increased application as the list of accomplishments continues to grow.

b. Sustainable Development and Bio-Diversity - Sustainable development holds that growth must take place in such a way that it will not destroy or deplete natural resources so that future generations will be able to benefit from them and not be compromised. Sustainable development then is growth without loss or depletion of species or genetic diversity. Maintaining biodiversity or the variety of living organisms and habitats is critical to richer and more productive natural systems. Our goal is to achieve and maintain a viable economy that supports sustainable development and bio-diversity.

F. RAP Financing:

Although there is currently no specific funding dedicated solely to the implementation of Remedial Action Plans activities, there are numerous environmental program activities, project proposals, and grants available that provide funding or are conducted that support RAP needs and strategies. A major potential funding source is the 1996 New York State Environmental Bond Act, introduced by Governor George Pataki, that provides multi-million dollar funding for the implementation of clean water, clean air, and waste disposal projects. Many of these funded activities will directly support RAP goals or indirectly benefit RAP strategies. Sources of the funds, available grants, potential sources, and program activities that support the implementation of RAP activities are listed below:

1. New York State 1996 Clean Water, Clean Air Environmental Bond Act

This Environmental Bond Act passed voter approval in November 1996; it will provide $1.75 billion in funding for projects to protect and improve the quality of New York's air and water. The main elements of the bond act and $ million are:

* Clean Water - $790m for municipal waste treatment improvements, nonpoint source control, and management/habitat plan implementation.
* Safe Drinking Water - $355m for protection and system upgrades.
* Solid Waste - $175m to improve recycling and close landfills.
* Municipal Restoration - $200m to cleanup "brownfields"; redevelop uses.
* Air Quality - $230m for state investments in clean technologies.

2. Great Lakes Protection Fund

This Great Lakes area regional fund (the nation's first multi-state environmental endowment) was created in 1989 by the governors of the Great Lakes states who have pledged $97 million. The Fund supports projects that identify, demonstrate, and promote regional action to enhance the health of the Great Lakes ecosystem. The Fund has four primary goals: 1) prevent toxic pollution; 2) support effective cleanup approaches in AOCs; 3) support natural resource stewardship; and 4) clarify health effects of toxic pollution on humans and wildlife.

The Great Lakes Protection Fund encourages a range of strategies to meet these goals, including demonstration projects, applied research, data management, policy analysis and evaluation, and various public participation/education actions. The Fund awards planning grants to help organizations develop the basin-wide collaboration and detailed work plans required for many projects. If the planning phase is successful, the applying organization may then propose a full-scale project. Each year there are two request for proposal dates. For more information call the Great Lakes Protection Fund at (312)201-0660.

3. **New York State Great Lakes Protection Fund (NYGLPF)**

The NYGLPF is funded by a portion of the interest earned on New York State's contribution to the Great Lakes Protection Fund established by the Great Lakes states. The New York Great Lakes Protection Fund provides a perpetual and dependable source of funds for regional and statewide research projects aimed at protecting and conserving the health of the Great Lakes ecosystem in New York State. DEC expects to grant several awards for one-year projects of up to $50,000. Public agencies, academic institutions, industry, non-governmental agencies, and environmental groups are eligible for funding to conduct research and exchange/apply information about remediating and sustaining the health of the plant, animal and human elements of New York's Great Lakes ecosystem.

New York projects should emphasize efforts to reduce the impacts of toxic substances and restore and protect the Great Lakes ecosystem by: improving the understanding of the economic, environmental and human health effects of contamination to the Great Lakes; collection and analysis of data; development of improved environmental cleanup technologies; assessment of current pollution control policies and assessment of the health of Great Lakes fish and wildlife. There is a pre- and full proposal application procedure. Priority categories for funding include: 1) populations at risk, 2) pollution prevention, and 3) policy, public participation and education. NYSDEC's contact in the Region 9 DEC Office is the Great Lakes Program Coordinator at (716)851-7200.

4. **Great Lakes Basin Program**

Funding for the Great Lakes Basin Program, which was initiated in 1991, is coordinated by the Great Lakes Commission under a cooperative agreement with the U.S. Environmental Protection Agency - EPA Region 5 and the U.S. Department of Agriculture Natural Resources Conservation Service. The program works to protect and improve Great Lakes water quality by controlling soil erosion and sedimentation by awarding competitive annual grants that fund these projects. Twenty projects have been selected from a field of 90 proposals to share $250,000 in funding under the 1996 grant cycle for the Great Lakes Program for Soil Erosion and Sediment Control.

The goals of the Great Lakes Basin Program are to demonstrate successful erosion control practices through state and local projects; increase community and political awareness; and, build partnerships that have a positive, long-term effect on Great Lakes water quality. The **Great Lakes Commission** is a bipartisan, interstate compact agency created by state and federal law that is dedicated to promoting a strong economy, clean environment and high quality of life for residents of the eight-state Great Lakes region. The Commission was granted congressional

consent legislation in 1968 and is the only Great Lakes organization with a statutory mandate to represent the collective views of the eight Great Lake states.

In New York State, four projects were selected for funding under the 1996 funding cycle. These projects are to be implemented by local County Soil & Water Conservation Districts. The four projects and counties are: 1) Cold Brook Stream Improvement, Steuben Co.; 2) Best Management Practices for Water Quality Improvements on Forest Lands, Chemung Co.; 3) Twelve Mile Creek Watershed Remediation, Niagara Co.; and, 4) Stewardship Awareness and Water Quality Protection Demonstration, Onondaga Co. The funding range for each project is between eleven and fourteen thousand dollars.

5. NYGLPF Small Grants Program

NYSDEC in conjunction with the New York Great Lakes Research Consortium and the New York State Great Lakes Basin Advisory Council have joined to offer a small grants program to provide initial funding for new, cooperative approaches to research on the environmental quality of the Great Lakes and its impact on the health and livelihood of the people of New York. Funding is provided from a portion of the New York Great Lakes Protection Fund and is intended to supplement the Great Lakes Research Consortium's small grants program for preliminary research to expand the small grants program to include: cooperative projects between academic institutions, local governments, non-profit organizations, school districts and others. Small grants of up to $7,000 each will be awarded for innovative projects. For additional information contact the Great Lakes Research Consortium at (315)470-6816.

6. Great Lakes Research Consortium (Small Grants Program)

Small annual grants are awarded to support and encourage collaboration among the New York State's colleges and universities by providing seed money to joint research projects. The purpose is to continue to improve understanding of the scientific and environmental management problems of the Great Lakes while building multi-disciplinary research teams involving investigators at several cooperating colleges and universities. Grant awards through SUNY at Oswego have provided research opportunities. For additional information contact Jim Pagano at SUNY Oswego at 315-341-3639.

7. New York State Environmental Protection Fund (EPF)

In 1993, former NYS Governor Cuomo and the legislature worked together to enact the Environmental Protection Fund (EPF), creating the State's first permanently dedicated fund to meet environmental needs. This newly created fund received $31.5 million in state fiscal year 1994-95 and under enhanced

funding proposals has continued to receive larger amounts each year thereafter. Future unclaimed beverage container deposits have also been discussed as going into this fund. One million dollars was made available in State Fiscal Year (SFY) 94-95 from the EPF to fund environmental projects; $1.2 million was appropriated in SFY 95-96; and, $4.0 million has been appropriated in SFY 96-97. As a result, two New York State Departments, Agriculture & Markets and Environmental Conservation, have proceeded with sharing these total annual appropriations to implement Requests For Proposals (RFPs) addressing nonpoint source (NPS) pollution projects under the New York State EPF. Contact NYSDEC's Nonpoint Source Section at (518457-0635 for details.

a. During SFY 94-95, the Department of Agriculture & Markets through the New York State Soil and Water Conservation Committee (NYSSWCC) started implementing an $800,000 grants program for agriculture projects. Project selection follows the end of year proposal submission deadline. Under the Agriculture Nonpoint Source Abatement and Control Grant Program, projects that will be funded will consist of plans and activities that will reduce, abate, control, or prevent nonpoint source pollution originating from agriculture sources. Projects must be located within a watershed of a priority waterbody (PWP) as identified by NYSDEC. Projects must propose to implement Best Management Practices (BMPs) as defined in Section 3 of the Soil and Water Conservation Districts Law. The "Agricultural Management Practices Catalog" published by NYSDEC will serve as the official guidance document for the BMP selection. Funds may be used for preventative or remedial initiatives. Projects must be sponsored by a Soil and Water Conservation District. In SFY 95-96, $700,000 was appropriated for agricultural projects. In SFY 96-97, $500,000 has already been designated for projects sponsored by the SWCD. The decision on how to share the remaining $3.5 million between NYSDEC and Agricultural & Markets needs to be made and the money needs to be committed to contracts by 3/31/97.

b. The Department of Environmental Conservation through the Division of Water was provided a grant of $200,000 for non-agriculture projects in SFY 94-95. At that time, NYSDEC combined the $200,000 with the $750,000 in 1995 grant money, provided by a federal Environmental Protection Agency Section 319 Clean Water Act grant, to make a total of $950,000 available for implementing nonpoint source pollution control measures to protect and improve the quality of New York's water resources. The Request For Proposals (RFP) were due at the end of the year. In state fiscal year 1995-96, NYSDEC was appropriated $500,000 under the NYSEPF and combined this with the (1996) $990,000 under the Section 319 money to administer 56 contracts for NPS pollution control projects. In SFY 96-97, as noted above, NYSDEC and Agriculture &

Markets must share the remaining $3.5 million provided under the EPF. The Section 319 funding source is described below.

8. Environmental Protection Agency Section 319 CWA Grant

During State FY 1994-95, EPA Section 319 Clean Water Act funding provided $750,000 in grant money to implement nonpoint source pollution control measures to protect and improve the quality of New York's water resources. As discussed above, $200,000 from the NYS Environmental Protection Fund (non-agricultural EBF grant) was combined with this federal money so that $950,000 was made available for funding projects in New York in SFY 94-95 to reduce the impacts of nonpoint source pollution and to address issues contained in County Water Quality Strategies. (Descriptions of these strategies are provided Section VIII.M). $990,000 in additional Section 319 federal grant funding was provided in federal fiscal year 1996; a reduced amount is expected in 1997. [Contact:(518)457-0635]

9. Remediation Projects

Federal and state funded remedial actions [e.g: under the Superfund programs and federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)], and private responsible party funded remediation projects, provide a great financial resource for environmental cleanup activities that contribute to RAP progress. These projects include required remedial actions or activities that are conducted as part of ongoing environmental quality and natural resource management programs.

10. Other EPA Great Lakes Grants

This source includes funding for Great Lakes, contaminated sediment, and other Nonpoint Source Management Program activities and projects through NYSDEC annual workplan grants. Section IV.D describes nonpoint pollution control projects and Section IV.I describes investigations and monitoring activities; many of which are federally funded. Another example is the Great Lakes National Program Office (GLNPO), established by Section 118 of the Clean Water Act, which makes grants for RAP projects, such as demonstration projects on the feasibility of controlling and removing toxic wastes.

Water Quality Management Planning Grants, issued under Clean Water Act Section 604(b), are awarded by USEPA to the states for projects, that determine the nature, extent and causes of water quality problems in the state and identify the most cost-effective measures to meet and maintain water quality standards. At least 40% of these funds must be passed through to regional public comprehensive planning organizations. Funding is used to support regional planning boards, to establish baseline water quality programs, and to implement projects. Citizen

Advisory Committees activities can be eligible. Also, USEPA research grants support pollution prevention programs with a multi-media approach that have the objective of preventing the generation of potentially harmful pollutants. These grants are authorized under 104(b)(3) of the Clean Water Act, as well as sections of the Resource Conservation and Recovery Act, the Clean Air Act, and the Safe Drinking Water Act.

11. Other Federal Program Monies

Funding is provided for other federal agency and department programs and projects that benefits RAP implementation. Examples include: technical and engineering assistance and grants provided by the U.S. Army Corps of Engineer under the Water Resources Development Act, the National Oceanic and Atmospheric Administration (NOAA), the Natural Resources Conservation Service (formerly Soil Conservation Service), the Oil Pollution Act (OPA), the Coastal Zone Management Act (where Section 306 grants are awarded to states), the 1990 U.S. Farm Bill, and other federal department Great Lakes related programs. Most of these grants require some non-federal matching funds.

USEPA's Environmental Education Program, which began in 1992, awards small grants to schools, colleges, nonprofit organizations, and government agencies to promote excellence and innovation at the grassroots level.

12. NYSDEC Investigations

Table 4 (in Section V.B of this 1996 RAP Update) identifies NYSDEC investigation and monitoring activities needed to address use impairments. Funding and implementation of many of these investigative activities are based on the projects having a high regional program priority (e.g. air, water, or other nonpoint source pollution study need) that directly benefit RAP strategies.

13. NYSDEC Funding

NYSDEC administers grant funding that supports local Water Quality Management Advisory Committee and County Water Quality Coordinating Committee project development and implementation. Funding of County Water Quality Strategies under Section 319 funds is discussed in item 8 above; Section VIII.M describes County Water Quality Strategies.

14. Other State Program Monies

Funding that supports other state agencies such as the Department of Health, the Department of Agriculture & Markets, and the Department of State, provides

programs and services that contribute to watershed protection and restoration activities in the Area of Concern.

15. Local Monies

Local funding committed to implementing strategies to protect and restore beneficial uses of water resources will benefit RAP objectives. These include activities of County Water Quality Coordinating Committees, Water Quality Coordinating Committees, Citizen Advisory Committees, etc.

16. State Funding Mechanisms

Financing options exist to potentially develop new sources of state revenue to assist in Remedial Action Plan implementation. These include: general revenues derived from a variety of state taxes, user fees, dedicated revenues, bonds, loans, special assessments, and special contribution projects.

17. State Revolving Fund (SRF) Loan Program

New York's SRF has gained widespread recognition as a program that provides low interest-rate loans to municipalities to construct water quality protection projects. The SRF is authorized and funded by the Federal Water Quality Act of 1987 and New York State Laws. Eligible projects have been expanded to fund a wide variety of nonpoint pollution control and best management practices (BMPs). Provisions for the special needs of small or disadvantaged communities requiring financial and technical assistance are also provided. The SRF is managed by the New York State Environmental Facilities Corporation (EFC). Funded projects in Oswego and Onondaga Counties have included wastewater treatment facilities upgrades and sewer separation projects.

18. Natural Resource Damage Claims

A discussion of the resources available as part of Natural Resource Damage (NRD) Claims is provided above in Section VIII.D. Because RAPs foster an ecosystem approach, Natural Resource Damage Claims and the resulting restoration projects will benefit RAP implementation.

