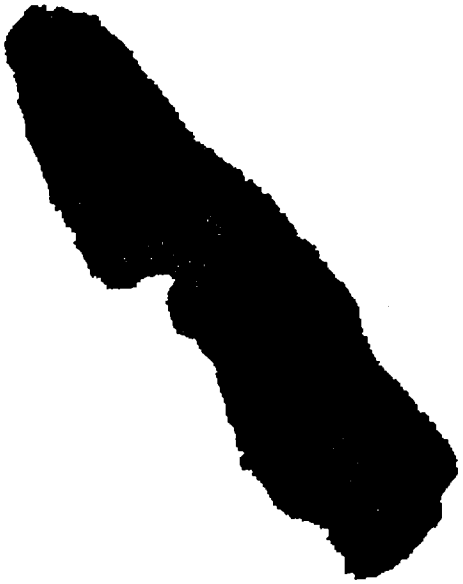
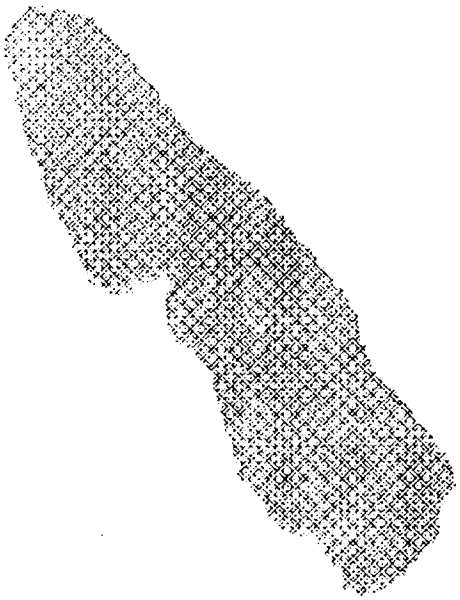


ONONDAGA LAKE

A Plan for Action

December 1993



Onondaga Lake Management Conference
Hanley Federal Building
100 South Clinton Street
PO Box 7136
Syracuse, NY 13261

RESOLUTION 99-1

Modification of the Plan of Action by the Amended Consent Judgment in Atlantic States Legal Foundation, et al. vs. Onondaga County, et al.

WHEREAS, on January 20, 1998, the United States District Court for the Northern District of New York (McAvoy, C.J.) entered the Amended Consent Judgment ("ACJ") in *Atlantic States Legal Foundation, the State of New York, et al. v. County of Onondaga, et al.* as previously agreed to the parties, State of New York, Atlantic States Legal Foundation and Onondaga County; and

WHEREAS, the ACJ sets forth the terms and conditions, including a detailed compliance schedule for the implementation of various upgrades and other measures, to bring the County's effluent discharges from Metro and the CSOs into compliance with the State's effluent limitations and water quality standards by December 1, 2012; and

WHEREAS, it is the purpose of the Onondaga Lake Management Conference to develop and coordinate the implementation of a comprehensive management, conservation, and restoration plan for Onondaga Lake; and

WHEREAS, approval and implementation of the ACJ is consistent with and supportive of the Onondaga Lake Management Conference's purpose:

NOW, THEREFORE, BE IT HEREBY:

RESOLVED, that the Onondaga Lake Management Conference does hereby approve and endorse the ACJ and incorporates it into and makes it part of its 1993 "A Plan of Action." Any portion of the 1993 Plan that is not consistent with the ACJ, is hereby removed and deleted.

Approved: **September 9, 1999** **Aye** 6 **Nay** 0 **Abstain** 0

Signature: Susan A. Miller

Susan A. Miller
Recording Secretary

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The Management Plan sets forth the recommendations of the Onondaga Lake Management Conference with respect to the remediation, restoration and development of the Onondaga Lake system. Nothing contained in this document, including any descriptions or characterization of legal standards, requirements or criteria, is intended to alter or affect any legal or equitable rights, claims, defenses or obligations of the members of the Conference, nor shall it be construed as an admission by any member against their legal interests.

Chapter I. Introduction

A. Onondaga Lake Management Conference

Onondaga Lake has been recognized as one of the most polluted waterbodies in the United States. During the last two decades, the levels of pollution have been reduced through a host of regulatory and enforcement actions, as well as the closing, in 1986, of the Allied-Signal chemical manufacturing complex which was a major contributor of industrial pollutants. However, the complexity of the Onondaga Lake system and the continued impact of numerous pollutants required a comprehensive and coordinated approach to the goal of reclamation. In response, the U.S. Congress created the Onondaga Lake Management Conference (OLMC) in 1990 (Public Law 101-596, section 401) and charged it with responsibility for:

> "(1) the development, in the two-year period beginning on the date of the enactment of this Act, of a comprehensive restoration, conservation and management plan for Onondaga Lake that recommends priority corrective actions and compliance schedules for the cleanup of such Lake; and
> (2) the coordination of the implementation of such plan by the State of New York, the Army Corps of Engineers, the Environmental Protection Agency, and all local agencies, governments, and other groups participating in such management conference."

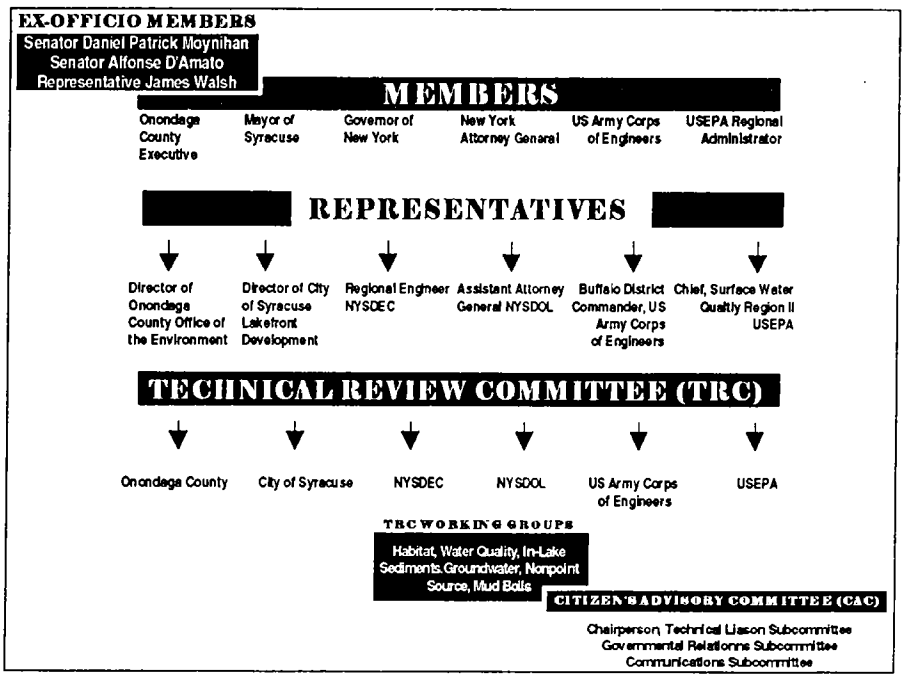

Figure I-1
Onondaga Lake Management Conference
Organizational Chart

The OLMC is made up of six voting members (see Figure I-1): the Assistant Secretary of the Army for Civil Works (USACOE), the Administrator of the Environmental Protection Agency (USEPA), the Governor of the State of New York, the New York State Attorney General (NYSDOL), the Onondaga County Executive and the Mayor of Syracuse. Two standing committees, the Technical Review Committee (TRC) and the Citizens Advisory Committee (CAC) provide advice to the OLMC on matters ranging from the conduct of scientific studies to public information programs. With input from the two committees and their working groups, the OLMC has produced this plan. The completion of the Onondaga Lake Management Plan (the Plan) represents the fulfillment of the OLMC's prime responsibility, to detail a plan of action for restoring the ecological health and recreational uses of Onondaga Lake. The Plan is intended to be dynamic, to spur action and to support the OLMC's second responsibility; the coordination of implementation of the recommendations contained in the Plan.

B. Management Plan Overview

The Plan contains specific recommendations which, if implemented, will lead to a cleaner Lake and increased usage by the public. Where possible, each recommendation identifies the party that should undertake the effort and an estimate of the time frame within which it should be completed. It should be understood that the problems of Onondaga Lake are extremely complex and their solution will be influenced by a variety of technical, legal, social and political factors, which are in many cases external to the OLMC. As a result, although the conferees are confident that Lake restoration can be accomplished, and must be done as rapidly as possible, accurate specification of target time frames for all of the recommendations is not possible at present. If the time frame is not explicitly stated, then the OLMC believes that factors external to the OLMC will dictate the speed of completion.

In addition to this Plan, a companion document, The State of the Lake Report, provides a detailed discussion of the Lake's history and ecology. A booklet summarizing The State of the Lake Report for the public has also been developed. At the end of that document, the OLMC has identified several "Major Restoration Issues" which it believes are critical to the Lake cleanup. They are:

MAJOR RESTORATION ISSUES

Eliminate or reduce as necessary:

- ✔ **Phosphorus and ammonia loading from The Onondaga County Syracuse Metropolitan Treatment Plan (METRO).**
- ✔ **Bacteria, floating debris and other pollutants discharged from the Combined Sewer Overflows (CSOs).**
- ✔ **Mercury and other pollutants including the salt wastes from the Allied-Signal (Allied) waste beds and other sources.**
- ✔ **Sediment input from the Tully Valley mud boils.**

Restore the ecological health of the Onondaga Lake system including habitat for a wider variety of fish, aquatic plants and animals.

Parallel with the remediation and restoration activities, increase the Lake's accessibility to the public for activities such as swimming, fishing and boating. Compatible commercial development in the Inner Harbor is strongly encouraged.

Figure I-2

The CAC has been heavily involved in reviewing numerous issues related to the Lake restoration. In addition, the CAC has been gathering input from the public about their specific needs and expectations of Lake restoration. While formulating the "Major Restoration Issues" outlined in Figure I-2, the OLMC has considered the goals developed by the CAC, listed in Figure I-3. The "Major Restoration Issues" are consistent with the CAC goals, which provide appropriate guidance in implementing Lake restoration.

Figure I-3

CAC GOALS

1. **The aesthetic qualities of the surface water and shoreline of the Lake shall be enhanced and improved.**

2. **Onondaga Lake shall be made fit for human contact recreation from the mouth of Onondaga Creek to the Seneca River.**

3. **The wildlife habitat of Onondaga Lake shall be restored and enhanced to sustain a thriving ecosystem in the lower tributaries of Onondaga Lake and the Lake itself.**

4. **Any water quality remediation of Onondaga Lake shall not result in an adverse impact to the Seneca and Oswego River systems.**

5. **The remediation of Onondaga Lake shall ultimately allow consumption of the fish from the Lake.**

Chapter II of the Plan provides an overview of Onondaga Lake's history as well as the ongoing and proposed activities and developments in the Lake's environs which help to frame its current and potential future role within the Syracuse-area community. Chapter III reviews the critical problems affecting Onondaga Lake and sets forth water management objectives. The subsequent chapters address the "Major Restoration Issues" set forth in Figure I-2 and make recommendations with regard to them. In addition to the key issues which the OLMC believes are priorities, recommendations regarding other less critical issues are also set forth. The final chapters of the Plan make recommendations about the future of the OLMC and reviews cost considerations relating to wastewater improvements. The *Bibliography* lists the various reports prepared on behalf of the OLMC, as well as other reports, which have provided information essential to developing the recommendations herein, and also which, in many cases, have significantly advanced the knowledge base necessary to support the actual Lake cleanup.

Chapter II. The Setting

A. The Historical Setting

In many ways the history of Onondaga Lake mirrors the evolution of the Syracuse community; an 18th century trapping, trading and missionary settlement, the urban development of the 19th century using the Lake as a recreation and leisure center, and the 20th century manufacturing and business center which turned the Lake into a repository for industrial and domestic waste. This Management Plan for Onondaga Lake represents a commitment to undo the historical legacy of the 20th century.

Before the American Revolution, the hills surrounding Onondaga Lake were the center of the Iroquois Confederacy. During the late 17th and early 18th centuries European settlers, mostly trappers and traders, followed Jesuit missionaries and French explorers into the Syracuse area. After completion of the Erie Canal in the early 1800s, the interior of upstate New York was opened to increased settlement. Some of those settlers were attracted to Syracuse by its fledgling salt industry. The Erie Canal, salt production, European immigration, and new manufacturing opportunities all contributed to the continued population growth of the Syracuse area in the mid to late 1800s. By 1822, the Lake's water level had been lowered after its outlet to the Seneca River was dredged and the swampy area that is presently the northern end of downtown Syracuse was drained.

As the area continued to grow, wastewater disposal became of increasing concern. The Syracuse interceptor sewer board was created in 1907 to alleviate the sewage related pollution of Onondaga Creek and Harbor Brook. Prior to the construction of interceptor sewers during the first part of the century, combined sewers were discharged directly into Harbor Brook, Onondaga Creek and Ley Creek. With growing concern over the health effects and odor associated with this practice, interceptor sewers were constructed to transmit the dry weather sanitary flow and a small amount of stormwater runoff. When the interceptor sewer system was completed in 1922, untreated sewage was then discharged directly into Onondaga Lake. However, the interceptor sewers were combined sewers intended to carry both sanitary and stormwater flows (combined sewage). In order to prevent surcharging during storms, relief structures were constructed at locations along interceptors to allow excessive combined sewage to overflow into the Lake's tributaries.

The first primary sewage treatment facility in the Syracuse area was completed in 1925 at the southern end of Onondaga Lake. Treatment technologies included settleable solids and disinfection of sewage. Effluent was discharged directly into Onondaga Lake. Another major treatment plant was built in 1940 on Ley Creek. This plant was the first in New York State to use the activated sludge treatment process. Nevertheless, with the continued growth and development of the Syracuse area, construction of sewage collection and treatment facilities failed to keep pace. By 1940, the Lake was declared unsafe for swimming.

In the 1950s, Onondaga County established the Metropolitan Sewer District which encompassed the City of Syracuse and some surrounding suburban areas with the construction of a new primary treatment plant. The Onondaga County Metropolitan Syracuse Wastewater Treatment Plant (METRO) was built in 1960 as a 50 million gallons per day (MGD) intermediate sewage treatment plant and sedimentation tanks were added which resulted in doubling the solids removed from sewage. However, METRO experienced severe hydraulic overloads. Waste flows coming into the sewage treatment plant were in the order of 70 MGD. The Ley Creek plant stopped discharging in 1970 and was replaced by a pumping station which discharged sewage to METRO for treatment. The METRO effluent continued to discharge to Onondaga Lake.

