

Onondaga Lake Revisited

by Robert D. Hennigan

Background

The Onondaga Lake situation should be somewhat familiar to our readers. Onondaga Lake was the theme of the winter issue of *Clearwaters* in 1989–90. This issue is an update on the current status of the continuing remediation effort. Some historical review will help put things in context.

Onondaga Lake became the receiving waters for industrial waste and sewage for the Syracuse community starting in 1880. The story of the pollution of Onondaga Lake is a fascinating story and case study of the abuse of a natural water resource that was driven by economic goals and a culture that placed little value on proper sewage and industrial waste disposal. It was complicated by a lack of good scientific knowledge and an effective regulatory system early on, and later (post 1950) when these limiting factors had been somewhat but not totally overcome, the cost of new facilities and cleanup of old industrial pollution sites remained formidable obstacles. The provision for municipal construction grants relieved this somewhat for localities but the cleanup of old industrial sites is a continuing problem.

The Solvay Process Company chemical plant in the village of Solvay, New York, adjacent to the City of Syracuse on the shores of Onondaga Lake, was the major lake industrial polluter over the years from 1884 to 1986. In the beginning, sodium carbonate was the sole product. It had a large waste-disposal problem. It produced one-and-a-half pounds of waste product for every pound of useable product; by 1896 the plant was producing 300 tons of sodium carbonate and 450 tons of waste product per day. This waste was discharged directly into Onondaga Lake until the state attorney general forced the company to abandon this practice in 1908. The waste was used to fill in lowlands around the

southern end of the lake, and then was disposed of in constructed waste beds along the shoreline and subsequently in waste beds on both sides of Nine Mile Creek upstream. These waste beds now cover over 900 acres and are 50–70 feet in height. Sement Solvay Company, a spin off from the Solvay Process Company, built their first coke plant (1906) in Syracuse to produce ammonia and tar byproducts. Benzene production was added in 1917 and continued until 1977. The production of chlorine gas was added in 1946 and was increased in 1950, resulting in mercury pollution. All of the waste products from these operations continue to adversely impact the lake today. The company underwent a number of reorganizations and name changes over years: Solvay Process Company, Allied Chemical and Dye Corporation, Allied Chemical Company, Allied Signal, and Honeywell. In order to avoid name confusion the company will be referred to as Allied; this name was part of its official name for most of its operating life in the Syracuse area. The company shifted its focus from chemical manufacturing to electrical components, divesting itself of the chemical facilities and selling them to General Chemical. It acquired the Signal Company and then Honeywell Company.

The other major source of pollutants was the sewage from the Syracuse–Onondaga County urbanized area. Originally the responsible municipality was the City of Syracuse, and later, in 1954, the county created the Metropolitan Sewer District to serve the City of Syracuse and certain urban areas in the county. In 1970, the city transferred the combined interceptor trunk sewers along Onondaga Creek and Harbor Brook to the county. The population of the county grew from 271,000 to 473,000 from 1920 to 1970. It had dropped to 458,336 in 2000. The county

population dropped 10,637 in the last decade of the century, 1990–2000. At the same time the city population dropped 17,425, demonstrating the movement of people from the city to the suburbs. As the population of the county grew from 1950 to 1970, the county wastewater operation expanded to eventually include eight wastewater treatment plants. The situation was complicated as technology improved and treatment requirements were upgraded over the decades from 1960 to 2000. This was further complicated by the discharge of the sewage into a relatively small, quiescent body of water, Onondaga Lake.

The Lake

Onondaga Lake is located in the Onondaga County–Syracuse city area. It is a quintessential urban lake in that it is located in the midst of a residential and industrial area surrounded by major interstate highways and railroads, as well as local access roads and streets. Sixty percent of the population of Onondaga County lives within its watershed, which drains into and through Onondaga Lake and subsequently into the Seneca River. The entire county drains into the Seneca, Oneida, and Oswego Rivers and then into Lake Ontario. The story of Onondaga Lake is the history of the development of New York State and the Syracuse area as it went from a rural agricultural era to an industrial urban era. Pollution of the lake was recognized in 1909 when ice harvesting was prohibited due to bacterial contamination. Starting around 1930, the need to protect water resources from sewage and industrial waste started to impinge on public officials and on the general public. This led to the enactment of a number of interstate compacts and eventually to the adoption of a state comprehensive water pollution control law in 1949. Although the pollution of Onondaga Lake was, in retrospect, inevitable, the attempts to clean it up have been difficult at best, and the effort continues to this day. This effort started in the early 1900s, and, after a century of effort, the work is unfinished.

