PUBLIC HEALTH ASSESSMENT

ONONDAGA LAKE

CITY OF SYRACUSE, TOWNS OF SALINA AND GEDDES
ONONDAGA COUNTY, NEW YORK

CERCLIS NO. NYD986913580

July 24, 1995

Prepared By

New York State Department of Health

Under Cooperative Agreement With

U.S. Department of Health & Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

Agency for Toxic Substances and Disease Registry.....David Satcher, M.D., Ph.D., Administrator
Barry L. Johnson, Ph.D., Assistant Administrator

Division of Health Assessment and Consultation. ..... Robert C. Williams, P.E., DEE, Director
Juan J. Reyes, Deputy Director

Exposure Investigations and Consultations Branch.....Edward J. Skowronski, Acting Chief

Federal Facilities Assessment Branch.....Sandra G. Isaacs, Acting Chief

Petitions Response Branch..... Cynthia M. Harris, Ph.D., Chief

Superfund Site Assessment Branch..... Sharon Williams-Fleetwood, Ph.D., Chief

Program Evaluation, Records, and Information Services Branch.....Max M. Howie, Jr., Chief

Additional copies of this report are available from:
National Technical Information Service, Springfield, Virginia
(703) 487-4650

FOREWARD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperataive agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its public health action plan. ATSDR is primarily an advisory agency, so usually these reports

identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When infomed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

TABLE OF CONTENTS

SUMMARY

The Onondaga Lake site is described as Onondaga Lake and any source that may be contributing to its contamination (e.g., hazardous waste sites discharging contaminants directly or indirectly via surface or groundwater into Onondaga Lake). The United States Environmental Protection Agency has entered into a cooperative agreement with the New York State Department of Environmental Conservation to produce a comprehensive site-wide remedial investigation/feasibility study, which will include a site-wide risk assessment. For the purposes of this public health assessment, the site is considered as Onondaga Lake and the surrounding shoreline. As more data become available on Onondaga Lake and subsites that may be contributing to contamination in the lake, an update of this public health assessment may be warranted.

Onondaga Lake is in the City of Syracuse and the Towns of Geddes and Salina in Onondaga County. The lake is surrounded by parks, industrial sites, waste beds and tar beds. The site is contaminated with many chemicals, including mercury, polychlorinated biphenyls (PCBs), petroleum hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Potential sources for some of the chemical contaminants include the petroleum storage facilities (Oil City) which may be contaminating the lake sediment; the tar beds which are releasing compounds into the air that can be detected up to three miles away; and mercury, which enters the lake primarily from Ninemile Creek and the wastewater treatment plant. In addition, the lake is contaminated with fecal bacteria.

Recommendations for the site include further studies to identify the source(s) and extent of some contaminants, use of controls to reduce the amount of mercury and fecal contamination entering the lake, and the reduction of odors from the tar beds.

As part of past public health actions taken to prevent possible human exposures to contaminants in the lake, the New York State Department of Health (NYS DOH) has issued advisories about fish and wildlife consumption and no approvals have been given for operating public beaches on the lake shore.

Based on the information reviewed, the Onondaga Lake site is a public health hazard. Fish from the site are contaminated with mercury and PCBs at levels which have a high risk of adverse health effects. In the past, people eating fish from Onondaga Lake were most likely exposed to mercury and PCBs. The NYS DOH has issued an advisory recommending that no fish from Onondaga Lake be eaten. Some reports suggest that limited fishing may be occurring. In addition, fecal contamination of the lake continues to be a problem, especially during combined sewer overflows. The presence of fecal bacteria is an indicator of potential contamination by other microorganisms that can produce disease. Fecal bacterial contamination of the lake poses a potential health hazard to recreational users, particularly swimmers. Swimming in the lake is minimized since the NYS DOH has not permitted any public beaches along the shoreline of the lake. Because the primary routes of exposure to site-related contaminants are due to recreational activities at the lake, it is difficult to estimate the number of persons actually exposed. However, ATSDR and NYS DOH estimate that 216,682 persons are potentially exposed to site-related contaminants. This

estimate, based on the 1990 census, is the total populations of the Towns of Salina and Geddes and the City of Syracuse bordering Onondaga Lake.

The health activities recommendation panel at the Agency for Toxic Substances and Disease Registry has reviewed this public health assessment to determine appropriate follow-up actions. The NYS DOH will continue community health education to the affected populations, including annual reviews and updates to the fish and game consumption advisories, as needed. The NYS DOH will evaluate measures to notify the public about the possible health risks associated with eating fish from Onondaga Lake. The NYS DOH will review additional data that are developed as part of on-going investigations of Onondaga Lake. If warranted, the NYS DOH will complete additional follow-up health activities based on these reviews.

BACKGROUND

A. Site Description and History

Onondaga Lake was proposed by the United States Environmental Protection Agency (US EPA) for listing on the National Priorities List (NPL) on May 10, 1993. The Onondaga Lake site is described as Onondaga Lake and any source that may be contributing to its contamination (e.g., hazardous waste sites discharging contaminants directly or indirectly via surface water or groundwater into Onondaga Lake). The US EPA has entered into a cooperative agreement with the New York State Department of Environmental Conservation (NYS DEC) to produce a comprehensive site-wide remedial investigation/feasibility study, which will include a site-wide risk assessment. This health assessment is being prepared, in part, in response to health concerns expressed by a former resident who lived near the lake. For the purposes of this preliminary public health assessment (PHA), the site is considered to be Onondaga Lake and the surrounding shoreline. As more data become available on Onondaga Lake and subsites that may be contributing to contamination in the lake, an update of this PHA may be warranted.