In 1972, Onondaga County implemented a ban on high phosphorus detergents. METRO was upgraded to secondary treatment in 1979, and tertiary treatment in 1981. These actions resulted in major reductions in biological oxygen demand and phosphorus loading to Onondaga Lake from METRO. In 1982, Onondaga County implemented the industrial waste pretreatment program which reduced heavy metal loading to the Lake from METRO. Industrial discharges, at least as destructive as the municipal effluent, also poured into the Lake and its tributaries.

During the last two decades of the 19th century, the local availability of salt and limestone, key raw materials for the production of soda ash, led to the location of the Solvay Process Company (later Allied-Signal, Inc.) at a site on the west shore of the Lake. Over the course of the succeeding 100 years, a variety of harmful industrial chemicals were discharged to the Lake and its environs by Allied and other local industries. Today, vast areas of the Lake's southern and western shoreline are occupied by the "Solvay waste beds," areas where industrial wastes from soda ash production have been deposited. Toxic materials associated with benzene and chlorinated benzene manufacturing processes at the Allied facility continue to enter the Lake from sites along the western shoreline. In 1946, production of chlorine by the "mercury cell" process was initiated at a property on Willis Avenue near the Lake. Later the production was expanded to include a site on Bridge Street near Geddes Brook. Significant quantities of mercury were discharged to the Lake and its tributaries from these facilities. By 1970, it was recognized that the Lake's fish were unfit for human consumption because they were contaminated with mercury.

There have been previous efforts to clean up the Lake. Early efforts to revive Onondaga Lake were hampered by a lack of both strong environmental laws and sophisticated pollution control technology. With passage of the Clean Water Act in 1972, direct intervention by the Federal and State government into local water pollution problems increased. The passage of the Resource Conservation and Recovery Act (RCRA) in 1976, the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in 1980 and comparable State laws greatly enhanced the enforcement capabilities of State and Federal authorities. Today a number of administrative orders, court orders and pending lawsuits are directed to address the many sources of pollution to the Lake. Primary among them are: one addressing the effect of METRO and combined sewer overflows (CSOs) in the Lake, the other dealing with the impact of Allied-Signal activities and waste disposal in and around Onondaga Lake.

The Lake is quite unique in that it is centrally located within the Syracuse urban area, and thus reasonably accessible to area residents, and in that much of the shoreline property is owned by Onondaga County and operated as parkland. In spite of the Lake's pollution problems, Onondaga Lake and its adjoining parklands have long been used for a wide variety of heavily attended special events as well as less formal recreational activities such as walking and picnicking. Annual powerboat races have been held on the Lake. The IRA regatta, a major intercollegiate rowing event, is held annually on Onondaga Lake. The Onondaga Lake marina, a County-owned facility within the park, receives heavy use. In recent years, the Onondaga Lake Extravaganza has drawn thousands of visitors to the park for a weekend of food, music and special exhibits which commemorate the Lake and its history.

Improved Lake water quality can only enhance the attractiveness of the Lake and its environs as a focal point of community-wide recreational events and leisure time activities.

The southern end of Onondaga Lake abuts the City of Syracuse roughly two-miles northwest of downtown. The triangular area between the Lake and downtown, and bordered by Interstate Routes 81 and 690, is generally known as "Oil City" because its landscape is currently dominated by a complex of major petroleum storage facilities. It is also home to a variety of other commercial and industrial uses. It is

bisected by Onondaga Creek, the lower portion of which has been channelized and has been the site of a terminal/maintenance facility for the New York State Barge Canal.

Historically, the Oil City area has been home to activities which were, in their time, very much a part of the Syracuse urban fabric. During most of the 19th century, and even into the early 20th century, it was the center of the area's salt production industry. At the turn of the century, the "Iron Pier" resort occupied the shoreline near the present site of the recently constructed Carousel Center shopping mall. In addition to the variety of recreational activities featured at the Iron Pier's 600-foot long resort pavilion, the Iron Pier offered steamboat service every half hour to the numerous resort facilities located on Onondaga Lake during that period.

B. Present Day Changes in Use of the Lake Environs

Today, there has emerged a significant interest and commitment locally to revitalizing the shoreline and the harbor area and making it more accessible to the community. Area-wide redevelopment concepts for the "Oil City" area originally advanced by the private sector, have been adopted and are being vigorously pursued by the City of Syracuse. The proposals envision a mix of retail, restaurant and residential uses centered on a redeveloped "Inner Harbor" marina complex at the present site of the Barge Canal terminal. Plans also include completion of a creekwalk along the Onondaga Creek corridor. A portion of the creekwalk has been constructed within the Franklin Square redevelopment at the southern end of the area. Ultimately, the creekwalk can be linked with Onondaga County's trail system which is envisioned to completely encircle the Lake.

In 1992, Governor Cuomo signed legislation intended to preserve and revive New York State's canal system, and in particular to develop the canal system as a world class recreational and tourism asset. The enhancement of the canal system is to be carried out as a cooperative venture with local government and private interests. There is a natural convergence of interest between this State initiative and the local initiative which is already underway in Syracuse, and indeed New York State Thruway Authority has committed substantial moneys for the Inner Harbor redevelopment. Perhaps even more significant, a strong State initiative to revive and promote the canal system for recreation and tourism will assist the successful transformation of the barge canal terminal area into a bustling harbor and marina complex.

The Syracuse Inner Harbor project, the creekwalk, the overall Oil City redevelopment, a major role as a canal tourism destination, as well as continuation and enhancement of the many activities and events which occur now on and around the Lake, are all elements of a vision for the future of the Syracuse area. Remediating the Lake is a positive ingredient in realizing the full potential of Onondaga Lake and the Harbor as major community assets.

C. Onondaga Lake in a Regional Context

One of the priorities of the OLMC concerns protecting the Seneca-Oswego River system from any adverse impacts that may result from the water quality remediation of Onondaga Lake. The Oswego River is New York's second largest tributary to the Great Lakes, the world's largest freshwater resource. Pollution sources which may affect Oswego Harbor and Lake Ontario occur throughout the Seneca-Oneida-Oswego River Basin. To protect and enhance the water quality of Oswego River, and improve the water quality of Lake Ontario and the overall Great Lakes ecosystem, the United States-Canada International Joint Commission (IJC) requested that the jurisdictions prepare plans for remediation of areas of concern (AOC) within the Great Lakes system. The 1987 amendments to the United States-Canada Great Lakes Water Quality Agreement (GLWQA) specify requirements for "Remedial Action Plans"

(RAPs) for identified areas of concern. The plans apply a systematic, comprehensive ecosystem approach to restoring and protecting water quality and ecosystems. A RAP for the Oswego River system has been developed by the New York State Department of Environmental Conservation (NYSDEC) and an Oswego River Citizen's Advisory Committee. The Oswego River RAP identifies Onondaga Lake as a potential source of several critical pollutants, including PCBs and mercury. In addition, Onondaga Lake is identified as a major contributor of phosphorus and other nutrients which contribute to the eutrophication and impairment of beneficial uses not only in Onondaga Lake, but also in the Oswego River and in Lake Ontario.

Additionally, the 1989 Lake Ontario Toxics Management Plan, developed by Environment Canada, the USEPA, Ontario Ministry of Environment and Energy and NYSDEC, identifies critical substances for the four-parties to address in an ecosystem-wide toxics reduction strategy. The Lake Ontario Toxics Management Plan is updated regularly and will also be expanded to meet the requirements of a Lake Ontario Lakewide Management Plan under the GLWQA.

The recommendations set forth in this Plan are intended to be consistent with the Oswego River RAP and Lake Ontario Management Plan initiatives which are currently being developed under the provisions of the GLWQA. The implementation of all recommendations contained in the Plan should be coordinated with these other planning initiatives to ensure that the remediation of Onondaga Lake is consistent with efforts to improve the water quality of the Seneca-Oswego River and Lake Ontario.

Chapter III. Water Management Problems and Conference Objectives

A. Overview of Problems and Causes

A host of pollutants have been, and continue to be, discharged to Onondaga Lake and its tributaries. METRO discharges large quantities of ammonia and phosphorus. The former is toxic to fish and the latter contributes to nuisance algae growth, a lack of water clarity and severe oxygen depletion. The CSOs emit pathogenic organisms and other conventional pollutants. The past industrial activities of Allied-Signal have caused, and continue to cause, the release of mercury, chlorinated benzenes, ammonia, salts and other pollutants into the Lake system. These activities have contaminated the fish with mercury, destroyed aquatic habitat and contribute to the Lake's lack of clarity. The mud boils in the Tully Valley are discharging sediment to Onondaga Creek, which also reduces water clarity in the Creek and the Lake. Other industrial discharges have also contributed to the pollution of the Lake with petroleum products, PCBs and other pollutants. The Lake's water quality problems and causes are summarized in Table III-1. The goals of the OLMC are targeted at reducing or eliminating all of these problems.

Table III-1
Onondaga Lake Problems and Causes

Problems	Causes and Sources	Consequences
High levels of algae.	Discharge of phosphorus from METRO and to a lesser extent from CSOs and nonpoint sources such as agriculture.	Dissolved oxygen depletion, High sediment oxygen demand, decreased transparency, lack of rooted aquatic plants caused by low light levels.
Dissolved oxygen (DO) depletion in deep waters both during warm weather and under the ice. DO reductions during the Fall in surface waters.	Bottom sediments and lower waters are overloaded with decaying algae from high phosphorus loads; Ionic stratification inhibits reoxygenation.	Limits viable fishery habitat; Causes the accumulation of toxic chemicals such as hydrogen sulfide and methane.
High ammonia concentrations.	Discharge from METRO.	Potential ammonia toxicity and nitrite toxicity to fish and other aquatic life
High chloride concentrations and deposition of calcium carbonate.	Former industrial discharges and leachate from Allied-Signal waste beds.	Contributes to dissolved oxygen loss in the Seneca River via density stratification; Exacerbates in-lake oxygen problems due to stratification; Exceed levels which are desirable for aquatic life.
Sediments discharged to Onondaga Creek.	Tully Valley Mud Boils.	Poor fish habitat below mud boils; Decreased transparency in Onondaga Creek and the Lake.
High fecal coliform loads during wet weather.	Combined sewer overflows (CSOs).	Contravention of fecal bacteria standards; Inadequate sewage treatment led to a ban on swimming in Onondaga Lake in 1940.
High mercury levels in fish flesh.	Former industrial discharges, continued inflow from the watershed.	High concentration accumulated in aquatic life. Although catch and release fishing is now allowed, the New York State Department of Health (NYSDOH) maintains an advisory against eating fish caught from the Lake.
Toxic pollutants in the water and sediments.	Various discharges.	Unknown at this time, studies ongoing.
Degradation of streams.	CSOs; Mud boils; Waste beds.	Floating debris; Accumulation of organic deposits; Loss of aquatic life in tributaries.
Physical and chemical alteration of near shore sediments.	Former industrial discharges, possibly accentuated by high algal productivity	Poor fish habitat caused by sparse rooted aquatic plant populations and limited fish food sources (insect larvae, etc.); Physical character of shallow waters not suitable for contact recreation.

B. Water Management Objectives

Objectives for managing the water quality of Onondaga Lake are set forth below. These are the specific standards or criteria which would be applied for meeting the goals of the OLMC. These objectives

are largely derived from New York State's water quality standards set forth in 6NYCRR Part 701. The Lake is presently classified as Class B and Class C see Figure III-1. All water quality standards for class B and C waters must be met. The following objectives are emphasized and have been used to establish the framework for this Management Plan:

New York State Water Quality Classifications of Onondaga Lake

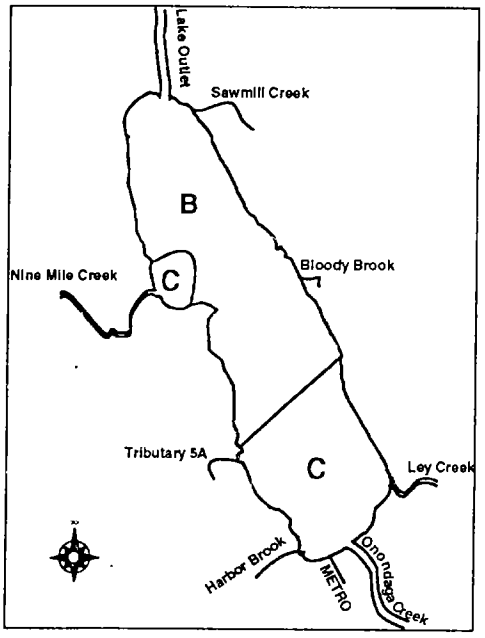

Figure III-1

i. **Water level**. The level of the Lake should be maintained to protect and enhance biological systems. The operation of downstream dams on the Oswego River system should not cause alterations in the water level in Onondaga Lake that would interfere with swimming, boating or fishing.

ii. **Dissolved oxygen.** The dissolved oxygen objective for Onondaga Lake is determined by what type of fishery exists. Class B and Class C non-salmonid waters share the same standard for dissolved oxygen (DO) that requires that the minimum daily average of oxygen not drop below 5.0 mg/L, and at no time should the DO concentration be less than 4.0 mg/L.

iii. **Ammonia.** This standard is based on EPA chronic toxicity limits of un-ionized or free ammonia for selected indicator fish species. Because the amount of free ammonia varies in the water column based on pH and temperature, this standard is presented as a table in the New York State regulations. The non-salmonid ammonia standard for Class B and C waters must be met for Onondaga Lake.

iv. **Color and odor producing substances.** The Lake should receive no substances that will adversely affect color or odor, or impair the waters for their best uses. Origins of color and odor producing substances are primarily from the growth of nuisance algae.

v. **Phosphorus, Chlorophyll a and Secchi disk depth.** According to New York State water quality standards, Onondaga Lake "... should also have no phosphorus in amounts that will result in the growths of algae, weeds and slimes that will impair the waters for their best uses."

vi. **Suspended, colloidal and settleable solids.** The Lake should receive no suspended, colloidal and settleable solids from sewage, industrial wastes or other wastes that cause deposition or impair the waters for its intended use.

vii. **pH.** The pH of the Lake shall not be less than 6.5, nor more than 8.5.

viii. **Dissolved solids.** Dissolved solids should be kept as low as practicable to maintain the water's best uses, and to restore natural conditions to the Seneca River.

ix. **Total coliforms.** The monthly median value for total coliforms and 20% of the samples from the minimum of 5 examinations should not exceed 2400 and 5000 colony forming units/100 ml. respectively.

x. **Fecal Coliforms.** The monthly geometric means of fecal coliforms from a minimum of 5 examinations should not exceed 200 colony forming units/100 ml.

xi. **Hydrogen sulfide.** Hydrogen sulfide should not exceed 2.0 μg/L in undissociated form.

xii. **Metals, organics and other contaminants.** Mercury, PCBs and chlorinated benzenes and other toxic pollutants should not accumulate in fish and other aquatic life in amounts that are injurious to aquatic organisms and/or pose a threat to humans. All applicable numerical standards for trace metals and organics must be met.

xiii. **Aquatic vegetation.** While enhancement of the vascular macrophytes is a primary goal for Onondaga Lake, they should not interfere with boating and bathing. The introduction of invasive species, such as Eurasian water milfoil, water chestnut and curly-leafed pondweed should be prevented.

xiv. **Fish Consumption Advisory.** To protect human health, the US Federal Food and Drug Administration (FDA) sets "action levels" which limit the levels of contaminants in human and animal foodstuffs that are transported interstate. For methyl mercury, one of the most poisonous chemicals known, the edible portions of fish and other aquatic animals must not exceed 1.0 PPM. Mercury was first measured above this level in fish flesh from Onondaga Lake in 1970 and since almost all mercury found in fish flesh is in the methyl form, the New York State Department of Health maintains a consumption advisory against eating fish from Onondaga Lake.