In order to understand this situation, a

Onondaga Lake 1970 to 2000 Time Line

The 1970s mark the beginning of the restoration of Onondaga Lake. Scientific studies are conducted relating to the impact of industrial wastes, combined sewer overflows, and treated sewage wastes discharged to the lake.

1981: Allied Chemical Corporation changes its name to Allied Corporation.

1986: Allied closes soda ash manufacturing operations. Catch and release fishing is reinstated in Onondaga Lake.

1987: Onondaga County implements best management practices for sewer interception. Combined sewer overflows are reduced by 90 percent. Allied merges with Signal Companies and forms Allied-Signal Inc.

1988: Atlantic States Legal Foundation, New York State Attorney General, and Department of Environmental Conservation file complaint against Onondaga County Department of Drainage and Sanitation alleging violation of its state discharge permit. LCP-Hanlin shuts down Bridge Street chlor-alkali plant due to illegal dumping of mercury. The Amended Consent Judgment is signed in federal court on January 20, 1998.

1989: New York State Attorney General and Department of Environmental Conservation file a complaint against Allied-Signal Inc. for pollution violations and resource damage.

1990: The Onondaga Lake Management Conference is established under the Great Lakes Critical Programs Act of 1990. It is convened in Syracuse by U.S. Senator

Daniel Patrick Moynihan.

1991: Onondaga Lake Management Conference begins lake research and remediation projects. Pump stations at Liverpool and Ley Creek are modified to eliminate raw sewage overflows to the lake.

1992: U.S. Army Corps of Engineers completes the Onondaga Lake Water Quality Technical Report outlining possible lake remediation alternatives. The Onondaga Lake Management Conference funds a major study of mud boil effluents and potential remedial solutions. Mud discharges to Onondaga Lake average 30 tons a day. Allied-Signal Inc. becomes AlliedSignal Inc.

1993: Onondaga Lake Management Conference drafts "A Plan For Action" which becomes the basis of the Onondaga Lake Management Plan.

brief physical description is in order as a starting point. Onondaga Lake is a relatively small body of water; it is approximately 4.5 miles long and a mile wide. The long axis of the lake is oriented in a northwest-southeast direction. The lake drains an area of 285 square miles with 95 percent of the watershed within Onondaga County. The lake is surrounded by developed residential and industrial areas and major highways. About 60 percent of the county population is within the lake's watershed. The depth of the lake is 59.1 feet in the north deep and 62.3 feet in the south deep. The tributaries proceeding clockwise from the outlet are Sawmill Creek, Bloody Brook, Ley Creek, Onondaga Creek, the Metropolitan Syracuse Wastewater Treatment Plant (Metro) outlet, Harbor Brook, East Flume, tributary 5A, and Nine Mile Creek. The flow in the tributaries follow the general hydrologic regimen with spring high flows and fall low flows. The Metro discharge is unique as a tributary. The flow from Metro is the used water supply whose sources are Otisco and Skaneateles Lakes. Lake Ontario was added as a source in 1960. Metro has a relatively steady flow year around. This means that the Metro effluent as a percentage of total inflow to the lake is about 17 to 30 percent as a year round average and is up to 50 to 60 percent in the low flow months of August, September, and October. This means that the Metro effluent impact is greatest in the months of maximum public use and contact. The major tributaries are Nine Mile Creek and Onondaga Creek, with a combined average annual flow about 70 to 80 percent of the total inflow.

The 1950s and 1960s

Pollution control and abatement started as a state effort in 1950 after the first state comprehensive water pollution control law was adopted in 1949. The law created the Water Pollution Control Board (WPCB) as the regulatory agency chaired by the commissioner of health, with the program administered by the Department of Health. The first federal water pollution control statute was adopted in 1948

with the goal of encouraging the states to adopt water pollution control programs.