Onondaga Lake borders the City of Syracuse, the Towns of Salina and Geddes, and the Village of Liverpool in Onondaga County, New York (Figure 1, Appendix A). The lake is about 4.5 miles long and 1 mile wide, with an average depth of 38 feet and maximum depth of about 67 feet. Seven major tributaries flow into the lake, including Ninemile Creek, Onondaga Creek, Ley Creek, Harbor Brook, Bloody Brook, Sawmill Creek, and Tributary 5A. Water flows out of the lake via the Seneca River, part of the Barge Canal System, at the northwest end. The land bordering the lake consists principally of county parks (including Longbranch and Onondaga Lake Parks), a marina, industrial properties, commercial properties, tar beds (Semet residue ponds), waste beds (Solvay beds), wetlands, undeveloped brush land and highways (Figure 2, Appendix A). There are several facilities which are listed on the NYS DEC registry of Inactive Hazardous Waste Disposal Sites in New York State and may be sources of contamination to Onondaga Lake including the Salina Town Landfill, the Onondaga Nation Barrel Site, McKesson Environmental, the State Fair Landfill, the Syracuse China Landfill, Onondaga Lake Mercury Sediments, Allied - Willis Avenue site, Ley Creek PCB Dredgings, Allied - Semet Residue Ponds, Val's Dodge, General Motors (GM) - Fisher Guide Division, LCP Chemicals, Bristol Labs, Crouse-Hinds, Quanta Resources, Crucible Steel - Syracuse Operation and the Clark Property. Numerous petroleum storage facilities exist in the area known as Oil City immediately south of the lake. Petroleum soil and groundwater contamination have occurred in the Oil City area.

In the late 1800's and early 1900's, Onondaga Lake supported a resort industry based on recreational use of the lake waters. By 1940, the lake was declared unsafe for swimming (Onondaga Lake Management Conference, 1993). Swimming was banned by the New York State Department of Health (NYS DOH) in the 1960's because of unsafe levels of bacteria. Currently, there are no permitted public bathing beaches at Onondaga Lake because of bacterial contamination and water clarity problems. Prior to 1900, the lake also supported

a commercial fishing industry with both cold and warm water fisheries. The lake was closed to public fishing in 1970 due to mercury contamination in fish. In 1986, fishing in the lake was reopened, and the NYS DOH issued a health advisory to eat no fish caught in Onondaga Lake or its tributaries to the first barrier impassable to fish (Appendix C).

The area near Onondaga Lake has had an industrial presence since the late 1700's. The earliest documented industry was a salt industry which operated from 1793 to 1908. Ice was harvested from the lake for both public and commercial use prior to 1901, when it was banned because of contamination. A large chemical industry (AlliedSignal, Inc. formerly Allied Chemical) developed in the area, and included manufacturing of soda ash, bicarbonate of soda, chlorine, benzene, toluene, xylenes, chlorinated benzenes, and naphthalene. Other industries present at one time or another included a fertilizer plant, manufacturers of pottery, candle manufacturing, vehicular accessories, steel, foundries, air conditioning, general appliances, electrical manufacturing facilities, petroleum storage, scrap yards, municipal dumps, pharmaceuticals, and transportation facilities.

Since the late 1800's, Onondaga Lake has received discharges of industrial and municipal waste. Presently, the most significant industrial pollutants in the lake appear to be mercury and various alkali wastes (e.g., chlorides, sodium and calcium). About 60 tons of mercury were discharged to the lake from the chlor-alkali process. Recent sampling indicates that ongoing releases from the closed LCP Chemical site (formerly operated by Allied Chemical) is responsible for a large portion of mercury entering the lake. High levels of mercury in the west flume of the LCP Chemical site drain into the lake via Geddes Brook and Ninemile Creek. About 100,000 tons/year of alkali wastes were released into the lake. These inorganic wastes increased salinity and calcium levels in the lake which affected normal mixing and caused extensive calcite precipitation. Other industrial pollutants including aromatic hydrocarbons, semi-volatile hydrocarbons, solvents, and polychlorinated biphenyls (PCBs), have also been found in the lake. Several Orders on Consent have been signed between AlliedSignal, Inc. or its predecessor(s) and the NYS DEC regarding the waste beds, tar beds and groundwater contamination at the Willis Avenue Plant. In addition, AlliedSignal, Inc. and the NYS DEC signed a consent decree requiring a remedial investigation/feasibility study (RI/FS) to determine the type and extent of contamination in Onondaga Lake and identify alternatives for remediation.