Chapter IV. Sewage Treatment and Discharge

METRO is an 80 MGD advanced wastewater treatment facility which services the sewage treatment needs of the City of Syracuse and several surrounding communities. The present METRO facility was completed in 1979 and represents the most recent of a series of sewage treatment improvements serving Syracuse and several surrounding communities dating back to 1922. There have been several additional incremental improvements made to the plant since 1979. Because much of the METRO service area utilizes combined sanitary and storm sewers, the plant is designed to provide full treatment up to a projected peak dry weather flow of 120 MGD. Full treatment consists of wastewater screening, grit removal, primary settling, activated sludge aeration, secondary settling, chlorination and tertiary settling (see Figure IV-1). At the time the plant was built, it was not designed to treat ammonia. Phosphorus removal is provided by chemical precipitation in the secondary clarifiers using ferrous sulfate. In the recent years, the plant has attained phosphorus removal to levels at, or near, technological limits.

Current METRO Facility Design

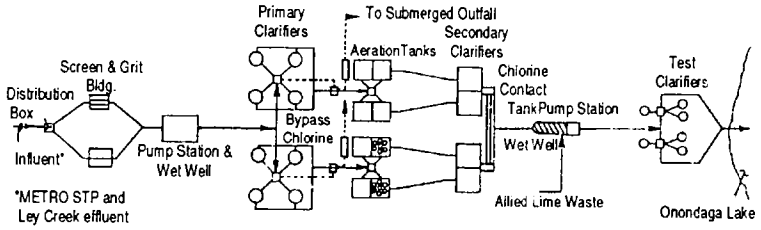

Figure IV-1

Nevertheless, the plant is one of the most significant contributors to the pollution problems in Onondaga Lake. According to The State of the Lake Report, METRO contributes approximately 60 percent of the annual phosphorus load, and more than 90 percent of the annual ammonia loading to Onondaga Lake. The phosphorus loading is a major factor contributing to problems of oxygen depletion and reduced transparency in the Lake. Ammonia in the Lake frequently exceeds the New York State standard which is based on toxic effects on fish and other aquatic life.

In 1988, the Atlantic States Legal Foundation filed a lawsuit in US District court against Onondaga County, alleging that the METRO and CSO discharges violated Federal water pollution standards. The State of New York intervened as a plaintiff, alleging that Onondaga County also violated the New York State Environmental Conservation Law. In 1989, the parties agreed to settle the litigation through the entry of a consent judgment (METRO consent judgment) by the District Court. The judgment directs Onondaga County to complete planning, design and construction of facilities to bring its discharge into compliance with regulatory requirements, and sets forth a specific process for selecting the appropriate solution. At the core of that process are a) the development of water quality simulation models. and b) the development of pertinent engineering characteristics including flows and pollutant loads for a range of possible sewage treatment and discharge options. At the completion of the models and the engineering reports, the models will be used to evaluate the effects of the various options on Onondaga Lake and the Seneca River.

As illustrated in Table IV-1, a total of six interrelated models have been developed for use in the evaluation of Onondaga Lake's projected response to sewage treatment improvements and discharge options. It

became increasingly clear during the process that diversion of effluent to the Seneca River would merit serious consideration. The modeling effort was therefore expanded to include appropriate constituents in the Seneca-Oswego system. It should be noted that the OLMC has assisted the parties to the METRO judgment by funding sampling and modeling work where necessary to fill unforeseen gaps in the effort.

Table IV-1
Onondaga Lake Management Plan
Simulation Models

Model	Modeled Constituents	Temporal resolution	Spatial Resolution
1. Lake Hydrodynamics	Water velocity (cm/sec)	produces a velocity field based on climatological forcing functions such as wind and water temperature	horizontal velocity vectors for a finite grid of 93 elements at selected depths
2. Lake Fecal Bacteria	fecal coliform bacteria (colony forming units)	hourly output	10 surface cells and 4 hypolimnetic cells
3. Lake Total Phosphorus	total phosphorus (µg/l)	seasonal growing season model with daily output	one epilimnetic cell and one hypolimnetic cell
4. Lake Nitrogen	organic, nitrate and ammonia nitrogen (mg/l), with conversion to un-ionized ammonia	seasonal growing season model	one epilimnetic cell and one hypolimnetic cell
5. Lake Optics and Phytoplankton	extinction coefficient (m^{-1}), Secchi disk depth (m)	empirical static model that converts chlorophyll a, gelbstoff and inorganic particle levels to transparency	linked to the output of the total phosphorus model
6. Lake Dissolved Oxygen	dissolved oxygen (mg/l)	annual model with daily output, although maximum, minimum DO and depth of anoxia can be output	horizontally well-mixed (see note on temporal resolution)
7. Seneca River Model	dissolved oxygen (mg/l), ammonia nitrogen (mg/l), chloride (mg/l), CBOD (mg/l)	annual model with daily output at selected locations from Baldwinsville to Oswego. Maximum and minimum DO can be output	one surface and one deep water layer for 5 reaches. Each reach has a specific number of cells
8. Stormwater Management Model	CSO chemistry and discharge	predicts storm by storm at short time intervals (minutes)	each CSO catchment is modeled separately
9. Lake Outlet Dynamics Model	discharge and direction of the Lake outlet	to be developed	to be developed

A broad range of generalized management alternatives were evaluated for their potential to reduce pollutant loadings from METRO. The consent judgment and associated work plan required that the evaluation consider the impacts of ongoing and future County wastewater treatment projects within the METRO service area. These included the Extraneous Flow Abatement Program to eliminate illicit stormwater connections to sanitary sewers from roof drains and sump pumps, the expansions of the Ley Creek and Liverpool Pump Stations to eliminate sewage overflows, and the parallel effort to reduce pollutant loadings from the CSOs. Table IV-2 lists and briefly describes the options that could be combined into the selected management solutions to reduce pollutant loads to Onondaga Lake.

Table IV-2
METRO Engineering Options

Option	Rationale
Full-time ammonia reduction	Elimination of Lake ammonia standard violation.
Seasonal ammonia reduction	In conjunction with development of an effluent limit variance for ammonia, elimination of standard violation.
Improved phosphorus removal (with and without effluent filtration)	Improve Lake water clarity, reduce odors caused by algae, reduce extent and duration of Lake dissolved oxygen standard violation.
Increased METRO design flow	Provide full treatment for peak flows from the METRO service area and/or increased flows diverted from combined sewer overflows.
Partial Diversion	Improve Onondaga Lake water quality by reducing ammonia and phosphorus loads while maintaining water quality standards in the Seneca River.
Complete bypass of METRO effluent to the Seneca River	Elimination of Lake ammonia standard violation, improve water clarity, reduce extent and duration of dissolved oxygen standard violation.
Split Bypass of METRO effluent to the Seneca River	Same as complete bypass.
Reconstruction of the Ley Creek Sewage Treatment Plant	Ley Creek and/or Westside service areas could be separated from the METRO system and discharged separately.
Shallow or Deep Lake Outfall	The location of the outfall in the Lake should be tested to see if the depth of discharge affects the quality of the Lake.

a. Ammonia Reduction. Ammonia reduction in municipal wastewater treatment facilities is generally accomplished through biological treatment referred to as the nitrification process. The existing METRO facility was not designed for ammonia removal. To achieve consistent nitrification, a major plant upgrade will be necessary. This option includes upgrading METRO to either a single-stage or two-stage activated sludge system to produce an effluent that would not exceed 2 mg/l ammonia nitrogen. Upgrading METRO to year-round nitrification would require acquisition of additional land for the construction of new facilities. Upgrading for seasonal nitrification only would require a smaller investment in new facilities. In summary, METRO could be upgraded to reduce ammonia in its effluent, and the primary factor in selecting the specific engineering alternative to meet a given water quality target would be cost.

b. Improved Phosphorus Removal. Under this option, physical, chemical and biological phosphorus removal alternatives have been examined. Both chemical and biological phosphorus removal technologies are capable of achieving less than 1.0 mg/l of phosphorus in wastewater effluent. The use of effluent filtration following biological and/or chemical treatment can achieve phosphorus removal to levels of less than 0.5 mg/l. The level of phosphorus removal required will be determined by the use of water quality models and associated costs.

c. Increased METRO design flow. As previously discussed, METRO is an 80 MGD advanced wastewater treatment facility. For flows up to 120 MGD, treatment consists of screenings and grit removal, primary settling, activated sludge aeration, secondary clarification, tertiary settling, chemical phosphorus removal and chlorination. During wet weather periods, flows which exceed 120 MGD receives limited treatment, consisting of screening and grit removal, primary settling and chlorination. A review of the existing design of METRO revealed that the plant was not designed to provide full treatment for projected peak flows from Ley Creek and Westside services areas as currently required by New York State standards. When all factors were considered, including population growth in the service area, the amount of wastewater that receives full treatment at METRO would need to be expanded from the present 120 MGD to between 160 and 190 MGD, depending on the CSO treatment option selected.

d. Partial bypass of METRO effluent to the Seneca River (see Figure IV-2). In November 1992, another option was presented by Onondaga County consisting of diverting of some METRO influent through a combination of new and existing pump stations and forcemains on the west side of Onondaga Lake to an expanded Baldwinsville-Seneca Knolls Treatment Plant. The Baldwinsville-Seneca Knolls Wastewater Treatment Facility was designed as a 9 MGD two-stage pure oxygen activated sludge plant, providing advanced treatment for ammonia and phosphorus removal. The average daily flow through the plant is presently about 5 MGD. The plant could be expanded on its existing site to handle an annual average flow of 47 MGD and a peak flow of 74 MGD. The expanded plant would continue to provide ammonia and phosphorus removal at current levels, unless otherwise dictated by the results of the Seneca River model. Diversion of influent from METRO would then allow METRO with some modifications to provide ammonia removal before discharge to Onondaga Lake.

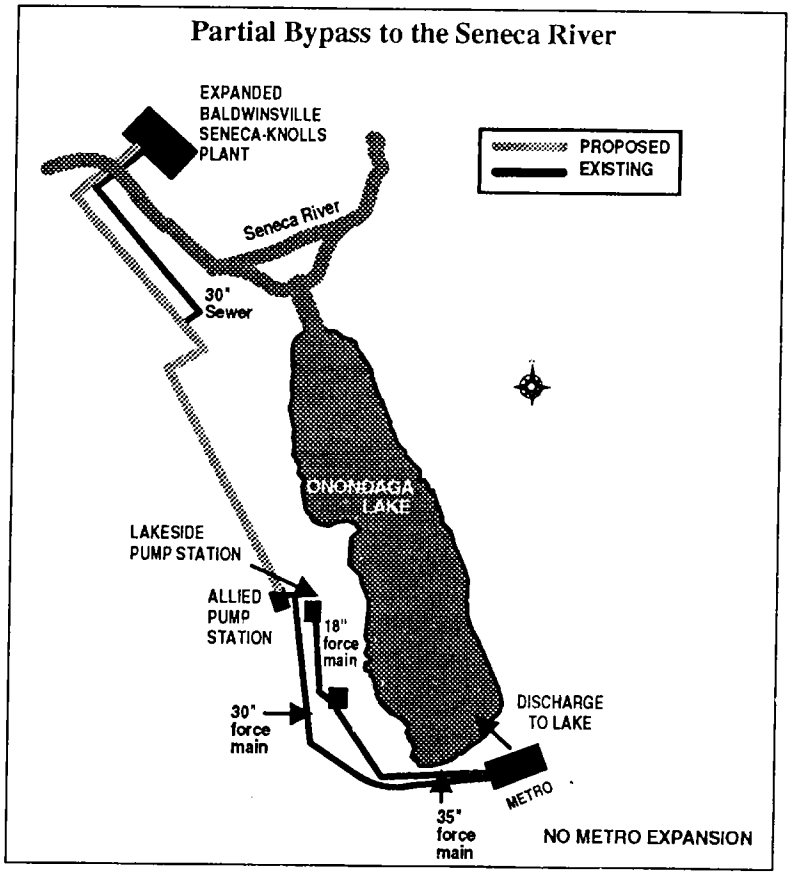

Figure IV-2

e. Complete bypass of METRO effluent to the Seneca River (see Figure IV-3). This option was conceived as a 6.5 mile force main with a diameter of 8 feet including expanding and upgrading METRO. A new effluent pump station would also be required since the wastewater could not flow by gravity from METRO to the Seneca River. In order to implement this option, year-round ammonia reduction and permanent chemical facilities for phosphorus removal would be required. This design would accommodate flows of about 260 MGD. The proposed bypass pipe would be sited along the north shore of the Lake and would discharge via a submerged diffuser to the Seneca River, just downstream of Onondaga Lake Outlet.

f. Complete split bypass of METRO effluent to the Seneca River (see Figure IV-4). This option consists of a combination of options **d.** and **e** above. The same volume of METRO influent would be treated at Baldwinsville-Seneca Knolls, with the remaining METRO effluent discharged to the Seneca River via a smaller diameter pipe than in option **e**.

g. Reconstruction of Ley Creek. This option included building a new treatment facility at the site of the old Ley Creek treatment plant with a direct discharge to Onondaga Lake or the Seneca River. By treating a large wastewater load at the Ley Creek site, the METRO plant would then be underloaded; and with minor

modifications could achieve ammonia removal. As a result of the consent order that Bristol Myers Squibb entered into with the US Attorney and the NY Attorney General, the Bristol Myers Squibb facility will be providing a high degree of pretreatment of their wastewater prior to discharge to the County sewer system by the end of 1996. Therefore, this option no longer provides the benefits as originally conceived.