The first step under the new state program was to survey the body of water under consideration and classify the waters according to their best social and economic use. Onondaga Lake was considered to be one of the most serious pollution cases in the state. Consequently it was very high on the state's agenda for cleanup and was one of the earliest bodies of water surveyed in 1950 under the new water pollution control law. Classification and standards were adopted in 1953 for the lake based on the extent of defilement as documented in the survey and on the best social and economic use of the waters. The southern end of the lake was classified for fishing (class C), as was a small area around the mouth of Nine Mile Creek. The northern end was classified for contact recreation (swimming) that includes fishing (class B). The next step was the adoption of a pollution abatement plan and the implementation of the plan. The major focus and competence of the Health Department was sewage disposal, with industrial waste a secondary interest. The agency was chary of putting pressure on industry because of economic and political demands. Consequently, the pollution abatement effort is mainly the story of the state and then federal regulatory agencies pressuring the county to comply with the state and federal pollution abatement laws and the county's response, or lack thereof.

Although the major sewage input was from the City of Syracuse, there were other inputs as well. The city input was from the antiquated sewage treatment plant (1924) and overflowing combined interceptor sewers. Other sewage inputs were the county's Ley Creek secondary sewage treatment plant via Ley Creek, the Village of Liverpool Imhoff tank (primary treatment), the Village of Solvay and the Solvay Process raw sewage, and untreated sewage from the state fairgrounds.

Onondaga Lake reached its nadir with respect to pollution conditions in the early fifties. Sewage sludge from these sources were deposited on the bottom of the lake. The

sludge underwent decomposition and generated hydrogen sulfide and methane gases that drifted into lakeside communities. Occasionally sludge rafts would rise to the surface to be broken up by wind and wave action and sink back down. Complaints to the New York State Health Department reached a crescendo. The executive secretary, A. F. Dappert, of the WPCB was compelled to come to Syracuse to investigate conditions. He and the writer took a boat ride on the lake and verified the situation. Conditions had worsened due to a strike at Allied (1950), which meant that the city lost its means of sludge disposal and had to stop operating the sewage treatment plant for four years. The plant closure was originally due to the Allied strike but later due to the Towns of Geddes and Camillus refusing to give permission for the discharge of sludge in their areas where the Allied waste beds were located.

The state Water Pollution Control Board (WPCB) made abatement of sewage pollution first on the lake clean-up agenda. After a lot of abatement pressure from the new WPCB, discussions started between the city and county on how best to proceed. The first move was to commission an engineering study to develop possible alternative courses of action. The engineering study recommended three alternatives:

1. Separate secondary treatment plants for the city and the west side county urban area both discharging into the lake
2. A combined secondary treatment plant discharging to the lake
3. A combined primary treatment plant bypassing the lake via force main to discharge to the Seneca River

All three alternatives provided for sludge treatment and disposal, thereby avoiding being tied to Allied's problems.

After extended discussion, the city and county selected alternative 3, with the Onondaga County Public Works Commission constructing and operating the new facility. The mayor, the Syracuse Common Council, and the Onondaga County Board of Supervisors formally approved the selection.

1994: Onondaga Lake Management Conference begins aquatic habitat restoration projects in Onondaga Lake.

1995: The Onondaga Lake Management Conference completes mud boil remediation projects to reduce flow of sediment to Onondaga Creek. Onondaga Lake is added to the Federal Superfund National Priority List.

1996: Allied-Signal Inc. continues Remedial Investigation and Feasibility Study of Onondaga Lake.

1997: State of New York, Atlantic States Legal Foundation and Onondaga County reach agreement (the Amended Consent Judgment) on wastewater treatment plant improvements and a schedule to attain compliance with the Clean Water Act. The State of New York and Allied-Signal Inc. agree to an expedited schedule for com-

pletion of the Remedial Investigation/Feasibility Study (RI/FS) process.

1998: The federal judge signs the Amended Consent Judgment (ACJ) ordering wastewater treatment plant improvements agreed upon by the State of New York, Atlantic States Legal Foundation, and Onondaga County. The ACJ is a multiyear program with projects extending until 2012.

1999: New York State Health Department lifts ban on eating certain species of fish (bass, white perch, and catfish) from Onondaga Lake. The ban remains in effect for wall-eye. The Health Department also maintains a health advisory that recommends anglers limit consumption to once a month. Women of childbearing age, infants, and children under the age of 15 are still advised not to eat any

fish from the lake. Congressman James T. Walsh initiates legislation in the Water Resource Development Act of 1999 that replaces the Management Conference with the Onondaga Lake Partnership (OLP). The OLP, led by the U.S. Army Corp of Engineers, is tasked with developing and improving projects consistent with the Onondaga Lake Management Plan. AlliedSignal Inc. merges with Honeywell Inc. and changes its name to Honeywell International Inc.

2000: The OLP holds an inaugural ceremony on the shore of Onondaga Lake, August 9, 2000.