Onondaga Lake has also received large volumes of raw sewage during most of this century. Sewage was either discharged from tributaries or directly into the lake. In addition to bacterial contamination, the sewage has caused severe eutrophication (i.e., increased mineral and organic nutrients and decreased dissolved oxygen levels) of the lake which affects the behavior of toxic compounds in the water. Throughout the 1900's, municipal sewage treatment capabilities were expanded. Currently, the Onondaga County Metropolitan Syracuse Wastewater Treatment Plant (Metro) has a tertiary treatment capability of 120 million gallons per day (mgd). When combined stormwater and sewage flow exceeds 120 mgd, the incremental flow above 120 mgd receives only primary treatment with chlorination before it is discharged into the lake. Until 1985, all combined sewer overflows (CSOs)

entered the lake and tributaries directly. Since 1985, efforts have been undertaken to reduce CSOs; however, CSOs still occur about 50 times per year (Onondaga Lake Management Conference, 1993). The Metro plant is also a significant source for mercury entering the lake. A consent judgement directs Onondaga County to complete planning, design and construction of facilities to bring discharges from the Metro sewage treatment plant in compliance with regulatory requirements.

B. Actions Completed During the Public Health Assessment Process

The PHA process was initiated when the Onondaga Lake site was proposed for listing on the NPL in May 1993. Since that time, actions that have occurred as part of the public health assessment process include the following:

- The NYS DOH reviewed recent NYS DEC data on chemical contamination of fish from Onondaga Lake and concluded that the health advisory recommending to eat no fish from Onondaga Lake or its tributaries to the first barrier impassable to fish be maintained in the 1994/1995 fishing season.

- The NYS DOH has initiated communications with the petitioner of this health assessment and provided information about the status of this public health assessment.

C. Site Visit

Robert Montione of the NYS DOH visited the site in April 1992 and Ron Heerkens of the NYS DOH Syracuse Field Office has also visited the site on several occasions. In June 1994, Pat Fritz and Daniel Luttinger of the NYS DOH accompanied Robert Montione and Ron Heerkens on a visit to the site. Onondaga Lake borders the City of Syracuse. A portion of the City of Syracuse, commercial enterprises, Allied Chemical, and extensive bulk petroleum facilities (Oil City) dominate the southern shore. The lake is used for boating, crew races, wind-surfing, water skiing and related recreational activities, as well as commercial inland shipping. The northwestern shore is mostly open parkland and is used for boating, picnicking, hiking and other recreational activities.

D. Demographics, Land Use, and Natural Resource Use

Demographics

The NYS DOH has estimated from the 1990 census that 216,682 people live in the Towns of Salina and Geddes and the City of Syracuse bordering Onondaga Lake. Of this population, 80.5% is of the white race, 15.6% is of the black race, and 3.9% is of other races. Within the three areas, 7.4% of the population is under 5 years of age, 22.2% is between 5 and 20 years of age, 55% is 21-64 years of age and 15.4% is 65 years or older. The median household income for the Town of Salina is $33,212, for the Town of Geddes,

$30,957, and for the City of Syracuse, $21,242. The percent of families below the poverty level for the Town of Salina is 2.2%, for the Town of Geddes, 4.1%, and for the City of Syracuse, 17%.

Land Use

A large portion of the shoreline, including most of the northern half of the shoreline, is parkland. These areas are used for a wide variety of heavily attended special events as well as less formal recreational activities. A county owned marina within the park is also frequently used. Railroad tracks run along parts of the eastern shore of the lake. Commercial and industrial areas near Onondaga Lake are concentrated along the south and southwest shores. Several extensive alkali waste beds and tar beds are situated along and near the shoreline (Figure 3, Appendix A). The waste beds along the shoreline occupy about 1,360 acres and are composed of inorganic salts from the soda ash industry (Blasland, Bouck and Lee, 1989). The tar beds, which occupy about 22 acres, are composed of residue tars that were placed there by a former division of AlliedSignal, Inc. that refined coke light oil via fractional distillation. In addition, there are numerous hazardous waste sites in the region as well as petroleum contamination associated with the Oil City area. Residential areas exist along the northeast and western shorelines, although no residential property borders the lake shore.

Natural Resource Use

Onondaga Lake is classified by the NYS DEC as Class B surface waters, although some portions of the lake are classified as Class C surface waters. The class system is used to identify best uses of surface waters but does not necessarily mean that the lake currently meets the water quality standards for Class B or C water. The best usage of Class B waters are bathing and any other usages except drinking and food processing. The best usage of Class C waters are fishing and any other usages except for bathing, drinking and food processing.

The lake is presently used for boating, waterfowl hunting, and fishing. The intensity of usage for these activities is low. The lake is not considered suitable for swimming because of high concentrations of fecal coliform and poor water clarity. Reportedly, however, people occasionally swim in the lake. Within a three mile radius of the lake, it is estimated that about 700 people use shallow groundwater for drinking (NYS DEC, 1989). All of these groundwater supplies are upgradient of the lake. There are no known public or private potable water intakes in the lake. Syracuse relies on Skaneateles Lake as its primary drinking water supply but also has interconnections with the Onondaga County Water Authority which uses Otisco Lake and Lake Ontario. All are several miles away from Onondaga Lake. The Village of Liverpool and the communities around the northern and western portions of Onondaga Lake use water provided by the Onondaga County Water Authority.