19. Private Foundation Grant Funds

This source of remedial activity funding to support RAP goals includes any private party cleanup, financing, or program activities. Examples would include an independently conducted site remediation, a project involving harbor revitalization, or a streambank improvement project, all of which would be privately funded.

20. Nonprofit Organizations

Not-for-profit organizations have been identified by IJC as a viable means to further the goals of RAPs. Funding of nonprofit organizations has emerged as a strong force in accomplishing objectives to restore and to protect beneficial uses. Activities include a broad spectrum: actual physical construction involving remediation, habitat rehabilitation and creation, conducting investigations, management plan implementation, public outreach and stewardship activities. As part of their development, some nonprofit organizations need to construct facilities.

21. Enforcement Actions

Formal enforcement actions result in administrative orders that may require the development and implementation of remedial activities. These formal actions, as well as new or modified permit requirements (such as Best Management Practices) and other special study and report conditions requirements, can result in activities (e.g. investigations, pollution prevention) that contribute to the furtherance (financial advancement) of Remedial Action Plan objectives.

G. Cleanup Policy and Guidelines:

A draft document was published in October 1991 that discussed the policy, guidelines and general procedures to determine the cleanup level where remediation is undertaken. The development of cleanup criteria for air, water, soil, and sediments are needed before work can resume on finalizing an overall cleanup policy. Emphasis is currently being placed on the development of aquatic sediment criteria. The Division of Fish, Wildlife, and Marine Resources has developed a "Technical Guidance for Screening Contaminated Sediments" document that is referenced in Appendix G.

H. Water Quality Enhancement and Protection Policy:

NYSDEC is developing the Water Quality Enhancement and Protection Policy (WQEPP) with the purpose to maintain the high quality of New York's waters and to continue to move forward the goals of federal and state laws and regulations to eliminate the discharge of pollutants. While parts of the WQEPP will be required specific to the Great Lakes Basin, New York State is considering applying all three parts of the policy statewide. The WQEPP policy has three main parts, each aimed at a specific goal:

* Discharge Restriction Categories - needed to protect sensitive waters that cannot assimilate the effects of additional discharges or additional discharges of specified substances.
* Antidegradation - needed to maintain the high quality of waters that are currently cleaner than standards now require.
* Substance Bans - needed to protect all waters from specific persistent toxic substances.

The Great Lakes Water Quality Initiative (Section VIII.L) has resulted in part in the promulgation of new federal regulations for the Great Lakes basin, called the Great Lakes Water Quality Guidance. The Great Lakes Water Quality Guidance includes procedures for an antidegradation policy. New York State will be revising its antidegradation procedures as necessary in order to meet the requirements of the Great Lakes Water Quality Guidance.

Summaries of the three main parts of the Water Quality Enhancement and Protection Policy are provided below:

1. Discharge Restriction Categories

Discharge Restriction Categories (DRCs) rulemaking was adopted and became effective October 7, 1993 as amendments to 6NYCRR PART 701. Two new categories have been added to the NYSDEC water use classification system: "No New Discharge" prohibits any new discharges to a receiving water and "No New Discharge of a Specified Substance" prohibits new discharges of a particular substance. The categories are to be applied to specific waters through the stream classification process. The types of waterbodies to which DRCs could be assigned are waters of public health concern, waters of significant ecological or recreational value, and sensitive waters at risk from additional discharges. An implementation strategy issues paper has been distributed for comments. NYSDEC is considering a range of options for establishing an implementation strategy that includes: additional formal rulemaking, a guidance document, and case by case review.

2. Antidegradation

To further protect the waters that are of higher quality than New York State standards require, NYSDEC is considering modifications to its existing antidegradation policy. The revised antidegradation policy would specify a process for reviewing proposed actions that would result in discharges that significantly lower water quality. The process is expected to require the consideration of alternatives that would first reduce or prevent the discharge of pollutants and then would weigh the social and economic benefits of actions that could still significantly lower water quality after alternatives have been explored.

The final rule for the Great Lakes Water Quality Guidance, developed under the Great Lakes Water Quality Initiative, was published in the Federal Register on March 23, 1995. New York State's antidegradation policy will be further revised as necessary based on the requirements of the new regulation.

3. Substance Bans

Certain persistent toxic substances present a threat to the environment when present in extremely small amounts. The only way to avoid release to the ecosystem is to ban their use, manufacture and storage. NYSDEC lacks statutory authority to ban substances but believes there is a need to further develop this part of the WQEPP. Therefore, NYSDEC is evaluating the issue of substance bans by looking at three components: 1) screening and prioritizing of chemicals through the use of a screening criterion, regulatory review, use-tree or life cycle analysis, and waterbody impairment analysis; 2) legal authority options analysis; and, 3) public participation. In addition, several other regional initiatives exist that may influence the direction of future substance ban efforts:

* USEPA's Virtual Elimination Project.
* IJC's "Virtual Elimination Workgroup" Report.
* Toxic Substances Control Act proposal to quantify the ecological threat from specific chemicals.

NYSDEC is currently investigating the issue of substance bans with technical support from USEPA.

I. Rotating Intensive Basin Studies (RIBS):

In conducting the Rotating Intensive Basin Studies, a statewide sampling cycle repeats every six years. The drainage basins in New York State are divided into three groups and each group is studied intensively over a two year period. The Seneca-Oneida-Oswego drainage basin was sampled during the 1989-1990 years of the first six year RIBS sampling cycle that ran from 1987 until 1992. RIBS sampling consists of various types of studies performed at a number of sites.

The Seneca-Oneida-Oswego drainage basin has ten sites that are monitored under the RIBS program; five involve Onondaga Lake. One site is in close proximity to Oswego at Minetto, just upstream of the AOC. The watershed covers an area of over 5,100 square miles. There are also sites near the outlets of Oneida and Onondaga Lakes and on the Seneca River at Jacks Reef. There are nine major lakes located in the basin: Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, Otisco, Onondaga, and Oneida; all but the last two are considered part of the Finger Lakes group.

The Minetto sampling site was chosen to monitor the Oswego River's discharge into lake Ontario. The community surrounding this site is rural residential. This segment of the stream is deep and wide having a muddy bottom and shore line. Boat traffic is heavy here because of the close proximity to the lock used for navigation. This location is also a Lake Ontario enhanced monitoring site where additional water column sampling has been performed for PCBs, PAHs, and organochlorine pesticides to support the Lake Ontario Toxics Management Plan. A fish advisory is in effect to limit channel catfish taken between Oswego and the upper dam in Fulton to one meal per month. The advisory identifies the impairment of the river's fishing use. Water quality in this stream segment is rated as fair.

RIBS sampling studies include a wide range: 1) conventional and toxic water quality parameters in the water column, 2) biological sampling including macroinvertebrate community assessments, toxicity testing and some fish tissue analysis, and 3) some bottom sediment analysis. Details of the RIBS study are contained in a separate report referenced in Appendix G; copies are available upon request.

Multi-plate artificial substrate samples for macroinvertebrates at the Minetto sampling site indicated moderate impact, although after adjusting the assessment to reflect the canalized large river habitat, a more appropriate assessment would be slightly impacted. The fauna was dominated by midges, scuds, and filter-feeding caddisflies, indicating high levels of suspended plankton.

Macroinvertebrate tissue analysis for metals, pesticides, and PCB found some detectable but none exceeding action levels. Water column analysis results were mostly non-detects with no action level exceedences. Bottom sediments collected in 1990 found only iron present at background levels. Toxicity testing results indicate that no significant mortality or reproductive impairment occurred in any test.

J. Presumptive Remedies:

Since the federal Superfund's beginning in 1980, remedial programs have identified that certain categories of sites have similar characteristics, such as types of contaminants, types of disposal practices, and the contaminant effects on environmental media. Based on more than ten years of remedial experience, EPA has developed presumptive remedies to streamline investigations and speed up remedy selections at these sites. Presumptive remedies are identified based on historical patterns of remedy selection and engineering evaluation of the performance of the remedy. The intent is to minimize the duplication of work involved in assessing all alternatives. Under this new method, data collection is to focus on confirming the site type, alternative analysis is to be shortened, and the feasibility study is to be limited to evaluating the presumptive remedy technologies. For example, EPA has established presumptive remedies for Volatile Organic Compounds (VOCs) in Soils and Municipal Landfills. For sites with VOC contaminated soils the

presumptive remedies are limited to: 1) soil vapor extraction, 2) thermal desorption, and 3) incineration. For municipal landfills, the remedy is defined as containment of mass and collection/treatment of landfill gas and leachate. Plans call for the development of presumptive remedies for VOCs for wood treaters, contaminated groundwater, PCBs, coal gasification, and grain storage sites.

K. EPA Contaminated Sediment Management Strategy:

The U.S. Environmental Protection Agency has developed a comprehensive, multi-media Contaminated Sediment Management Strategy. The proposed strategy describes specific actions that EPA will take to reduce environmental and human health risks associated with contaminated sediment. The strategy does not propose new regulation. The intent is to implement policies to consistently assess, prevent, and remediate contaminated sediments. EPA has taken the unusual step of requesting public comment on this internal strategy.

EPA's proposed Contaminated Sediment Management Strategy describes actions that the agency will take to accomplish the following four strategic goals: 1) prevent further sediment contamination that may cause unacceptable ecological or human health risks; 2) cleanup existing sediment contamination, when practical, that adversely affects the Nation's waterbodies or their uses, or that causes other significant effects on human health or the environment; 3) ensure that sediment dredging and dredged material disposal continue to be managed in an environmentally sound manner; and 4) develop and consistently apply methodologies for analyzing contaminated sediments.

The Strategy is comprised of six component sections: assessment, prevention, remediation, dredged material management, research, and outreach. In each section, EPA describes actions that are to be taken to accomplish the four broad strategic goals:

1. Assessment

EPA program offices are to use standard sediment toxicity test methods and chemical-specific sediment quality criteria to determine whether sediments are contaminated. A national inventory of sites and sources of sediment contamination (National Sediment Inventory) is proposed to be used to target sites for remedial activities.

2. Prevention

To prevent the spread of contaminated sediments and regulate the use of pesticides and toxic substances that accumulate in sediment, EPA proposes the use of acute sediment toxicity tests to support registration of chemicals under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Toxic Substances Control Act (TSCA). In the Strategy, EPA also proposes: developing effluent

guidelines for industries that discharge sediment contaminants in significant amounts; using pollution prevention policies to reduce or eliminate sediment contamination resulting from noncompliance with permits; preparing guidelines for the design of new chemicals to reduce the bioavailability and the partitioning of toxic chemicals to sediment; and implementing point and nonpoint source controls that will protect sediment quality. Preventive actions are intended to stop further contamination of sediments and to reduce ecological and human health risks.

3. Remediation

EPA proposes using multiple statutes to require contaminated sediment remediation by parties responsible for pollution. These statutes include the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), Superfund Amendment and Reauthorization Act (SARA), the Clean Water Act (CWA), the Toxic Substances Control Act (TSCA), the Rivers and Harbors Act, and the Oil Pollution Act (OPA). The proposed strategy states that EPA will not proceed with a cleanup if a combination of pollution prevention and source controls will allow the sediments to recover naturally in an acceptable period of time. EPA's remedial actions are designed to cleanup sediment contamination that adversely affects the Nation's waterbodies.

4. Dredged Material Management

EPA proposes the development of technical guidance regarding dredged material testing, disposal alternatives consideration, and dredged material disposal site selection to ensure continued disposal of dredged material in an environmentally sound manner. (Note: NYSDEC has developed and is using a July 1994 publication, "Technical Guidance for Screening Contaminated Sediments" as referenced in Appendix G.

5. Research

EPA proposes a program of investigative research that is needed to: develop and validate new chemical-specific sediment criteria and other sediment assessment methods; improve EPA's understanding of the transfer of sediment contaminants through the food chain; and develop and evaluate a range of technologies for remediating contaminated sediments.

6. Outreach

Public outreach activities are planned to demonstrate EPA's commitment to, and accountability for, sediment management efforts. Regular status reports on sediment management activities are to be provided.

L. Great Lakes Water Quality Initiative:

The 1972 **Great Lakes Water Quality Agreement (GLWQA)** between the United States and Canada established common water quality objectives for the Great Lakes System. The chief objective was the reduction of phosphorus levels to no more than 1 ppm in large municipal discharges to Lake Ontario and Lake Erie. Some new limits were also placed on industrial discharges including the elimination of oil, visible solid wastes and other nuisance conditions. The 1978 Great Lakes Water Quality Agreement shifted the focus from solely the control of nutrients to include the control of toxic substances and called for the virtual elimination of the discharge of persistent toxic chemicals. The 1987 Amendments to the GLWQA centered on technology advancements and the need to clarify the roles of the two governments and the International Joint Commission (IJC). The amendments include specific objectives to address contaminants and requirements for the development and implementation of RAPs and LaMPs. As a result of the foundation laid by the GLWQA to address persistent toxic substances, the United States has taken further steps to establish quidance, create a "level playing field", and implement action to address persistent toxics in the Great Lakes ecosystem.

In 1989, the **Great Lakes Water Quality Initiative (GLWQI)** was introduced by USEPA (Region V) to provide a forum for State and EPA development of uniform water quality criteria and implementation procedures. The GLWQI has focused on water quality criteria and the control of point sources of toxics that are persistent and bioaccumulative. In 1990, Congress passed the Great Lakes Critical Programs Act that required EPA to publish water quality guidance and procedures for the Great Lakes states. The proposed Great Lakes Water Quality Guidance component of the GLWQI focuses on point source discharges of bioaccumulative chemicals of concern (BCCs). The nonpoint source element of the GLWQI is being addressed through the Great Lakes Toxic Reduction Effort. Both are described below.

The purpose of the **Great Lakes Water Quality Guidance (GLWQG)** is to establish a consistent level of water quality protection in the Great Lakes States with emphasis on BCCs. Elements of the GLWQG addressing antidegradation, new water quality criteria and the limited use of mixing zones will result in SPDES permit limits for many substances at the limits of analytical detection. It is expected that new, improved and required effluent limits for point source dischargers will be achievable through the implementation of extensive pollution prevention measures, such as reduced use or product substitution, as well as through advanced treatment technology in some situations.

