
**BENEFITS ASSESSMENT
FOR THE ONONDAGA LAKE CLEANUP**

A Report For:
The Onondaga Lake Management Conference



By:
**Apogee Research
August 23, 1993**

This report looks at the effects of making infrastructure improvements to the municipal wastewater treatment system as contemplated in the 1989 Judgement on Consent. It does not address the effects of other lake-related investments. Any and all references to cleaning up Onondaga Lake reflect these infrastructure improvements to the municipal wastewater treatment system only.

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY	
II. INTRODUCTION	4
III. INDUSTRIAL BENEFITS	6
IV. COMMERCIAL BENEFITS	8
Defining Commercial Benefits	8
Measuring Commercial Benefits -- The Results	9
Measuring Commercial Benefits -- The Methodology	10
V. LEISURE BENEFITS	13
Defining Leisure Benefits	13
Measuring Leisure Benefits -- The Results	14
Measuring Leisure Benefits -- The Methodology	14
Netting Out Substitution Activities	16
VI. FINES AND PENALTIES	17
Temporarily Suspended Penalties	17
Penalties for Failure to Meet Consent Judgement on Consent Milestones	17
Penalties for Violating Interim Effluent Limits Established in the Judgement on Consent	18
Total Potential Liability	18

I. EXECUTIVE SUMMARY

Once the site of several resorts, Onondaga Lake is no longer used for recreational purposes. A State Health Department Fish Consumption Advisory warns against consumption of fish taken from the lake. Swimming is banned and boaters use the lake primarily to travel up to the Seneca and Oswego river systems. The Onondaga Lake Management Conference (the Conference) has been charged with developing and coordinating the implementation of a comprehensive restoration, conservation, and management plan to clean up the Lake's waters, rehabilitate its ecosystem, and restore beneficial uses of the lake for the citizens of Onondaga County.

The problems of Onondaga Lake are complex. This report looks at the effects of making infrastructure improvements to the municipal wastewater treatment system as contemplated in the 1989 Judgement on Consent. It does not address the effects of other lake-related investments. Any and all references to cleaning up Onondaga Lake reflect these infrastructure improvements to the municipal wastewater treatment system only.

This report presents an assessment of the benefits that are expected to accrue to the residents of Onondaga County given the lake is cleaned up in accordance with the goals and objectives of the Conference. The report examines five categories of benefits including:

- **the value of increased industrial activity in terms of new income generated and employment gains;**
- **the value of increased commercial activity in support of the construction of the improvements as well as commercial activities in support of leisure activities;**
- **the value of leisure benefits that will accrue to area users, including recreational fishing, swimming, and boating. For non-users, a clean lake will provide the option for lake recreation;**
- **costs associated with fines and legal fees that will be avoided if the lake is made clean; and**
- **new tax revenues to County government from increased economic activity.**

Different methods are used to estimate expected benefits for each category, including a survey of area residents and the use of a regionalized 500-sector input-output model adopted from the Bureau of Economic Analysis, U.S. Department of Commerce.

This report finds:

- 1 Economic benefits of cleaning up Onondaga Lake are far greater than simply the restoration of recreational activities. Total benefits are expected to range from over \$8 million in 1994 to almost \$85 million per year by 2000, dropping to \$56 million per year by 2006.**
- 2 Cleanup will generate significant commercial activity, jobs, and income for the residents of Onondaga County. As many as 152 jobs will be created when the projects commences in 1994, rising to 2,130 additional jobs by the end of the century.**
- 3. Industrial impacts are likely to be negligible or zero. There is not currently a moratorium on sewer hookups to the system that the investment would alleviate thereby creating an incentive to industry to locate within the County. Second, the investment in the wastewater infrastructure is not expected to change the standards required under industrial discharge permits -- the cleanup is unlikely to induce firms to relocate to the area based on any increased ability to discharge to the system or to the lake. Third, as water supply costs are very low in the County, it is unlikely that firms which use water as an input to production will find the use of lake water less expensive than publicly supplied water due to any investment in the wastewater treatment infrastructure.**
- 4. "Restoration of beneficial uses" to Onondaga Lake are estimated to be worth \$5 - \$6 million per year to County residents. While the value of leisure benefits are not dollars that will be collected, the willingness-to-pay for lake related leisure activities demonstrated by survey respondents, indicates that some fees could be captured by the County if desired.**
- 5. Local tax revenues will rise with the increase in economic activity to \$5.4 million in 2000 falling to about \$4.5 million per year thereafter. These revenues could be used to offset part of the cost of the cleanup project.**

Table 1: Net Benefits Associated with the Cleanup of Onondaga Lake
(\$ millions 1993 dollars)

	1994	1995	2000	2005	2006
Industrial Impact		neg	neg	neg	neg
Commercial Impact					
employment ¹	152	296	2130	1373	1213
wages	\$6.5	\$11.8	\$54.1	\$30.1	\$29.5
value added	\$7.8	\$14.5	\$73.8	\$46.2	\$45.3
Leisure Benefits	n/a	\$5.5	\$5.7	\$5.8	\$5.8
Local Tax Revenues	\$0.6	\$1.1	\$5.4	\$4.5	\$4.4
Total Benefits Excluding Avoided Costs ²	\$8.4	\$19.9	\$84.9	\$56.5	\$55.5
Avoided Costs	\$5.9	\$5.6	\$5.6	\$5.6	\$5.6
Total Benefits Including Avoided Costs	\$14.3	\$25.5	\$90.5	\$62.1	\$61.1

1/Employment benefits are measured in number of new jobs created within the County attributable to the project

2/Value added includes net new wages.

This report estimates the benefits that would accrue to County residents *given* the lake is made clean. It does not look at the net position of County residents as calculated in a traditional cost-benefit analysis. The latter is used to determine whether an investment is worth undertaking. This report does not address the issue of whether to invest in wastewater treatment infrastructure improvements that are estimated to result in a cleaner lake. The 1989 Judgement on Consent directs the County to undertake investments in its wastewater treatment infrastructure. This report evaluates the benefits might accrue to County residents as a result of compliance with that Judgement on Consent.

One of the benefits of interest to the Onondaga Lake Management Conference is potential avoided costs. Given that the analysis is not a cost-benefit study *per se*, it is incorrect to add these benefits to the total benefits that will accrue. In a traditional cost-benefit analysis, avoided costs do constitute a benefit to be included in the net benefit calculation. The exercise conducted here asks, given that the investments directed under the Judgement on Consent have taken place, are there any benefits that will accrue to County residents? Fines have thus been avoided and do not now constitute a benefit that will accrue.

As a separate exercise, however, it is worth noting the consequences of *not* complying with the Judgement on Consent. Because "no action" may have very real costs to the residents of Onondaga County, the value of potential fines and penalties are estimated and listed in Table 1 as a separate entry. Fines and penalties could cost the County \$5 - \$6 million per year if the penalty provisions in the Judgement are enforced.

II. INTRODUCTION

In 1988, the Atlantic States Legal Foundation and the State of New York brought suit against the Onondaga County Department of Drainage and Sanitation for violations of environmental standards. The suit was settled in 1989 when County Executive Nicholas Pirro signed a Judgement on Consent, agreeing to take whatever action was necessary to correct the County's sewage system in order to ensure compliance with those standards.

The Onondaga Lake Management Conference was established by federal statute in 1990 to develop and coordinate the implementation of a comprehensive restoration, conservation, and management plan to clean up the Lake's waters, rehabilitate its ecosystem, and restore beneficial uses of the lake to the citizens of Onondaga County. Currently the lake is not used for recreational purposes -- indeed, direct human contact such as swimming is banned altogether.