E. Health Outcome Data

The NYS DOH has not evaluated health outcome data specific for the Onondaga Lake site. However, the NYS DOH maintains several health outcome data bases which could be used to generate site-specific data, if warranted. These data bases include the cancer registry, the congenital malformations registry, the heavy metals registry, the occupational lung disease registry, vital records (birth and death) certificates, hospital discharge information and water-related disease outbreak data. Two studies evaluating the incidence of cancer in Clay, New York, and also in the Towns of VanBuren and Camillus, New York were conducted by the NYS DOH (NYS DOH, 1985 and 1990). The findings of these studies are discussed in the Public Health Implications section (subsection B, Health Outcome Data Evaluation) of this PHA. Two other cancer incidence studies are currently in progress. One of the studies is being done for the Town of Geddes and should be completed by 1996. The other study includes the Village of North Syracuse and parts of the Town of Clay and the Town of Cicero. This study should be completed by 1997.

COMMUNITY HEALTH CONCERNS

In 1990, a resident who used to live near Onondaga Lake expressed concern about the incidence of cancer among family members and others in the community of Lakeland, which borders Onondaga Lake. This former resident expressed concern about past disposal practices by the Allied Chemical Plant, which reportedly dumped wastes directly into the lake, and had health concerns about the risk of developing cancer because of the nearby chemical plant.

In August 1994, the NYS DOH received an inquiry about the occurrence of cancer among people living in Liverpool, a community within the Town of Salina which borders Onondaga Lake to the northeast.

Other community health concerns have centered on: 1) recreational use of the lake including swimming; 2) fishing and use of the shoreline; 3) odors emanating from the tar beds; and 4) health effects from the Oil City rehabilitation efforts.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

To evaluate if a site poses an existing or potential hazard to the exposed or potentially exposed population(s), the site conditions are characterized. This site characterization involves a review of sampling data for environmental media (e.g., soil, surface water, groundwater, air) both on- and off-site and an evaluation of the physical conditions of the contaminant sources or physical hazards near the site which may pose an additional health risk to the community or receptor population(s).

Contaminants selected for further evaluation are identified and discussed based upon consideration of the following factors:

Concentrations of contaminant(s) in environmental media both on- and off-site;

2. Field data quality, laboratory data quality, and sample design;

3. Comparison of on-site and off-site contaminant concentrations in environmental media with typical background levels;

4. Comparison of contaminant concentrations in environmental media both on- and off-site with public health assessment comparison values for (1) noncarcinogenic endpoints, and (2) carcinogenic endpoints. These comparison values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), drinking water standards and other relevant guidelines. Contaminant concentrations which exceed a comparison value do not necessarily pose a health threat; and

5. Community health concerns.

The identification of a contaminant does not necessarily mean that it will cause adverse health effects from exposure. Contaminants selected for further evaluation are evaluated in subsequent sections of the PHA to determine whether exposure to them has public health significance.

The On-Site Contamination and the Off-site Contamination subsections include discussions of sampling data for environmental media. If a chemical is selected for further evaluation in one medium, that contaminant will also be reported in all other media, if it is detected.

A. On-site Contamination

Surface Water

Several metals have been identified in Onondaga Lake. Water samples from the uppermost layer of the water column and lowermost layer of the water column have been analyzed for organic compounds (i.e.,benzene, toluene, ethylbenzene, xylene and chlorinated benzenes). The concentrations of the compounds detected are generally lower than the NYS DOH drinking water and the NYS DEC Class A surface water (drinking water source) standards, with the exception of chloride. High concentrations of chloride (about 500 milligrams per liter, or mg/L) which exceed the NYS DOH drinking water and the NYS DEC class A surface water standards (250 mg/L), have been detected in the lake water (PTI, 1993a). The drinking water standard for chloride is based on taste; however, since the lake is not used as a drinking water supply, the chloride contamination will not be considered further. Some of the samples taken by Onondaga County in 1987-1990 were reported to have cadmium and lead at levels equal to or slightly above the NYS DOH drinking water standards or action levels. However, more recent sampling (PTI, 1993a) did not confirm these results. Although some samples contained levels of antimony (about 25 micrograms per liter, or mcg/L) and manganese (about 650 mcg/L only in deep water, i.e.,12 meters) which exceed the NYS DEC class A surface water standards or guidance values, none

exceeded health assessment comparison values for recreational exposure to surface water (Table 1, Appendix B).

Fecal coliform and streptococcal bacteria in Onondaga Lake have been monitored since 1974. Levels of bacteria have declined since then, but are still present (PTI, 1991) at concentrations which occasionally exceed the NYS DOH standards for bathing beaches (refer to Table 2, Appendix B). The public health significance of bacterial contamination of the lake will be considered further in the PHA. Recently, dichlorobenzenes, naphthalene, xylenes and alkyl benzenes and two previously unidentified compounds (1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane) were found in the water at the southern end of the lake; however, no concentrations were reported (Hassett, 1994).

Although the lake water is generally considered to be horizontally well mixed and homogenous, there is the potential for higher concentrations of contaminants near localized sources. Due to the lake stratification the concentrations of some compounds varied with water depth, and the sampling and analysis took this into account. A visible petroleum sheen was noted on the water surface in two areas at the southern end of the lake (PTI, 1993a).