The GLWQG was published final in the federal register on March 23, 1995 and promulgated as federal regulation effective April 24. Great Lakes States have until March 23, 1997 to comply with the federal regulation. The new final regulation contains provisions that require enhanced and new water quality criteria for the protection of aquatic life as well as human health and wildlife. Some New York State DEC program modifications are expected. These will affect some guidance documents, policy,

procedures, and regulations. Certain point source discharge permits (SPDES) may need modification. Details of the steps to be taken by affected program areas, will be developed as the implementation strategy is developed and finalized. The focus will be on a set of 22 chemicals known to bioaccumulate that have been identified on a list of bioaccumulative chemicals of concern (BCCs). Another concern is the provision that calls for the elimination of mixing zones in determining the discharge limits for BCCs. The methodology used to identify these BCCs uses a bioaccumulation factor (BAF) of greater than 1,000. This means that the substances build up in fish tissue to levels toxic to humans and wildlife and originate from concentrations in the water column which are so low that they cannot be easily detected. A BAF of 1000 is characteristic of chemicals which bioaccumulate due to significant dietary uptake, or the point at which build up of the contaminant in fish tissue due to food chain contamination can account for 10 to 100 times the build up in fish tissue due to the contaminant in the water column alone. The provisions in the GLWQG for BCCs include an antidegradation policy, procedures for calculation of total maximum daily loads, and procedures for determining water quality based effluent limits. NYSDEC is required to adopt implementation procedures and water quality standards consistent with the federal GLWQG regulation. For a summary of the proposed changes refer to the following bulletin in Appendix G: NYSDEC. Summer 1996. Great Lakes Water Quality Guidance, Proposed Changes to New York's Water Quality Programs. 4 pages.

In order to focus on identifying, assessing, and reducing nonpoint source loadings of BCCs, a program called the **Great Lakes Toxic Reduction Effort (GLTxRE)** is under development. This effort has two proposed multi-media tracks: the "pathways" track focuses on BCCs entering the Great Lakes System, and the "Virtual Elimination" track focuses on a detailed analysis of a small number of BCCs. A description of each of these approaches that make up the Great Lakes Toxic Reduction Effort is provided below:

1. Pathways

The pathway approach applies a multi-media effort, with representatives from water, waste, air, and pesticides, as appropriate, to identify and address any gaps or barriers in existing regulatory and nonregulatory programs to reduce loadings of BCCs. The pathway approach focuses on nonpoint source pathways relative to:

* Air deposition
* Sediments
* Spills (storage, handling and transport)
* Combined sewer overflows/storm water
* Waste sites
* Agricultural sources - Programs are underway to remove banned and restricted persistent toxic pesticides from unused stockpiles and implement "Whole Farm Management" to minimize the use of pesticides and fertilizers.

2. Virtual Elimination

The virtual elimination approach selects a small group of BCCs and performs an in-depth analysis of their uses, sources, releases, and opportunities for reduction (currently reviewing mercury and PCBs). The goal is to generate ideas concerning regulatory and non-regulatory gaps and identify actions that can be taken to reduce the use of targeted chemicals. The virtual elimination project is chaired by the Great Lakes National Program Office and will build on existing information and programs including the Lakewide Management Plans (LaMPs), the Lake Superior Pollution Prevention Strategy and recommendations of the International Joint Commission's Virtual Elimination Task Force.

M. County Water Quality Strategies:

1. County Water Quality Coordinating Committees

Nonpoint sources of pollution have been identified as the primary source of water quality problems on more than 1,300 water body segments listed on New York's Priority Water Problem (PWP) list. Due to the nature of nonpoint source pollution and the types of actions needed to address the resulting water quality problems, local implementation efforts based on locally established priorities are essential.

To facilitate these local implementation efforts, the NYS Soil and Water Conservation Committee (NYSSWCC), in conjunction with NYSDEC, encouraged the formation of County Water Quality Coordinating Committees (CWQCCs) to prepare county water quality strategies. Committee membership is voluntary and is comprised of representatives from local organizations involved in preventing nonpoint source pollution. Each committee, through its strategy, identifies and sets local priorities for nonpoint source pollution prevention.

Minimum requirements for county strategies were established by the NYS Soil and Water Conservation Committee and the NYSDEC. They are as follows:

* Statement of who the committee reports to (if applicable).
* Mission/purpose statement.
* Description of function.
* Summary of the individual agencies' roles and responsibilities.
* Watershed-specific list of PWP focusing on county-wide issues.
* List of goals and objectives.
* List of work tasks, contact, timing, costs, and funding.
* Committee's role in implementation of the strategy.

Counties that developed strategies meeting these minimum requirements were eligible to receive a one-time payment of $4,750 to implement a component of their strategy. A total of 55 of the 57 counties outside New York City completed their strategy in time to qualify for this funding. Additional grant funding has been made available for implementation of elements of these strategies as discussed under RAP financing in Section VIII parts F.7 and F.8. The overall NPS grant funding has increased over each of the last three years. Implementation of County Water Quality Strategies is important towards achieving the watershed and ecosystem approaches in restoring and protecting the beneficial uses of the waters in the Oswego River Area of Concern.

2. Oswego County Water Quality Strategy

The Oswego County Water Quality Strategy was prepared by the Oswego County Water Quality Advisory Committee. The committee works to coordinate efforts to improve water quality in the county, especially through the development and implementation of a strategy to control nonpoint source water pollution.

The Water Quality Advisory Committee (WQAC) plans to concentrate on nonpoint source water pollution problems. Nonpoint sources are seen as a threat or potential threat to water quality in all of the county's major watersheds. Sources of nonpoint pollution include: agricultural and related runoff (fertilizers and pesticides), sedimentation from erosion, septic system failure, and other runoff from sources such as road salt, leaking underground storage tanks, and other chemical containers.

It is the mission of the Oswego County Water Quality Advisory Committee to work to maintain, enhance and restore the quality of Oswego County's water resources, through a cooperative, coordinated manner which will include educational and technical efforts and which will serve to implement the County Water Quality Strategy. The goals of the advisory committee are primarily to:

* Establish a cooperative, locally based effort to identify nonpoint source pollution problems in the county and develop a comprehensive strategy to address these problems.
* Utilize educational, technical, and other non-regulatory means to implement the comprehensive strategy.
* Focus on the prevention, reduction and remediation of nonpoint source problems according to the priorities established in the Strategy.

N. Research Initiatives:

This research initiatives section is included to provide a checklist of more current research projects and/or references developed that have been or could be of assistance to RAP implementation. The main listing of RAP references is provided in Appendix G.

1. Great Lakes Information Network (GLIN)

The Great Lakes Commission [established to implement the elements of the Great Lakes Basin Compact among the eight Great Lakes states] has developed a computer network for Great Lakes data and information exchange entitled the Great Lakes Information Network (GLIN). A grant from Ameritech Foundation has provided the Great Lakes Commission with funding for a two-year pilot project to link agencies, organizations, and individuals via the Internet on the World Wide Web (WWW). GLIN partners, including USEPA, NOAA, Environment Canada, and others are contributing their organization's data and information. To obtain more information about GLIN, call (313)665-9135.

2. Virtual Elimination Task Force

Reference document: International Joint Commission. 1993. A Strategy for Virtual Elimination of Persistent Toxic Substances. Report of the Virtual Elimination Task Force to the International Joint Commission. IJC Great Lakes Regional Office, 100 Ouellette Ave, 8th Floor, Windsor, Ont. N9A 6T3. This report consists of two volumes:

* **Volume 1**. ISBN 1-895085-65-9. 72 pages. Recommends that the virtual elimination goal be achieved by the implementation of a broad array of activities that focus on persistent toxics. These activities include legislation, regulations, technology, economic instruments, education, and consultation. Terminology, criteria and strategy considerations are discussed.

* **Volume 2.** ISBN 1-895085-66-7. 112 pages. Appendices entitled "Seven Reports to the Virtual Elimination Task Force". Includes background reports on: the application of the virtual elimination strategy to PCBs and Mercury; a long-term chlorine strategy, Pulp and Paper Industry application, and case study; economic incentives, assessment and policy; injury impact assessment; and, progress discussion.

3. The Great Lakes Research Review

The "Great Lakes Research Review" is a new publication from the Great Lakes Program of SUNY Buffalo, the Great Lakes Research Consortium at SUNY

College of Environmental Science and Forestry, and New York Sea Grant. The publication will provide the Great Lakes community an easy-to-understand summary of current research efforts taking place in New York State, the Province of Ontario, and other Great Lakes states. This semi-annual publication will be presented in two-issue sets. The first issue,"Understanding Toxic Exposure in the Great Lakes", focuses on research related to the fate and transport of toxic substances. The second issue will concentrate on "Human and Ecological Effects of Toxics". For more information contact the Great Lakes Program at SUNY Buffalo, 207 Jarvis Hall, Buffalo, NY 14260, (716)645-2088.

4. Human Health Considerations

This 1996 RAP Update document contains a number of descriptions of ongoing activities relative to human health considerations. These human health consideration activities include narratives that describe the following initiatives:

* The Health Consultation report concerning the Armstrong Cork Landfills prepared by NYS Department of Health and described in Section IV.G.5.

* USEPA and the Agency for Toxic Substances and Disease Registry (ATSDR) Great Lakes basin health study described in Section IV.G.4.

* Fish and wildlife consumption advisories discussed in Section IV.F.1.

* Investigations, study needs, and priorities identified in Section VII.

* Injury and damage assessment as described under the Natural Resource Damage Assessment program described in Section VIII.D.

* USEPA's Contaminated Sediment Management Strategy, described in Section VIII.K that addresses reduction and prevention of health risks.

* Air toxics health risk assessment required by the CAAA (Section IV.E.2)

In addition to the above ongoing human health considerations, there are two aspects of involvement that will need additional RAP attention. These are how to incorporate human health considerations into RAPs and the topic of studying endocrine disruptors. Both are discussed below:

5. Incorporating Human Health Considerations into RAPs

A workshop conducted in February of 1995 sponsored by the Great Lakes Research Consortium, the Great Lakes Protection Fund, and the Agency for Toxic Substances and Disease Registry identified five approaches for incorporating human health considerations into RAPs. Each of these approaches relies on certain key elements:

* Evaluation of the impairments of beneficial uses.
* Development of other indicators to evaluate and to measure environmental health, public perception, body burden, and illness considerations.
* Development and evaluation of community and participatory health exposure concerns and assessment data.
* Development and assessment of exposure data.
* Communication of public health risks/advisories.

A proceedings document from the workshop is being finalized; the draft provides broader descriptions of these approaches and identifies implementation needs.

6. Endocrine Disruptors and Human Health

Recently published articles have highlighted the known fact that some chemicals, such as PCBs and DDT, at sufficiently high levels, can disrupt the normal reproduction and sexual behavior of some organisms. In response to the significant reductions in the levels of these chemicals and other environmental contaminants that have occurred over the last two decades, New York State Great Lakes' fish and waterbirds have been observed to be currently reproducing normally. This observation suggests that the levels of these contaminants of concern are below the adverse effect level for these organisms. The primary concern, therefore, focuses on humans who consume contaminated Great Lakes fish and wildlife that could biomagnify these contaminants in their tissues to levels which could pose potential health problems.

A number of scientists have noted that these chemicals appear to mimic or interfere with the action of sex hormones (particularly the female hormone, estrogen) during embryonic development. Questions have been raised as to whether changing rates of human reproductive tract disorders and breast and testicular cancers may be related in part to chemicals released into the environment. The endocrine and reproductive effects of these chemicals are believed to be due to their ability to mimic the effects of endogenous hormones and disrupt their synthesis and metabolism.

Recognizing the potential environmental health threats posed by this class of contaminants, state and federal environmental programs have targeted bioaccumulative toxic contaminants, such as PCBs and DDT, for elimination from the Great Lakes ecosystem. There is insufficient evidence to indicate that the health of New York State RAP human populations are directly or significantly impacted by present levels of Great Lakes' contaminants. Basic research is incomplete regarding what levels of these contaminants would be required to cause human reproductive or cancer-causing effects. Given the problems in separating out the very complex influences and interaction of diet, weight, work place exposures, lifestyle variables (i.e. exercise, smoking), naturally occurring carcinogens, virus, and genetic factors, it will be extremely difficult to establish any link between anthropogenic Great Lakes' contaminants and measurable levels of human health problems.

The potential reproductive and cancer-causing effects of bioaccumulative toxics is a topic that merits and demands further research. General agreement already exists that persistent toxic substances have no place in the environment and that they need to be reduced and ultimately eliminated. Remedial Action Plans and Lakewide Management Plans, as well as other water quality, Great Lakes, and human health data collection and assessment programs, are already being further developed to achieve this end. Consideration must be given as to where limited RAP resources should be directed. Managers need to decide if resources should be used to better evaluate the problem through research projects or if these resources should be used to further identify and eliminant contaminant sources.

O. North American Free Trade Agreement:

The North American Free Trade Agreement (NAFTA) requires that the United States and Canada "harmonize" their environmental rules. An assessment of laws and regulations will determine where more stringent rules apply. Following this identification process, determinations of what additional measures need to be adopted can be made. Implementation procedures will then need to be agreed upon in order to comply with the agreement.

P. Zebra Mussels in the Oswego River:

Since the discovery of zebra mussels in Lake Erie in 1987, the small striped mollusk has wreaked havoc in New York's Great Lakes region by clogging electric generation facility and public water facility industrial plant pipelines and boat intakes, disrupting natural

ecosystems and littering beaches with its sharp shells and rotting meat. Native to the region of the Black and Caspian Seas, zebra mussels are believed to have been transported to North America as hitchhikers in the ballast water tanks of ships from European freshwater ports. When ballast water was discharged into the Great Lake, so too were the mussels.

In the ecosystem, high zebra mussel populations impact existing food webs since the mussels compete for the same type of food as fish larvae and other larger zooplankton. The mussels are filter-feeders, drawing water in through a tube called a siphon and removing what they can use for food. As a result, there is now less desirable food available which includes tiny floating plants and animals called phytoplankton and zooplankton. In areas of the Hudson River for example, researchers are discovering that zebra mussels are dramatically impacting both phytoplankton and zooplankton populations, dropping them to less than 20 percent of their normal concentrations. Researchers are investigation bioremediation measures to help reduce the spreading of zebra mussels.

Q. Seneca-Oneida-Oswego River Basin:

The "three rivers" drainage basin covers an area of approximately 5,122 square miles in the central portion of New York State. The basin stretches about 100 miles east to west from Rome to Macedon, and about 70 miles north to south, at its widest point. There are nine major lakes in this basin: Canadaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, Otisco, Onondaga, and Oneida; all but the last two are considered part of the finger Lakes group.

Much of this basin is characterized as rural-agricultural or rural-residential, however a highly industrialized area exists along the Seneca and Oswego Rivers and Onondaga Lake around Syracuse stretching downstream to Oswego. Recreational activities such as swimming, boating, and fishing revolve around the lakes and rivers. The Seneca and Oswego Rivers are heavily regulated by the Department of Transportation and now the Thruway Authority for the Barge Canal Operations.