The goals of the Management Conference include:

- improvement of the lake's appearance by reducing turbidity and odor;
- assurance that the lake is fit for human contact recreation including swimming, boating, water skiing, wind surfing, and similar uses;
- restoration of fisheries (with the longer term goal of edible fisheries); and
- reduction in the pollutants leaving the lake that could adversely impact the Seneca and Oswego River systems.

Cleaning up the lake will do more than restore a series of beneficial uses to the citizens of Onondaga County. It will result in new economic activities as well. Direct benefits may include: increased income and employment from an increase in industrial or commercial activities, leisure benefits, and tax revenues. Indirect benefits include the avoided costs of fines and penalties which would be levied for noncompliance with the Judgement on Consent.

This report examines five types of economic benefits that may result from cleaning up the lake and quantifies those benefits where possible. This exercise is not meant to generate dollar values against which the costs of the investment in the wastewater infrastructure should be compared for purposes of evaluating whether it is worthwhile to make those investments. The 1989 Judgement on Consent directs the County to undertake investments in its wastewater treatment infrastructure. This report evaluates the benefits might accrue to County residents as a result of compliance with that Judgement on Consent.

The value of measuring the benefits serves to educate the public as to the return they may expect from their joint investment in the environment -- benefits that they can enjoy now, and that will accrue to generations to come. This report does not investigate the ecological benefits that will accrue from preserving and restoring the ecosystem around Onondaga Lake.

The five categories of benefits measured include:

the value of increased industrial activity that may be expected, measured in terms of new income generated and employment gains;

- **the value of increased commercial activity including economic activities in support of the construction of the improvements such as cement wholesalers and producers, general contractors, and so forth, as well as commercial activities in support of leisure activities such as fish and tackle shops, boat repair, boat rental and equipment shops, and clothing and food service businesses;**
- **the value of leisure benefits that will accrue to area users, including recreational fishing, swimming, and boating. For non-users, a clean lake will provide the option for lake recreation, an option that is not currently available;**

the costs associated with fines and legal fees that will be avoided if the lake is cleaned up; and

an increase in income, sales, and property tax revenues to County government from increased commercial and industrial income and sales, and from increased property values.

III. INDUSTRIAL BENEFITS

There are two ways in which the investments in the County's wastewater infrastructure could increase industrial activity within the County. First, the investment and resulting cleaner lake could alter conditions for discharging wastewater to the lake or to the sewerage system, thereby increasing the number of wastewater permits available to industry. Alternatively, a clean lake resulting from the investments could decrease the cost of using lake water as an input to production processes relative to other sources for water as an input. Firms that use large quantities of water in their production methods might choose to take advantage of this cheaper input good and relocate to the County.

Industrial dischargers require a State Pollutant Discharge Elimination System (SPDES) permit to discharge wastewater to the lake (direct discharge), and a County Industrial Wastewater Discharge Permit, to discharge to the local treatment plant (indirect discharge). In both cases, industry is required to "pretreat" its wastewater, to ensure that the effluent released complies with toxicity limits set by the state and County respectively.

If the investments in the County's wastewater infrastructure resulted in greater ease of attaining one or both of these permits, or the standards required by the permits were lowered, firms would have an incentive to locate or expand operations in the lake's vicinity, and the resulting economic activity would be a direct result of the improvement in water quality. SPDES and County pretreatment permit limits, however, for existing and new industries, are based on fishable/swimmable *goals* for the lake, and are therefore not a function of the lake's water quality.¹ Improving the water quality will not alter permit limits. In addition, there is not currently a moratorium on either SPDES or County pretreatment permits; cleaning up the lake will not, therefore, increase the number of permits available. Any firm that can meet the toxicity limits required by the permits can discharge or hook up to the sewerage system.

The state currently requires direct discharges to the lake and river system to be treated at a level that protects the water for fishing and swimming, and will continue to do so in the future, regardless of the present or anticipated water quality of Onondaga Lake.² With respect to indirect discharges, the treatment plants must hold industrial discharges to federal pretreatment standards. These pretreatment standards may not be relaxed, even if water quality of the lake improves (treatment plants may impose more stringent pretreatment standards in cases where receiving water quality is limited). Consequently, it is not expected that an improvement in the sanitary parameters of the lake will result in new discharges to the lake that would not otherwise be approved.³

Conditions for discharging wastewater are unlikely to change in ways that would create an incentive for firms to relocate to the Onondaga region, or to expand operations *per se*. Hence, the net gain in longer-term industrial activity directly resulting from the lake's cleanup is likely to be small.

Even if the availability of permits were to rise, or discharge limits eased, it is far from clear that industrial activity would expand as there is no indication that permit availability has acted as a constraining factor on industrial activity. Indeed, current forecasts for economic growth in the region suggest just the opposite: demand for future permits will be low. Income and employment will be generated from growth in the local service sector: manufacturing activity is projected to remain steady or decline.⁴ Projected growth sectors include finance, insurance, health services, and computer research. Consequently, new demand for industrial treatment capacity in the system or new demand for SPDES permits is expected to be low *regardless of the availability of permits.*

The second way in which the cleanup could act to induce firms to relocate to the area is by affecting the cost of using lake water as an input to the production process. Water supply is already inexpensive in the region and it is unlikely that the proposed investments would significantly lower the cost of using clean lake water relative to the cost of using publicly supplied water. Further, it is difficult to determine in the aggregate at what point lake water becomes less expensive in the production process and the importance of this cost savings in firms' overall location decisions. There is no evidence to suggest that this cost savings is significant.

IV. COMMERCIAL BENEFITS

Defining Commercial Benefits

The construction of improvements to the County's sewage treatment system and subsequent rehabilitation of Onondaga Lake will generate an increase in commercial activities, in the short run due to expenditures on labor and materials for the construction of the improvements, and over the longer run from annual expenditures on lake-related leisure activities. While these effects are not strictly benefits from a national perspective, from the County perspective they could represent new beneficial economic activity.

Direct, Indirect and Induced Effects

Increased commercial activities resulting from the two expenditure streams include wage income, jobs, tax revenues, and new economic activity (value added), in most sectors of the local economy. Due to the respending of any initial expenditure (the multiplier effect), indirect and induced economic effects are added to the direct effects brought about by the two expenditure streams.

Each dollar spent on cement, for example, represents one dollar of income to the firms providing that input good. This income is used to provide additional employee wages, new material purchases, profits, investment in plant and equipment and so forth. *Indirect* effects of the dollar spent on cement are defined as: local jobs, goods, and services required to produce that dollar's worth of input to the construction project. *Induced* effects of the dollar spent are defined as: local jobs, goods, and services required to satisfy household demands for products and services, which result from the wages of additional employees, hired to produce either the construction good or an input good.

Some portion of this respending each period by providers of goods and services and by households of additional employees, "leaks" out of the local economy (accruing to individuals or firms outside the County), diminishing the net local impact over time. For this reason, indirect and induced effects of an initial expenditure have been likened to a set of "ripples", whereby the net effect diminishes with each round of respending until it approaches zero.

The Multiplier

The set of "ripples" due to the indirect and induced demand for goods and services in the local economy act to multiply the original impact of any expenditure. The multiplier associated with a particular direct expenditure quantifies the size of this ripple effect by measuring total impact on wages, employment, output, and so forth, as a multiple of the initial direct effect. A multiplier of 2.0, for example, indicates that total impacts are twice the size of the initial expenditure. The multiplier is defined as:

$$[\text{original direct expenditure} + \text{indirect impact} + \text{induced impact}] / \text{original direct expenditure.}$$

Measuring Commercial Benefits – The Results

Commercial benefits of lake cleanup are divided into:⁵

- additional employment -- measured in terms of new jobs;
- additional wages -- from additional employment opportunities;
- value added -- or net regional product, measured as the difference between the value of inputs required for production and the value of outputs produced and represents the net addition to the region's economic production; and
- local tax revenues -- including Syracuse and Onondaga County.