One point of discussion was raised when the city consultant favored locating the plant on the Seneca River. However, this recommendation did not prevail.

After the city and county officials selected alternative 3, providing for primary treatment with the discharge to the Seneca River and for sludge treatment and disposal, the top state regulatory official suggested that the discharge to the lake was necessary to dilute the Allied waste. This, in effect, undermined the local decision. Other changes took place: the sludge treatment was dropped in favor of the Allied waste beds, and the secondary treatment for the lake discharge was downgraded to primary treatment only. There is no record of why these latter decisions were made but in all probability it was done to save money. These changes proved to be contrary to abating the pollution of the lake, since it made it appear as though Allied and the county had the same interests when, in fact, they had divergent interests. This resulted in the continued discharge of inadequately treated sewage into the lake for the next 20 years. It also sanctioned the use of the lake for sewage disposal to this day (2005).

Under this altered plan, the new county primary wastewater treatment plant was completed in 1960. It had some positive

effects: it reduced the bacterial pollution and sludge deposition. Serious problems remained, and an evaluation of the combined sewers problem in 1954 by the writer and the U.S. Geological Survey (USGS) showed that only 50 percent of the sewage from the city reached the treatment plant, and the rest went into Onondaga Creek due to malfunctioning and plugged interceptor sewers. The combined interceptor sewers were still a city problem until 1970, when the City of Syracuse turned the combined sewers over to the county to operate and maintain.

Rockefeller's Initiative

In the 1960s Governor Rockefeller decided to make pollution control a major goal of his administration. He authorized a comprehensive study by the state Office for Local Government of the problem, and based on this study, he adopted the Pure Waters Program. This program provided 60 percent construction grants for the construction of new municipal treatment facilities and tightened up the state water pollution law. A billion dollar bond issue was proposed to fund the program. By a 4 to 1 margin the people overwhelmingly approved it in 1965. A series of federal water pollution control laws were adopted in 1948, 1953, 1956, 1961, 1965, and

1966, and each act strengthened federal authority and increased federal construction grants. The federal acts were never adequately funded, and that limited their effectiveness. The program responsibility remained with the states.

The 1966 act responded to the New York State initiative and conformed the act to support the state effort. However, the federal law, as noted above, was not of much help due to lack of funds. The state program was full speed ahead, and secondary treatment was mandated for all sewage treatment facilities.

The environmental movement and demands of the people resulted in the creation of the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (USEPA) in 1970. In 1972 the Congress adopted the Clean Water Act (CWA). This act made water pollution control a federal responsibility, created a regulatory structure, provided 75 percent of construction grants, and required secondary treatment as a minimum. It incorporated many of the provisions of the New York State program. The act directly appropriated sufficient funds to make the program operable, thereby bypassing the executive budget and the appropriations committees of the Congress. The usual

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practice of bills authorizing expenditures with the appropriation made by agreement between the appropriations committees and the executive had consistently resulted in insufficient funds to make previous water pollution control statutes effective. A number of additional environmental statutes were adopted. The main one that had an impact the Onondaga Lake situation was the Resource Conservation and Recovery Act of 1976. This act along with the Toxic Substances Control Act of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) directly related to the Allied situation and other industrial operations and sites in the watershed, and required that the owners clean up the contaminated areas. The regulatory agency responsible for implementing and enforcing these acts was the USEPA. The state acted as the surrogate for the USEPA with its oversight.

Allied

The Allied operation continued to produce sodium carbonate and other products, with waste being discharged to the waste beds and overflow discharged to the lake. Production of benzene, chlorinated benzene, and chlorine also continued. Both benzene

and chlorine would be identified as significant sources of lake pollution. The chlorine production facilities used the mercury cell process to disassociate brine and produce chlorine gas at the Willis Avenue plant (1946) and the Bridge Street plant (1950). Later (1970) it came to light that this process wasted mercury into the lake.

There was considerable waste bed overflow and drainage being discharged into Nine Mile Creek. Carbonates in the material were settling in the streambed and in the lake, forming a large delta where the deposits were up to 15 feet deep. The streambed itself was scoured out periodically by high stream flows that added to the lake deposits. This situation created a poor public impression, and the company and the pollution control people entered into discussions of remedial action. Allied agreed to dredge the delta by removing material up on the waste beds and cutting back on the overflows. The work was undertaken and that issue was resolved.