R. Onondaga Lake:

The future of Onondaga Lake is heavily dependent on the outcome of the decisions and actions resulting from the Onondaga Lake Management Conference. A large factor in this decision making process is the resolution of the wastewater discharge from the Syracuse Metropolitan sewage treatment plant and the correction of combined sewer overflows into Onondaga Lake. Remedial activities involving a number of hazardous waste sites surrounding the lake as well as the lake itself will also have a great influence on the

lake's restoration. For a specific update on Onondaga Lake activities, reference is made to periodic reports by Onondaga County, NYSDEC's Lakes Section, and the Management Conference. In regard to the Remedial Action Plan, the assessment that needs to be made is to define to what extent are the conditions in Onondaga Lake contributing to use impairments in the Area of Concern. After all, the goal of the RAP is to restore and to protect beneficial uses in the AOC. The 1996 Clean Water, Clean Air Environmental Bond Act includes a funding proposal for implementing existing management plans

S. Federal Energy Regulatory Commission (FERC) Licensing:

The relicensing of the hydroelectric generating dams along the Oswego river is very complicated. Since these are 30 year licenses, each renewal must address a number of issues that understandably are difficult to predict so far into the future. Because the construction of the dams has dramatically changed conditions of the river; steps need to be taken to address fish and wildlife habitat rehabilitation. Project negotiations are currently underway; issues that cannot be settled will have to go before and Administrative Law Judge for decision. Details of the FERC relicensing process and the effects on such locations as below the Varick Dam will be reported on in future RAP update documents.

T. Reclassification of River/Harbor Stream Segments:

In 1993 a series of public meetings were conducted regarding the reclassification of the surface waters in parts of the Seneca-Oneida-Oswego Rivers Drainage Basin. This "upgrading" of selected stream segments was part of a statewide effort to better protect drinking water supplies and raise all segments to establish fish propagation and survival as a minimum best use.

* **Oswego Harbor -** As part of the comments made during this reclassification effort, the Remedial Advisory Committee for the Oswego RAP suggested that the Oswego Harbor be reclassified from a "C" classification to a "B" classification. This was believed necessary and fair so as not to show the harbor as a "lower" classification than upstream. The harbor, however, cannot be reclassified simply to show a "higher" classification because the accompanying best use designation is not necessarily desired in the harbor. In other words, according to the NYS Department of Health policy, the Oswego Harbor will not support a "B" classification unless one of the following is true: 1) there are formally designated beaches on the waterway, or 2) contact recreation takes place and water quality is a critical component necessary to protect public health. Because NYSDEC and

NYSDOH do not desire to encourage swimming in the harbor, neither agency will support a reclassification. This does not imply the water quality standards are lower for the "C" classification. In fact, the only significant difference between the two classifications (B and C) in the Water Quality Regulations NYSCRR Title 6, Chapter X, Parts 700-705 is the descriptions involving best uses. Primary and secondary contact recreation and fishing are the best usages for Class B. Classification C states that the water quality shall be suitable for fish propagation and survival as well as suitable for primary and secondary contact recreation, although other factors may limit contact uses. The narrative water quality standards for each of these classifications are the same.

* **Oswego River** - When complete, the reclassifications will result in a class B designation for the Oswego River up to the Three-Rivers junction. Other class changes were under consideration to further protect drinking water supplies.

* **Oswego River (Fulton to Phoenix)** - Consideration had been recommended by NYSDEC for a classification change to "A" in this area; however, this aspect has been withdrawn from the reclassification package. It is known that the Oswego River surface waters feed the drinking water aquifer for Fulton's drinking water wells. Under the Safe Drinking Water Act, treatment of surface water supplies is required unless a use attainability analysis indicates otherwise. Due to prohibitive costs and other complicating factors, this class change is no longer under consideration. To keep the reclassification of the drainage basin on schedule, this Class A change was dropped; a waiver may be granted in the future allowing the class change.

U. Armstrong Landfills Delisting:

Site remediation at the Armstrong plant included draining, filling, and capping a lagoon as well as capping two site landfills. Surface waters, soils and sediments have been monitored. Mirex and PCBs were primary concerns. NYSDEC concluded no contaminants were leaving the sites and subsequently delisted the Armstrong landfills from the hazardous waste site registry. River sediments are considered to be the likely source of any remaining mirex and related PCBs entering Lake Ontario. Mirex is a persistent toxic substance; however, it is not a listed hazardous waste. Because the inactive hazardous waste site law deals with hazardous wastes, the Armstrong landfills are no longer considered to present a significant threat to the environment. Documentation of an environmental impact that can be traced to a source is needed to require remediation of a site involving hazardous substances.

V. NYS Canal Recreationway Plan:

The Canal Recreationway Plan was developed over a two year period with a massive public outreach program that included dozens of public meetings, sessions with local and county government officials, and a bringing together of numerous canal interest groups. The Plan is a visionary blueprint for the revitalization of the 524-mile and 57-lock New York State inland navigational Canal System.

The Canal Recreationway Plan includes recommendations for Canal Landings which will provide boater and other recreational amenities, an end-to-end trail and linear park, and the designation of a scenic auto route paralleling the canal. The objective of the Plan is to spur economic activity while preserving the pristine wilderness along the Canal System. The Plan includes development of seven major canal harbors, of which Oswego is one.

In developing a strategy for the protection and enhancement of natural resources along the canal, a number of actions are recommended: creation of a public/private greenway with emphasis on access to the canal and its trails, improvement of fish and wildlife habitats, protection from nonpoint source pollution, conservation of open space, maintenance of minimum water levels, control of exotic species, adoption of Best Management Practices, improved management of dredge spoils, and increased erosion control by vegetation management.

The NYS Canal Recreationway Plan also recommends that the Thruway Authority pursue designation of the canal recreationway as a National Heritage Corridor. The National Park Service is conducting a study to determine whether the Canal System is nationally significant according to established criteria, and whether it represents a suitable type of resource for inclusion in the National Park System.

W. Oswego River Scenic Assessment:

This report published in 1992 was prepared by the Oswego County Planning Board. The purpose of the study is to increase the appreciation of the Oswego River by providing or improving visual and physical access to the river. The study identifies existing recreational areas, right of ways, scenic view locations, recommendations for access sites and view improvements, and techniques to maintain scenic quality along the Oswego River between the City of Oswego and the Village of Phoenix.

IX. APPENDIX PAGE

APPENDIX A

List of Remedial Advisory Committee Members

1.	Joe Allerton 827 Forest Ave. Fulton, N.Y. 13069	Citizen 315-592-5900
2.	John DeHollander 2 Erie St. Oswego, N.Y. 131126	Oswego Co. SWCD 315-343-0040
3.	Karen Noyes and Ed Marx 46 East Bridge St. Oswego, N.Y. 13126	Oswego Co. Dept. of Planning 315-349-8292
4.	Les Monostory 125 Euclid Drive Fayetteville, N.Y. 13066	Izaak Walton League; Planning Agencies 315-435-2640
5.	Greg Neal City of Oswego Oswego, N.Y. 13126	Oswego Waterfront Revitalization Plan 315-342-8172
6.	James Pagano Research Center SUNY Oswego Oswego, N.Y. 13126	SUNY at Oswego 315-341-3639
7.	Terry Hammill 69 West 5th St. Oswego, N.Y. 13126	Oswego Mayor 315-342-8136
8.	Celia Sgroi 115 West Seventh St. Oswego, N.Y. 13126	Oswego Port Auth. 315-343-7648
9.	Jack Khun 300 Erie Blvd. West Syracuse, N.Y. 13202	Niagara Mohawk 315-428-6379
10.	Augustine Silveira P.O. Box 98 Minetto, N.Y. 13115	SUNY at Oswego 315-341-2703

APPENDIX B

REMEDIAL PROGRESS HIGHLIGHTS

This table is a summary of the major remedial activities involving the Oswego River Area of Concern since the United States and New York State committed to Remedial Action Plan (RAP) development and implementation in 1985.

Date	Action
Overall RAP Progress and Accomplishments:	
1985	U.S. government/New York State commit to RAP development/implementation
1986	USEPA hires consultant (SAIC) to compile data
4/87	Oswego River Citizens' Advisory Committee (CAC) formed
7/87	SAIC completes working RAP document for NYSDEC and CAC.
2/90	Stage I RAP completed and submitted to EPA and IJC.
6/91	Stage II RAP completed and submitted to EPA and IJC.
6/91	IJC review of Stage I RAP completed.
11/91	Remedial Advisory Committee (RAC) replaces CAC for implementation activities.
3/94	Fisheries Enhancement Plan report completed.
12/94	Oswego Harbor Survey (1994) report completed.
4/95	Oswego Harbor Fish Pathology report completed.
4/96	Oswego River Sediment Study draft report.
Hazardous Waste Sites (land based and contaminated sediments):	
1990	Priority given to hazardous waste sites in an IJC designated Areas of Concern.
1992	Onondaga Lake Remedial Investigation begins.
1996	Fulton Terminals remedial work completed.

Industrial Point Source Discharge Controls (SPDES Permits):

1986	Allied Chemical (the largest chemical manufacturer in the basin) closes its Syracuse plant.
9/87	NYSDEC Consent Order with Armstrong World Industries (Fulton) requires correction of ammonia discharge violations by 3/1/88.
7/88	LCP Chemical closes plant after illegal mercury discharge discovered.
3/89	State fines LCP Chemical $650,000 for illegal discharges of mercury to Onondaga Lake.
9/89	Anheuser-Busch, Inc. settlement results in criminal pleas and a consent order with a total penalty of $1,000,000 for by-passing waste from treatment plant. Correction of operating problems is required.
1990	Carousel Center Mall construction completed on old scrap yard and industrial dumping area adjacent to Onondaga Lake. SPDES permit issued for pump and treat of contaminated groundwater on-site.
4/92	Bristol-Myers Squibb pays $3.5 million in criminal fines and penalties and agrees to build a $30 million pretreatment facility as part of a plea agreement with state and federal officials for illegally discharging pollutants into Syracuse area waters.

Municipal Point Source Discharge Controls (SPDES Permits):

1986	Oswego completes CSO interceptor on city's west side which includes swirl concentrator to remove solids.
1989	Correction of dry weather overflows within the Wetzel Road (Onondaga County) collection system.
10/89	City of Fulton completes upgrade of treatment plant.
1/31/89	A negotiated settlement (judicial order) requires the development and implementation of control alternatives for the Syracuse Metro sewage plant and its collection system.
8/91	NYSDEC consent order with the City of Oswego for Eastside Sewage Treatment Plant upgrade.
1991	Upgrades completed at the Ley Creek and Liverpool pump stations which will eliminate bypasses and further reduce overflows from the Onondaga Metro sewer system.

Nonpoint Source Management Activities:

1/90	NYSDEC completes Nonpoint Source (NPS) Program.
6/90	NYSDEC completes NPS assessment report for all counties in the basin.

6/90	NYSSWCC & NYSDEC complete "Guidelines for Establishing Water Quality Strategies".
4/91	NYSDEC completes a BMP manual for agricultural NPS control.
4/92	NYSDEC completes BMP catalog for agricultural sources.
1995	EPA Section 319 grant funding provided for NPS project implementation.

Air Pollution Control:

1990	Clean Air Act Amendments (CAAA) require MACT limits.
1996	NYSDEC proposes regulation changes to comply with Title V CAAA.

Fish and Wildlife Assessments / Actions:

1993	Fish Flesh Chemical Residue Analyses results (Alewives, smelt, catfish).
1994	Fish Flesh Chemical Residue Analyses results (American Eels).
3/94	Fisheries Enhancement Plan report completed.
4/95	Oswego Harbor Fish Pathology report completed

Health and Environmental Assessments / Actions:

1995	Helen Daly (SUNY at Oswego) reports PCB infant behavior effects.
1/96	Armstrong Cork Landfills' Health Consultation report finalized.

Investigations and Monitoring Activities:

12/91	NYSDEC completes Rotating Intensive Basin Study for the Oswego River basin.
3/94	Fisheries Enhancement Plan report completed.
12/94	Oswego Harbor Survey (1994) report completed.
4/95	Oswego Harbor Fish Pathology report completed.
4/96	Oswego River Sediment Study draft report.

Public Participation and Outreach:

1994	RAP informational Slide Show completed.
1995	"Oswego River RAP - Past, Present and Future" brochure completed.
1996	Annual "Watershed Watch" newsletter produced.

Other Watershed or Statewide Initiatives:

1986	NYSDEC appoints Onondaga Lake Advisory Committee.
6/89	NYS files civil suit seeking remedial work and natural resource damages related to Onondaga Lake.
1989	Onondaga Lake Management Conference convenes as an intergovernmental effort to coordinate lake clean-up.
2/90	Onondaga Lake International Remediation Conference on mercury contamination held as part of partial settlement with LCP Chemicals.
1/92	Allied-Signal, Inc. agrees to fund a $7 million study on how to best remediate the lake (RI/FS).
1986	Local Waterfront Revitalization Program adopted by City of Oswego.
1987	Salt storage discontinued in Oswego Harbor.
2/89	Lake Ontario Toxics Management Plan (LOTMP) completed.
9/91	LOTMP update completed.
1995	Mirex Transport and Fate - Mass Balance study completed.
1996	Lake Ontario Source Contaminant study report completed.

APPENDIX C

Strategy Management Forms

Presented below is the shell of the Use Impairment Restoration and Protection Strategy Management Form. This blank form is provided as a worksheet to update the eleven completed strategy management forms that follow and are described in Section V.D of this 1996 Remedial Action Plan Summary Update:

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#:

USE IMPAIRMENT INDICATOR:

IJC#: AOC LOCATION:

IMPAIRMENT STATUS & CAUSES:

POLLUTION SOURCES:

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.			
2.			
3.			
4.			
5.			
6.			

COMMENTS:

STATUS KEY:

C = Completed
P = Planned
D = Deferred
I = Implementation progressing
U = Under development/assessment/investigation
N = Needs development/assessment/investigation
R = Required by enforcement/permit/agreement

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 1

USE IMPAIRMENT INDICATOR: Fish & Wildlife Consumption Restrictions

IJC#: 1 AOC LOCATION: Lower Oswego River, Oswego Harbor, and Lake Ontario

IMPAIRMENT STATUS & CAUSES: IMPAIRED - PCBs and Dioxin; Potentially Mirex and Chlordane

POLLUTION SOURCES: Lake Ontario, point and nonpoint source discharges upstream of the AOC (industrial discharges, inactive waste sites, contaminated sediments).