Impacts on these four sectors are summarized in Table 2, over the period 1994-2006. For each year, expected direct expenditures are listed for comparison with resulting impacts.

	1994	1995	2000	2005	2006
Direct Expenditures					
Within Region	\$7.0	\$13.7	\$77.5	\$51.2	\$51.2
Outside Region	\$0.0	\$0.7	\$13.8	\$22.0	\$22.0
Total	\$7.0	\$14.4	\$91.4	\$73.2	\$73.2
Employment (number of jobs)	152	296	2130	1373	1213
Wages	\$6.5	\$11.8	\$54.1	\$30.1	\$29.5
Value Added	\$7.8	\$14.5	\$73.8	\$46.2	\$45.3
Local Tax Revenue	\$0.6	\$1.1	\$5.4	\$4.5	\$4.4

Estimates are shown to 2006, but the results for 2006 approximate annual benefits thereafter, as leisure expenditures will continue annually, with resulting associated impacts on the local economy.

Benefits in any one year represent total expected employment, wages, and value added resulting from lake-related expenditures in that year. Employment growth from year to year is the difference between the number of jobs expected to be associated with the expenditures in any two years. If 152 jobs are expected due to the lake cleanup in 1994, and 296 jobs result in 1995, this implies that the cleanup will result in 152 jobs initially, followed by 144 new jobs the following year.

Measuring Commercial Benefits -- The Methodology

Commercial benefits for each of the four sectors described above were estimated by the Regional Science Research Corporation using their adaptation of a 500 sector national input-output model developed by the Bureau of Economic Analysis, U.S. Department of Commerce.⁶

The Core of Input-Output Analysis: The Technology Matrix

An input-output (IO) model translates changes in expenditures in a particular sector of the economy to changes in economic activity in other sectors. It uses a technical matrix where each row (and corresponding column) is an economic sector based on standard industrial classification (SIC) codes as developed by the Bureau of Census, U.S. Department of Commerce. Row 1 (and Column 1) might be lumber and wood products, for example, a subgroup of manufacturing.

Each cell within the matrix has a coefficient associated with it, called A_{ij} . A level of expenditure in a particular sector j (input into the model), when multiplied by this cell input coefficient, A_{ij} , calculates the resulting impact on sector i . For each row i , the resulting impacts in each cell are then multiplied by a regional purchase coefficient (RPC_i), where the RPC_i equals the percentage of a purchase that is made within the region, for that sector. If the RPC for lumber and wood products sector is .6, then 60 cents of every dollar spent in that sector due to the investment in wastewater infrastructure or due to lake-related leisure activities, takes place locally. Multiplying the resulting impacts by the RPC for each sector reveals the resulting impact within Onondaga County.

The total impact on sector i equals the direct + indirect + induced effect, and is described in terms of the impact on four economic factors that characterize the sector: employment, wages, output, and value added (or gross regional product). Each A_{ij} thus represents all of the 12 following effects in sector i :

	Employment	Wages	Output	Value Added
Direct Impact	1	2	3	4
Indirect Impact	5	6	7	8
Induced Impact	9	10	11	12

The total effect on each of the four economic factors, within a sector i , is determined by summing the effects on that factor across each cell in the row. This calculation gives rise to the multiplier for that factor in that sector. The entire impact on a sector is thus described in terms of:

- total impact on employment;
- total impact on wages;
- total impact on output; and
- total impact on value added.

By summing this information across all sectors of the economy, the total impact on each economic factor, resulting from an initial expenditure, is estimated. For benefits estimation purposes, the final impact on three of the four indicators is calculated. (Output is excluded as it does not represent a *net* addition to regional production.) For example, an expenditure of \$6.99 million on construction inputs in 1994 may be broken down into expenditures in several sectors j , for materials, plant and equipment, and labor. This initial expenditure is estimated to create 152 jobs in 1994 (the first year of project related expenditures), \$6.5 million in wages, and \$7.8 million in value added. This income and employment will, in turn, generate \$0.6 million in local tax revenues in 1994.

Households are considered a sector of the economy in that as inputs, they spend money across all sectors, and as outputs, expenditures by other sectors impact them in the form of wages.

Taxes are not a part of the matrix. Tax revenues are calculated separately by applying local, state, and federal tax rates (for all applicable taxes: income, property, sales, etc.) to incomes or expenditures as required.

Cell input coefficients (A_{ij}) and the regional purchase coefficients (RPC _{i}) are estimated for Onondaga County using either survey data or regression analysis. The relationships between different sectors of the economy (e.g. construction and cement production), and between different economic factors within the economy (e.g. output and wages) are complex and dynamic. The amount of labor needed to build a plant, for example, will change over time due to technological advances in production processes (among other reasons). While IO does assume a fixed relationship between factors of production and between economic indicators (wages, employment, etc.) across all firms within a sector, in a particular year, technological change over time is accounted for by estimating a new matrix each year (hence the cell input coefficients will change accordingly). Appendix A lists the assumptions made as well as provides a detailed summary of all model results.

The Inputs

Two expenditure streams are used as inputs to the model. The cleanup of Onondaga Lake will involve non-recurring expenditures for design and construction of the improvements to the Sanitation District sewerage system. The cash-flow schedule for a total diversion of wastewater is used, where expenditures each year are broken down into expenditures on engineering and planning; contractor labor; commodity building materials such as concrete, gravel, topsoil, paving, etc; and miscellaneous materials such as small piping and valves, heating and ventilating equipment, and small plant and equipment. Annual operations and maintenance expenditures occurring as a result of the project are also included in this expenditure stream.

Once the lake is clean, lake related leisure expenditures can take place. As individuals will use the lake over and over, these are characterized as recurring expenditures, and are input each year. Data on recurring leisure expenditures are based on the results of a survey conducted of 500 County residents that determined expected use of the lake, once it was clean, for different leisure activities. County-wide expected expenditures for six categories of leisure activity are used as input data, where boating activity and related expenditures are assumed to begin in 2000 and fishing and swimming activities and related expenditures are assumed to begin in 2004.

Netting Out Substitution Leisure Activities

When the lake is clean, individuals will spend money on leisure activities. In some cases the expenditures will be new. In other cases, individuals will substitute going to the lake (and spending money), for other leisure activities, such as going to the movies or going shopping. The total impact from expenditures on leisure activities will thus include positive and negative effects on the local economy, as in some instances, an increase in lake related expenditures will be accompanied by a decrease in expenditures elsewhere. A dollar spent on fishing equipment may have been otherwise spent on movie admission. These negative impacts are netted out of the final overall impact estimate.

V LEISURE BENEFITS

Defining Leisure Benefits

Use Benefits

A third set of benefits that will accrue from the lake cleanup include increased recreational activities. Area residents will be able to boat, swim, and fish in Onondaga Lake, activities that they cannot or do not undertake now.

These types of leisure benefits are referred to as *use* benefits. The total *use* benefit of an activity is represented by the area under the demand curve for that activity and above the price level. This equals the sum of the value associated with each level of use.

Non Use Benefits

Leisure benefits also include *non-use* benefits. Even if an individual does not engage in boating or swimming or fishing, he or she may still enjoy a cleaner lake. If an individual gains satisfaction from knowing the lake is clean, regardless of whether they can see it, are anywhere near it, or ever intend to use it, a benefit exists. This type of non-use benefit is referred to as the clean lake's *existence value*. An analogy that might illustrate the concept of existence value is the amount that people would be willing to pay, for example, to know that the spotted owl is safe -- a person may never see a spotted owl, nor have its safety affect their life in any way, yet they are willing to pay something to know that it is protected. While existence value is recognized as a benefit, the monetization of that benefit is beyond the scope of this project, and to ensure conservative estimates are used throughout the analysis, it is assumed to be zero.