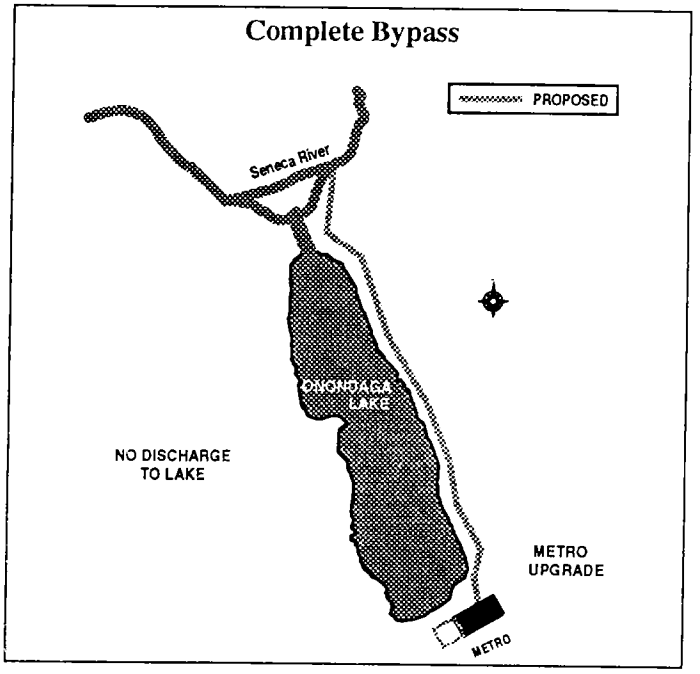

Figure IV-3

h. METRO Lake outfall pipe options. Several outfall options were examined, including using the existing submerged outfall for the larger volume of fully-treated sewage, and construction of a single new deep water submerged outfall. Any changes to the location and type of outfalls should be evaluated using the water quality models.

The process outlined in the METRO consent judgment is nearing conclusion. Performance characteristics have been developed for a variety of treatment and discharge options described previously. Additionally, Onondaga County has estimated costs for the various options, although these costs were not required as part of the consent judgment process. The water quality models have been submitted and are being reviewed by the parties in preparation for their formal use in evaluating alternatives.

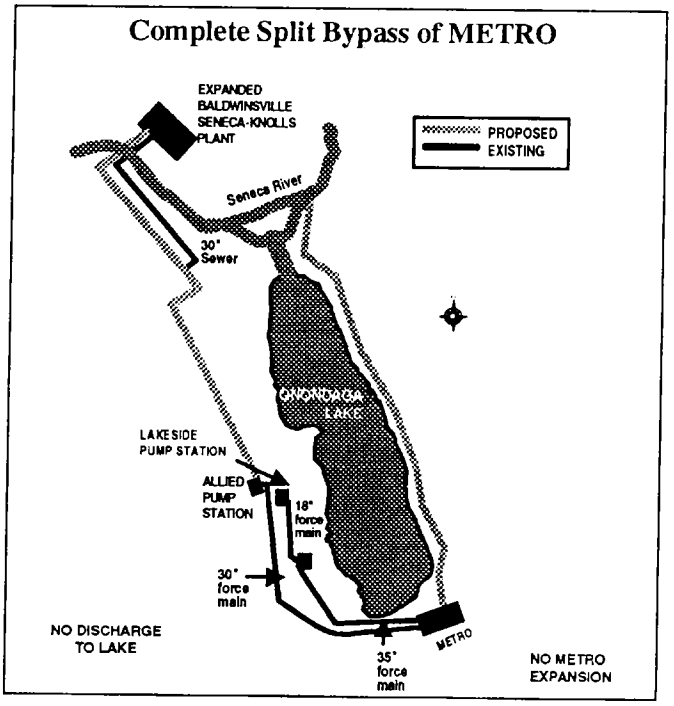

Figure IV-4

The OLMC has reviewed all of the information generated over the past four years through this very intensive and complex sampling modeling and engineering effort. While reviewing this body of information, the following becomes evident:

1) Any remedial alternatives that will result in substantial progress on the key water quality issues of dissolved oxygen, ammonia, phosphorus loading and transparency will be expensive to implement.

2) Options involving an out-of-lake discharge provide the most water quality benefit to the Lake when the effect on all of these parameters is considered.

3) The impacts on the Seneca River should be reviewed and evaluated prior to the selection of any management alternative.

4) On the issue of phosphorus and transparency, meaningful improvements most likely cannot be achieved in Onondaga Lake without significant reduction or elimination of the phosphorus load from METRO as well as controls on other sources.

Recommendations

The OLMC makes the following recommendations with regard to METRO:

> ✔ **The OLMC endorses an out-of-lake discharge of wastewater currently treated at METRO. At the present time, the most promising discharge alternatives include a diversion of some influent flow to an expanded Baldwinsville-Seneca Knolls treatment facility, and a diversion of the remaining METRO effluent to the Seneca River below the Onondaga Lake Outlet. Effluent limitations for both discharges should be defined through the use of the Onondaga Lake and Seneca River water quality models. The OLMC recommends that the diversion be implemented as soon as possible.**
>
> ✔ **Onondaga County and the City of Syracuse should coordinate any construction activity relating to the renovation of METRO so as to minimize, to the extent possible, any negative impact on lakefront development and the surrounding community.**

Chapter V. Combined Sewer Overflows (CSOs)

The Problem and Background

A majority of the METRO service area has combined sanitary and storm sewers. This is quite typical of the older cities in the northeastern United States. The combined sewer system encompasses an area of about 10 square miles and is within the limits of the City of Syracuse.

Sixty-six combined sewer overflows (CSOs) discharge approximately 50 times during a typical year to Onondaga Creek, Ley Creek and Harbor Brook. Almost all of the CSOs are within the Onondaga Creek or Harbor Brook drainage areas. CSOs discharge a mixture of stormwater and untreated sewage during periods of intense rainfall. In 1979, a report was prepared by Onondaga County on the CSO problem which led to some improvements in the management of the system. Onondaga County conducted a CSO Best Management Practices (BMP) Program from 1983 until 1985 which reduced the loading of untreated sewage by reducing the overflows to the Lake from approximately 150 times to the present 50 times per year. The BMP Program also reduced the loading of conventional pollutants by over 85 percent.

In spite of these improvements, the CSOs are the major contributor of fecal bacteria to Onondaga Lake and its tributaries. They also contribute floating debris, suspended sediment, organic matter and phosphorus. The CSOs are also included in the METRO consent judgment discussed in the previous chapter. The flows in a combined sewer system are strongly influenced by precipitation; therefore, a model was needed to evaluate the system's response to rainfall events of various durations and volumes. Simulation models have been developed to project the Lake's response to selected control alternatives. The models described previously in Chapter IV are also being used to evaluate control strategies for the CSOs. In addition, USEPA's Storm Water Management Model has been used to develop the preliminary design for the combined sewer overflow engineering alternatives.

CSO Control Options

The principal goals for CSO treatment are two-fold. First, coarse solids, floatables and other large debris must be reduced. Second, any overflow from the combined sewers must be disinfected or rerouted to METRO, in order to reduce the levels of fecal bacteria. The following options were considered:

a. Sewer Separation. The first option examined was replacement of the combined sewers with separate sanitary and stormwater lines. The sanitary wastes would be fully directed to METRO. Options ranged from geographically-limited to complete separation of sewers. Sewer separation has not been considered viable on a wide-scale because it would be extremely costly and construction would be disruptive to the community. In addition, sewer separation would still require some treatment of urban stormwater (street runoff, etc.).

b. Regionalized Treatment with Swirl Concentrators (see Figure V-1). Both small regional CSO treatment facilities and a large centralized facility have been evaluated. To achieve this end, high-rate vortex separators known as swirl concentrators were selected as the prime alternative. A swirl concentrator uses gravity and centrifugal force to settle out debris and solids. The reduction in suspended material allows for more effective disinfection of fecal bacteria. The regionalized strategy consists of the construction of CSO interceptor pipelines that would lead to high-rate treatment facilities. Ten regional facilities would be required, with 13 swirl concentrators ranging in diameter from 16 to 62 feet. About 30 to 50 percent of the total suspended solids could be removed by properly sized units. Some of this "removal" is accomplished by separation of the underflow of wastewater and settled material. The overflow

would be chlorinated and the underflow would be directed back to METRO for further treatment. It is roughly estimated that a 25 percent reduction in phosphorus levels could be expected.

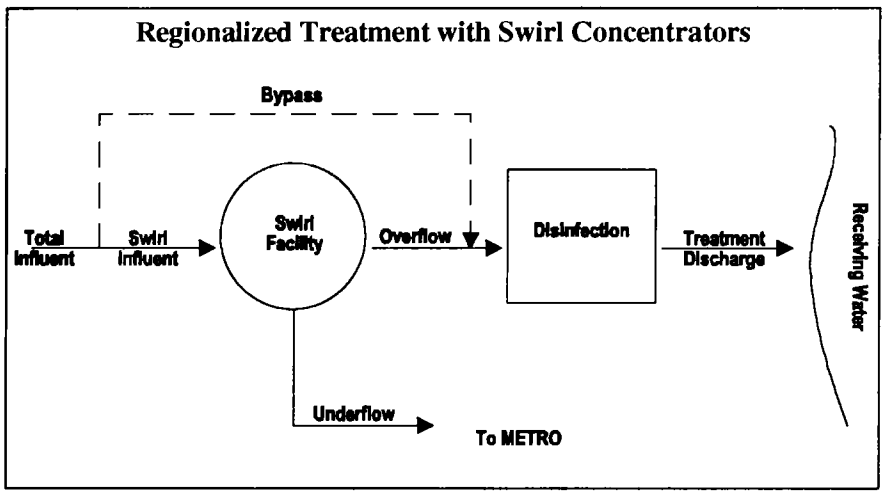

Figure V-1

c. Regionalized Treatment with Storage. For each high-rate regional site, the additional storage to accommodate one half of the volume of the one-year storm was also calculated. Between the existing trunk sewers and the proposed swirls, about 6 MG of storage would be available. An additional 46 MG of storage would need to be constructed at the regional sites.

d. Centralized Treatment. The centralized CSO facility options consist of a two large CSO interceptor pipelines terminating in a group of swirl concentrators located near the METRO site and near the Lake adjacent to Harbor Brook.

e. Storage Tunnels. In-line storage tunnel options were also evaluated. For example, for Harbor Brook, assuming a 15,000 feet length, and the ability for the tunnel to store a one-year storm, the tunnel diameter would be 17.5 feet. A similar calculation for Onondaga Creek yields a tunnel diameter of 30 feet.

f. Best Management Practices (BMPs). Onondaga County has also investigated the feasibility of the following supplemental BMP measures: 1) modifications to existing overflow structure, 2) elimination of selected stormwater by diversion, 3) creating more in-line storage in the existing trunk sewer, 4) controlling infiltration and inflow, 5) selective small-scale sewer separation and 6) sewer cleaning. None of these BMPs could be considered to provide anything but modest savings in design costs when compared to the various CSO options.

g. Disinfection Options. If high-rate devices are selected, then the discharge from the swirls must still be disinfected to reduce pathogenic organisms. With the solids removal provided by the swirl concentrators, the disinfection process could be relied on to effectively control pathogenic organisms in the combined sewage. CSO disinfection must meet different criteria than that applied to conventional wastewater treatment. The contact time is short and the process must be effective in waters of high turbidity. It must be amenable to automatic startup and shutdown and must be able to operate intermittently. Most important, the residual toxicity must not pose a problem for receiving waters. If toxicity is a problem, than detoxification must be utilized. When such factors as safety, environmental impact and reliability were examined, sodium hypochlorite was selected as the disinfection option of choice.

Although not CSO recommendations in the strictest sense, the OLMC agreed to some additional concepts that should be adhered to. First, Onondaga County and the City of Syracuse governments should work together to design and construct engineering solutions to eliminate floatables and silt in Onondaga Creek over the next several years. This item will address aesthetic concerns about the present appearance of the Inner Harbor during stormy periods. In accordance with their authorities, the USACOE has agreed to

assist in this effort, as requested by the City and the County governments. Also, The County will cooperate to ensure that various CSO treatment options are compatible with plans by the City of Syracuse and the New York State Thruway Authority for redevelopment of the Inner Harbor.

Recommendations

The OLMC makes the following recommendations with regard to the CSOs:

✔ **Onondaga County should implement a pilot project to test CSO control technology. The project should consist of the design and construction of two regional CSO storage and treatment facilities. Onondaga County should seek sources of State and Federal funding including the Water Resources and Development Act of 1992 to the extent available to support this effort.**

✔ **Using appropriate treatment methods, Onondaga County should provide additional storage and/or treatment facilities to control remaining combined sewer overflows. The remediation of the CSOs should be implemented as soon as possible.**

✔ **The City of Syracuse and Onondaga County should work together to design and construct engineering solutions to eliminate floatables and silt in Onondaga Creek over the next several years. The USACOE should assist consistent with its authority.**

✔ **Onondaga County and the City of Syracuse should coordinate to ensure, to the extent possible, that CSO treatment projects are compatible with plans by the City and the New York State Thruway Authority for redevelopment of the Inner Harbor.**

VI. Mercury and Other Industrial Pollutants and Wastes

Since the late 1800s, the Onondaga Lake drainage basin has been the site of extensive industrial and chemical manufacturing activities. As a consequence of these activities, significant quantities of contaminants, and chemical wastes and pollutants have entered, and continue to enter, Onondaga Lake. Most of the significant industrial pollutants were generated and discharged by Allied-Signal Inc. at its production facilities located near the southwestern shore of Onondaga Lake. From 1882 until 1986, Allied discharged a variety of waste products including: mercury, salt wastes, ammonia, benzene and chlorinated benzenes.

From 1947 until 1979, Allied operated chlor-alkali plants which utilized mercury electrodes in the production of chlorine. It is estimated that from 1947 until 1970, Allied discharged 20 pounds of mercury per day into Geddes Brook and Nine Mile Creek, and directly into the Lake. In 1979, the Bridge Street chlor-alkali plant was sold to LCP-Hanlin which operated the plant until 1988. Although active operations have ceased, recent data suggests that mercury continues to enter the Lake system from the vicinity of the former chlor-alkali facility. It is estimated that seven million cubic yards of Lake bottom sediments contain mercury concentrations over one part per million (PPM). In addition, sediment concentrations of mercury in Nine Mile Creek and Geddes Brook have been found to exceed 10 PPM. Fish flesh has been contaminated with mercury to such a degree as to render the fish unfit for human consumption.