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 10/94	NYSDEC	Sample Sediment (core & surficial)	C
2. 8/95	DFW	Eel & Catfish Study Results (to NYSDOH)	C
3. 4/97	NYSDEC	Final Report on Sediment Sample Results	U
4. Ongoing	DEC/Ind.	Complete Haz. waste rem. & implement BMPs	I
5. Ongoing	DEC/Ind.	Report of success of haz. waste rem.	I
6. Ongoing	NYSDEC	Document F & W study contam. levels	I
7.	NYSDEC	Establish any add'l F & W management Plans	N
8.	NYSDOH	Declare no health advisories (AOC caused)	N
9.	DEC/DOH	Establish any add'l health mgt. strategy	N
10.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Fish consumption advisory issued by NYSDOH for all of Lake Ontario including streams up to first barrier. No advisories specific to the AOC. PCBs exceed FDA fish consumption guideline; dioxin exceeds State fish guideline; PCBs and mirex exceed FDA wildlife (duck) guideline. No specific data for AOC guidelines. Lake Ontario catfish and eel data sent to DOH for advisory reconsiderations. Eel still above std.; catfish lower but may be false indicator since lipid values also lower.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 2

USE IMPAIR. INDICATOR: Degradation of Fish & Wildlife Populations

IJC#: 3 AOC LOCATION: Lower Oswego River, Oswego Harbor

IMPAIRMENT STATUS & CAUSES: IMPAIRED - Periodically dry areas and to a lesser extent PCBs, Octachorostyrene, and dioxin.

POLLUTION SOURCES: AOC/watershed industrial discharges, inactive hazardous sites, Lake Ontario, contaminated sediments.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/94	NYSDEC	Conduct Water Quality Study Sampling	C
2. 4/95	CORNELL	Perform Fish Study & Complete Report	C
3. 9/95	NYSDEC	Water Quality Survey Results Report	C
4.	Nia.Mo.	Obtain / Implement FERC Relicense	U
5.	DFW	Assess F & W numbers and balance goals	N
6.	NYSDEC	Verify acceptable F & W population levels	N
6.	NYSDEC	Confirm no water quality toxicity	N
7.	NYSDEC	Document F & W targets/mgt. goals achieved	N
8.	RAC/DEC	Reassess Use Impairment Status	N

COMMENTS: This use impairment was identified by F & W management programs; mgt. goals needed. New habitat and BMPs may be needed to aid restoration. Niagara Mohawk FERC relicensing should impact habitat req'ts. Restoration goal, follow-up investigations and long-term monitoring need to be defined to reassess use impairment status.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 3

USE IMPAIRMENT INDICATOR: Loss of Fish & Wildlife Habitat

IJC#: 14 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: IMPAIRED - Dry area below Varick Dam; contaminated sediments and physical disturbances, water levels.

POLLUTION SOURCES: Elevated levels of contaminants including PCBs, most likely impact benthos; dredging and potentially natural erosion disturbances are sources.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.	NYSDEC	Assess Habitat / Refine Restoration Criteria	U
2.	NYSDEC	Monitor FERC Relicensing Process	U
3.	Local	Define any Needed Land Use Controls	N
4.	Nia.Mo.	Implement FERC projects & BMPs	N
5.	NYSDEC	Assess quantity & quality of habitat areas	N
6.	NYSDEC	Verify adequate habitat (amt./type/quality)	N
7.	NYSDEC	Verify Mgt. Plans inplace to protect habitat	N
8.	RAC/DEC	Reassess Use Impairment Status	N

COMMENTS: Stage 1 defined habitat loss as a cause of impairment of IJC criteria #3 Degradation of Fish and Wildlife Populations. Need to define the quality and location of AOC habitat to compare with future changes. Dry area below Varick Dam is main concern. FERC licensing will have bearing on habitat.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 4

USE IMPAIRMENT INDICATOR: Eutrophication or Undesirable Algae

IJC#: 8 AOC LOCATION: Lower Oswego River, AOC and Lake Ontario nearshore

IMPAIRMENT STATUS & CAUSES: IMPAIRED - Phosphorus

POLLUTION SOURCES: Point and nonpoint watershed sources (Municipal wastewater, combined sewer overflows, runoff)

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/94	NYSDEC	Conduct AOC Water Quality Sampling	C
2. 9/95	NYSDEC	Water Quality Survey Results Report	C
3. 9/95	RAC/DEC	Determine Add'l Toxicity Testing Needed	C
4. 12/96	RAC/DEC	Define Restoration (delisting) Criteria	C
4.	NYSDEC	Conduct Add'l Toxicity Testing	N
6.		Implement restoration/protection needs	N
7.	RAC/DEC	Reassess Use Impairment Status	N
8.			

COMMENTS: Reports of algal blooms in the AOC and Lake Ontario nearshore areas and lower Oswego River above the AOC. 1994 Water Quality Survey indicates dissolved oxygen high; no eutrophication problem in AOC. No observed over abundance of free floating algae in harbor; however, shallow harbor areas do support abundant rooted plants. Phytoplankton tests OK. Improvements have been made in sewage treatment systems (overflow controls). Zebra Mussels contribute to water clarity. Dissolved oxygen in the AOC is not impacted; however, some upstream areas may be. Some upstream areas may need to employ weed harvesting.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 5

USE IMPAIRMENT INDICATOR: Degradation of Benthos

IJC#: 6 AOC LOCATION: Oswego Harbor and River up to Dam

IMPAIRMENT STATUS & CAUSES: LIKELY - unknown

POLLUTION SOURCES: Potentially past industrial discharges, contaminated sediments, inactive hazardous waste sites, and nonpoint sources.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 4/97	NYSDEC	Final Report on Sediment Sample Results	U
2.	RAC/DEC	Define Restoration (delisting) Criteria	U
3.		Define/implement any needed Benthic Study	N
4.		Define/implement needed Management Plans	N
4.		Define Long-Term Monitoring Needs	N
5.	RAC/DEC	Reassess Use Impairment Status	N
6.			

COMMENTS: Toxicity tests conducted on sediments in 1987 suggest benthic macroinvertebrate populations may be impaired. A survey of macroinvertebrates in 1972 and 1978 found a greater number of species in the AOC than the upper reaches of the river. Results of the 1994 Oswego River Sediment Study indicate the harbor area as not impacted, and the lower river area was assessed as slightly impacted.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 6

USE IMPAIRMENT INDICATOR: Fish Tumors or Other Deformities

IJC#: 4 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: UNKNOWN - reassessing as not impaired

POLLUTION SOURCES: Potentially contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. -4/95	CORNELL	Perform Fish Study & Complete Report	C
2. 8/95	DFW	Eel & Catfish Study Results (to NYSDOH)	C
3. 9/95	NYSDEC	Water Quality Survey Results Report	C
4. 4/97	NYSDEC	Final Report on Sediment Sample Results	U
5. 7/97	RAC/DEC	Evaluate Sampling & Fish Study Results	N
6. 7/97	RAC/DEC	Define any Follow-Up Study/Monitoring	N
7. 7/97	RAC/DEC	Reassess Use Impairment Status	N
8.			

COMMENTS: Limited initial Stage 1 data and reports indicated rates exceed those in unimpacted areas. Recent study by Cornell indicates little evidence of impairment of fish health by contaminants in the Oswego Harbor. Although fish from the AOC contain contaminant levels sufficient to warrant the fish consumption advisory, these contaminant levels are below those causing any increase in tumors or other abnormalities in the fish. Based on this new tumor data, a use impairment status change to "not impaired" is to be considered by the Remedial Advisory Committee.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 7

USE IMPAIRMENT INDICATOR: Bird and Animal Deformities or Reproductive Problems

IJC#: 5 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: UNKNOWN - Potentially PCBs, dioxin, and octachlorostyrene; no definitive data reported.

POLLUTION SOURCES: Potentially contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1 12/96	RAC/DEC	Define Restoration (delisting) Criteria	C
2.		Define / Conduct Further Investigations	N
3.		Define / Implement Long-term Monitoring	N
4.		Define / Implement add'l Mgt. Plans	N
5.		Attain State, Fed, IJC tissue stds./objs.	N
6.		Confirm incident rates < inland controls	N
7.		Confirm wetlands support healthy community	N
8.	*	Biomonitoring results better than controls	N
9.	RAC/DEC	Reassess Use Impairment Status	N

COMMENTS: Contaminant levels in fish flesh exceed DEC criteria for protection of fish-eating wildlife. Additional studies needed. The delisting criteria are satisfied when studies demonstrate compliance with standards and objectives and healthy communities of significant species are observed. Incidence rates should not exceed controls with no reproductive problem.
* An extensive biomonitoring program is not warranted unless sufficient evidence suggests that deformities or reproductive impairment are probable.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 8

USE IMPAIRMENT INDICATOR: Degradation of Aesthetics

IJC#: 11 AOC LOCATION: AOC

IMPAIRMENT STATUS & CAUSES: UNKNOWN - Potentially algae and turbidity

POLLUTION SOURCES: Stormwater, spring runoff

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/94	NYSDEC	Conduct AOC Water Quality Sampling	C
2. 9/95	NYSDEC	Water Quality Survey Results Report	C
3. 9/95	NYSDEC	Study Results: No Harbor Pathogen Problem	C
4. 12/96	RAC/DEC	Define Restoration (delisting) Criteria	C
4. 7/97	RAC/DEC	Reassess Use Impairment Status/Needs	N
5.			
6.			

COMMENTS: No aesthetic problem has been identified. Based on the upstream observations of algae and duckweed, the Remedial Advisory Committee must consider the impact on the downstream Area of Concern in the use impairment status determination. The aesthetics of the harbor area during the 1995 summer season were observed as good.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 9

USE IMPAIRMENT INDICATOR: Degradation of Plankton Populations

IJC#: 13 AOC LOCATION: AOC

IMPAIRMENT STATUS & CAUSES: UNKNOWN - May need add'l investigation

POLLUTION SOURCES: Past hazardous waste disposal areas; physical habitat changes.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/94	NYSDEC	Conduct AOC Water Quality Sampling	C
2. 9/95	NYSDEC	Water Quality Survey Results Report	C
3. 9/95	NYSDEC	Study Results: No Impact but Inconclusive	C
4. 12/96	RAC/DEC	Define Restoration (delisting) Criteria	C
5. 7/97	RAC/DEC	Define any Add'l Study and Implement. Plan	N
6. 7/97	RAC/DEC	Reassess Use Impairment Status	N
7.			

COMMENTS: Phytoplankton and zooplankton population data needed to evaluate if plankton community structure significantly diverges from unimpacted control sites. Results of 1994 Water Quality Survey notes phytoplankton of the harbor quite different from that of the open lake. Large population of "Aphanocapsa" (may produce cyanobacteria toxins) was found in the harbor that may account for toxicity that interfered with the BOD tests. Zooplankton in the AOC were low which may reflect river conditions (plankton is usually not abundant in rivers). Water clarity was good and attributed to zebra mussels. Conclusions from this limited sampling of plankton were noted as difficult to make.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 10

USE IMPAIRMENT INDICATOR: Restrictions on Dredging Activities

IJC#: 7 AOC LOCATION: AOC harbor - expanded area

IMPAIRMENT STATUS & CAUSES: NOT IMPAIRED - navigational maintenance dredging only.

EXPANDED REVIEW - for other dredging proposals in the AOC.

POLLUTION SOURCES: Contaminated sediments from upstream hazardous waste sites and point and nonpoint source discharges

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.	EPA/DEC	Define contaminated sediment criteria	U
2.	NYSDEC	Define span of AOC dredge area	U
3.	NYSDEC	Conduct sediment analyses and evaluate	U
4.	NYSDEC	Confirm sediment criteria achieved	N
5.	NYSDEC	* Assure dredging restrict. safe/approved	N
6.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Shipping channel maintenance dredging is not impaired. Need to review expanded dredge area for restrictions on dredging and/or disposal activities. Disposal plans for dredge spoils must be reviewed and approved. USACOE has scheduled a maintenance dredging for 1997 that includes open Lake disposal that has been assessed at no impact.

* Delisting criteria are satisfied when the sediment criteria are achieved and restricted dredging activities (if any) are approved and registered. Studies should confirm that the cause of any restrictions is not the result of currently active AOC or watershed sources. Spoil disposal must not contribute to use impairments and beneficial uses must be protected.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **OSWEGO RIVER** FORM#: 11

USE IMPAIRMENT INDICATOR: Beach Closings

IJC#: 10 AOC LOCATION: Oswego Harbor AOC

IMPAIRMENT STATUS & CAUSES: NOT IMPAIRED - as defined by Stage 1 and Stage 2 documents.

EXPANDED REVIEW - needed for partial body contact in harbor area.

POLLUTION SOURCES: no beaches in the AOC, no sources documented

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/95	NYSDEC	Water Quality Survey Results Report	C
2. 9/95	NYSDEC	Study Results: No Impact	C
3. 12/96	RAC/DEC	Define Restoration (delisting) Criteria	C
4.	RAC/DEC	Define any Add'l Study and Implement	N
5. 7/97	RAC/DEC	Reassess Use Impairment Status	N

COMMENTS: The 1994 Water Quality Survey bacterial data indicates no partial-body non-bathing contact concern in the harbor AOC. Therefore the "Beach Closings" use impairment indicator status of "Not Impaired" remains unchanged after this additional consideration.

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APPENDIX D

Use Impairment Restoration and Protection (Delisting) Criteria

A detailed description of the restoration and protection (delisting) criteria for each use impairment indicator is provided below. Three groupings are used to present the delisting criteria based on the current evaluation of the status of each use impairment (as summarized in Update Table 1). Group 1 use impairment indicators have a status of impaired; Group 2 indicators have a status of needing further study; and, Group 3 indicators have a status of not impaired. A description of the rationale and supporting data needed to address the use impairment is included for each indicator's restoration and protection criteria. The objective, of course, is to achieve each criteria so that the use impairment indicator can be assessed as restored with beneficial uses protected.

Also refer to Appendix E, which contains a table from the Water Environment Federation's 1994 Conference, for quantitative examples of targets/objectives for delisting each use impairment indicator. This table builds on an earlier International Joint Commission guidance table describing listing/delisting criteria.

In this 1996 Oswego River RAP Update, Table 5 has been developed as a summary that lists the delisting criteria for use each use impairment and indicates the status of accomplishing each criteria. By defining specific standards and guidelines, the delisting criteria needed to declare a use impairment indicator as not impaired are provided below. Certain aspects of these criteria are dynamic and are subject to revision as progress is made in further defining the restoration targets for Great Lakes Areas of Concern. The three groups of use impairment indicators follow:

1. **Use Impairments rated as IMPAIRED:** These use impairment indicators have a status of impaired. Upon achieving all defined restoration and protection criteria, the use impairment indicator will be considered no longer impaired with its beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

   Fish and Wildlife Consumption Restrictions -

   * Restrictions on fish and wildlife consumption in the Area of Concern due to watershed or inplace contaminants are absent. Contaminant levels created by anthropogenic chemicals do not exceed current standards, objectives or guidelines in all non-migratory fish and wildlife. No public health advisories are in effect for human consumption.