Individuals may also benefit from seeing a clean lake or from an improvement in the smell around the lake. This kind of benefit is referred to as a *direct utility* benefit resulting from the cleanup. Direct utility benefits would accrue mainly to individuals living on the lake, and would be reflected by a change in their property values. In the case of Onondaga Lake, the land around the lake is publicly owned, and is zoned for public ownership. The only incidence of direct utility benefits will occur by users of the municipal park, during that time that they are using the park for some leisure activity. For that group of users, the value of this type of benefit is captured through a willingness-to-pay survey described below.

Finally, individuals may benefit from a cleaner lake because it gives them the *option* to use the lake for swimming or boating or some other water activity. While the individual may not currently undertake a water activity, providing them with the option to do so is a benefit. The amount of money an individual would be willing to pay to have the option to use the lake at some point in the future approximates the value of that option benefit.

Measuring Leisure Benefits The Results

Five hundred residents of Onondaga County were surveyed to understand the value they would place on having Onondaga Lake made clean enough to swim, boat, and fish, but not clean enough to create edible fisheries (fish caught would still have to be thrown back into the water). The results are summarized in Table 3. Detailed survey results may be seen in Appendix B.

Table 3: Estimated Leisure Benefits Resulting from Onondaga Lake Cleanup Selected Years (millions 1993 Dollars)				
	1995	2000	2005	2006
General Leisure Benefit	\$5.5	\$5.7	\$5.8	\$5.8
Boating Benefit	\$1.5	\$1.6	\$1.6	\$1.6
Fishing Benefit	\$1.1	\$1.2	\$1.2	\$1.2
Swimming Benefit	\$2.5	\$2.5	\$2.6	\$2.6
Demographic Estimates Used:⁷				
Population	469,142	473,814	478,378	478,378
Household size	2.50	2.45	2.43	2.43
Number of households	187,657	193,393	196,863	196,863

1/ Household size for 1995 based midpoint of 1990 and 2000 estimate.

2/ Household size for 2005 and 2006 based on midpoint of 2000 and 2010 estimate.

Overall, the net leisure benefit of having a clean lake ranges from \$5.5 - \$5.8 million per year for County residents. Broken into its component parts, swimming is valued at between \$2.5 and \$2.6 million per year, boating is valued at \$1.5 - \$1.6 million per year, and fishing is valued at just over \$1 million per year by County residents.

Measuring Leisure Benefits -- The Methodology

Leisure benefits can be measured several ways. Area residents can be surveyed to determine their anticipated use of the lake for various activities, and the value they attach to those activities. Because a lake cleanup would typically improve the value of lakefront property, the benefits accruing to lakefront property owners should be separately estimated by measuring the expected change in the market value of their land. Such residents would not therefore be

surveyed with other area residents. In Onondaga County, however, the land around the lake is publicly owned or zoned for industrial purposes. In addition, the tract of land adjacent to the park is zoned for park development only.⁸ This land extends from the canal at the western border of Onondaga Lake Park to Interstate 690 and includes the land north of the fairgrounds. As a result, the benefits from having the option to use the lake and benefits associated with seeing and smelling a cleaner lake are completely captured by the value placed on a clean lake by visitors to the lake. While the park and potential park remain publicly owned therefore, the beneficiaries are the area residents, and the benefits they enjoy may be captured by using the survey technique discussed above. The change in value of lakefront land is therefore not measured separately.⁹ (See Appendix D for a fuller discussion of this issue.)

The increase in leisure activity may induce demand for non-water related activities. If, when an area resident uses the park, he also undertakes other activities (hiking, biking, picnicking etc.), and if his increased use of the park to undertake water activities increases his demand for these non-water activities, then the cleanup generates an increase in non-water related benefits too, due to an induced demand effect for the non-water activities. This induced benefit effect is partially captured by the survey technique.

Sample respondents were asked about their:

- current use of Onondaga Lake;
- anticipated future use of, or visits to the lake;
- anticipated future use of the lake by specific activity;
- willingness to pay for the lake to be clean; and
- willingness to pay for particular activities.

The benefits calculation approximates the total value individuals place on having a clean lake and is calculated by measuring the area under the demand curve for a clean lake. This captures general use benefits, direct utility benefits accrued while visiting the lake, and the benefit of having the option to use the lake.

The benefits associated with being able to recreate on the lake as a result of the lake's cleanup are calculated by measuring the area under the demand curve for individual recreation activities including:

- the demand for boating;
- the demand for fishing; and
- the demand for swimming.

In each case, the change in expected use was calculated for every respondent. The respondent was then asked what price he would be willing to pay for that particular good. The product of the increase in his demand resulting from the lake cleanup and the price he would be willing to pay reflects the benefit to him of a clean lake, for that good. This product was then calculated for each respondent and summed across respondents to generate the total benefit of

that good for the sample. This exercise approximately measures the area under the sample demand curve for each good. To derive the expected benefit of that good for the County as a whole, the results were aggregated over the County household population expected in that year.

Because of the nature of individuals' preferences, the benefits of the three individual activities do not necessarily sum to the overall benefit calculation estimated. This can occur for several reasons. Suppose, for example, an individual reveals that he would be willing to pay \$4 each time he fished and \$3 each time he swam. In practice, this individual might combine these two activities, but this does not necessarily mean he is willing to pay \$7 to undertake both activities together.

It is assumed that most lake related activities are household based, not individually based. If the survey revealed, for example, that the total number of fishing trips per year would be 15,000, or 3 trips per respondent per year, this is assumed to reflect 3 trips per household per year, not 3 trips per person per year. This assumption ensures that the most conservative estimate of benefit is calculated.

Netting Out Substitution Activities

Sample respondents were asked whether their increased use of the lake would come at the expense of either lake visits elsewhere or participation in other local activities. The results of the latter group were separated out and the benefits associated with this group were subtracted out.

VI. FINES AND PENALTIES

While avoided fines and penalties do not strictly constitute a benefit if benefits are measured *given* the cleanup takes place, it is worth examining, in a separate exercise, the consequences of not complying with the Judgement on Consent, as "no action" will generate real costs to County residents. Under the Judgement on Consent resulting from the suit filed by the Atlantic States Legal Foundation and the State of New York, the County may face substantial fines and penalties if the investments in wastewater infrastructure as directed under the Judgement are not carried out. These avoidable costs include:

- \$875,000 in suspended penalties;
- Up to \$15,000 per day for failure to comply with the milestones for planning and plant improvements set forth in the Judgement on Consent;

Up to \$5,000 per month for each daily effluent limit violated and \$5,000 per month for each average monthly limit violated (interim limits); and

Up to \$25,000 per day for violations of the Clean Water Act and/or up to \$25,000 per day for violations of ECL Article 17 or State Pollutant Discharge Elimination System (SPDES) permit provisions not specifically covered by the Judgement.

These fines and penalties are described in more detail below.

Temporarily Suspended Penalties

The County faces a temporarily suspended penalty of \$875,000 that will be fully suspended after the County completes the work outlined in the Judgement on Consent and it has been approved by the Department of Environmental Conservation. If the County fails to comply with the Judgement on Consent, the State's Attorneys' Office may seek to impose this penalty.

Penalties for Failure to Meet Consent Judgement on Consent Milestones

In meeting the planning and plan improvement milestones in Appendix A of the Judgement on Consent, the County is avoiding up to \$15,000 per day in penalties. If the County failed to meet a milestone date, it would be fined penalties under the following schedule:

- \$1,500 per day for the 1st through the 30th day of noncompliance;
- \$3,000 per day for the 31st through the 40th day;
- \$8,500 per day for the 41st through the 50th day;
- \$12,000 per day for the 51st through the 60th day; and
- \$15,000 per day for each day beyond the 60th day.