Sediments

The lake sediments have been studied extensively, and contain many chemicals at concentrations above typical background concentrations. The type of contamination in lake sediments varies; generally, the southeastern part of the lake below Ninemile Creek is more heavily contaminated than the northwestern regions of the lake.

Mercury has been found in the sediment throughout the lake and at various depths. Mercury is unevenly distributed throughout lake sediment. The surface sediments in the lake near the shoreline tend to have lower contaminant concentrations than the sediments in the lake at distances further from the shoreline (PTI, 1991). The mean (average) detected concentration of mercury in the surface sediment is 3.8 milligrams per kilogram (mg/kg), about 7.7 times higher than the background concentration (PTI, 1993a). The range of concentrations of mercury in the surface sediment is 0.15 mg/kg to 68.9 mg/kg. Deeper samples had a higher mean of detected values (13.9 mg/kg), though the range was comparable.

Several additional metals were also found in lake sediments. The average concentration detected in the surface sediment for cadmium (2.5 mg/kg), chromium (79.3 mg/kg), copper (44.9 mg/kg), nickel (26.6 mg/kg) and zinc (110 mg/kg) exceeded typical background ranges for metals in soils. The average concentrations for deeper sediment samples were generally two to three times higher than the surface sediment concentrations. Barium, cadmium, and lead were detected in some of the sediment samples at concentrations above naturally occurring levels for NYS soils (NYS DEC, 1989). The concentrations of antimony and manganese in lake sediments were within the background range for NYS soils. No metals

were detected at concentrations exceeding health assessment comparison values (see Table 3, Appendix B).

Several volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) were detected in some sediment samples (PTI, 1993a), including benzene (up to 5.7 mg/kg), toluene (up to 4.2 mg/kg), chlorinated benzenes (e.g., monochlorobenzene up to 43 mg/kg; 1,4-dichlorobenzene up to 16 mg/kg; and hexachlorobenzene up to 1.2 mg/kg), bis(2-ethylhexyl)phthalate (up to 3 mg/kg), and PCBs (up to 1.1 mg/kg). The average concentrations of total polycyclic aromatic hydrocarbons (PAHs) detected exceed background levels; the higher concentrations were found in the southeastern portion of the lake. In addition, several different benzene compounds, PAHs, and aliphatic hydrocarbons were tentatively identified in some sediment samples (PTI, 1993a). Petroleum hydrocarbons were also detected at extremely elevated concentrations (up to 47,000 mg/kg) in sediment samples at the southern end of the lake (PTI, 1993a). The petroleum hydrocarbons detected have not been adequately characterized to evaluate possible public health implications. This represents a data gap that precludes further evaluation of petroleum hydrocarbons in this PHA. Although concentrations were not quantified, 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane were also detected in sediment at the southern end of the lake (Hassett, 1994). A potential source of these compounds are the tar beds.

There are no comparison values for evaluating exposure to metals or organic compounds in lake sediments. However, soil comparison values do exist and the concentrations for metals above background do not exceed comparison values for soil in a non-residential setting (Table 3, Appendix B). Therefore, metals found in the lake sediment will not be considered further in this health assessment. With the exception of PAHs, the values of the organic compounds detected did not exceed health comparison values for soil in a non-residential setting and will not be evaluated further in this PHA.

For some of the PAHs detected in lake sediments there are no comparison values. For these compounds, the comparison value for benzo(a)pyrene was used to evaluate concentrations of carcinogenic PAHs and the comparison value for pyrene was used to evaluate concentrations of non-carcinogenic PAHs. The average concentration of all carcinogenic PAHs detected exceeds comparison values for soil in a non-residential setting. The public health significance of PAHs will be considered further in the Pathways Analysis section of this PHA.

Fish

Studies of fish in Onondaga Lake by the NYS DEC have found mercury concentrations which exceed the U.S. Food and Drug Administration (US FDA) action level (1 mg/kg) and health assessment comparison values (Table 4, Appendix B) in several fish species collected from the lake. In 1970, the first year that fish data were available from Onondaga Lake, the mean mercury concentrations in thirteen different species ranged from 0.4 to 5.3 mg/kg. The highest mercury level reported for an individual fish was 8.2 mg/kg. Based on these

data, a fishing ban in Onondaga Lake was issued in 1970. Mean concentrations of mercury in fish from Onondaga Lake have varied since 1970; between 1970 and the mid-1980's, a general trend towards reduced mercury concentrations in fish was observed. In the mid-1980s, mean mercury concentrations in smallmouth bass was 1.2 mg/kg and in walleyes was 1.6 mg/kg. Individual fish from other species also had mercury concentrations that were greater than 1 mg/kg. Additional data for smallmouth bass, from 1987 to 1990, suggest that mercury levels in this fish species increased compared with earlier (mid-1980's) sampling data (average concentration about 1.6 mg/kg). Samples of smallmouth bass collected in 1992 had mean mercury concentrations of 0.91 and 0.75 mg/kg in two different studies; a peak concentration of 3.4 mg/kg was also reported (PTI, 1993b; NYS DEC, 1994). However, legal-size smallmouth bass ($\geq$12 inches) had a mean mercury concentration which exceeded the US FDA action level. In 1992, mean mercury concentrations for walleye were 1.5 and 2.3 mg/kg and about 1.1 mg/kg for white perch (PTI, 1993b; NYS DEC, 1994). Gizzard shad, carp, channel catfish, and bluegill had mean mercury concentrations below the US FDA action level. From 1970 to 1992, the mercury concentration in individual smallmouth bass has ranged from 0.4 mg/kg to 3.4 mg/kg.