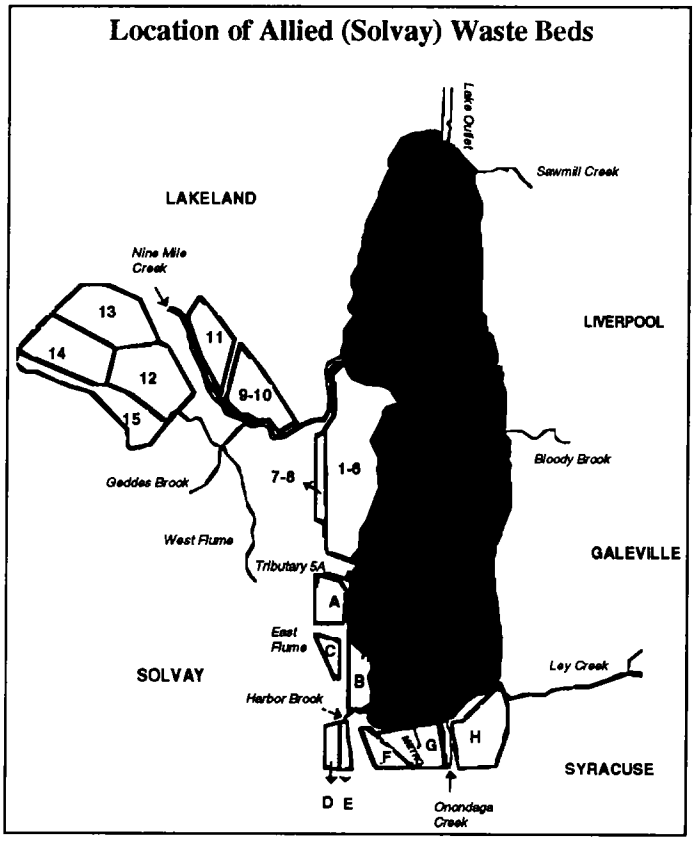

Figure VI-1

Allied has also generated large quantities of "salt" wastes (for example, compounds containing calcium, chloride and sodium) as by-products of its soda ash, baking soda and caustic soda production activities. Some of these wastes were discharged, as an aqueous solution, directly into the Lake and certain of its tributaries, e.g. Nine Mile Creek, while the rest were deposited and decanted into land areas ("waste beds") located near the Lake. The magnitude of the salt discharges can be gauged by the fact that there are approximately 1500 acres of waste beds, some as high as 80 feet above grade (see Figure VI-1).

Studies conducted in the 1980s indicated that over 4000 tons of chlorides were entering Nine Mile Creek from the area of the waste beds daily. Since Allied's production facilities closed in 1986, daily chloride loadings into Nine Mile Creek are reported to be on the order of 400 tons a day. Salt wastes have had a destructive impact on the Lake's ecology, blanketing the near shore areas with a precipitant of calcium carbonate and adversely affecting the coldwater fish habitat, as well as contributing to the Lake's water clarity and stratification problems. Stratification exacerbates dissolved oxygen problems in both Onondaga Lake and the Seneca River.

Allied also produced benzene and chlorinated benzene products. Wastes from the production of these chemicals were deposited into waste lagoons ("Semet Tar Beds") which lie approximately 200 feet from Onondaga Lake. These lagoons contain approximately 100 million gallons of tar wastes which may contribute benzene and chlorinated benzenes to the Lake via the ground water.

Onondaga Lake System Judicial Consent Decree

In June 1989, Attorney General Robert Abrams filed a lawsuit in the U.S. District Court on behalf of the State of New York against Allied-Signal pursuant to the Federal Comprehensive Environmental Response Compensation and Liability Act (CERCLA), the New York State Environmental Conservation Law and the common law of public nuisance. The lawsuit seeks to compel Allied-Signal to remediate the destructive impacts of waste disposal activities on the Onondaga Lake system and to pay the State monetary damages for the injury, destruction and loss of natural resources. Monies recovered for natural resource damages (NRD) must be used to restore, replace or acquire the equivalent of such natural resources.

In March 1992, following a public hearing in Syracuse in January 1992, an interim consent decree was entered in US District Court requiring Allied-Signal to perform a remedial investigation and feasibility study (RI/FS) to determine the nature and extent of its contamination associated with the Lake and to evaluate various cleanup technologies.

The consent decree requires Allied to provide New York State, under stringent oversight, and subject to ultimate revision by the State, various work items including:

- Geophysical Investigation Report
- Calcite and Mercury Modeling Plan
- Bioaccumulation, Ecological Effects, and Mercury and Calcite Mass-Balance Reports
- Remedial Investigation Report
- Feasibility Study Report

These work items are being prepared in conformity with regulations promulgated by USEPA which are known as the National Contingency Plan (NCP).

Subsequent to the conclusion of the RI/FS process, the State of New York will select an appropriate remedy for addressing the contamination problems of the Lake including, but not limited to, those problems associated with Allied's activities. In addition to the judicial consent decree covering the Lake system, the NYSDEC has issued three administrative consent orders against Allied-Signal requiring the company to investigate contamination at, and migrating from, the Willis Avenue site, Solvay waste beds and the Semet tar beds.

Willis Avenue Administrative Consent Order

The Willis Avenue site is the site of a former chlorine and chlorinated benzene production facility. An administrative consent order to perform a RI/FS was signed in December 1990. The remedial activities thus far have found chlorinated benzenes on the site, in ground water exiting the site and in the sediments of Onondaga Lake. It is anticipated that a final remedial investigation report will be completed during 1993.

In January 1993, a second administrative consent order was signed requiring Allied to develop an

interim remedial measure (IRM) to intercept the flow of a free product layer of chlorinated benzenes very close to the Lake shore. Allied has begun to implement this obligation.

Solvay Waste Beds Administrative Consent Order

The waste beds are not considered to be hazardous waste sites and, consequently, are regulated under the New York State solid waste regulations. Allied signed an administrative consent order in February 1987 requiring the company to perform a hydrogeologic assessment and feasibility study of the waste beds and their impacts on surface, and ground waters. Allied completed its hydrogeologic assessment of the waste beds area in April 1989. Completion of the feasibility study is now proceeding in tandem with the overall Lake system work being performed by Allied pursuant to the judicial consent decree.

Tar Beds Administrative Consent Order

The tar beds site is located on the southwestern side of Onondaga Lake. The 22-acre site was used from 1917 until 1970 for disposal of tar-like wastes from Allied's former benzene production plant. In June 1989, an administrative consent order was signed by Allied requiring the company to perform an RI/FS. The remedial investigation is complete, and the feasibility study is expected to be completed during 1993.

The requirements of the judicial consent decree, taken in conjunction with the three administrative orders, provide a comprehensive approach to the environmental problems associated with Allied-Signal and establishes the framework for remediating these problems.

Allied-Signal is not the only industrial operation which has discharged pollutants into or near the Lake. Other hazardous waste sites in the vicinity of the Lake are also of concern. For example, the McKesson site in "Oil City", and the Ley Creek PCB sediments. The potential impact of petroleum products on Onondaga Lake from "Oil City" is of particular concern. The "Oil City" area at the southeastern end of Onondaga Lake, bisected by Onondaga Creek, includes a large area which historically has been the location of various major petroleum product storage facilities servicing the Central New York region. It has been proposed that these facilities be moved in the near future to a location outside the immediate environs of Onondaga Lake to make way for major residential/commercial/recreational redevelopment. However, it has long been suspected that significant ground water contamination by petroleum products may exist as a result of over 60 years of petroleum terminal operations in this area. Contamination has been documented in several locations within the area. New York State is actively pursuing this matter and is discussing the terms of a consent decree with various oil companies to address this problem. Regardless of whether the oil terminals are ultimately moved, it is important to the ecology of the Lake that contamination in this area be remediated as necessary.

On May 10, 1993, Onondaga Lake was proposed by USEPA for listing on the National Priorities List (NPL) created pursuant to CERCLA. If the Lake is ultimately listed on the NPL, it will make available increased federal monies and enforcement authority, and will formally involve the USEPA in the remedy selection process.

Recommendations

The OLMC makes the following recommendations:

✔ **New York State should, through the judicial consent decree, oversee the completion by Allied of the remedial investigation studies of mercury and other Allied**

related pollutants. Thereafter, upon completion of the feasibility study, the State should select an appropriate remedial technology. The OLMC recommends that the process leading to remediation of mercury and other Allied-related toxic pollutants should be pursued as a priority.

✔ New York State should implement through its remedial program an investigation and remediation of the LCP Chemicals site. This should include the evaluation and implementation of interim remedial measures as appropriate.

✔ New York State should, through its administrative consent orders with Allied-Signal oversee: a) the implementation of an interim remedial program to remove, treat or dispose free product chlorinated benzenes from the Willis Avenue site.
b) the completion of studies of the sources and extent of contamination associated with the Willis Avenue site. These studies are scheduled for completion in late 1994. The State will evaluate and select appropriate remedial options thereafter.

✔ New York State should, through its consent order with Allied-Signal, oversee an investigation and remedial program of the Semet Tar Bed deposits. The initial investigation is scheduled for completion in 1993. The State will evaluate and select appropriate remedial options thereafter. This should include the evaluation and implementation of interim remedial measures as appropriate.

✔ New York State should, through its consent order with Allied-Signal, oversee implementation of physical closure of the Solvay waste beds where determined necessary and appropriate. This may include grading, soil cover, installation of positive surface drainage and bulkheading.

✔ Onondaga County should require Allied-Signal to cease discharge of waste bed drainage to METRO within one year. Through its SPDES permit process, NYSDEC should determine the conditions for issuance of a permit for the drainage to be redirected, treated and released appropriately.

✔ New York State should carry out the RI/FS and NRD assessment processes to define further remedial needs and methods, and collect monetary damages for:

- **lake sediments**
- **ground water**
- **lower Nine Mile Creek**
- **Tar beds site**
- **Willis Avenue site**
- **Other Allied impacts**

✔ New York State should prioritize and implement through responsible parties remediation of any other sites that are determined to pose a threat to the Lake ecosystem and usage.

✔ The New York State should, through the appropriate responsible parties, implement a comprehensive investigation and appropriate remediation of Oil City petroleum product contamination. This should address contamination on-site, as well

as any contamination moving off-site, if applicable. As the first step, NYSDEC should finalize and implement a consent order with appropriate parties to fully evaluate subsurface conditions at the site.

✔ New York State should pursue a program to selectively remove near-shore deposits which due to their physical characteristics may impede construction of the proposed New York State boat launch site on the Lake's west shore.

VII. Tully Valley Mud Boils.

The Tully Valley mud boils, located approximately 18 miles south of Syracuse, are a significant source of sediment and chlorides to Onondaga Creek and Onondaga Lake. The mud boils are cone-shaped, spring-like features about 4 to 13 feet in diameter. They discharge small turbid streams of either saline or fresh water which run across the land and eventually enter the Creek. The loading of sediment has impaired fish habitat in the Creek by covering the bottom with inorganic muds which ruin the substrate for insect-larvae and other benthic organisms. Sediments accumulate on the Creek bed and banks. During high flow events, they become resuspended and eventually the material is carried downstream and deposited in the Inner Harbor and Onondaga Lake increasing the cloudiness of the Lake. High salt levels in the Creek also significantly stress indigenous plants and aquatic life.

There are two main areas of mud boils in the Tully Valley. The first is the main mud boil depression area (MDA) where land subsidence and mud boil "eruptions" occur at a high rate. A second major area of freshwater mud boils is located along the Onondaga Creek corridor near Otisco Road.

The earliest known mud boil in the Tully Valley was reported by the Syracuse Post-Standard on October 19, 1899. The Tully Valley residents observed small, seasonal mud boils in the Otisco Road area until the mid-1970s when a marked increase in mud boil activity was noticed. Until this time, the mud boils had no major impact on water quality in Onondaga Creek or Onondaga Lake. Since the mid-1970s, the mud boils have increased in size, number and duration so that they occur year-round, and Onondaga Creek is perpetually turbid from the mud boils all the way to the Lake.

The inactive Tully Valley Brine Field occupies about 3,000 acres of land in the southern portion of the Tully Valley, along both sides of Onondaga Creek, about 20 miles south of Syracuse. Between 1888 and 1986, when Allied-Signal Inc. closed its Syracuse operations, Allied solution mined about 1.4 billion cubic feet of salt (enough to fill the Syracuse University Carrier Dome thirty-four times) from about 1,000 feet below the Tully Valley. One hundred and seventy wells were ultimately drilled to the Salina formation, freshwater was injected, salt was dissolved, and the resultant brine was lifted to the surface and piped to Syracuse for use in the soda ash manufacturing process. Until the late 1950s, freshwater was imported for injection. By the late 1950s, enough shallow ground water was intercepted and transmitted to the salt zone for Allied to be able to dissolve salt and produce brine without injecting imported freshwater. When brining operations ceased in the late 1980s, the one billion gallons of ground water that had previously been removed by Allied annually, became integrated into the existing northward ground water flow pattern. As a result, hydrostatic pressure in the brine field area increased.

New York State began an enforcement initiative in the mid-1980s that, to date, has resulted in Allied's plugging of 42 of the 170 abandoned wells, some of which had been leaking chloride-rich water at the surface. The remainder of the wells will be plugged under an order on consent recently executed between Allied and New York State. This plugging effort should reduce both the likelihood of future sinkhole development in the brine field, and subsurface brine mixing with freshwater flows and possibly contaminating freshwater aquifers. The consent order also requires a payment to New York State's well plugging account of approximately $200,000, and a provision for on-site monitoring of the plugging by the State. The State's enforcement initiative also included a limited investigation of the mud boil activity about one mile north of the brine field. These investigations have been continued and expanded upon by several State and Federal agencies through the OLMC.

The OLMC has conducted several studies aimed at finding solutions to the discharge of turbid and brackish water from the mud boils. A diversion channel was completed in 1992 to reduce the surface water

flow and sediment discharged from the MDA to Onondaga Creek, by diverting the flow to a tributary south of the main depression area. The channel has diverted about 80 percent of the streamflow that had previously entered the MDA and has substantially decreased the sediments discharged to the Creek. However, measurements taken during 1992 indicate that an average of 15 tons per day of clay, silt and fine sand are still discharged to the Creek from the mud boils. Other studies involving deep and shallow drilling along Onondaga Creek and near the MDA have also been completed. Based on these efforts and other data being collected through OLMC funded studies, it is hoped that scientists will be able to understand the cause and nature of the mud boils.