Federal Control Water Pollution Abatement The County

Onondaga Lake was still polluted in 1972. The primary wastewater treatment plant was inadequate, and the Allied waste continued unabated. Pressure continued to mount on

the USEPA under the new federal initiative. In response to the CWA and related developments, the county undertook a series of studies and, in 1979, expanded Metro into a secondary treatment plant. Sludge disposal was taken care of by pumping sludge to the Allied waste beds. The discharge permit included a provision that reserved the right to require additional treatment; this related to the discharge of ammonia nitrogen and phosphorus to the lake. Ammonia nitrogen is toxic to certain aquatic organisms, and phosphorus caused excessive algal growth leading to oxygen depletion. The county was obligated to monitor the effect on the lake and come up with a satisfactory remedial plan.

Allied

In 1970, the USEPA determined that Allied was discharging mercury to the lake in violation of the CWA. The U.S. Attorney General then sued Allied to stop mercury discharge to Onondaga Lake. Allied wasted over 20 pounds of mercury a day since the plants opened (1950-1970), for a total of 150,000-170,000 pounds. The mercury in the lake sediments was altered by bacterial reaction to methyl mercury. This mobilized it and allowed it to move into and contaminate the food chain, including aquatic plants and

Voluntary Certification for Wastewater Collection Systems Operators

The New York Water Environment Association (NYWEA) is offering a Voluntary Certification Examination Program for wastewater collection system personnel. Membership in the association is not required. The Voluntary Certification Examination has been accepted by the Association of Boards Certification (ABC) for reciprocity with the states that utilize an acceptable ABC program.

This Voluntary Certification Examination Program for the examination and certification of wastewater collection systems operators in New York is hereby established in order to promote the employment of trained, experienced, reliable, and efficient personnel for the operation of public and industrial collection systems, and to establish standards and facilities whereby wastewater collection systems personnel can demonstrate proficiency. By means of this program, the NYWEA will strive to

- improve the quality of wastewater collection systems operations;
- improve the status of wastewater collection systems personnel;

- promoted safe conditions for wastewater collection systems personnel; and
- provide a means whereby those responsible for employment of wastewater collection systems personnel can readily determine the qualifications that are considered desirable in such personnel.

The examinations will be offered in September and April, deadlines for applications are July 21st and February 21st, respectively.

Please complete the questionnaire and mail it as indicated to receive your application kit. The application kit will contain a detailed explanation of the requirements to qualify you for each certification type. After completing the application, NYWEA will arrange the date and place for the examination based on the feedback from the questionnaire. The cost of each application and test is \$45 for members and \$85 for nonmembers. This covers the application fee and testing procedure.

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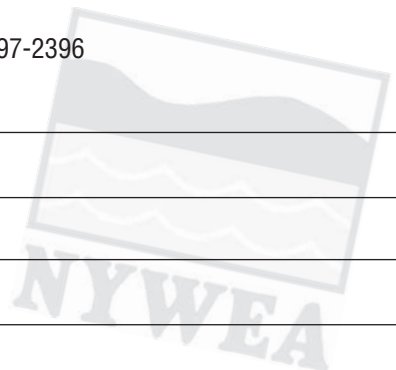
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animals and the entire fishery. The same year the state banned fishing due to the health hazard from consuming such fish. The amount of mercury wasted to the lake was reduced considerably but not totally eliminated. Most manufacturers had stopped using the mercury cell process in favor of using a permeable membrane process.

The company discharged waste bed overflow into the lake; this constituted a waste outlet that required a permit under the CWA of 1972. The company pursued an alternative. A proposal was made to Onondaga County to accept the waste flow into the Metro treatment plant on the supposition that this material would function as a coagulant and greatly enhance the removal of solids from the waste stream. The material ended up plating out on all plant surfaces and interfering with plant operations. The solution was to use a small amount as a coagulant and to bypass more than 90 percent directly to the effluent stream. This simply meant the Allied discharge was relocated from the west side of the lake to the Metro outfall sewer that was the responsibility of the county. (Later studies also found that benzene and its byproducts were also reaching the lake by groundwater travel.)

Allied closed two plants on Willis Avenue in 1977, the chlorinated benzene plant and the chlor-alkali (chlorine) plant that was using the mercury cell process. The larger chlor-alkali plant that was using the mercury cell process on Bridge Street was sold to Lyndon Chemicals and Plastics Corporation. They continued to utilize the mercury cell process to manufacture chlorine.