Under this schedule, penalties for missing milestones would add up quickly:

- \$45,000 after one month;
- \$280,000 after two months;
- \$2,105,000 after six months; and
- \$4,855,000 after one year.

The State's Attorneys' Office stated that it will pursue these penalties if the County fails to meet the milestones established in the Judgement on Consent.

Penalties for Violating Interim Effluent Limits Established in the Judgement on Consent

The County could also be fined up to \$5,000 per month for violations of daily effluent limits (established in the Judgement on Consent) and \$5,000 per month for violation of average monthly limits. Penalties for violating daily effluent limits are based on the number of parameter violations per month: \$500 per parameter for one to two violations; \$1,000 per parameter for three to four violations; \$2,000 per parameter for five to nine violations; and \$5,000 per parameter for ten to 30 violations. For example, violating two parameters three times each could result in a penalty of at least \$2,000 (\$1,000 per parameter); if those violations resulted in the average monthly limit also being violated, then an additional \$10,000 penalty could be levied (\$5,000 per parameter).

Total Potential Liability

In sum, Onondaga County will face fines and penalties of \$450,000 per month after two months of failing to meet a milestone deadline. If the County fails to complete the work outlined in the Judgement on Consent, the judge may impose the \$875,000 penalty, which is currently suspended. After one year, the County could face total penalties for failing to complete work and missing milestones of \$5.7 million. In subsequent years, the total falls slightly to \$5.6 million per year.

ENDNOTES

Lee Flocke, Regional Water Engineer, NY Department of Conservation. Personal communications, April 1 and April 20, 1993.

2. SPDES-permitted discharges to the lake include industries, stormwater pipes, and remedial sites. One exception is the Village of Marcellus, which discharges approximately 200,000 gallons per day to Nine Mile Creek, and is subject to sanitary parameters.
3. Lee Flocke, Personal communication, April 1, 1993.
4. Onondaga County, *County Growth and Infrastructure, 2010 Development Guide, Onondaga County Plan, Report 1*, pages A-6 through A-14; and *Onondaga Lake Development Plan*, sponsored by the Metropolitan Development Foundation, the New York State Urban Development Corporation, the Onondaga County Industrial Development Agency, and the City of Syracuse, page II-8.
5. Output, which describes total economic activity and is equivalent to direct, indirect, and induced sales, is also calculated by the model, but the total effect on output is not calculated, as it also includes the value of input goods. The estimate of value added represents the *net* addition to the region's product.
6. The Regional Science Research Corporation is a consulting firm that conducts policy studies using models and techniques developed in regional science. RSRC is a licensee of the Regional Science Research Institute and has the right to use, modify, adapt, and update RSRI's PC I-O models. Dr. Benjamin H. Stevens is president and research director of both RSRC and RSRI.
7. *Onondaga County Plan, Report 1: County Growth & Infrastructure*, Syracuse-Onondaga County Planning Agency, June 1990.
8. *1991 Onondaga Lake Development Plan*, April 13, 1992.
9. If the park or potential park were sold to a private owner, the change in the value of the land would represent the entire leisure benefit, as the land provides the only access to the lake. In that case, no survey would be necessary as the only beneficiary would be the private landowner. Benefits could be measured hedonically.

APPENDIX A: INPUT OUTPUT RESULTS AND ASSUMPTIONS USED

GENERAL ASSUMPTIONS

The general assumptions used are typical of similar input-output studies, including previous studies done for Onondaga County by Regional Science Research Institute (RSRI), predecessor to the current consultant, Regional Science Research Corporation (RSRC). These include the following:

1. Construction companies are hired from inside and outside the county in the current proportions typical for contractors of the types to be used on this project. The construction expenditures used in the present analysis represent those that go to county-based construction companies. Actual construction labor is drawn from the labor market area of the county with the proportion actually from Onondaga based on recent commuting patterns of workers in general.
2. All goods and services, including those used by contractors and those purchased for recreational purposes are provided from inside or outside the county based on the typical patterns incorporated in the model. The important exceptions are pre-mixed concrete and paving materials and services at the lake and in nearby eating and drinking places, gasoline service stations, and other local activities whose direct impacts are on the county's economy exclusively.
3. The Engineering and Planning services included in the construction expenditures are only those paid directly to county firms in these professions. Again, local labor proportions are based on recent commuting patterns.
4. The survey data on projected visits to the lake once the cleanup is complete are based on interviews of individuals. However, it is assumed that such individuals are speaking for a family group that would ordinarily accompany the individual on a recreational trip. For example, using the projected figures for population and household size for the year 2000, means that there will be about 185,000 visitor "groups" in that year. Thus, the expansion of the sample survey data to total lake visits (and, ultimately, total expenditures) will be made by multiplying average individual behavior by 185,000.
5. All results are reported in 1993 constant dollars for comparison purposes. This includes the discounting of future direct expenditures back to the present. Employment figures for future years reflect increases in both productivity and wages per person-year. Employments are in terms of nominal full-time equivalents but do not reflect exactly the variations in the length of the typical work week among economic sectors and occupations.

SPECIFIC ASSUMPTIONS

Each of the categories of expenditure -- for construction, lake recreation, and other recreational activities (for which added lake recreation will substitute once the water quality of the lake is acceptable) -- require a special set of specific assumptions, including the allocation of expenditures among the 515 detailed sectors of the PC IO model.

Construction Expenditures

Construction expenditures are specified by the four major categories of Engineering & Planning, Contractor Labor, Concrete, and Miscellaneous Materials. Engineering & Planning is a single sector (467) in the PC IO model so distribution of these expenditures is not required. "Concrete," as defined for this project, is also quite simple, consisting of premixed concrete, other concrete products (except concrete pipe and related products which are in a separate category not paid for by this project), gravel, asphalt, topsoil and related materials. The latter distribution is assumed to be essentially the same as that found for the same materials in the translator for Sewer Systems (including waste water treatment) incorporated in the PC IO model. The original data for this translator come from the U.S. Department of Commerce, Bureau of Labor Statistics (BLS) input-output data for 1987.

The distribution among "other materials" is also adapted from the sewer system translator. Much of the total value of these expenditures is made up of such items as pumps, pipes, valves, fittings, controls and "special industry" machinery. Many of these products are not produced in Onondaga County, which is one reason why a noticeable proportion of the total construction expenditures are, most years, for purchases from other regions.

The category "Construction Labor", is assumed to include both the workers hired for the project and the "overhead" expenditures of the construction companies, including benefits, management, office operations, and related. The distribution among the specific categories in the IO model is, again, adapted from the assignment of expenditures by general and "heavy" contractors as indicated by the 1987 BLS IO data.

Recreational Expenditures

The new recreational expenditures associated with a "clean" Onondaga Lake require a number of assumptions in order to be fully specified. The survey data collected for this project focusses primarily on collecting behavioral rather than expenditure information. Thus while some expenditure information was collected, further expenditure data must be adapted from previous recreation and tourism studies by RSRI and RSRC.

The data include a mixture of the expenses associated with boat ownership and boat rental, adapted from analyses of lake boating activities in South Carolina and Florida. They also include fuel, bait, and other expenses associated with the use of both rented and owned boats. It is assumed that the expenses of boating activities include the purchase of picnic items and

other refreshments.

In fact, almost all of the recreational activities at the lake are assumed to include some degree of picnicking and the purchase of refreshments either before or during the lake visit. Thus picnicking, is subsumed under the other visit categories including boating, swimming, fishing,, biking, and walking. Furthermore, boating and fishing are viewed as a single category since the major expense in both is the ownership or rental of a boat and its costs of operation.