OLMC Mud Boil Remediation Projects

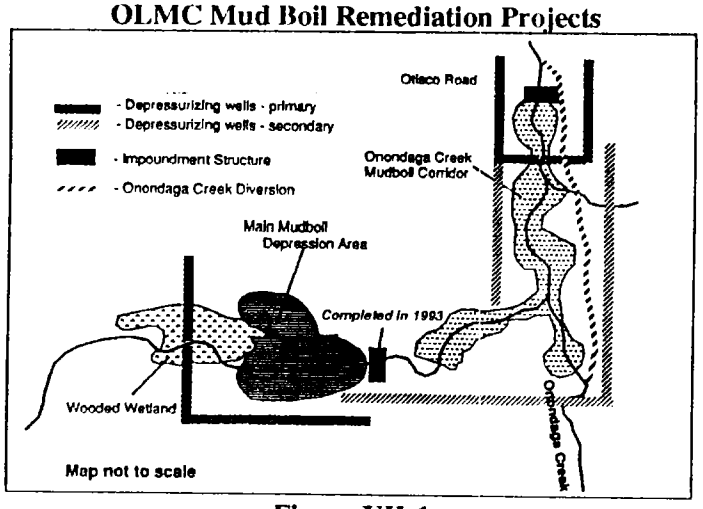

Figure VII-1

Two long-term remedial options are currently being considered by the OLMC and are illustrated in Figure VII-1.

The first remedial option for which a prototype project has been authorized by the OLMC, will be the construction of a settling pond at the MDA outlet to increase the retention of finer grained sediments. This project will be monitored to determine if this technology could be used to control sediment transport in Onondaga Creek. Another remedial option being explored is the construction of depressurizing wells. If constructed properly, the wells would allow discharge of water, but retain sediments. Wells might also reduce brackish water discharge as the freshwater pressure is relieved. However, additional studies are needed before a permanent remedial strategy can be finalized. These studies include soil surveys, studies of geochemistry, simulation modeling and construction of additional pilot studies.

Recommendations

The OLMC recommends that:

✔ **The OLMC, in cooperation with U.S. Geological Survey (USGS), US Department of Agriculture (USDA), USACOE, NYSDEC, New York State Department of Law (NYSDOL) and other agencies and experts should assess and report on the feasibility of implementing a short list of cost-effective remedial solutions for the mud boil effluents so as to substantially reduce sediment and chloride discharges to Onondaga Creek and Onondaga Lake. This effort may include implementation and monitoring of such pilot projects as:**

- **emplacement of subsurface depressurization wells**
- **rerouting a portion of Onondaga Creek**
- **installation of impoundment structures to allow settling of the fine sediments and the creation of additional overburden pressures.**

✔ **NYSDEC through the Administrative Consent Order with Allied-Signal should continue oversight of the plugging of solution mining wells to promote stabilization of the brine field area.**

✔ **The USGS in conjunction with NYSDEC, NYSDOL and other agencies should continue hydrogeologic investigations and research, as needed, to define the characteristics and impacts of the Tully Valley mud boils.**

✔ **New York State should pursue parties found responsible for the initiation and/or exacerbation of the mud boils in the Tully Valley, and require both appropriate remediation and compensation for damages.**

VIII. Fish and Wildlife Habitat and Fisheries Management

Problem Statement and Overview--Fish.

Though the first scientific survey of fish in Onondaga Lake was done in 1928, a variety of written reports document fishing in the region back to the 1600's. These earliest reports cite the presence of Atlantic salmon, presumably landlocked populations migratory to Lake Ontario, as a prominent feature of the Onondaga Lake system. In addition to these migratory species, large catches of the Onondaga Lake whitefish (ciscoes) are reported. The ciscoes, a non-migratory species, would be indicative of a coldwater fish community requiring adequate concentrations of dissolved oxygen in at least portions of the hypolimnion (lower waters) throughout the summer.

By the time the first formal fish survey was completed in 1928, the Onondaga Lake system had already been markedly disturbed due to settlement and industrialization, and there were accompanying changes in water levels, size of wetlands, water quality and habitats. Impediments to passage of migratory species came about with the construction of dams along the Oswego River system. In addition, Lake tributaries were channelized, thereby affecting their resident and migratory fish habitats.

With increased industrial and municipal growth, the Lake ecosystem became increasingly affected by industrial and municipal pollution creating conditions that further adversely affected fish and their habitat. A fish survey in 1946 recorded 13 species; however, over 90 percent of the catch was carp. Fifteen species were accounted for in a 1969 survey, and a similar number of species (17) were identified in a 1980 NYSDEC survey.

In recent years with heightened environmental awareness and stronger pollution control laws, improvements have been made in the water quality of the Lake and, in turn, the fishery. The number of fish species identified in the Lake has increased, and the locations and extent of different and more desirable species have expanded. An extensive sampling effort over the three-year period from 1989 until 1991 was funded by the OLMC and conducted by Dr. Neil H. Ringler (SUNY College of Environmental Science and Forestry). During the course of the study, 52 fish species were identified in the Lake. Although this recent diversity is consistent with those in other lakes in New York State, seasonal transients are common, and only 16 of the 52 species found in Onondaga Lake are known to reproduce there. Along with the diversity, the surveys showed wide changes in predominant species from season to season, which appear due to changes in oxygen levels and lack of suitable habitat for spawning.

Reduced oxygen levels during fall turnover causes species such as smallmouth bass and walleye pike to migrate out of Onondaga Lake into the Seneca River. Movement of desirable gamefish out of the Lake during these periods was confirmed by tagging and radio telemetry in Dr. Ringler's studies. Studies have also shown that distribution of most fish relate directly to the areas of plant growth which provide nursery and foraging areas. Areas covered by oncolites display few plants and thereby limit the amount of fish habitat.

Current fishing activity is concentrated at the north end of Onondaga Lake near the outlet to the Seneca River. Warmwater fish dominate angler catches, particularly smallmouth bass, largemouth bass and panfish. Other gamefish such as northern pike, walleye and channel catfish, although found in the Lake, appear to be rarely caught perhaps due to the large crop of forage fishes and the relatively low abundance of these species in the Lake.

In 1970, New York State closed Onondaga Lake to fishing due to mercury contamination. Fish

flesh from the Lake has been monitored for mercury contamination since the initial efforts in 1970. In 1986, the Lake was reopened on a "catch and release" basis with a health advisory warning against eating fish from the Lake which is still in effect to date.

In addition to mercury, other toxics have been identified in the Lake ecosystem and found in fish flesh including PCBs and chlorinated benzenes. Current studies are underway by Allied-Signal and the OLMC which may help further define the extent and impact of toxic contaminants on the Lake's fishery. As long as mercury levels remain above FDA standards in some fish, New York State will continue to maintain its advisory against eating fish from Onondaga Lake.

Current adverse conditions in the Lake include low levels of dissolved oxygen, high levels of turbidity, elevated levels of ammonia and salinity, reduced plant life, unsuitable substrate and the presence of mercury and other contaminants.

Fisheries Management

The diversity and health of the Lake's ecosystem and fishery is directly dependent on the Lake's water quality and availability of suitable habitat. Therefore, fisheries management cannot be considered independent of water quality and habitat factors. The most significant water quality problems affecting the fishery are low dissolved oxygen and high ammonia in the Lake water. Both create conditions which restrict the quantity and extent of fish in the Lake. Improvements to sewage treatment would yield reduced levels of phosphorus and ammonia, thereby increasing levels of dissolved oxygen and expanding available habitats.

Excessive algae growth due to phosphorus inputs cause Lake turbidity, limits aquatic plant growth by blocking sunlight and leads to oxygen depletion in the Lake's bottom waters. Suitable habitat is limited by the lack of oxygen as well as plant life for cover and forage areas and adequate food supplies. Near-shore deposits of oncolites created by salt-waste discharges from Allied-Signal are not conducive to plant growth in these shoreline areas where juvenile fish and spawning might normally occur. Other factors limiting the Lake's aquatic life include elevated salinity, limited wetlands and high suspended sediments in the Lake and its tributaries.

The presence of mercury and other toxic contaminants affect the health and edibility of the fish. Achievement of a fishery fit for consumption will be dependent on eliminating the impact of toxics in the Lake ecosystem.

With these water quality, habitat and contamination considerations, fisheries management recommendations were developed with long and short-term time frames. Because of the close correlation and dependency of the fishery on water quality issues, biological monitoring of fish and plants should be coordinated with water quality studies and toxic investigations. Remedial efforts to resolve water quality issues including the impacts of wastewater, CSOs, the mud boils, salinity, the Solvay waste beds and in-place toxic sites will permit the development of a diverse and healthy fishery throughout Onondaga Lake and the tributary system.

The OLMC convened a working group of fisheries scientists and managers to examine the various alternatives available for enhancing the Lake's fishery. The following options were considered:

Option A. Enhanced Warmwater Resident Fishery. The group concluded that Onondaga Lake could continue to support a fairly diverse warmwater fishery with relatively few management initiatives, as long as it continued to receive minimal fishing pressure. The legacy of industrial and municipal pollution still

limits the expansion of the warmwater fishery, and preclude the re-establishment of a year-round coldwater fishery because the Lake continues to experience severe declines in dissolved oxygen levels particularly during fall turnover.

Option B. Resident Coldwater Fishery. Year-round populations of these more sensitive species would require water quality conditions that might only be met through immediate implementation of a full wastewater diversion, a rigorous program of non-point source management and temporary artificial oxygenation of the bottom waters.

Option C. Resident Warmwater/Transient Coldwater Fishery. Current stocking efforts by NYSDEC, and studies of the fishery demonstrate the potential for a transient coldwater fishery, where the fish migrate between the Lake and the Seneca River. The OLMC concluded that if Lake water quality was enhanced to meet B and C water quality standards, to support warmwater fish populations, the establishment of a transient Atlantic salmon fishery in the Lake and lower reaches of the main tributaries would also be feasible. This option was the program chosen by the Working Group on an interim basis.

Long-term objectives suggest the establishment of a resident warm and coldwater fish population in Onondaga Lake. The water quality and habitat in Onondaga and Nine Mile Creeks would also need to be improved to support their use as spawning and nursery areas for resident and transient warm and coldwater fish. Ultimately, it was felt that the Lake system should offer a consumptive fishery for all Lake gamefish.

Other Ecological Management Considerations

The OLMC has funded a comprehensive program to study and restore near-shore aquatic habitat. Lake and greenhouse pilot studies have been conducted in order to determine the best species of aquatic plants for revegetation efforts and the proper planting and culture techniques. During 1993, a number of areas were revegetated with aquatic plants to assess the feasibility of large-scale shoreline rehabilitation efforts.

As the land around the Lake becomes more heavily used for hiking and picnicking, every effort should be made to protect the indigenous plants and animals. Education of the public may be very useful in this regard and may take a variety of forms. One effort would include the establishment of a "watchable" wildlife program of the existing wildlife. Another option may be the construction of wildlife platforms to view deer and other animals around the shoreline.

Problem Statement and Overview--Wildlife

According to early accounts of the area, the land around Onondaga Lake consisted of expansive marshes and swamp lands extending outward along low areas. The uplands were covered by forests where wildlife were abundant. Plants and animals were described as bountiful in the area; and the area which would later become the City of Syracuse was home to such animals as bears, wolves, wildcats and deer.

Settlement and development of the area led to widespread and extensive alteration of the landscape and natural communities. Industrial, commercial, business, transportation, residential and recreational uses led to modification of the soils, hydrology, vegetation and wildlife community throughout the Onondaga Lake watershed. Most notable was the loss of extensive wetland areas around the Lake and their accompanying plant and animal life.

Despite historical impacts, the current wildlife and wildlife habitat surrounding Onondaga Lake is

diverse, particularly considering its proximity to a highly industrialized urban area. Habitats available range from maintained park areas, to mature swamp forests, to marshes and mudflats.

In a review of existing literature and information on wildlife and their habitats funded by the OLMC, Dr. Larry Van Druff assisted by Margaret Pike found little available on past and current wildlife in existing scientific literature. However, based on their discussions with local naturalists and their own personal observations, they concluded that the Lake area supports a variety of wildlife. Eleven different types of habitats were described and accompanying wildife was identified. According to local experts, the Onondaga Lake area is second only to the Montezuma Refuge in the Central New York area for its opportunity to observe diverse shore birds and waterfowl species.

Although any previously existing natural habitat on the waste bed sites have been buried long ago, the beds are undergoing vegetational succession and new wildlife habitats have developed. Among the wildlife inhabiting the waste beds and their near-shore areas are white-tailed deer, beavers, woodchucks, foxes and a variety of waterfowl, migratory shorebirds and raptors. The sheer face of the waste bed cliffs supports a thriving colony of nesting bank swallows.

The remaining mudflats on the southern shore attract a wide variety of bird species and the wooded swamp on the northern shore of the Lake supports wildlife associated with forest-edge and bottom land species. This wooded area and the adjoining waste bed area provide a wildlife corridor for mobile species like deer, fox and coyote.

Wildlife Management

Considering Onondaga Lake's past, it currently supports a diverse and interesting wildlife community. Although the Lake's shoreline and surrounding lands have been disturbed and degraded, wildlife areas still exist that are of interest to the experienced naturalist or the casual observer. The absence of cottages on the Lake, lack of lakefront development and extensive public ownership of the lakefront can greatly aid wildlife and habitat management in this area. Further survey and research work would assist in determining site specific information to prioritize areas for protection and management while public education efforts would help to inform the public about the wildlife and habitats in this area to enjoy, protect and manage.