Into the 1980s

During the 1980s, major improvements were made to the combined sewer system reducing overflows significantly (90 percent). In 1982, the county created an industrial pretreatment program. The purpose of this was to enforce regulations to protect the facilities from substances that would damage the facilities, create safety hazards, interfere with treatment processes, and result in the pass-through of pollutants to receiving waters that would be in violation of the CWA. This was a mandated program under the CWA. The state did not administer this program for the USEPA because of limited personnel. Consequently the USEPA dealt directly with the county on this program. This put the county in the role of the regulator of local industry, a difficult role for local governments. A situation arose that showed the difficulty in administering such a program: the local U.S. attorney brought a criminal complaint against Bristol Myers Squibb for violation of the CWA. At the same time the USEPA

brought an action against county personnel for failure to enforce under the pretreatment program. After some negotiation, the federal complaint was changed to a civil complaint, and Bristol agreed to pay a substantial fine and build a pretreatment plant at a cost of \$20 million. Bristol complied and that was the end of the case.

When Allied closed in 1986, the county had a problem with sludge disposal. The Allied waste neutralized the sludge discharged to the waste beds. The lack of Allied waste meant that the sludge decomposed and released noxious gases, and that resulted in an uproar in the Towns of Geddes and Camillus. The county moved quickly to develop sludge treatment and installed a composting system. Final disposal was for the treated sludge to be used by local farmers as a soil conditioner. However, toxic substances contaminated the sludge, making the sludge unsuitable for use as a soil conditioner. The county then began delivering the contaminated sludge to a secure landfill in Erie County. The pretreatment program was tightened up, and after a year or so, the sludge contamination dropped to acceptable levels and the original plan for using the sludge as a soil conditioner was reinstated.

In 1988, the Atlantic States Legal Foundation filed a complaint against the Onondaga County Department of Drainage and Sanitation, alleging violation of the state permit conditions. Shortly thereafter, the New York State Attorney General and the NYSDEC joined in support of the allegation. A consent agreement was entered into between the court and the county providing that the county would submit an acceptable municipal compliance plan in a timely manner.

In 1985, Allied announced that it would close the soda ash operation in 1986. The only manufacturing left on site was the LCP chlorine plant. LCP was fined in 1988 by NYSDEC for continued release of mercury, and the company shut down the operation. Responsibility for the site reverted to Allied. Economic factors played a significant role in these plant closures, as well as water pollution control regulatory action. Sodium carbonate deposits (trona) were found in Wyoming, and it was much cheaper to mine sodium carbonate than manufacture it. Changes were also taking place in the chlorine market. Its use as a disinfectant for water supplies and wastewater disposal was being challenged by ultraviolet light disinfection. Closure of these facilities did not abate the pollution of the lake by Allied, although it certainly eliminated the direct manufacturing input. The runoff from precipitation on the waste bed flowed into the lake, as did the mercury and

benzene from the manufacturing sites via ground and surface water. In addition, mercury and the other pollutants had heavily contaminated the lake sediments. The lake bottom was also covered by carbonate deposits, and much of the lakeshore was covered by oncolites another form of carbonate.

Senator Daniel Moynihan held a hearing in Syracuse on April 27, 1989, on his proposed legislation S-27 Onondaga Lake Restoration Act of 1989. During this hearing, he excoriated NYSDEC for their failure to take appropriate action against Allied. Shortly thereafter the New York State Attorney General and NYSDEC filed a complaint against Allied in 1989 for pollution violations and resource damages. Allied agreed to undertake a series of studies relative to its many polluted sites and the lake itself. Most of these studies were rejected by the NYSDEC as inadequate. Allied has now advanced a number of proposals for remedial action, which are now under review by NYSDEC and USEPA. Sandy Lizlovs covers the status of some of this work in her article.

Continuing Pollution

The 1990s ushered in increased attention of elected federal and state officials to the continuing dilemma of Onondaga Lake. The lake was designated as a Superfund site due to the contaminated sediments. It is the only lake in the United States that is so designated. The benzene and the mercury continued to move from their respective sites to the lake, as does the runoff from the Allied waste beds. The benzene lagoons filled with still bottoms from the benzene manufacturing remain to be remediated. A layer of tar-like substance was found by NYSDEC investigators along the shore in the southwest corner that was identified as tarry goop, a descriptive but unscientific term.