Such combining of activities into multi-purpose visits is both logical and required by the data -- the sum of the reported total additional visits to the cleaned-up lake is less than the total of the increases in visits of each specific type. In order to achieve consistency, it was necessary to assume that some of the walking visits included swimming (and picnicking) in addition to the assumptions mentioned above.

The actual expenditures for each type of (combined) activity were adapted from previous similar studies by RSRI and RSRC. The cost of travel (gas, auto wear and tear, etc.) to the lake for any or all of the visit purposes is estimated based on data developed in an earlier study for a Convention Center/Arena for Onondaga by Peat, Marwick, Main and RSRI.

Recreation Activities for Which Extra Lake Visits Substitute

Given individuals' limited time and budget for total recreation, the added lake visits will lead to some reduction in other leisure activities. The survey indicates that 28 percent of the new visits will substitute for current leisure activities in the County and 72 percent of the new visits will be additions to total recreation or substitutes for activities currently undertaken outside the County.

It is assumed that about one half of the reduction in activity is in home recreation, such as watching TV, whose marginal cost is negligible and which therefore has no economic effects. However, the other half of the reduction will come from activities outside the home, such as movies, going out to eat, bowling, going to the mall, etc. Reduction in these activities will cause associated reductions in travel expenditures.

Given no available data on this topic, we assume that a typical movie/entertainment night out would involve a total of \$30 in expenditure and a mall visit would cost \$15 (in both cases including the purchase of some food and gasoline but not any other purchases of goods that would be bought by the family or group out of other non-recreation portions of their budget. The ratio of movie/entertainment nights to mall visits was assumed to be two to one.

The distribution of expenditures among the detailed IO sectors is based on expenditure data adapted from previous studies.

**ECONOMIC EFFECTS ON ONONDAGA COUNTY FROM CONSTRUCTION
(INCL. O&M)
TO IMPROVE WATER QUALITY IN LAKE ONONDAGA
(Dollar figures in millions of 1993 dollars)**

	1994	1995	1996	1997	1998	1999
DIRECT EXPENDITURES						
Within Region	7.0	13.7	27.02	37.8	38.5	22.3
In Other Regs.	0.0	0.7	2.5	2.1	1.6	0.9
Total	7.0	14.4	29.6	39.9	40.1	23.2
EMPLOYMENT*						
Direct	52	130	295	428	429	168
Indirect	100	166	275	380	360	194
Total	152	296	570	808	789	362
WAGES						
Direct	3.9	7.5	14.5	21.8	22.2	10.5
Indirect	2.6	4.3	7.2	10.2	10.0	5.7
Total	6.5	11.8	21.7	32.0	32.2	16.1
VALUE ADDED						
Direct	4.1	8.7	18.2	26.8	27.3	13.6
Indirect	3.7	5.7	8.8	12.2	11.8	7.6
Total	7.8	14.5	27.1	39.1	39.1	21.2
TAXES						
Local	0.6	1.1	2.1	3.0	3.0	1.6
State	0.8	1.5	2.7	3.9	3.9	2.0
Federal	1.5	2.7	5.1	7.4	7.4	4.0
Total	2.9	5.3	9.9	14.3	14.3	7.6

Source: Regional Science Research Corp. PC I-O Model of Onondaga County
*/ Employment is actual number of jobs.

**SUMMARY OF ECONOMIC EFFECTS ON ONONDAGA COUNTY FROM CONSTRUCTION OF WASTEWATER FACILITIES (INCL. O&M)
AND NET INCREASES IN RECREATIONAL EXPENDITURES DUE TO IMPROVED WATER QUALITY OF ONONDAGA LAKE**
(Dollar figures in millions of 1993 dollars)

	2000			2001			2002			2003		
	CONSTR	RECREA	TOTAL									
DIRECT EXPENDITURES												
Within Region	42.4	35.2	77.5	48.5	35.2	83.7	50.2	35.2	85.3	35.7	35.2	70.9
In Other Regs.	3.6	10.2	13.8	3.1	10.2	13.3	3.2	10.2	13.4	2.9	10.2	13.1
Total	46.0	45.4	91.4	51.6	45.4	96.9	53.3	45.4	98.7	38.6	45.4	84.0
EMPLOYMENT*												
Direct	433	993	1426	546	918	1464	550	847	1397	314	782	1096
Indirect	408	295	704	421	271	692	395	248	643	249	236	485
Total	842	1288	2130	966	1189	2156	944	1095	2040	564	1018	1581
WAGES												
Direct	21.0	14.6	35.6	25.8	14.6	40.4	26.7	14.6	41.2	16.1	14.6	30.6
Indirect	10.9	7.6	18.4	11.5	7.3	18.8	11.1	6.9	18.0	7.3	6.6	13.9
Total	31.9	22.2	54.1	37.3	21.9	59.2	37.8	21.5	59.2	23.3	21.2	44.5
VALUE ADDED												
Direct	25.4	23.4	48.9	30.9	22.9	53.9	32.0	22.9	54.9	21.2	22.9	44.1
Indirect	15.9	9.0	24.9	16.8	8.4	25.2	16.2	7.8	24.0	10.7	7.4	18.1
Total	41.4	32.4	73.8	47.7	31.4	79.1	48.2	30.7	79.0	31.9	30.3	62.2
TAXES												
Local	3.1	2.3	5.4	3.6	2.2	5.8	3.6	2.2	5.8	2.3	2.2	4.5
State	4.0	2.9	6.8	4.6	2.8	7.5	4.7	2.8	7.5	3.0	2.7	5.7
Federal	7.8	6.9	14.7	9.0	6.7	15.7	9.1	6.6	15.7	6.0	6.5	12.5
Total	14.9	12.0	26.9	17.3	11.7	29.0	17.5	11.5	29.0	11.3	11.4	22.7

Source: Regional Science Research Corp. PC I-O Model of Onondaga County

*/ Employment is actual number of jobs.

**ECONOMIC EFFECTS ON ONONDAGA COUNTY FROM NET
INCREASES IN RECREATIONAL
EXPENDITURES DUE TO IMPROVED WATER QUALITY OF LAKE
ONONDAGA
(INCL. O&M OF NEW FACILITIES)
(Dollar figures in millions of 1993 dollars)**

	2004	2005	2006
DIRECT EXPENDITURES			
Within Region	51.2	51.2	51.2
In Other Regs.	22.0	22.0	22.0
Total	73.2	73.2	73.2
EMPLOYMENT*			
Direct	1136	988	855
Indirect	423	385	358
Total	1560	1373	1213
WAGES			
Direct	19.3	19.3	19.3
Indirect	11.4	10.8	10.2
Total	30.7	30.1	29.5
VALUE ADDED			
Direct	33.3	33.0	33.0
Indirect	14.3	13.2	12.3
Total	47.6	46.2	45.3
TAXES			
Local	4.6	4.5	4.4
State	6.2	6.1	6.0
Federal	10.0	9.7	9.6
Total	20.7	20.3	20.0

Source: Regional Science Research Corp. PC I-O Model of Onondaga County
 */ Employment is actual number of jobs.

APPENDIX B: LEISURE BENEFITS SURVEY RESULTS AND ASSUMPTIONS USED

PROJECT BACKGROUND

Introduction

Apogee Research, Inc. has been commissioned by the Onondaga Lake Management Conference to prepare a Preliminary Capital Plan and benefits assessment in support of its efforts to prepare and implement a comprehensive Management Plan for cleaning up the lake and, ultimately, rehabilitating the lake's ecosystem and restoring its beneficial uses.

As part of this effort, the Market Strategies division of Apogee Research designed and conducted a telephone survey of Onondaga County, New York residents to measure current attitudes and perceptions of Onondaga Lake and the perceived benefit of cleaning-up the lake for increased recreational use.