PCBs have been detected in several different fish species from Onondaga Lake, occasionally at concentrations exceeding the US FDA tolerance level (i.e., 2 mg/kg), and health assessment comparison values (Table 4, Appendix B). Smallmouth bass collected in 1972 and 1979, had mean PCB concentrations of 0.71 and 1.1 mg/kg respectively; white perch collected in 1972 had mean PCB concentration of 1.6 mg/kg (NYS DEC, 1981). However, sampling of both of these fish species in 1975 showed mean PCB concentrations of 4.95 mg/kg for smallmouth bass and 4.72 mg/kg for white perch (Armstrong and Sloan, 1980). In 1985, ten different fish species were sampled by the NYS DEC, and only channel catfish had a mean PCB concentration which exceeded the US FDA tolerance level (PTI, 1993b). In 1992, gizzard shad had a mean PCB concentration of 2.2 mg/kg, and nine other species of fish had average PCB concentrations between 0.1 mg/kg and 1.5 mg/kg (PTI, 1993b; NYS DEC, 1994). Some individual channel catfish and walleye contained PCBs at concentrations of 4.7 mg/kg and 3.1 mg/kg, respectively. Some smallmouth bass, channel catfish and white perch collected in 1992 as part of a limited study had PCB concentrations which exceeded 2 mg/kg (Stearns and Wheler, 1993).

Fish collected from Onondaga Lake in 1980 had detectable levels of monochlorobenzene, dichlorobenzene and benzene at concentrations ranging from 0.2 to 0.8 mg/kg (reviewed in PTI, 1991). 1,4-Dichlorobenzene, cadmium, lead, phthalates, hexachlorobenzene, chlorinated dibenzofurans, DDT and other contaminants were also detected in fish collected from Onondaga Lake in 1992 (PTI, 1993b; Stearns and Wheler, 1993). Although not quantified, 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane were also detected in fish (Hassett, 1994).

Mercury and PCBs will be evaluated further in this PHA. Due to the limited data about other contaminants, including cadmium, chlorinated dibenzofurans, benzene,

monochlorobenzene and dichlorobenzene found in fish collected from Onondaga Lake, they will not be considered for further evaluation in this PHA.

Shoreline Soil

The shoreline soil has been investigated for potential chemical contaminants; however, the primary emphasis of these investigations has been on the industrial regions in the southeastern portion of the lake. Soda ash wastes (Solvay) have been deposited in several waste beds along the southwestern portion of the lake (Figure 3, Appendix A). These waste beds generally contain inorganic salts such as calcium chloride, sodium chloride, calcium carbonate, calcium silicate, magnesium hydroxide and calcium hydroxide (Blasland and Bouck Engineers, 1990). The waste beds are alkaline and surface water drainages from the waste beds have pHs that range from 7.5 to 10.6. In addition, wastes containing tar, benzene, toluene, xylene and PAHs from a plant that refined coke light oil were deposited about 200 feet from the shoreline in the Semet residue ponds (tar beds) that were built on top of a soda ash wastebed. Benzene, toluene, chlorobenzene and dichlorobenzene have been detected in the soil between the tar beds and Onondaga Lake (Groundwater Technology, Inc., 1993). Odors from the tar beds have been detected by the NYS DOH personnel several miles from the site, including in several parts of the City of Syracuse. There is a large bulk petroleum storage/terminal facility, known as Oil City, on the shoreline. The presence of petroleum products in lake sediment suggests that there may be petroleum products contaminating the shoreline soil.

Data are not available for other portions of the shoreline. However, a 1973 report describes some sediment dredging operations in the outlet barge canal, the oil terminal area, and the delta near the mouth of Ninemile Creek (US EPA, 1973). The disposition of most of the dredged sediments was not reported and is not currently known. The delta near the mouth of Ninemile Creek was dredged in 1968 and the dredge spoils were disposed in a low area just north of the creek which was being developed as a recreational park. These spoils have not been analyzed for potential contaminants.

Waterfowl

Potential contaminants in waterfowl present in the Onondaga Lake region have not been characterized. However, it is known that PCBs and mercury, which have been detected in fish in Onondaga Lake, can bioaccumulate in waterfowl.

Air

There are no data from the lake pertaining to surface water releases of compounds. However, volatilization of contaminants from lake surface water, especially mercury, is a possibility. Odors from the tar beds vary and tend to be stronger in the warmer weather and have been detected by local health officials two to three miles away. Therefore, depending on the wind direction, air quality at or near the lake can be affected by odors

from the tar beds. Elevated levels of benzene have been detected by the NYS DEC, the NYS DOH and the Onondaga County Health Department in the region near the tar beds.