Recommendations

a. The OLMC makes the following Fisheries recommendations:

> ✔ **In the short term, the OLMC supports the establishment of a suitable year-round habitat for a sustainable warmwater fishery in the Lake and to allow migration of coldwater fish into the Lake's tributaries by the achievement of sufficient water quality, vegetative cover, access, food supply and other habitat requirements.**
>
> ✔ **In the long term, the OLMC supports the achievement of a suitable year-round habitat for a sustainable consumptive warm and coldwater fishery in the Lake and its tributaries.**
>
> ✔ **In the long term, the OLMC supports making specific reaches of both Nine Mile Creek and Onondaga Creek suitable for spawning, migration and residence of indigenous fish species.**

✔ **The NYSDEC should develop a Fisheries Management Plan specific to Onondaga Lake to address and work toward achieving the above OLMC recommendations on the fishery.**

✔ **The OLMC should continue to completion its on-going study to evaluate methods of littoral zone rehabilitation. The results of such study should be considered in determining remediation options for the Lake.**

✔ **The OLMC should undertake an artificial in-lake oxygenation pilot project to evaluate the potential role of in-lake oxygenation on Lake restoration, and its effect on the release of nutrients and metals from the bottom sediment.**

✔ **NYSDEC should undertake experimental stocking of Nine Mile Creek with Atlantic salmon smolts to assess remediation needs to allow future Atlantic salmon migratory runs.**

✔ **As long as fish continue to exceed FDA levels for mercury, the advisory against eating fish should be maintained. If the levels of these contaminants falls below these FDA guidelines, the OLMC recommends that careful review be undertaken of all contaminants likely to be of concern in the Onondaga Lake system prior to lifting the consumption advisory.**

b. The OLMC makes the following Fisheries and Wildlife recommendations:

✔ **The OLMC recommends that the development of a comprehensive biological monitoring program to demonstrate trends and to identify sources and causes of ecosystem-wide problems be undertaken. Biological monitoring should be coordinated with other activities such as water quality studies, mercury studies and fishery investigations.**

✔ **The OLMC recommends that the NYSDEC undertake an annual fish monitoring program of Onondaga Lake, associated tributaries and the Lake outlet to identify all appropriate and likely contaminants that may be present in the Lake system.**

✔ **The OLMC should oversee implementation of a Natural History Information and Education Program to educate and inform the public on fish and wildlife species in and around the Lake.**

c. The OLMC makes the following Wildlife Recommendations:

✔ **The OLMC recommends the development and implementation of a plan to hydrological connect selected wetland areas to Onondaga Lake.**

✔ **NYSDEC should identify environmentally sensitive areas and significant wildlife habitat around the Lake's shoreline. The OLMC recommends that incompatible development in these areas should be discouraged.**

IX. Inner Harbor, Shoreline Use and Lake Use

Onondaga Lake is almost entirely surrounded by developed areas. It lies within the jurisdictional boundaries of the City of Syracuse, the towns of Salina and Geddes and the villages of Solvay and Liverpool. After more than a century of damaging industrial and manufacturing practices, the Lake and its environs are now experiencing the beneficial effects of community-wide interest in restoration. In addition to improvement of the Lake's water quality, there has been considerable development of compatible land use in the neighborhoods surrounding the Lake in recent years. Improvement projects currently underway include the adaptive reuse of Franklin Square, the development of the Carousel Center, plans for the year-round utilization of the New York State Fairgrounds, and renovations of the Saint Marie Among the Iroquois Living History Site.

The shores of Onondaga Lake are now making the transition from industrial use to lands that support commercial development and outdoor recreation. The regulation of this transition is almost entirely the role of local government. It is imperative that this process be cooperative among the various jurisdictions, to ensure the most appropriate use of the land and water, without creating significant negative environmental impact. In recognition of the scope of present and future development opportunities in the area around Onondaga Lake, and at the request of the County Executive, the Metropolitan Development Association, the City of Syracuse, Onondaga County and the New York State Urban Development Corporation have jointly sponsored a Land Use Master Plan to be used by the community as a tool in selecting policies to develop the lakeshore and adjacent properties in a coordinated manner. The City of Syracuse has also developed an Action Plan for Lakefront Development to describe redevelopment efforts that the City plans for the Onondaga Lake Inner Harbor Area.

The Land Use Master Plan has incorporated preliminary plans for many area projects. These include: improvement of downtown Syracuse Streetscapes; the development of a Museum of Science and Technology at the present Jefferson Street Armory; construction of a bikeway to complete the pedestrian trail system that presently exists around Onondaga Lake to tie into other county bikeways; expansion of the Onondaga Creekwalk from Franklin Square to Armory Square; revamping the infrastructure and construction of a new administration and vendor buildings, site access roads and parking facilities for the Central New York Regional Market; a Transportation Center located adjacent to the Conrail Main Line on the west side of the Regional Market; rerouting the Conrail Baldwinsville Secondary Line to the west side of the Fairgrounds; a tourist and downtown shuttle train on Conrail's old freight tracks; the construction of a Water Sports Training Center; upgrading MacAurthur Stadium; and a seasonal performing arts center.

The City of Syracuse proposed a two-phase $126 million redevelopment of the New York State Thruway Authority (NYSTA) Barge Canal facility located near the mouth of Onondaga Creek. The Barge Canal Harbor area and basin encompass 127 acres of land and 54.4 acres of water extending south to Spencer Street and west to Van Rensselaer. Currently owned by NYSTA, most of the land is unused and overgrown with vegetation. The first phase of the Syracuse Inner Harbor project calls for the development of a pleasure-boat marina, restaurants and retail establishments, and a water-oriented recreation and cultural park. There is also a long-term component of the plan that envisions the construction of waterfront housing, corporate offices, a hotel and expansion of the marina. Implementation of second phase of the plan hinges on future market conditions and the success of initial development. The overall project requires an estimated $100 million in private funds and $26 million in public moneys. In return, the project promises to produce direct annual economic benefits of $6.75 million, 2,000 construction jobs and 535 permanent employment positions. The goals of the project are to increase the City's tax base and create and retain jobs for area residents, provide recreational and cultural uses along the Lake, open the lakefront to the public and engage in activities which provide the highest and best use of the land and water. Under Phase I of the

project, the NYSTA will remain an integral part of the waterfront.

Given the focus on water quality remediation and the land use development efforts around the lakefront, removing obstructions and enhancing access to the Lake and its shoreline is a primary management objective for the overall enhancement of Onondaga Lake. Another priority of the Lake restoration effort focuses on providing area residents with improved access for fishing and viewing wildlife.

Land use development proposals that are endorsed by the OLMC are the design and construction of an outdoor performing arts facility, a year-round skating rink and a public art park in the Inner Harbor Area, a Lake education and research center along Onondaga Creek, the extension and development of pedestrian/bicycle trails around the Lake and into the downtown area, and expansion of the East Shore Marina. To provide better access to boat traffic in the Inner Harbor area, the USACOE also plans to assess the feasibility of dredging the area.

All development efforts must be coordinated with water quality remedial efforts so as not to degrade the Lake System, its aquatic life, water quality improvements, or pose a threat to the public. Likewise, all construction related to the water quality remediation of Onondaga Lake and its tributaries, (storage tanks for CSOs, for example) should consider area design, zoning, and set back requirements and be integrated into the landscape of area development. In addition, as the water quality of Onondaga Lake improves and other water-based recreation activities increase, issues such as heavy boat traffic might need to be considered.

Public participation will be a key component in the redevelopment of the Onondaga Lakefront. These types of efforts should be coordinated between the local and state constituencies who are involved in area redevelopment to promote tourism, recreation and commerce. In addition, the establishment of an advisory committee to comment on land use decision between towns involved in planning decisions should be considered.

Recommendations

The OLMC makes the following recommendations:

✔ **NYSDEC, Onondaga County and the City of Syracuse should work to expand and improve access to the Lake for fishing and boating as the fishery and public demand warrant. Facilities should provide access for boating and shoreline anglers and may include boat access sites and public fishing piers. All facilities should be handicapped accessible and located in consideration of all area residents.**

✔ **The NYSDEC should continue to pursue the development and construction of a fishing access site on the west shore of the Lake.**

✔ **The USACOE should design and prepare plans to dredge the Inner Harbor during 1993/1994. The planning process will determine the appropriate party to dredge the Inner Harbor; and the dredging should be conducted before 1996.**

✔ **Local governments should seek public and private funds for the design and construction of projects which may include, but not be limited to: an outdoor performing arts facility, a year-round skating rink, a public art park, a Lake education and research center, bike paths and pedestrian walkways.**

✔ **Local governments should coordinate any construction activity relating to the development of wastewater treatment facilities so as to minimize to the extent possible any negative impacts on lakefront development and the surrounding community.**

✔ **The City, the County and other local governments should work with the NY State Department of Economic Development and NY State Canal Corp. to design and circulate tourism focused promotional publications to promote the Lake and the Inner Harbor.**

✔ **The OLMC endorses the re-use of the Allied waste beds, where appropriate, for public use purposes including the possibility of parks, golf courses, etc. Remedial efforts undertaken by responsible parties should be developed and implemented in consideration of future possible public usage.**

✔ **Local governments should continue to improve public access to the Lake by completing the lakewide trail system and expanding the East Shore marina.**

✔ **No land use should be permitted which would be deleterious to the Lake's water quality.**

X. Non Point Source Pollution

The Problem and Background

Point sources of pollution, which have been the focus of the Management Plan, are the most significant contributors to water quality problems confronting the Lake today. Nonetheless, nonpoint sources of pollution carried to the Lake by stormwater runoff from both the urban and rural areas of Onondaga County will take on growing significance as point source problems are reduced, and ultimately remediated. Pesticides, petroleum products, road salt, fertilizers and sediment from urban and rural sources in the Onondaga Lake watershed are routinely transported by the tributaries to Onondaga Lake. Ultimately, implementation of a nonpoint source management strategy for Onondaga Lake that selects and prioritizes appropriate best management practices for the watershed will reduce the significance of the loadings on the Lake system.

Nonpoint Source Control Options

A first component of a comprehensive nonpoint source management strategy for Onondaga Lake is scheduled for completion by the OLMC by the end of 1993. In addition to identifying the types of areas of nonpoint sources on the watershed, the strategy will identify areas of the watershed that are of more critical concern, and establish priorities for nonpoint source pollution control within identified areas.

Implementation of a nonpoint source management strategy can be carried out through information, education and technical assistance, in addition to some financial incentives. Manuy of the most effective nonpoint source control techniques are low cost. These strategies can include fencing streams from livestock, revegetation of stream banks, litter control and cleanup, and campaigns for pollution prevention. Beyond this, gains in nonpoint source pollution control can be realized by the use of zoning and building codes, and ordinances dealing with erosion and sediment control on construction sites at the municipal level. At the state level, various divisions of the NYSDEC have regulatory authority over activities that relate to nonpoint source pollution. The Division of Hazardous Substances Regulation, for example, administers the Pesticide Management Program. At the federal level, the USEPA develops guidelines and provides assistance for nonpoint source pollution control. Onondaga County, through the Onondaga County Soil and Water Conservation district, should assist the agricultural community in the establishment of best management practices to reduce soil and nutrient inputs from the Onondaga Lake watershed and identify and actively pursue implementation of BMPs in priority areas. The USDA agencies, Cornell University Cooperative Extension and County Soil and Water Conservation District should cooperatively provide information and technical assistance to farmers for erosion control, nutrient and pest management. Agricultural Stabilization and Conservation should provide financial cost-share assistance for eligible conservation practices.

Recommendations:

The OLMC makes the following recommendations:

> ✔ **The OLMC should complete its nonpoint source management strategy to address the impacts of nonpoint source pollution on the Onondaga Lake watershed based on available geographic, demographic, hydrologic and water quality data.**
>
> ✔ **A nonpoint source management strategy, which incorporates, urban, suburban and rural control problems, should be incorporated into Onondaga County's Water**

Quality Strategy. The Water Quality Strategy should be under the direction of the Onondaga County Water Quality Coordinating Committee and would continually evaluate and update watershed protection implementation programs.

✔ **Based on data collection efforts funded by the OLMC, portions of the Onondaga Lake watershed should be identified and prioritized for implementation of best management practices (BMPs) to control nonpoint source pollution.**

✔ **The OLMC should define a "Zone of Primary Ground Water Management Concern" in order to further evaluate and manage ground water pollution impacts to the Lake and its tributaries.**

✔ **New York State, Onondaga County, local governments and other appropriate government agencies should initiate a non-point source public education program to raise public awareness and promote practices at the individual household level to reduce nonpoint source pollutant inputs to the watershed.**

XI. The Onondaga Lake Management Conference

Background

As described in Chapter I, the OLMC was established by an Act of Congress, the Great Lakes Critical Programs Act of 1990 (Public Law 101-596, Section 401), for the purposes of:

1) development of a comprehensive restoration, conservation and management plan for Onondaga Lake to recommend actions for the cleanup of the Lake; and
2) coordination of implementation of the plan by participants in the OLMC

The OLMC is made up of six voting members and two standing committees (see Figure I-1). In order to provide administrative services for the implementation of research and surveys initiated by the OLMC, and to fund pilot remediation projects, the OLMC established an office in the Hanley Federal Building in Syracuse, NY. Currently, several projects, as described in this proposed plan, are ongoing with OLMC funds.

The OLMC has served as a focus of interagency discussion and coordination of Lake restoration issues. The conferees have met regularly since its inception for the purposes of the development of this Plan. Additionally, committees of the OLMC and technical subcommittees have met on a frequent basis.

The draft Onondaga Lake Management Plan was completed by the OLMC and released on May 27, 1993. This date marked the beginning of a 45-day comment period to receive both verbal and written comments on the proposed plan. During this period, a public meeting was also conducted on June 30, 1993 in Syracuse to hear verbal comments and accept statements. The comment period closed in mid-July. This Plan was produced by the OLMC following the review and evaluation of both oral and written comments from the public and preparation of a responsiveness summary.

Over recent years, the various agencies and citizen groups involved with the Onondaga Lake cleanup have conducted efforts to inform and educate the public about the Lake's history and restoration issues. Educational videos, classes, displays, the annual Waterfront Extravaganza, conferences, news media coverage and publication of printed materials have been produced.

As the OLMC moves into its implementation phase, efforts to build the public's understanding of the Lake's restoration efforts will be a priority. To this end, the CAC will work with the OLMC to develop and implement a public education program to augment other past and on-going efforts. The goal of this program will be to educate the residents of Onondaga County about the current condition of the Lake, proposed cleanup plans and progress on implementation of lake-related projects. The program will describe current Lake issues and information on the Lake obtained by the research funded by the OLMC. In addition, the program will educate the public about the agencies, laws and processes involved in the restoration efforts as well as the kinds of costs involved and anticipated benefits that could be derived from a cleaner Lake.

To help oversee the execution of a public education program and implementation of the remedial activities set forth in the Plan, the OLMC intends to maintain an office in Syracuse. The long-term structure of the OLMC will be re-evaluated in a period of two years to ensure effective oversight of the remediation efforts. Meetings of the Conference will be convened regularly during this initial two year period.