Methodology

Telephone interviews were conducted with a random sample of 500 adult residents of Onondaga County, New York from April 7 to April 10, 1993 by professional interviewers at the Gordon S. Black Corporation's telephone center in Rochester, New York under the direction of Apogee's market research staff.

The sample is a statistical valid cross section, representative of the population of adults living in Onondaga County. Results from the total sample are accurate within plus or minus 4.4 percentage points, the margin for sampling error.

The survey included questions designed to measure a broad range of public attitudes, perceptions and preferences, including:

- Current recreational activities at lakes and parks, including Onondaga Lake;
- Attitudes toward the clean-up of Onondaga Lake, including willingness to pay;
- Current expenditures to participate in recreational activities at lakes and parks and
- Potential for increased use and recreation at Onondaga Lake.

The results of this survey and subsequent benefits estimation analyses are outlined in this appendix, and detailed in a separate report presented to the Management Conference.

SURVEY HIGHLIGHTS

Current Recreational Activity

- Onondaga County residents are very active in outdoor recreation -- nearly 8 in 10 are "water enthusiasts" who boat, swim or fish.
- About 9 in 10 adult county residents visit or use area lakes; adults make an average of 26 visits to lakes each year.

Current Recreation at Onondaga Lake

- Onondaga Lake was mentioned more often than any other single lake as the lake respondents used most.
- 56 percent of all adult county residents visit or use Onondaga Lake at least once a year; adults make an average of 10 visits to Onondaga Lake each year.
- People who live closer to the lake use it more often. Those living less than 10 miles from the lake make an average of 22 trips each year to lakes in the area. About 16 of those trips are outings to Onondaga Lake.
- People who live further out make more use of lakes in general (33 trips per year) and rarely visit Onondaga Lake (3 times per year).
- People often use Onondaga Lake to picnic, bicycle and walk, but very rarely for fishing or boating. Swimming is not allowed.
- Onondaga Lake would be a more convenient place for most people to recreate. The average distance from a respondent's home to the lake he or she uses most is greater than their average distance to Onondaga Lake.

Attitudes Toward Onondaga Lake Clean-Up

- Onondaga Lake was mentioned most often (40%) as the "biggest environmental problem" facing the county today. This question was asked "open-ended" with no choices provided by the interviewer.
- About 8 in 10 adults say it is "very important" (52%) or "somewhat important" (28%) to clean up the lake.
- 63 percent of all adult county residents said those who polluted the lake should pay for its clean-up; 15 percent named specific companies.

- Residents are more likely to favor charging fees to lake users than to favor raising taxes or increasing sewer or water rates. Opposition to a sales tax or property tax hike is very strong.

The Potential for Increased Lake Usage and Recreation

- In addition to the 56 percent of adults who currently use the Onondaga Lake, another 30 percent were classified as "potential users" who say they would use lake if it were clean.
- Current users of the lake say their number of visits each year would increase from 17.5 to almost 30.
- Potential users do not currently use the lake, but say they would make an average of 15 visits per year if it were clean and safe.
- Younger respondents age 18-34 say their visits would nearly triple from the current 11 times per year to nearly 30.
- "Water enthusiasts" who fish, boat or swim say their visits would more than double from the current 11 times per year to about 26. They currently go elsewhere for these activities.
- People who live 10 or more miles from Onondaga Lake make only 3 of their 33 lake visits each year to Onondaga Lake, on average. If it were safe and clean, they say they would use it 16 times per year.
- People who live within 10 miles of the lake say their number of visits would increase from the current 16 to 24 times each year.
- Clean-up of Onondaga Lake could also have a dramatic impact on the likelihood and frequency of participating in outdoor recreation at the lake:

While less than 10 percent of all county adults currently boat or fish in the lake, about 4 in 10 say they would if it were clean.

The impact is not restricted to water-related activities; picnicking, walking and bicycling would increase as well.

- Among respondents who recreate and said they might use Onondaga Lake (more) if it were clean, about 6 in 10 said that any increase in their use of the lake would represent an increase in their outdoor recreation overall -- and not come at the expense of the other lakes they now use.

Current Spending for Recreation

- County residents who recreate at area lakes and parks pay an average of \$3.22 each time they use the location they visit most. About 65 percent pay nothing and the remaining 35 percent pay an average of \$9.08.
- Participants' spending on a typical outing varies with each activity, from an average of 90 cents for a typical walk in the park to an average of \$16.20 per boating trip and \$11.50 per fishing trip.
- Altogether, respondents estimate they spend an average of \$232.70 each year for outdoor recreation, with little gap between the amount spent by people in the lowest and highest income brackets.

Financing Onondaga Lake Clean-Up

- 54 percent of adult county residents said they would be willing to pay higher taxes to make Onondaga Lake clean and safe for swimming and boating (but not fishing and drinking).
- The amount they were willing to pay averaged out to \$54.10 per resident each year:
- Current users of Onondaga Lake were willing to pay an average of \$67.70 per year; potential users would pay an average of \$51.10 per year and those who never plan to use the lake would pay only \$8.70 per year on average.
- Nearly 9 in 10 current and potential users of the lake said they would be willing to pay a user fee each time they visited Onondaga Lake, for an average amount of \$6.10 per visit.
- About 9 in 10 current and potential users said they would be willing to pay some type of fee each time they participated in a particular type of recreation at the lake -- \$7.10 each time for boating, \$3.80 for swimming and \$5.00 for fishing. These averages assume there is no entrance fee.
- About 7 in 10 current and potential users of the lake said they might purchase or rent recreational equipment if Onondaga Lake were clean and safe:

The average total estimated expenditure was \$578.20

This spending amounts to \$395.90 per adult county resident, but is somewhat skewed due to a relatively small number of persons who would be considering making a big ticket purchase such as a boat.

BENEFITS ESTIMATION AND ANALYSIS

Additional analyses of the survey data were performed to calculate economic impacts and benefits associated with cleaning up Onondaga Lake.

Benefit Estimation for Overall Lake Use

The net increase in overall demand at Onondaga Lake was calculated by first subtracting the number of times each respondent said they currently visit Onondaga Lake each year from the total number of times they said they would visit the lake each year if it were clean and safe. In nine cases, inconsistent responses (negative values) were obtained and converted to "zero" to reflect "no net increase in demand."

The increased demand for each respondent was then multiplied by the amount they said they were willing to pay each time they visited Onondaga Lake if the money were used to make the lake clean and safe. These values were then summed across all respondents to obtain a total dollar value benefit. For the 500 respondents in the survey, that total overall dollar value benefit for the clean-up of Onondaga Lake was \$27,211.

Benefit Estimation for Individual Activities

The same basic approach was used to calculate the increased demand and benefits associated with each of three key activities at area lakes -- boating, swimming and fishing -- if Onondaga Lake were made safe and clean.

The increase in demand that would likely occur if Onondaga Lake was cleaned up was first calculated for each activity (boating, swimming and fishing) by subtracting the number of times each respondent said they currently participate in that activity at Onondaga Lake each year from the total number of times they said they would participate at the lake if it were cleaned up. In one or two cases, negative values were obtained and converted to "zero" to reflect "no net increase in demand." The increased demand for each respondent was then multiplied by the amount they said they were willing to pay each time they participated in that activity at Onondaga Lake if the money were used to clean up the lake. This process was repeated for each of the three activities.