B. Off-site Contamination

Surface Water

Surface water exiting the lake at the northwest corner has not been characterized for potential contaminants but it is assumed to be similar to the surface water quality in the lake. The water from Ley Creek has been analyzed and detectable concentrations of PCBs have been reported (O'Brien and Gere Engineers, Inc., 1993). The water from Ninemile Creek has been sampled and several contaminants including mercury were identified (CDR Environmental Specialists, 1991). The Metro plant has also been identified as a significant source of mercury entering the lake (Driscoll and Wang, 1994). Approximately 48% of the mercury currently entering the lake has been attributed to Ninemile Creek, and 25% has been attributed to the Metro plant (Driscoll and Wang, 1994).

Sediment

Sediments in the Barge Canal in the northwest corner of the lake and further downstream (i.e., Seneca River) have not been characterized for potential contaminants. As with the surface water of the tributaries to the lake, there has been some characterization of the sediments in some of the tributaries. Mercury has been detected in the sediments of Ninemile Creek at concentrations that are higher than background levels for NYS soils, and PCBs have been detected in Ley Creek (CDR Environmental Services, Inc., 1993; O'Brien and Gere Engineers, Inc., 1993).

Fish

Contaminant levels in fish from the Barge Canal at the northwest corner of the lake and further downstream (i.e., Seneca River) have not been characterized. Studies of fish movement for fish initially caught in Onondaga Lake have indicated that some fish leave the lake via the outlet and have been found as far up the Seneca River as Baldwinsville (about six miles), and as far down river as Fulton (about 16 miles).

In 1990, limited sampling of fish from Ninemile Creek and Geddes Brook found smallmouth bass with approximately 1.5 mg/kg mercury and other species of fish contained mercury at levels which ranged from 0.055 to 0.635 mg/kg (CDR Environmental Specialists, 1991). Some of the fish caught in Ley Creek have been reported to have greater than 2 mg/kg of PCBs (O'Brien and Gere Engineers, Inc., 1993). In addition, dioxins and dibenzofurans have been detected in fish caught in Ley Creek (Estabrook, 1992).

As mentioned previously, odors from the tar beds can be detected at distances two to three miles away. However, there is insufficient air sampling data and information to characterize possible exposures. AlliedSignal, Inc. is conducting a RI/FS on the tar beds. AlliedSignal, Inc. signed an Administrative Order on Consent (Dec. 15, 1994) agreeing to a temporary cover over tar bed ponds nos. 3 and 4, as an interim measure.

Groundwater

Onondaga Lake is a local groundwater discharge point and contaminants from the lake would not be expected to migrate to groundwater under non-pumping conditions (NYS DEC, 1989). During periods of flooding, local hydraulic gradients may be reversed and some water from the lake may discharge to groundwater as a short-term, temporary effect. The nearest homes to the lake served by groundwater wells are on Walters Road, about 1.5 miles from the lake boundary (NYS DEC, 1989). There are no other known private wells near the lake. Groundwater near the southwestern portion of the lake was analyzed for potential contaminants that may be transported to the lake. Several volatile organic compounds (e.g., benzene, toluene, xylene, chlorobenzene and dichlorobenzene) have been detected in the groundwater (PTI, 1993a). An interim remedial measure consisting of product recovery for a mixture of chlorobenzene and dichlorobenzene solvents has been initiated by Groundwater Technology, Inc. on behalf of AlliedSignal, Inc. (Groundwater Technology, Inc., 1993). Petroleum storage facilities near the southern end of the lake may contribute to groundwater contamination by petroleum products which could also be affecting the lake (Onondaga Lake Management Conference, 1993).

Soil

There are no data to characterize soils beyond the shoreline. As mentioned previously, lake sediments were dredged and it is unclear where the spoils were disposed.

C. Quality Assurance and Quality Control

In preparing this public health assessment, the NYS DOH relies on the information provided in the referenced documents and assumes that adequate quality control measures were followed with regard to chain-of-custody, laboratory procedures and data reporting. The validity of the analyses and the conclusions drawn for this assessment are determined by the availability and reliability of the referenced material.

Some of the referenced reports did not have quality assurance/quality control (QA/QC) statements in their reports. However, it is assumed for the purposes of this public health assessment that the data reviewed are of acceptable quality.

Several of the reports (e.g., PTI, 1993a,b; Blasland and Bouck Engineers, 1990) have not been evaluated or approved by the NYS DEC for accuracy, QA/QC, or completeness. The reader should be aware that references to these data are references to preliminary information only and that inferences and conclusions based upon this draft data may be significantly revised following the NYS DEC review of the data.

D. Physical and Other Hazards

Physical and other hazards are associated with the lake and shoreline. The lake water has high turbidity, causing poor water clarity. Drowning is one hazard associated with recreational use of the lake. Parts of the southern shoreline, near Ninemile Creek, are steep and rocky and access to the lake along these areas is difficult and potentially hazardous. The soft and unstable inshore bottom substrate (e.g., oncolites) created by past industrial waste discharges also presents a physical hazard, particularly if swimming becomes a future lake use. The industrial and commercial sites including the tar beds and some waste beds along the shoreline have not been evaluated for physical and other hazards as part of this PHA.