   * U.S. Food and Drug Administration Action Level of 2 mg/kg PCBs in the edible portion of the fish; and, 0.05 mg/kg in fish tissue accomplished to protect human health in New York State. (Determine chemicals of concern and allowable levels for all consumed species. FDA levels and AOC levels may differ; need to verify standards and specify acceptable levels)

* Any remaining restrictions on fish and wildlife consumption are due to upstream sources that are addressed by other management plans such as Lakewide Management Plans (LaMPs).

* Cleanup standards have been accomplished both in contaminated river sediments and land-based hazardous waste sites. (Specify standards)

Rationale: Delisting criteria are satisfied when the absence of consumption advisories due to sources from the AOC and its watershed are in accordance with IJC guidelines and address jurisdictional, state, and federal standards.

Supporting Data: Document fish and wildlife study reports that indicate satisfactory consumption result levels. Verify remediation results assure protection.

Degradation of Fish and Wildlife Populations -

* Environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical, and biological habitat present.

* Fish and wildlife objectives for the AOC are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals.

* In the absence of community structure data, fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.

* Quantitative fishery targets achieved indicating a self-sustaining mesotrophic community. Targets include: kg/ha units of biomass of fish in littoral habitats, percent of native species, and species richness per survey transect.

Rationale: Delisting criteria are satisfied for fish when populations are determined to be healthy and self-sustaining in a mesotrophic environment. Effort is needed to demonstrate that environmental threats to all species are addressed by fish and wildlife management programs consistent with the GLWQA, Great Lakes Fishery Commission goals, and Great Lakes ecosystem objectives. The construction of the seaway and power dam changed the ecology significantly such that a post 1959 fish and wildlife baseline needs to be developed.

Supporting Data: Fish and wildlife community structure data (number and balance) supports conclusions; abundance and composition is not impaired based on historical data. Desired levels within a statistical range achieved. Sediment bioassays with fish confirm no significant toxicity. Surveys indicate healthy, reproducing populations of benthivores and piscivores. Bird preservation guidelines, nature observation, aesthetics, and resident and transitory species guidelines are achieved.

Loss of Fish and Wildlife Habitat -

* Amounts and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.

* Amount and type of wetlands and riparian vegetation adequate with beneficial uses protected.

* Local plans or other management plans in place to restore and protect habitat.

* Federal Energy Regulatory Commission (FERC) relicensing requirements accomplished to enhance and protect habitat.

Rationale: Delisting criteria are satisfied when fish and wildlife management goals have been achieved and protected. The location of habitat creation will be based on compatibility with other use goals, such that an acceptable balance among habitat, shipping and boating interests is achieved. A post-power dam construction habitat baseline needs development. Stakeholders, Remedial Advisory Committee members, and biological habitat assessment professionals all have roles in identifying acceptable habitat levels.

Supporting Data: Describe desired habitat and management goals. List specific habitat creation and/or rehabilitation projects and the status of each in the AOC. (For example, additional littoral shore may be provided by the creation of islands.) Describe fish and wildlife management programs. Demonstrate rehabilitation and protection of habitat. Document that current habitat surveys indicate an adequate amount of habitat is present with no additional loss attributable to water or sediment quality. Document FERC relicensing requirements and accomplishments.

Eutrophication or Undesirable Algae -

* No persistent water quality problems attributed to cultural eutrophication (e.g. none of the following present: dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity).

* Ambient water quality survey data consistently equal to or better than standards, criteria, or guidelines.

* Beneficial goals are achieved and maintained including boating, fishing, sightseeing, nature observation, aesthetics, passive and active recreational activities.

Rationale: Delisting criteria are satisfied when survey results indicate phosphorus concentrations and loadings, chlorophyll, ammonia, water clarity, dissolved oxygen and other ambient water quality levels are consistently better than standards, criteria, and guidelines. The observation of algal blooms in the AOC or downstream needs to be evaluated as to the cause, the undesirable nature and any proposed remedial action.

Supporting Data: Suggested thresholds for ambient water quality in the AOC include: phosphorus concentration < 20 ug/l, Secchi disc transparency > 1.2 meters, dissolved oxygen > 6 mg/l, unionized NH3 < 0.02 mg/l.

2. **Use Impairments rated as NEEDING FURTHER STUDY:** These use impairment indicators have an impairment status of likely, unknown, or under expanded review. Further investigation or assessment is needed. Upon achieving all defined restoration and protection criteria, the beneficial use will have been enhanced by the RAP process, the RAP goals satisfied, and the use impairment indicator considered no longer impaired with its beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

Degradation of Benthos -

* Benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics.

* In the absence of community structure data, the toxicity of sediment-associated contaminants is not significantly higher than unimpacted control sites.

* Populations of mesotrophic species are present in the benthos where suitable substrates are located (i.e. waters with moderate nutrients have species diversity).

* Resident fauna do not have elevated levels of contaminants.

Rationale: Delisting criteria are satisfied when benthic surveys demonstrate a healthy community. In the absence of community data, sediment quality criteria are to be achieved such that no threat is evident. Because of boating and shipping, the emphasis is placed on demonstrating the absence of acute and chronic toxic effects of sediment associated contaminants and on demonstrating bioassay results comparable to controls.

Supporting Data: Benthic macroinvertebrate community structure surveys, at representative locations in the AOC, are desired with results comparable to unimpacted control site composition. When performed, bioassay results comparable to control site values are desired. Demonstrate that appropriate sediment quality criteria requirements are achieved. Need to determine acceptable statistical deviation of benthic community structure and control site relationship.

Fish Tumors or Other Deformities -

* Incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites.

* Survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers.

* Compliance with IJC, state and federal biological tissue standards or objectives.

* No reproductive deformities in observed resident species.

Rationale: Delisting criteria are satisfied when survey results are consistent with expert opinion on tumors and there are no reports of tumors or other deformities based on acknowledged background incidence.

Supporting Data: Survey results confirm the absence of tumors and demonstrate no significant difference from control sites. Studies document that the AOC and watershed sources are not the cause of any reported incidence. Fishing and nature observation goals met.

Bird or Animal Deformities or Reproductive Problems -

* Compliance with IJC, state and federal biological tissue standards or objectives.

* Compliance with the establishment of appropriate sediment quality criteria.

* Incidence rates of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels of inland control populations.

* Wetlands support healthy communities of significant species.

* When conducted, biomonitoring study results are better than standards or objectives when compared to unimpacted control sites.

Rationale: Delisting criteria are satisfied when studies demonstrate compliance with tissue standards or objectives which indicates healthy communities; this protection level serves to prevent the initiation of tumors and deformities in species and their consumers. Incidence rates should not exceed control sites. Without sufficient evidence to suggest that deformities or reproductive impairment is probable, an extensive biomonitoring program is not warranted.

Supporting Data: Survey results from bird, animal, and amphibian populations confirm the absence of deformities or reproductive problems and demonstrate no significant difference from control sites. AOC and watershed sources are not the cause of any incidence. Measurements verify a healthy community and population balance. Habitat and nature observation goals are achieved.

Degradation of Aesthetics -

* Area of Concern waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color, or turbidity, or unnatural odor (e.g. oil slick, surface scum).

* No increase in turbidity that would cause a visible contrast from natural conditions.

* No visible residue of oil or floating substances.

* Any sightings of oil, scum, floating objects, or reports or objectionable odors are spill related and at a frequency of occurrence and cleanup response acceptable to the public (instances of repeated spills require improved response and prevention measures).

Rationale: Delisting criteria are satisfied when the narrative standards for ambient water quality parameters such as suspended solids, oil, and color are achieved. These require no presence that would adversely affect the waters best use or interfere with achieving the beneficial use goals.

Supporting Data: Document that the quantitative targets established for dischargers having the potential to cause such conditions are achieved: 3 mg/l for suspended solids, 15 mg/l for oil and no floating substances. Verify that water clarity data, bioassay, and bacteria survey data support aesthetic use goals. Document that the implementation of remedial measures involving physical construction provide protection of beneficial uses and improve AOC aesthetics.

Degradation of Plankton Populations -

* Phytoplankton or zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics.

* In the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters (i.e. no growth inhibition).

* Healthy fish communities are present in the Area of Concern which indicates a viable plankton community.

Rationale: Delisting criteria are satisfied when a healthy fish community can be demonstrated. This incorporates the ecosystem approach. Bioassay data should confirm no significant toxicity in ambient waters in accordance with AOC beneficial use goals.

Supporting Data: Plankton community structure data and bioassay toxicity data support observations of the presence of healthy fish communities. Plankton community structure favorable when compared to unimpacted sites in population, composition, and statistical variability.

3. **Use Impairments rated as NOT IMPAIRED:** These use impairment indicators have a status of not impaired. Upon confirming that all defined restoration and protection criteria have been achieved, the use impairment indicator will be verified as not impaired with beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

Restrictions on Dredging Activities -

* Concentrations of metals, trace organic compounds and nutrients in the sediment within the AOC (located within the actual or potentially expanded areas of shipping and maintenance dredging) do not exceed the sediment quality standards, criteria, or guidelines for acceptable dredge and disposal material (lowest effect levels), except where background concentrations exceed levels.

* When sediment criteria are exceeded, any restrictions on dredging are specific to inplace conditions located within the actual or potential shipping routes and are not attributable to current AOC watershed contributions. Restricted dredging activities are registered with and have appropriate authority approval. Restrictions do not contribute to other use impairments and assure beneficial use protection.

* When restricted dredging is approved, sediment disposal activities are also registered and approved by appropriate authority. These disposal activities do not contribute to other use impairments and assure beneficial use protection.

Rationale: Delisting criteria are satisfied when contaminants in sediments do not exceed standards, criteria, or guidelines such that they are not causing restrictions on the dredging. Where restrictions exist, dredging and disposal activities are approved, do not contribute to other use impairments, and provide use protection. Restricted dredging areas are due to inplace conditions and are not the result of currently active AOC or other watershed sources.

Supporting Data: Sediment core results are in compliance with IJC and state sediment quality standards, criteria and guidelines. Where data is available, provide graphic displays of trends. Restricted dredging and disposal activities must be monitored to assure beneficial use protection. Assure against sediment toxicity.

Beach Closings -

* When waters, which are commonly used for total body contact or partial body contact recreation, do not exceed standards, objectives, or guidelines for such beneficial use.

* For public swimming beaches, the waters must be free of chemical substances capable of creating toxic reactions or irritations to skin/membranes, must achieve numerical and clarity standards for safety, and must be free of public health advisories.

* Beaches are considered safe for swimming when the daily geometric mean of a minimum of five fecal coliform samples collected from different sites within the beach area is less than 100 colonies per 100 ml. based on standardized sampling protocols.

* Ambient water quality standards are not exceeded: The monthly median value for total coliforms per 100 ml., and more than 20 percent of the samples, from a minimum of five samples, does not exceed 2,400 and 5,000 respectively. The monthly geometric mean of fecal coliforms per 100 ml. from a minimum of five samples, does not exceed 200.

* Exceptions apply to stormwater events in non-bathing beach areas located downstream below combined sewer overflows. Monitoring may indicate some standards and guideline exceedences; however, these non-bathing partial body contact areas must present no threat to downstream designated bathing areas.

Rationale: Delisting criteria are satisfied when bathing beach and partial body contact water standards and guidelines are met. Concentrations of fecal coliform and E. coli should be consistently below 100 colonies per 100 ml. sampled.

Supporting Data: Coliform data, bathing beach reports, and AOC open water quality surveys indicate the beneficial use of bathing in beach areas and partial body contact in non-bathing areas is in compliance with regulations and protected against health threats.

Tainting of Fish and Wildlife Flavor -

* There are no complaints about fish tainting.

* Survey results confirm no tainting of fish and wildlife flavor.

* The presence of tainting contaminants (such as phenols) in the water column do not exceed ambient water quality standards and criteria.

Rationale: Delisting criteria are satisfied when there is an absence of reports of fish tainting and surveys support this conclusion. Compliance with ambient water quality standards, objectives, and guidelines indicates no tainting problem.

Supporting Data: Documented reports and ambient water quality data support beneficial use goals.

Drinking Water Restrictions, Taste and Odor Problems -

* The absence of taste and odor problems for treated drinking water supplies.

* No exceedence of human health standards, guidelines, or objectives for treated drinking water supplies for densities of disease causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances.

* For treated drinking water, the treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in other comparable portions of the Great Lakes which are known not to be degraded (e.g. settling, coagulation, and disinfection treatment is standard).

Rationale: Delisting criteria are satisfied when standard drinking water treatment practices are employed and human health standards and guidelines are achieved. Contaminants from the Area of Concern watershed and the AOC should not be causing drinking water quality problems in the AOC or contributing to impacts on drinking water quality in areas outside of the AOC.

Supporting Data: Ambient water quality and treated drinking water quality survey data confirm compliance with the New York State standards and guidelines. Document that there is no significant health impact from the area surrounding the Area of Concern.

Added Costs to Agriculture or Industry -

* No additional costs are required to treat water prior to use due to contamination or spills within the Area of Concern.

* No downstream impact due to watershed or AOC contamination.