The amount each respondent would end up paying annually to participate in an activity was then summed across all respondents to obtain a total dollar value benefit for that particular activity. This provided a separate estimate of the total dollar value benefit for each of three activities. For the 500 respondents in the survey, those total dollar value benefits were:

- Boating -- \$8,357
- Swimming -- \$12,507
- Fishing -- \$9,100

A grand total could not be calculated because each of these amounts were originally obtained separately from the respondents and the potential for "double counting" clearly exists. For example, respondents were asked how often they went boating and how much they might spend on a typical boating trip. They were also asked how often they go fishing and how much they spend on a typical fishing trip. However, some respondents are likely to fish on some of those boating trips and dollars they spend while fishing would also be spent while boating.

For that reason, survey respondents were asked to provide a separate estimate of the number of times they visit Onondaga Lake and how much they spend each year in total.

Possible Adjustments for Substitution Activities

Finally, an attempt was made to identify and discount respondents who said their increased demand for Onondaga Lake might come at the expense of other local activities, representing a potential offset against the estimated dollar value benefits derived from the lake clean-up.

The total survey sample was divided into two groups -- those who said their increased use of Onondaga Lake might come at the expense of other activities and those who said they would continue their current activities and increase their total recreation by simply using Onondaga Lake more often. The benefit estimation process was then repeated for each group separately to obtain the benefits derived from:

- Increased lake usage overall;
- Increased boating;
- Increased swimming; and
- Increased fishing.

Substitute usage appears to account for the following dollar value benefits:

	Substitution	Total Benefit	Net
Overall lake usage	\$12,599	\$27,211	\$14,612
Boating	\$4,346	\$8,357	\$4,011
Swimming	\$5,968	\$12,507	\$6,539
Fishing	\$6,071	\$9,100	\$3,029

APPENDIX C: LEISURE BENEFITS WILL NOT BE REFLECTED BY A CHANGE IN PROPERTY VALUES AROUND THE LAKE

Benefits from water quality improvements can be measured by increases in property values and economic development potential of land near the waterbody that are attributable to water quality improvements. Three areas around Lake Onondaga were initially identified as sites that might benefit from water quality improvement:

Old Resort Property and Land Adjacent to State Fairgrounds -- This area extends from the canal at the western border of Onondaga Lake Park to Interstate 690 and includes the land north of the fairgrounds;

West Side Industrial Property -- This area extends from the Conrail Railroad tracks on the south end of the lake northward to Interstate 690 where it hugs the shore; and

Syracuse Inner Harbor -- This area includes the property surrounding the Barge Canal, roughly bounded by Interstate 81, Spencer Street, Pulawski Street, and Hiawatha Boulevard.

Evaluation of changes in activities and land use in these areas that are expected to result from water quality improvements indicates that benefits to the Old Resort Property and Fairground are best measured by projected increases in recreational use in those areas and that the other two sites will neither directly nor measurably benefit from water quality improvements. In summary:

- The Old Resort Property and State Fairgrounds are publicly-owned and expected to remain in public use. Water quality improvement benefits in these areas are captured through the willingness-to-pay for those activities and other assessments of recreational use benefits;

The West Side Industrial Property is zoned for industrial uses; no one is expected to live on this property. Further, it has limited potential for development of commercial uses which would increase in value as water quality improves; and

The Syracuse Inner Harbor will be affected by improvements in water appearance and smell. The source of turbidity at the south end of the lake is due to sediment loading from Onondaga Creek, which is not expected to be affected by the capital improvements being considered. There is little expected direct effect on the Inner Harbor as a result of the cleanup.

Old Resort Property and Land Adjacent to State Fairgrounds

The old resort property extends from the canal at the western border of Onondaga Lake Park to Interstate 690 and includes the land north of the fairgrounds. The land adjacent to the state fairgrounds is located at the point where Route 690 veers away from the lake and is approximately two miles in length and 1/2 mile wide between the highway and the lake shore. Both areas are currently in public ownership: the County owns the old resort property and the state owns the site adjacent to the fairgrounds.¹ The area is zoned as park land and protected open space. In addition, these areas are expected to remain in public ownership and any development of the areas is expected to be related to Onondaga Lake Park or the state fairgrounds.²

Given current use, ownership, zoning and planned uses, any benefits accruing to the old resort property and the site adjacent to the fairgrounds as a result of water quality improvements are best measured by the value of increased recreational activity projected for the area. Consequently, benefits resulting from water quality improvements will not appear as increases in property value or as increments of private economic development. Instead, benefits will appear as an expansion of the types of recreational activity supported in the area and in the demand for those activities.

West Side Industrial Property

The west side industrial property extends from the Conrail Railroad tracks on the south end of the lake northward to Interstate 690 where it hugs the shore; a large industrial section also exists on the west side of the Interstate. The land in this area is currently owned by a number of private companies including Conrail, Allied-Signal, Inc., and Crucible Steel. The entire area is zoned for general industrial use; heavy industrial uses are allowed on a number of the parcels. Several sites are currently being redeveloped, including the construction and operation of cogeneration, manufacturing, and light-industry plants.³

In addition, flood hazards and unstable soils in the area may limit the potential for development of any kind. The land nearest the lake is characterized by fill, chemical waste, wetlands, and floodplains.⁴ This type of soil is highly erodible and is subject to frost heave. Furthermore, significant questions remain about the extent and severity of the soil contamination

1991 Onondaga Lake Development Plan, and personal communication with John Eallonardo, Onondaga County Parks.

² *1991 Onondaga Lake Development Plan*, and personal communication with Thomas Blanchard, Metropolitan Development Association.

1991 Onondaga Lake Development Plan, April 13, 1992, page IV-6.

Ibid. Page II-5 and Soil Association Map, Appendix A.

in areas where waste deposits exist. Without expensive cleanup and soil remediation, much of the land nearest the lake (where water quality derived benefits could be greatest) may not be amenable to development, except for low impact - low intensity uses, such as the bike trail.

As a result, the cleanup of Onondaga Lake is not expected to result in any direct economic benefits to the west side industrial property.

Syracuse Inner Harbor

The Syracuse Inner Harbor includes the property surrounding the Barge Canal, roughly bounded by Interstate 81, Spencer Street, Pulawaski Street, and Hiawatha Boulevard. The parcels immediately adjacent to the harbor are zoned for commercial use.⁵ Anticipated retail and commercial developments in the Inner Harbor will be located on or near the Barge Canal rather than the lake itself.

The water at the south end of the lake and in the Barge Canal feeding into the south end of the lake is currently discolored and cloudy. The canal carries sediment from Onondaga Creek to the lake, contributing to the lake's brown color at the south end. While upgrades to METRO may result in small improvements in observable water quality in the lake, it is not expected that the improvements will affect the water quality in Onondaga Creek, nor affect the discoloration or odor in the Barge Canal.

As a result, the visual appearance and smell of the waterbody directly affecting the Inner Harbor will not be affected by the Lake Cleanup project. The Inner Harbor area is not therefore expected to derive measurable direct utility benefits (improved appearance and smell) from improvements to the water quality of the lake.⁶ Expected indirect benefits, such as improved business due to higher recreational traffic on the lake (boats, for example), are captured in the analysis of expected commercial benefits.⁷

⁵ *1991 Onondaga Lake Development Plan, Land Use and Ownership Patterns Map.*

⁶ G.D. Garrod and K.G. Willis, "Valuing Goods' Characteristics: An Application of the Hedonic Price Method to Environmental Attributes," in *Journal of Environmental Management*, No. 34 1992, pages 59-76; and Donald N. Steignes, "Measuring the Economic Value of Water: The Case of Lake Shore Land," in *The Annals of Regional Science*, 1992-26, pages 171-176.

See also *Design Use and Feasibility Study -- Syracuse Harbor*, prepared for the Syracuse Industrial Development Agency by Halcyon Limited, 1990, for a discussion of planners' expectations regarding increased traffic on the lake and Canal as boaters from the river system are attracted to the Inner Harbor, pp.1-2 and 19-21.