The Metro treatment plant also continued to pollute the lake. The Metro treatment processes did not remove sufficient ammonia nitrogen and phosphorous. The nitrogen resulted in a toxic environment for the fishery, and the phosphorus input encouraged the growth of algae and the subsequent anoxia (oxygen depletion) of the hypolimnion (lowest water layer) in the lake. Although the county had significantly reduced dry weather and wet weather combined sewage overflows, the remaining overflows continued to contaminate the lake waters. Other county projects are discussed in the article by Sue Miller. Fishing for keepers and swimming were still prohibited after 50 years of effort. Both the county and Allied were under state and federal enforcement actions to eliminate pollution of the waters of Onondaga Lake.

Mud Boils

Another facet of the Onondaga Lake pollution story is the development of the Allied brine wells in the upper Onondaga Creek watershed near Tully. Allied solution mined salt from the geologic salina formation at a depth of about 1,200 feet from 1889 to 1986–88. After the Allied closure, the mud boil phenomenon grew and concentrated. The mud boils were delivering about 30 tons per day of sediment to Onondaga Creek. This sediment load represented about 50 percent of the total sediment load to the lake. The USGS has conducted a number of scientific studies that are continuing in the area. Bill Kappel, a USGS scientist, covers this topic in some detail in this issue.

New Approaches

In 1984–85, an Onondaga Lake management study was conducted under the Central New York Regional Board and Upstate Freshwater Institute. One of the major recommendations was the creation of a state commission for Onondaga Lake. The bill, introduced by Senator Lombardi to create such a commission, was passed by the Senate and Assembly. This was pocket vetoed by Governor Cuomo, a process where he didn't

act but persuaded the leadership to withdraw the bill. (This process was later found to be unconstitutional by the courts.) He then created an Onondaga Lake Advisory Committee, chaired by the NYSDEC Commissioner Hank Williams (1982–86). After one year, the chair passed to the writer who held the post for nine years (1987–96).

Governor Cuomo in his 1989 State of the State message said that he had directed the DEC commissioner, then Tom Jorling, to develop a master plan for restoring the lake by the year 2000. The Onondaga Lake Management Conference (OLMC) created by Senator Moynihan's Onondaga Lake Restoration Act of 1989 superceded this effort. An appropriation of \$500,000 was made to the USEPA to finance the conference, and \$250,000 was given to the U.S. Army Corps of Engineers (USACE) to begin planning efforts. This conference was composed of the mayor of Syracuse, the Onondaga County executive, the governor, the attorney general, a USEPA representative, and a USACE engineer. OLMC developed an extensive program of engineering studies, lake studies, and tackled the mud boil problem in cooperation with the Onondaga County Soil Conservation District and the

USGS. Actions taken greatly diminished the mud boil problem. The USACE produced an extensive report, and the major recommendation was to bypass the lake and discharge to the Seneca River. Onondaga County objected. The conflict over the best approach became a highly charged, partisan political fight. The political climate changed in 1994 when the Republicans took the House and in 1996 when they took the Senate. This greatly diminished the role of Senator Moynihan. It also changed the power relationships in the OLMC and diminished its role.

The county submitted a municipal compliance plan in response to the consent order of 1989. This plan was rejected as inadequate (1995). Negotiations then commenced between the state, the county, the Atlantic States Legal Foundation, and other parties of interest over actions needed to bring Metro and the combined sewer overflows (CSOs) into compliance. Steve Eidt, NYSDEC's regional water engineer was party to these negotiations and explained the process in the following words:

"In May 1995 DEC and the county established teams to begin meeting to seek a solution for the stalled efforts at lake cleanup. Technical staff from DEC,

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Onondaga County, and their consultants began a lengthy process to determine acceptable technical alternatives to deal with the Metro and CSO issues. The group met on a biweekly basis for over 15 months to develop and select the activities that would become the basis for the Amended Consent Judgment. After the technical issues were settled, it was apparent that the more intrinsic issues of duration of build-out, commitment to meeting water quality objectives, and paying for the implementation were not resolvable at staff levels.

In early 1997, Governor Pataki summoned the parties to his office for a meeting to discuss the remaining problems. A series of monthly meetings in the governor's office was followed by several months of long meetings with upper level management from DEC, the AG's office, USEPA Region 2, ASLF, and Onondaga County. In August 1997, after a series of daily meetings, the parties reached an agreement on the Amended Consent Judgment that was subsequently signed by the state, county, and ASLF. After a public outreach initiative and review and approval by USEPA and the U.S. Department of Justice, it was signed by Federal Judge McAvoy on January 20, 1998."