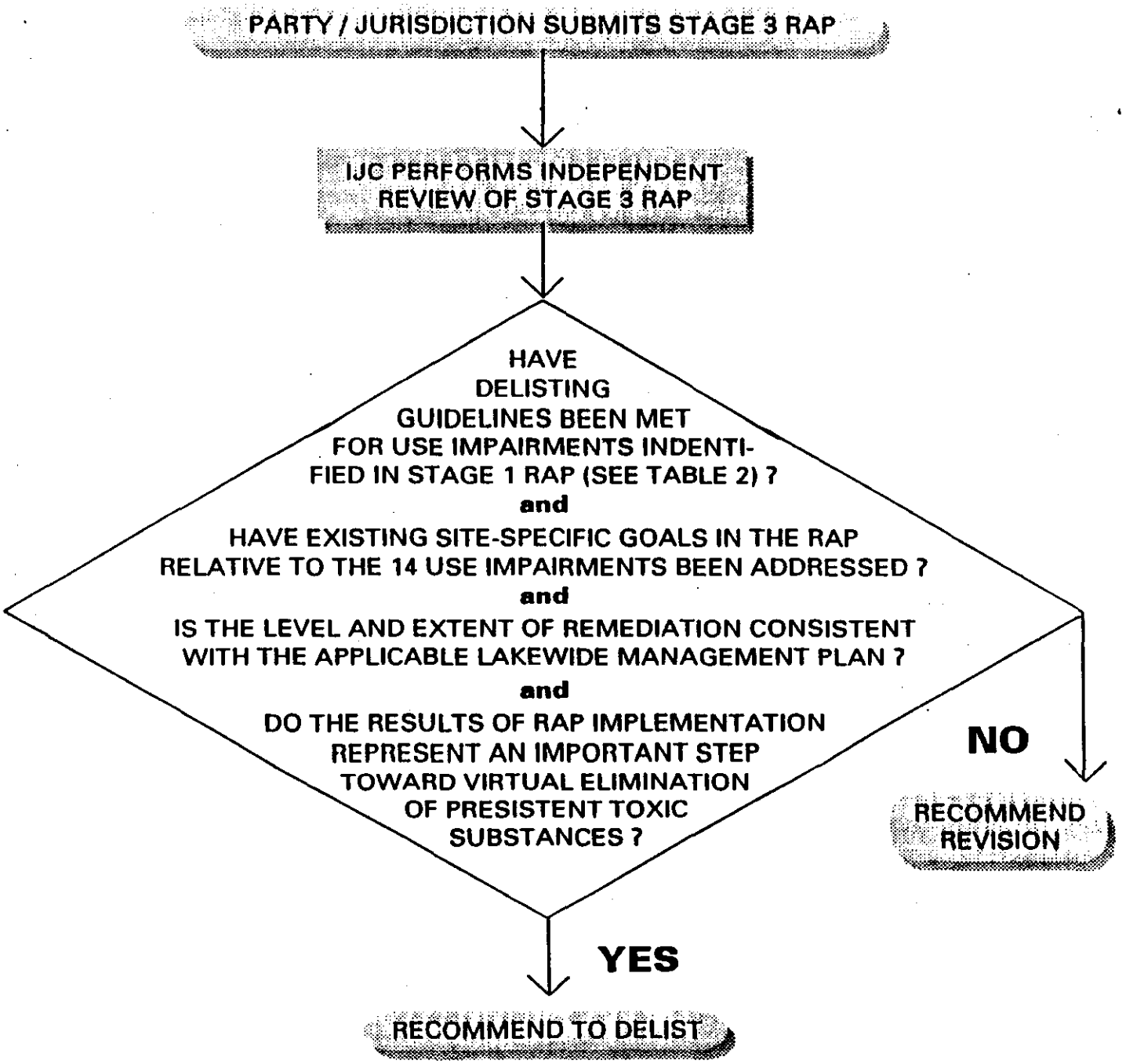
Rationale: Delisting criteria are satisfied when there are no additional costs required to treat the water prior to use for agricultural or industrial purposes (e.g. livestock watering, irrigation, crop-spraying, noncontact food processing, industrial application).

Supporting Data: No reports of increased costs to agriculture or industrial business due to spills or inplace contamination affecting water use.

APPENDIX E

Use Impairment Listing / Delisting Guidance

A GENERALIZED PROCESS FOR IJC REVIEW OF A STAGE 3 RAP AND APPLICATION OF GUIDELINES USED TO MAKE RECOMMENDATIONS ON DELISTING AREAS OF CONCERN.



Listing and delisting guidelines for Great Lakes Areas of Concern and examples of quantitative objectives and targets for use restoration.

USE IMPAIRMENT	LISTING AND DELISTING GUIDELINES	EXAMPLE OF QUANTITATIVE OBJECTIVE/TARGET FOR USE RESTORATION
Restrictions on fish and wildlife consumption	Listing Guideline: When contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Delisting Guideline: When contaminant levels in fish and wildlife populations do not exceed current standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife. • Contaminant levels in fish and wildlife must be due to contaminant input from watershed.	Over 159,000 kg of PCBs reside in Kalamazoo River (Michigan) sediments and have resulted in contamination of the fishery. Two levels of cleanup standards apply: a short-term target based on the U.S. Food and Drug Administration Action Level of 2 mg/kg PCBs in the edible portion of fish; and a long-term target of 0.05 mg/kg PCBs in fish tissue established to protect human health through Rule 57 of Michigan Water Quality Standards (Waggoner and Creal 1992).
Tainting of fish and wildlife flavor	Listing Guideline: When ambient water quality standards, objectives, or guidelines, for the anthropogenic substance(s) known to cause tainting, are being exceeded or survey results have identified tainting of fish or wildlife flavor. Delisting Guideline: When survey results confirm no tainting of fish or wildlife flavor.	In Spanish River (Ontario), 72 hour in situ fish exposure under low flow and subsequent sensory evaluation were used to re-evaluate fish tainting due to mill effluent (upstream control site and downstream effluent plume). A triangle test (three samples to each of eleven panelists; two samples the same and one different) was used to determine a difference (Jardine and Bowman 1992). The number of correct responses must not be significantly different (95% confidence) from chance of guessing odd sample. Based on this approach, a sensory panel could not distinguish tainting in fish exposed to mill effluent.
Degraded fish and wildlife populations	Listing Guideline: When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field validated, fish or wildlife bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contaminants. Delisting Guideline: When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. An effort must be made to ensure that fish and wildlife objectives for Areas of Concern are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. Further, in the absence of community structure data, this use will be considered restored when fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.	In Hamilton Harbor (Lake Ontario), the overall objective is to shift from a fish community indicative of eutropy, to a self-sustaining community indicative of mesotrophy. Quantitative fishery targets include (Hamilton Harbour Remedial Action Plan Writing Team 1992): 200-250 kg/ha total biomass of fish in littoral habitats; 40-60 kg/ha piscivore biomass in littoral habitats; 70-100 kg/ha specialist biomass in littoral habitats; 30-90 kg/ha generalist biomass in littoral habitats; native piscivores representing 20-25% of total biomass; 80-90% native species; and a species richness of 6-7 species per survey transect.

Fish tumors or other deformities	Listing Guideline: When the incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers. Delisting Guideline: When the incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites and when survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers.	In the Black River (Ohio), PAH contamination is known to cause fish tumors. Based on standardized fish survey techniques, two targets apply: no neoplastic liver tumors in a minimum sample of 25 brown bullhead (≥ two years old); and the incidence rate of skin and lip tumors must be less than the incidence rate at a control site. 150 control site and 130 contaminated site fish would be needed to verify a 5% difference (2% vs 7%; 95% confidence)(Bauman 1992).
Bird or animal deformities or reproductive problems	Listing Guideline: When wildlife survey data confirm the presence of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species. Delisting Guideline: When the incidence rates of deformities (e.g. cross-bill syndrome) or reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels in inland control populations.	In the lower Green Bay and Fox River Area of Concern (Wisconsin), historical discharges from the largest concentration of pulp and paper mills in the world are believed to have been the primary source of the 30,000 kg of PCBs that now reside in the sediments of the river downstream of Lake Winnebago and up to 15,000 kg of PCBs in Green Bay. Studies have demonstrated avian exposure to contaminants through aquatic food chains. A 1983 study of two colonies of Forster's tern, showed the reproductive success of a lower Green Bay colony to be significantly impaired when compared to a relatively clean reference colony on Lake Poygan, upstream from industrial activities on the Fox River. Based on the 1983 study and an additional study in 1988, reproductive success was defined as: a hatching rate of 90% based on the mean hatchability of the 1983 reference colony at Lake Poygan (Kubiak et al. 1989) and the mean hatchability of 155 populations of 113 avian species (Koenig 1982); a mean fledging rate of between 1.0 chick/pair judged necessary to sustain the Forster's tern population (Trick 1982) and 1.55 chicks/pair measured at the 1983 reference colony; an average incubation time of 23 days; and a normal growth rate of chicks (body weight and length of wing, tarsus, bill and head) based on 1988 data for chicks known to have successfully fledged from the Green Bay colony (Harris et al. 1993).
Degradation of benthos	Listing Guideline: When benthic macroinvertibrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls. Delisting Guideline: When benthic macroinvertibrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls.	In Canada, site-specific guidelines for benthos are being established from a reference site data base (i.e. biological attributes and environmental variables) using multivariate techniques, such as cluster and ordination analysis (Reynoldson and Zarull 1993). Reference site benthic communities are grouped using cluster analysis. The site environmental variables, which are not affected or minimally affected by anthropogenic activity, are then used as predictors to group the sites into the appropriate biological clusters. The benthic community structure and the same nine environmental variables (depth, NO^3, silt, aluminum, calcium, loss on ignition, alkalinity, sodium, pH) are measured at the test sites. Using the environmental predictors and the discriminant model (derived from the reference site data base), each site is assigned to a biological cluster. The benthic invertebrate data are then similarly analyzed. If the observed (biological community) cluster lies outside the predicted cluster, then the site is judged to be impaired. In the Great Lakes, 335 sites have been sampled and the multivariate "model" developed from this data base correctly predicts biological site clustering with 90% accuracy (Reynoldson et al. 1994). In addition, acute and chronic measures of "toxicity" (including growth and reproduction) are performed at these same sites, to provide measures of background performance for the appropriate, indigenous organisms that are to be used in assessing sediment toxicty (see below).

Restrictions on dredging activities	Listing Guideline: When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities. Delisting Guideline: When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	Great Lakes dredging guidelines were developed to provide protection against the short and long-term impacts associated with the disposal of dredged sediments. These guidelines employ bulk chemistry measurements for a few parameters that are assessed using either water quality equivalent standards or background concentration classifications (Zarull and Reynoldson 1992; IJC 1982). More recently, the Ontario Ministry of Environment and Energy has released a biologically-based, sediment contaminant concentration guidelines for use in assessing bottom sediments in Areas of Concern and for use in assessing dredged material disposal. These chemical concentration guidelines are also supported through the use of site-specific bioassays (OMOE 1992). In many areas outside the Great Lakes, the Sediment Quality Triad Approach (i.e. chemistry, benthos community structure, and bioassays) is being used to assess sediment problems and recommend remedial actions (Chapman 1990). A similar method has been recommended for use in the Great Lakes (IJC 1987, 1988; Zarull and Reynoldson 1992). Endpoints for benthos community structure are being established as described above, using reference sites throughout the nearshore Great Lakes. Sediment bioassays, an essential adjunct, provide confirmation that sediment is the source of the impact, rather than the water column or other factors, which are integrated by the benthos. As with community structure, a reference site (bioassay) data base has been established (Day et al. unpublished report). Examples of quantitative endpoints for standard sediment bioassays performed at "clean" sites include: Chironomus riparius 10-day bioassay: 84% survival in all sediments and growth of 0.34 mg dry weight per individual; Hexagenia limbata 21-day bioassay: 95% survival in all sediments, growth of 2.3 mg dry weight per individual in sand ($\geq$ 25%), and growth of 8.0 mg dry weight in silt ($\geq$ 40%); Hyallella azteca 28-day bioassay: 44% survival in $\leq$ 20% silt, 88% survival in > 20% silt, and growth of 0.48 mg dry weight in all sediments; and Tubifex tubifex 28-day bioassay: nine cocoons per adult in all sediments and 24 young per adult in all sediments. If the community criteria (CC) and the bioassay criteria (BC) are met, then open water disposal is acceptable. If neither CC nor BC are met, then confinement and/or treatment are necessary. If CC are not met, but all BC are, then open water disposal is possible since community problem is not likely sediment related. If CC are not met, but some BC are, then open water disposal is dependent upon the degree of acceptable risk. If CC are met, but some BC are not, then open water disposal is possible since the problem is not likely contaminant related. If CC are met, but all of the BC are not, then a careful reassessment of methods/procedures is required (this could also be a result of a highly adapted indigenous community).

Eutrophication or undesirable algae	Listing Guideline: When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication. Delisting guideline: When there are no persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.	In Saginaw Bay, Lake Huron, modelling phosphorous loading-phosphorous concentration-threshold odor value relationships has led to establishment of a 15 mg/L total phosphorous (TP) concentration for the inner bay (Bierman et al. 1983). The TP loading target is 440 tonnes/yr, which will result in threshold odor values < 3 and a TP concentration of 15 mg/L. In Green Bay, Lake Michigan, regression analysis has been used to model the relationships among TP loading, TP concentration, total suspended solids, chlorophyll a, and water clarity. Based on a 0.7 m Secchi depth (summer average) necessary to restore submerged aquatic vegetation (McAllister 1991), trophic state objectives were established as follows: 90 ug/L summer average TP, 25 ug/L summer average chlorophyll a, and 10 mg/L total suspended solids. These values correspond to an annual TP load of about 350 tonnes/yr, or a 50% reduction in current loading (WDNR 1993).
Restrictions on drinking water consumption or taste or odor problems	Listing Guideline: When treated drinking water supplies are impacted to the extent that: 1) densities of disease causing organisms or concentrations of hazardous/toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection). Delisting Guideline: For treated drinking water supplies: 1) when densities of disease causing organisms or concentrations of hazardous/toxic chemicals or radioactive substances do not exceed human health standards, objectives or guidelines; 2) when taste and odor problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed standard treatment as defined above.	In the Maumee River Area of Concern in southwestern Lake Erie, nitrate levels have increased above 10 mg/L during spring and fall in some municipal water supplies. When this occurs, drinking water consumption warnings are issued because elevated levels of nitrate have been found to be harmful to certain groups of people (e.g. excessive nitrate causes methemoglobinemia in infants). Drinking water consumption warnings are removed by the municipalities when nitrate levels fall below 10 mg/L for two consecutive days based on standardized sampling and analytical techniques. In Saginaw Bay, Lake Huron, taste and odor problems associated with blue-green algae have been identified in the municipal water supplies. Threshold odor is quantitatively measured and ranked on a scale from one to ten based on the dilution necessary to ensure that taste and odor are barely detectable, with a value of three being the U.S. Public Health Service Threshold Standard (Bierman et al. 1983). Threshold odor is measured daily and biweekly averages are calculated to determine compliance with the U.S. Public Health Service Standard of three.
Beach closings	Listing Guideline: When waters, which are commonly used for total body-contact or partial body-contact recreation, exceed standards, objectives, or guidelines for such use. Delisting guideline: When waters, which are commonly used for total body-contact or partial body-contact recreation, do not exceed standards, objectives, or guidelines for such use.	Along the Metropolitan Toronto Waterfront (Lake Ontario), numerous beaches are posted unsafe for swimming as a result of high bacterial counts from stormwater runoff and combined sewer overflows. The Ontario Ministry Health Standard is 100 colonies Escherichia coli/100 ml. Beaches are considered safe for swimming when the daily geometric mean of a minimum of five samples collected from different sites within the beach area is less than 100 colonies/100 ml based on standardized sampling protocols (Ontario Ministry of Health 1992). In Wisconsin, both narrative and numerical standards are set for public swimming beaches. Waters must be free of chemical substances capable of creating toxic reactions or irritations to skin/membranes, must achieve numerical bacterial standards, and must achieve a 4 m Secchi Disc water clarity standard for safety reasons (Wisconsin Adm. Rule HSS 171).