Recommendations

In order to complete the tasks described in the previous chapters, and to meet the Congressional charge of coordinating plan implementation, the following recommendations concerning institutional arrangements for the OLMC are made:

✔ **The OLMC should continue, in its present structure, for a period of up to two years, to complete ongoing studies and projects, and to finalize the Management Plan for Onondaga Lake and other related documents.**

✔ **The OLMC should oversee the development of a public education program for Onondaga Lake that is aimed at building public understanding about the remediation effort to improve Lake water quality.**

✔ **The OLMC, during a two-year period necessary to complete on-going studies and projects, should meet to determine the long-term management structure for overseeing the implementation of the final Plan. The form and structure of the OLMC, beyond the Plan implementation period, should also be determined during this time.**

✔ **The OLMC should maintain an office in Syracuse, NY, for the purposes of administrative support, and for coordination with the public during the period of Plan finalization. Based on the availability of a source of funding, the OLMC office should continue to operate under the present OLMC structure.**

✔ **Within a two-year time frame, the necessity for the maintenance of an OLMC office should be determined. The continuation and structure of the office should also be determined during this period.**

✔ **The OLMC should, in addition to its regular meetings, hold at least one special meeting each year to provide the public with the status of implementation of the projects and remedial actions contained in the Management Plan.**

Chapter XII. Financing Wastewater Improvements

Overview

The cost of making large scale improvements to wastewater delivery and treatment systems is made up of three basic components:

1. Capital costs
2. The cost of borrowing money to finance the capital costs
3. The additional cost of operating and maintaining the improved facilities.

Under the direction of the CAC, the OLMC has retained expert consultants to assist the Conference in evaluating the financial impacts of making improvements to that portion of Onondaga County's sewer system that affects Onondaga Lake. A report addressing these issues was completed in June 1993.

To assist the public in understanding some of the financial implications of making sewage treatment improvements to reduce pollution of the Lake, the OLMC and its CAC have utilized preliminary information from that effort to prepare a comparison of financing three possible options. These options are:

Option A. Regional CSO treatment and partial diversion of METRO effluent to Baldwinsville implemented over a period of seventeen years,

Option B. The identical plan as Option A except that it would be implemented over a period of ten years,

Option C. Regional CSO treatment and total diversion of METRO effluent which would consist of partial diversion of METRO influent to Baldwinsville, and diversion of the remaining effluent to the Seneca River.

These options are presented as illustrations and are not necessarily the only alternatives available.

The Onondaga County Consolidated Sanitary District consists of eight sewage treatment plants, 50 pump stations and 350 miles of sewer mains. The Sanitary District also maintains two sewage treatment plants, 70 pumps stations and 2700 miles of sewer line owned by other governmental entities as well as 60 miles of District owned sewers within the City of Syracuse. The District's operating budget for 1993 is currently $42.8 million. A charge per unit supports over 75% of the operating expenses of the Drainage and Sanitation District. Each single family structure represents one unit. Multi-family structures are allocated three a unit per dwelling unit. Business and industry are assigned one unit for every 146,000 gallons discharged. The 1993 County charge per unit is $203.

All of the capital costs for the various components (pipelines, pump stations, etc.) of the three scenarios presented below, with the exception of the METRO effluent bypass included in Option C, were taken from estimates provided by Onondaga County. The County's estimates include a 20% cost allowance for contingencies and 25% for planning, engineering design and project administration, and a 6.5% cost for financing during construction. The cost estimates discussed in Options A, B and C do not include the price of land acquisition. Costs for the METRO effluent bypass were generated by consultants to the OLMC by

adjusting the County's estimate for the cost of full effluent diversion to reflect the reduction in pump stations and forcemain size as required in Option C.

Engineering Options

1. Option A. This alternative consists of diverting 38 MGD of raw wastewater from the METRO plant to an expanded Baldwinsville-Seneca Knolls WWTF. The current Baldwinsville plant is a two-stage pure oxygen activated sludge facility with a design average flow of 9 MGD and a peak of 18 MGD. The plant will be expanded to a nominal 47 MGD with a peak flow capacity of 74 MGD. This diversion will reduce the wastewater flows at METRO to 49.5 MGD at average and 202.4 MGD at peak, with discharge to Onondaga Lake. CSO abatement would consist of regional high-rate treatment (swirl concentrators), without storage.

Table XII-1
Option A
Regional CSO Treatment and Partial Diversion to Baldwinsville (17 years)

Major Components	1995 Cost (Millions)[1]	Phased Cost (Millions)[2]	Project Time Frame (Phased Cost)
METRO WWTP Misc. Improvements, excluding Ringlace for nitrification	$ 22.5	$ 24.1	1993-1999
Baldwinsville WWTF Expansion	$ 134.0	$ 221.0	2000-2005
Flow Diversion Pump Stations & Force Mains	$ 72.0	$ 119.0	2000-2005
METRO WWTF Treatment Upgrade	$ 33.0	$ 55.0	2000-2005
CSO Abatement Demonstration Units	$ 23.8	$ 23.8	1993-1996
CSO Abatement Regional Facilities (Phase I)	$ 136.3	$ 213.0	1997-2004
CSO Abatement Regional Facilities (Phase II)	$ 98.1	$ 201.4	2005-2009
Total Cost	**$ 521.7**	**$ 857.3**	

Note: [1] Capital Cost escalation base on 5.6% annual increase.
[2] County Engineering Consultants' cost estimate for capital costs in 1995 dollars.

2. Option B. This alternative consists of the same physical modifications and improvements as Alternative A, but the implementation plan has been reduced from 17 years to 10 years.

Table XII-2
Option B
Regional CSO Treatment and Partial Diversion to Baldwinsville (10 years)

Major Components	1995 Cost (Millions)	Phased Cost (Millions)	Project Time Frame (Phased Cost)
METRO WWTP Misc. Improvements, excluding Ringlace for nitrification	$ 13.2	$ 13.55	1994-1996
Baldwinsville WWTF Expansion	$ 134.0	$ 148.0	1994-1998
Flow Diversion Pump Stations & Force Mains	$ 72.0	$ 81.6	1995-1998
METRO WWTF Treatment Upgrade	$ 42.3	$ 53.5	1997-2000
CSO Abatement Demonstration Units	$ 23.8	$ 23.8	1994-1996
CSO Abatement Regional Facilities	$ 237.0	$ 332.3	1997-2003
Total Cost	**$ 521.7**	**$ 652.75**	

3. Option C. This alternative likewise consists of diverting 38 MGD of raw wastewater from the METRO plant to an expanded Baldwinsville-Seneca Knolls WWTF (same modifications and improvements as Alternative A). The fully treated effluent from the METRO Plant, up to a maximum of 120 MGD, will be pumped directly to the Seneca River. The effluent bypass will be based on a new 120 MGD pump station and a 72-inch force main. CSO abatement would consist of regional high-rate treatment (swirl concentrators).

Table XII-3
Option C
Regional CSO Treatment and Total-Diversion (Partial Diversion to Baldwinsville and Remaining Effluent to Seneca River/10 years)

Major Components	1995 Cost (Millions)	Phased Cost (Millions)	Project Time Frame (Phased Cost)
METRO WWTP Misc. Improvements, excluding Ringlace for nitrification	$ 13.2	$ 13.55	1994-1996
Baldwinsville WWTF Expansion	$ 134.0	$ 148.0	1994-1998
Flow Diversion Pump Stations & Force Mains	$ 72.0	$ 81.6	1995-1998
METRO WWTF Treatment Upgrade	$ 42.3	$ 53.5	1997-2000
METRO WWTF Effluent Bypass	$ 86.9	$ 122.5	1999-2002
CSO Abatement Demonstration Units	$ 23.2	$ 23.8	1994-1996
CSO Abatement Regional Facilities	$237.0	$ 332.3	1997-2003
Total Cost	**$ 608.6**	**$ 775.25**	

In each of the previous three tables, two columns contain cost estimates for each of the major components of potential wastewater improvements. Another column indicates the time frames for the phased implementation approach.

The first cost column shows the estimated project cost if the project were undertaken in 1995. Although it is recognized that constructing the projects all in one year may not be realistic, showing the costs in 1995 dollars allows a consistent basis for comparison.

The second of the cost columns, "Phased Cost" shows the estimated cost of each project in the years indicated in the far right column, during which it could be undertaken. The costs in the "Phased Cost" column are obtained by applying a 5.6 % yearly rate of increase to the 1995 cost.

Financing Scenarios

Three principle debt financing scenarios were considered for Options A, B and C based on the premise that 1) due to the size of the capital outlays required, pay-as-you go financing by Onondaga County will not raise a sufficient amount of revenue and 2) in the absence of a large Federal or State grant, wastewater improvements will need to be debt financed. The three scenarios considered are:

- **General Obligation Bonds (GO).** These are issued by the County, and backed by the full faith and credit worthiness of the County's tax base.

- **Revenue Bonds.** These must be issued by a public authority created by Onondaga County, which could have full authority over the provision of wastewater services for the Onondaga County Consolidated Sanitary District.

- **Loans from the New York State Water Pollution Control Revolving Fund (SRF).** Leveraged loans from the SRF must be "backed" by either GO debt, or revenue bond debt, depending on the loan recipient.

Each scenario was evaluated in terms of: 1) the cash-flow required each year (capital and operating costs); 2) cost of capital; and 3) the user base. The basic model assumes that "cash-flow financing" is used (i.e. only the amount of cash needed in a particular year is borrowed). This implies that a series of bonds must be issued during the course of the construction period, and that a combination of financing options could be used. For each year, the cost is then divided by the number of users to determine the cost/user ratio. If the current sewer use rate structure in Onondaga County is not altered, then the cost/user ratio in any one year represents the *addition* to current rates that will result from financing construction of the project in that year.

After considering the range of financing scenarios and the financial analysis prepared for the OLMC, the most practical method for financing wastewater treatment improvements under current law appears to be through a series of revenue backed loans from the SRF. The annual cost of borrowing from the SRF through a series of revenue bond backed loans appears to be the most cost effective method to finance the necessary capital improvements. Financing assumptions are based on current and anticipated SRF lending practices and standard revenue bond practices in the state of New York.

If available, borrowing from the SRF may be the least costly option in terms of its effect on user rates. The SRF lends funds primarily for investments in wastewater facilities. Currently, for example, the SRF is offering loans at 3 %, which is approximately 60% of the rate of recent Onondaga County GO bonds. The offer of a 50 % subsidy from the SRF is currently scheduled to end December 31, 1994.

To access loans from the SRF, the County could authorize GO bonds for placement with the SRF or create an independent authority, that in turn, could authorize revenue bonds for placement with the SRF.

GO bonds authorized to back SRF loans are subject to the same limits on GO debt capacity as GO bonds issued directly on the market. Because of this limitation, only a portion of the Lake cleanup project could be GO-backed SRF loans. The remainder would have to be financed with revenue bond backed SRF loans. Since the County faces investment in capital improvement plan (CIP) projects that also will use up some GO debt capacity, the County could consider using revenue bonds to back SRF loans for the entire project.

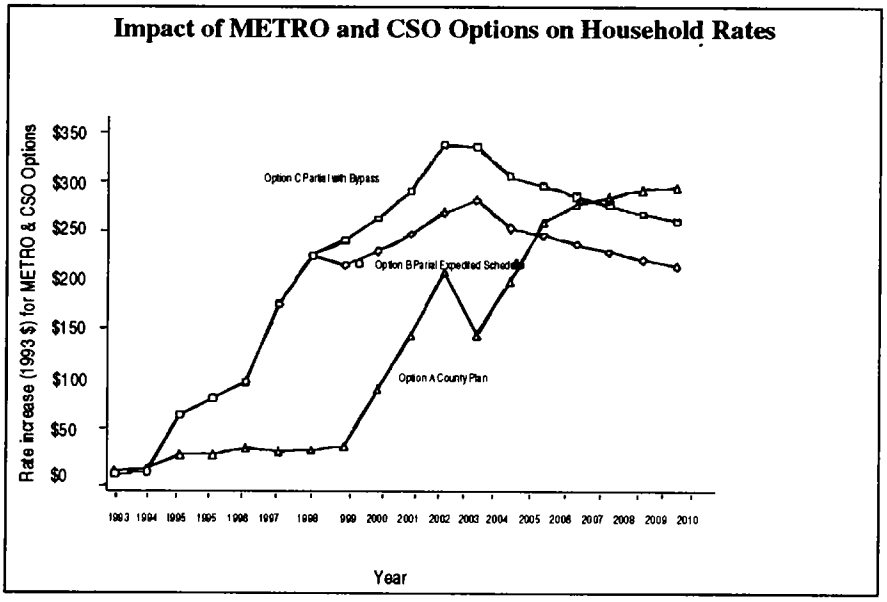

Figure XII-4

Results of Financial Analysis

Assuming that the current sewer fee rate structure remains the same, the impact of the three engineering options on sewer fees is shown in Figure XII-4 and Table XII-5. The results are summarized as follows:

1. **Option A. Regional CSO Treatment and Partial Diversion to Baldwinsville (17 years).** Under this construction phasing option, rates increase slowly at first and by the year 2010, household rates (in 1993 dollars) will have increased by $289.38.

2. **Option B. Regional CSO Treatment and Partial Diversion to Baldwinsville (10 years).** Under this construction phasing option, rates increase more rapidly than Option A, but by the year 2010, household rates (in 1993 dollars) will have increased by $207.71.

3. **Option C. Regional CSO Treatment and Total Diversion (Partial Diversion to Baldwinsville and Remaining Effluent to Seneca River/10 years)** Under this option, rates increase in a similar fashion to Option B, but by the year 2010, household rates (in 1993 dollars) will have increased by $253.61. The increase is larger than with Option B, reflecting the additional capital cost of the second diversion pipe.

Table XII-5
Expected Increase In Current User Rates Under
SRF Financing Current Rate Structure in 1993 Dollars

	1995	2000	2005	2010
Option A	+$19.24	+$27.22	+$192.61	+$289.38
Option B	+$60.15	+$210.05	+$247.55	+$207.71
Option C	+$60.15	+$235.03	+$300.34	+$253.61

In conclusion, it should be noted that the report compiled by the OLMC's financial consultants has not been finalized, and therefore has not been available for review and analysis by the Conferees and their technical staff.

It is clear that in considering a plan which involves project costs of the magnitude contained herein, the most careful and thorough consideration should be given to the costs and financial aspects.

This chapter has presented some preliminary information mainly for the purpose of providing the public some initial understanding of the costs involved and their potential effects on ratepayers. Consequently, when the final report of the financial consultants become available, further refinements and revisions of this chapter may be necessary. Should substantial refinements or revisions be made, the document as revised will be made available for further public comment.

Recommendations

The Management Conference makes the following recommendations, with regard to financing the METRO and CSO improvements:

> ✔ **Consistent within its legal authority, New York State will assist the County with its diligent pursuit for non-local financial support for the County's efforts to upgrade its wastewater treatment facilities.**
>
> ✔ **The County shall review and evaluate options for financing improvements to the wastewater treatment system, of which the concept of a sewer authority will be included.**

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