The federal Water Resources Development Act of 2000 established the Onondaga Lake Partnership due to the initiative of Congressman James Walsh. Its membership is similar to the Onondaga Lake Management Conference membership. The USACE representative is chair of the partnership that succeeded the OLMC. The main objective is to keep all parties working together to meet the Amended Consent Judgment requirements and to keep the public informed and involved as much as possible.

The job of cleaning up Onondaga Lake is a work in progress. Additional treatment to further reduce phosphorus may be needed. The CSO projects are incomplete and work is continuing over the objections of city residents who are displaced by the new facilities. Oxygenation of the hypolimnion may be required. Thanks to the efforts of Congressman Jim Walsh and Governor Pataki, most of the construction grants monies needed to do the county work to date has been provided by state and federal grants.

The Allied site and lake remediation projects are being negotiated between NYSDEC, USEPA, and Allied. There are a number of other industrial Superfund sites that need to be remediated. Additional work may be need-

ed in the mud boil area. Nonpoint sources such as runoff from agricultural and urbanized areas need controls.

Onondaga Nation

The Onondaga Nation has filed a claim (2005) to their ancestral lands. This includes Onondaga Lake, although the claim does not focus on Onondaga Lake. Tribal leaders have said that one of their goals is the restoration of Onondaga Lake, which is a sacred place according to their tradition. This action is a late starter and its impact on the Onondaga Lake situation is problematical.

A Vision

What steps could be taken to restore Onondaga Lake to a state somewhat near a natural state? Steps that could be taken include the dredging of all the contaminated sediments in the lake, the restoration of the lakeshore by removal of the oncolites and replacement with natural material, the rehabilitation of the Allied waste beds to limit infiltration and runoff to the lake, the removal of the lakeshore waste bed at Lookout Point across from the fairgrounds, the complete removal of all contaminated soil from the Allied benzene and chlorine sites, the cleanup of other Superfund sites in the watershed, the rehabilitation of the Allied Tully brine fields and impacted watershed areas to eliminate mud boil overflows that deliver sediment and salty water to Onondaga Creek, the development of programs to control and reduce nonpoint pollution in urban and rural areas of the watershed, the continuing work on the interceptor trunk sewers to further limit overflows, the rerouting of the Metro discharge to the Seneca River, and the relocation of U.S. Route 690 to allow access to the west shore of the lake.

Conclusion

The cleanup of Onondaga Lake is a work in progress, as it has been since 1960. It will continue to be so for the foreseeable future. The wastewater infrastructure must be maintained and operated at a high level of excellence and commitment. The county has reached a high point with the current effort. It involved dedication and hard work by federal and state regulators, by the professional county staff, by Governor Pataki and Congressman Walsh, by the county elected officials, and by ASLF and other groups who insisted that the job be done. Some elements of the current plan are not complete as yet, but they are scheduled. Although the county part of this effort is well on its way, the same cannot be said for the Allied component.

Practically all of the Allied clean-up proposals are still in the discussion stage. The impact on the lake of all this material has been and is profound. Pollution by sewage is transitory in nature: stop the pollutant input and the receiving waters recover. The same cannot be said for much of the chemical industrial waste. Sixteen or more years after the input has stopped, we are still faced with a massive clean-up effort of chemical industrial waste. All we can do is hope that the regulators and Allied make a commitment to really clean up and restore Onondaga Lake.

Of necessity, this presentation is like the part of the iceberg you can see that makes up 10 percent of the whole. This story is decades long and shot through with complexities, varied interests, economic interests, historical happenings that distracted us all such as the Depression, World War II, post-war boom, technologic development, widespread development and use of toxic materials, changing professional standards, economic decline of the Northeast and upstate New York, and on and on. None of us lives in a vacuum. The effort to clean up Onondaga Lake certainly didn't either, and it has been greatly impacted by changing conditions.

Sources: Clearwaters Vol. 19, No. 4, 1989-90 NYWEA, Syracuse, New York; The State of Onondaga Lake, Summer 1993, Onondaga Lake Management Conference, Syracuse, New York; Roscoe Martin et al., Decisions in Syracuse, Doubleday Anchor Book 1965, Garden City, New York; Amended Court Judgment, Judge McAvoy, Jan. 20, 1998, Binghamton, New York; and a number of websites on Onondaga Lake.

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