Degradation of aesthetics	Listing Guideline: When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum). Delisting Guideline: When the waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).	In New York, narrative standards for suspended sediment and color are set at "none" that would adversely affect the waters for their best use (New York State 1991). For turbidity, the standard is no increase that would cause a visible contrast from natural conditions and, for oil and floating substances, it is no residue that would be visible. If conditions are attributable to unnatural causes and sources, New York ambient water quality standards are used to establish reduction targets in order to make a determination. Examples of quantitative targets that have been established for dischargers causing such conditions include: 3.0 mg/L for suspended solids; and 15 mg/L for oil and floating substances.
Added costs to agriculture or industry	Listing Guideline: When there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including but not limited to, livestock watering, irrigation and crop-spraying) or industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing). Delisting Guideline: When there are no additional costs required to treat the water prior to use for agricultural or industrial purposes (as defined above).	In the St. Clair River Area of Concern, "added costs to agriculture or industry" has been identified as an impaired beneficial use. Food processing industries in Ontario and a salt processes facility in Michigan had to temporarily shut down their intakes due to upstream spills in 1990 and 1989, respectively (Ontario Ministry of the Environment and Michigan Department of Natural Resources 1991). In both instances, added costs to these industries were approximately $2,000/hour during the spill events. This use is considered restored when there are no added costs to treat the water prior to use in industrial or agricultural processes.
Degradation of phytoplankton and zooplankton populations	Listing Guideline: When phytoplankton or zooplankton community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when relevant, field-validated, phytoplankton or zooplankton bioassays (e.g. Ceriodaphnia; algal fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters. Delisting Guideline: When phytoplankton or zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use is considered restored when plankton bioassays confirm no toxicity in ambient waters.	Limited attempts have been made to quantify objectives based on zooplankton and phytoplankton community structure due to the expensive and time-consuming nature of plankton enumeration and quantification. Bioassay endpoints are more frequently used. Degraded zooplankton populations were identified as an impaired use in the Cuyahoga River due to chronic toxicity of ambient waters below the Akron Wastewater Treatment Plant. Toxicity was measured by the seven-day, three brood Ceriodaphnia test. Ceriodaphnia are easily cultured, found in the Great Lakes, sensitive to toxic substances, and have a short maturation time. Based on standard Ceriodaphnia bioassay protocols (IJC 1987), zooplankton populations were considered not impaired when there was no significant difference in survival and number of young per female relative to controls ($P < 0.05$).
Loss of fish and wildlife habitat	Listing Guideline: When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a pertubation in the physical, chemical or biological integrity of the Boundary Waters, including wetlands. Delisting Guideline: When the amount of physical, chemical and biological habitat required to meet fish and wildlife management goals has been achieved and protected.	Approximately 80% of the wetlands in Hamilton Harbour, Lake Ontario have been lost to development. The water use goal for the fishery is "that water quality and fish habitat should be improved to permit an edible, naturally-reproducing fishery for warmwater species, and water and habitat conditions in Hamilton Harbour should not limit natural reproduction and the edibility of cold water species." This water use goal has been translated into the following targets for fish habitat (Hamilton Harbour Remedial Action Plan Writing Team 1992): increase the quantity of emergent and submergent aquatic plants in the Hamilton Harbor, Cootes Paradise, Grindstone Creek Delta, and Grindstone Creek Marshes to approximately 500 ha in accordance with the Fish and Wildlife Habitat Restoration Project; rehabilitate 344 ha of littoral fish habitat; rehabilitate 39 ha of pike spawning marsh and nursery habitat; provide additional 10 km of littoral shore by creating 5 km of narrow islands; and achieve water clarity as measured by Secchi Disc during the summer season of 3.0 m in the harbor and 1.0 m in the Cootes Paradise and Grindstone Creek.

APPENDIX F

LIST OF ACRONYMS

AOC	Area of Concern
ARCS	Assessment and Remediation of Contaminated Sediments
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation Factor
BAT	Best Available Technology
BCC	Bioaccumulative Chemicals of Concern
BMP	Best Management Practice
CAAA	Clean Air Act Amendments
CAC	Citizen Advisory Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPP	Citizen Participation Plan
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWQCC	County Water Quality Coordinating Committees
CZARA	Coastal Zone Act Reauthorization Amendments
DDE	Dichlorodiphenyl-dichloroethene
DDT	Dichlorodiphenyltri-chloroethane (Dicophane)
DED	Department of Economic Development
DEIS	Draft Environmental Impact Statement
DfE	Design for the Environment (EPA Program)
DER	Division of Environmental Remediation
DOW	Division of Water
DRC	Discharge Restriction Categories
DFW	Division of Fish and Wildlife (merged with Marine Resources)
DFWMR	Division of Fish, Wildlife and Marine Resources

EBPS	Environmental Benefit Permit Strategy
EPF	Environmental Protection Fund
ESP	Environmental Services Program
FERC	Federal Energy Regulatory Commission
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GLIN	Great Lakes Information Network
GLNPO	Great Lakes National Program Office
GLTRL	Great Lakes Technical Resource Library
GLTxRE	Great Lakes Toxic Reduction Effort
GLWQA	Great Lakes Water Quality Agreement
GLWQG	Great Lakes Water Quality Guidance
GLWQI	Great Lakes Water Quality Initiative
HCB	Hexachlorobenzene
HRA	Health Risk Assessment
IEP	Industrial Effectiveness Program (DED)
IFM	Integrated Facility Management (M2P2)
IJC	International Joint Commission
IRM	Interim Remedial Measure
ITES	Industrial Technology Extension Service
LaMP	Lakewide Management Plan
M2P2	Multimedia Pollution Prevention
MACT	Maximum Achievable Control Technology
MCP/DEIS	Municipal Compliance Plan/Draft Environmental Impact Statement
MDL	Method Detection Limits

NAFTA	North American Free Trade Agreement
NAWMP	North American Waterfowl Management Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRA	Natural Resource Damage
NSPS	New Source Performance Standards
NYMEP	New York Manufacturing Extension Partnership
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	NYS Department of Health
NYSDOS	NYS Department of State
NYSPPIC	NYS Pollution Prevention Information Clearinghouse
NYSSWCC	NYS Soil and Water Conservation Committee
OCS	Octacholorstyrene
OPA	Oil Pollution Act
OTC	Ozone Transport Commission
PAC	Public Advisory Committee
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated Biphenyls
PPIS	Pollution Prevention Incentives for States
PRP	Potentially Responsible Parties
PSA	Preliminary Site Assessment
PWP	Priority Water Problem
RAC	Remedial Action Committee
RACT	Reasonably Available Control Technologies
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RFP	Request for Proposal
RI/FS	Remedial Investigation/Feasibility Study
RIBS	Rotating Intensive Basin Studies
ROD	Record of Decision

SARA	Superfund Amendment and Reauthorization Act
SBAP	Small Business Assistance Program
SPDES	State Pollution Discharge Elimination System
SRF	State Revolving Fund
SUNY	State University of New York
TAGA	Trace Atmospheric Gas Analyzer
TRI	Toxic Releases Inventory
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
USFWS	United States Fish and Wildlife Service
USATSDR	United States ATSDR (see ATSDR)
VOC	Volatile Organic Compounds
WQEPP	Water Quality Enhancement & Protection Policy
WQMAC	Water Quality Management Advisory Committee
WWW	World Wide Web
YOY	Young-of-the-Year (fish Study)

APPENDIX G

REFERENCES

1. DePinto, J., J. Hassett, M. Velleux, and S. Burns. 1995. A Screening-Level Mass Balance Analysis of Mirex Transport and Fate in the Oswego River. Journal of Great Lakes Research Report. 17 pp.

2. Giesy, J.P., J.P. Ludwig and D.E. Tillitt. 1994. Deformities in birds of the Great Lakes region: assigning causality. Environmental Science & Technology, 28, No. 3, 128A-135A.

3. Great Lakes Fishery Commission. 1987. Guidelines for fish habitat management and planning in the Great Lakes. Special publication 87-1.

4. Hartig, J.H. and M.A. Zarull (eds.). 1992. Under RAPs: Toward Grassroots Ecological Democracy in the Great Lakes Basin. Univ. of Michigan Press, P.O. Box 1104, Ann Arbor, Mi 48106-1104. 289 pp.

5. Hartig, J.H. 1993. A survey of fish-community and habitat goals/objectives/targets and status in Great Lakes areas of concern. Great Lakes Fish. Comm. 95 pp.

6. Hovinga, M.E., M. Sowers and H.E.B. Humphrey. 1993 Environmental exposure and lifestyle predictors of lead, cadmium, PCB, and DDT levels in Great Lakes Fish eaters. Arch. Environ. Health, 48, No.2, 98-104.

7. Horner, R.R. and J.J. Skupien. 1994. Fundamentals of urban runoff management: technical and institutional issues. 302 pp.

8. International Joint Commission Review Comments of the Oswego River Stage 2 Remedial Action Plan. April 20, 1993. 8 pp.

9. International Joint Commission (by the LURA Group). 1996. Pathways to Success: Workshops and Strategies for Sustaining RAP Public Advisory Committees - A Guidebook. 76 pp.

10. Litton, S. 1996. New York Sources of Waterborne Contaminants to Lake Ontario. 100 pp.

11. Longabucco, P. 1991. Controlling agricultural nonpoint source water pollution in New York State: a guide to the selection of best management practices to improve and protect water quality. NYSDEC, Albany, N.Y. 169 pp.

12. National Association of Conservation Districts. 1994. The District Role in Developing and Implementing Remedial Action Plans for AOCs in the Great Lakes Basin. 5 pp.

13. New York State Department of Environmental Conservation (NYSDEC). Oswego River Remedial Action Plan Update, June 1992 and Summary Update 1995.

14. NYSDEC. Oswego River Remedial Action Plan Stage II, June 1991.

15. NYSDEC. Oswego River Remedial Action Plan Stage I, Feb. 1990.

16. NYSDEC. 1996. Oswego River Sediment Study

17. NYSDEC. 1994. Oswego Harbor Survey

18. NYSDEC. 1993. Pollution Prevention Guidance for Local Governments.

19. NYSDEC. 1993. Priority Water Problem List: summary and county listing documents.

20. NYSDEC. 1992. New York State 25-Year Plan for the Great Lakes.

21. NYSDEC. 1995. Technical Guidance for Creating Wetlands. 16 p.

22. NYSDEC. 1994. Watershed Planning Handbook for the Control of Nonpoint Source Pollution. 30 pp.

23. NYSDEC. 1994. Predicting Pollution Loading Through the Use of Models. 28pp.

24. NYSDEC. 1995. Trends in Water Quality of Selected Rivers in New York State.

25. NYSDEC. 1993. Twenty Year Trends in Water Quality of Rivers and Streams in New York State.

26. NYSDEC. 1995. New York State Water Quality Report (for 1994 under Section 305(b) of the Clean Water Act).

27. NYSDEC. 1994. Technical Guidance for Screening Contaminated Sediments. Division of Fish & Wildlife and Division of Marine Resources. 36 pp.

28. NYSDEC. 1992. Rotating Intensive Basin Studies. Water Quality Assessment Program 1989-90 Biennial Report. Seneca-Oneida-Oswego Rivers Basin. pg. 67-82.

29. NYSDEC. 1992. Reducing the impacts of stormwater runoff from new development. 178 pp.

30. NYSDEC. 1990. Nonpoint Source Management Program.

31. NYSDEC. 1996. New York Nonpoint Source Coordinating Committee: Annual Outreach Plan.

32. NYSDEC. Management Practices Catalogue for nonpoint source pollution prevention and water quality protection in New York State: a nine section document of best management practice categories.

33. NYSDEC. 1996. Great Lakes Water Quality Guidance, Proposed Changes to New York's Water Quality Programs. 4 pp.

34. NYSDEC and USFWS. 1994. Fisheries Enhancement Plan.

35. NYSDOH, USATSDR, Health Consultation for the Armstrong Cork Landfills. Summary Report 1996. 49 pp.

36. Onondaga County Water Quality Strategy. Report by Water Quality Management Agency (WQMA), 1992. 20 pp.

37. Onondaga Lake Management Conference. Onondaga Lake - A Plan for Action. December 1993. 46 pp.

38. Oswego County Water Quality Coordinating Committee Strategy. Committee Report. 1992.

39. Oswego County Planning Board. 1992. Oswego River Scenic Assessment. 56 pp.

40. Schueler, T.R. 1994. The Stream Protection Approach: Guidance for developing effective local nonpoint source control programs in the Great Lakes region. 66 pp.

41. Skinner, L.C., S.J. Jackling and R.W. Karcher. August, 1994. Identification of and changes in chemical contaminant levels in young-of-the-year from New York's Great Lakes Basin: 1992. Tech. Report 94-4 (BEP), NYSDEC, Albany, NY. 44 pp.

42. Spitsbergen, Jan. Report on Neoplasia and Other Lesions in Fish from the Oswego Harbor AOC, sampled 1993-94. Technical Report 1995. 20 pages plus data.

43. The Center for the Great Lakes. 1991. Making RAPs happen: financing and managing cleanups at Great Lakes Areas of Concern.

44. USEPA & Environment Canada. State of the Great Lakes. 1995. 56 pp.

45. USEPA & NYSDEC. June 1994. Lakewide Impacts of Critical Pollutants on United States Boundary Waters of Lake Ontario.

46. USEPA, Office of Water. August 1994. Developing Successful Runoff Control Programs for Urbanized Areas. EPA 841-K-94-003, 94 pp.

47. USEPA, Office of Water. August 1994. EPA's Contaminated Sediment Management Strategy. EPA 823-R-94-001, 130 pp.

48. USEPA, Office of Water. September 1993. Proceedings of the U.S. Environmental Protection Agency's nation technical workshop "PCBs in Fish Tissue". EPA/823-R-93-003,

49. USEPA. March 1994. Urbanization and Water Quality: A guide to protecting the urban environment. Typical runoff pollutants, pg.3; Table of urban BMPs, pg.37; List of federal watershed restoration and pollution control programs, pg.59.

50. USEPA, Office of Research and Development. 1993. Wildlife Exposure Factors Handbook, Volume I of II. EPA document 600/R-93/187a.

51. USEPA. September 1994. Polychlorinated Biphenyls (PCBs): Sources and Regulations, background information for the virtual elimination pilot project. Prepared by Ross & Associates for GLNPO. 29 pp.

52. USEPA, Office of Science and Technology. September 1992. National Study of Chemical Residues in Fish, Volume 1 and 2. EPA document 823-R-92-008A.

53. USFWS, Dept. of Interior. Report to Congress: Great Lakes Fishery Resources Restoration Study. September 1995.

54. Myers, S., Manno J., Schmeltz D. and Cabala, T. 1996. Report on Incorporating Human Health Considerations into RAPs. 62 pp.