E. Toxic Chemical Release Inventory (TRI)

To identify other facilities that could possibly contribute to site-related contaminants in soil, air, groundwater, and/or surface water at or near the Onondaga Lake site, or create health threats unrelated to the site, the NYS DOH searched the Toxic Chemical Release Inventory (TRI). The TRI has been developed by the US EPA from chemical release information provided by those industries that are required to report contaminant emissions and releases on an annual basis. The NYS DOH reviewed TRI data submitted by industrial facilities identified to be within a 2.5 mile radius of the perimeter of Onondaga Lake for the years 1988 through 1992 as a means to evaluate other sources of additional health risk in the exposed population.

The NYS DOH uses a simple mathematical model to estimate if potential contaminant concentrations resulting from air emissions at a facility may be contributing to community (receptor population) exposures to contaminants at a site. This model uses information about the facility location (distance from the exposed population) and annual air emission data to calculate the radial distance from the facility at which contaminant concentrations in ambient air are below screening criteria. For most contaminants the NYS DOH then evaluates what portion, if any, of the population living within this distance from the manufacturing facility may also be exposed to contaminants originating at the site.

Presently, there are 28 industrial facilities within about a 2.5 mile radius of Onondaga Lake (refer to Figures 4 and 5, Appendix A). Additionally, H.P. Hood, Inc. and the Cambridge Filter Corporation were also considered in this evaluation, since the facilities are situated near the 2.5 mile radius from Onondaga Lake. Those facilities which filed TRI data for 1992 include the Syracuse Heating Corporation; Crucible, Inc. (Specialty Division);

Chemtech Industries, Inc.; Pass & Seymour; General Chemical Corporation; Church and Dwight Company, Inc.; Marcellus Casket Company; Caldwell & Ward Brass Company; Boorum & Pease, Inc.; Anoplate Corporation; Benbow Chemical Packaging, Inc; Syracuse China Corporation; Crouse-Hinds Company (Wolf Street Plant); Meloon Foundries, Inc.; B.G. Sulzle, Inc.; Martin Marietta -General Electric Company; Strathmore Products, Inc. (Plant #2); Syrtek, Inc. (formerly Pico Products, Inc.); Deluxe Check Printers; and H.P. Hood. Summaries of the TRI-reported releases to air, surface water and publicly owned treatment works by these facilities for the year 1992 are presented in Tables 5 and 6 (Appendix B), respectively. Eight facilities did not file TRI data for 1992. These include LCP Chemicals; Frazer & Jones Company; Lipe-Rollaway Company; Fastek; Strathmore Products, Inc. (Syracuse); R.E. Deitz Company; the GE Company (Farrel Road Plant); and the Cambridge Filter Corporation. For those facilities that filed TRI data in 1992, the 1992 data appeared to adequately represent releases from previous years (i.e., 1988-1991). For those facilities which did not file TRI data in 1992, data from previous years were evaluated.

Church and Dwight Inc. is a potentially significant source of ammonia in the lake. In 1988, LCP-Chemicals discharged mercury into surface water (110 lbs.) and publicly owned treatment works (9 lbs.). In 1989 and 1990 no mercury releases were reported from LCP-Chemicals. In addition, Crucible Inc. discharged manganese, nickel, chromium and copper into surface water that enters the lake. The levels of mercury, manganese, nickel, chromium and copper in the sediments exceed typical background concentrations for soils. The discharges from LCP-Chemical and Crucible Inc. may have contributed to the concentrations found in lake sediment. None of the other compounds released to surface water from TRI facilities between 1988 and 1992 had concentrations in lake sediment or lake water which exceeded comparison values.

Results of the screening evaluation indicate that TRI-reported air emissions from the facilities identified would not increase contaminant levels in ambient air near the Onondaga Lake site to levels above the screening criteria of 0.1 micrograms per cubic meter (mcg/m^3) for chromium, 0.02 mcg/m^3 for nickel, 0.4 mcg/m^3 for manganese, or 1 mcg/m^3 for other compounds. Based on the results of the screening evaluation, the public health significance of contaminant air emissions and water discharges from TRI facilities as additional sources of community exposures at the Onondaga Lake site will not be evaluated further in this public health assessment.

PATHWAYSANALYSES

This section of the public health assessment (PHA) identifies potential and completed exposure pathways associated with past, present and future use of the site. An exposure pathway is the process by which an individual may be exposed to contaminants originating from a site. An exposure pathway is comprised of five elements, including: (1) a contaminant source; (2) environmental media and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

The source of contamination is the source of contaminant release to the environment (any waste disposal area or point of discharge); if the original source is unknown, it is the environmental media (soil, air, biota, water) which are contaminated at the point of exposure. Environmental media and transport mechanisms "carry" contaminants from the source to points where human exposure may occur. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal absorption). The receptor population is the person or people who are exposed or may be exposed to contaminants at a point of exposure.

Two types of exposure pathways are evaluated in the PHA; a completed exposure pathway exists when the criteria for all five elements of an exposure pathway are documented; a potential exposure pathway exists when the criteria for any one of the five elements comprising an exposure pathway is not met. A suspected exposure pathway is considered to be eliminated when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present and will never exist in the future. Because the primary routes of exposure to site-related contaminants are due to recreational activities at the lake, it is difficult to estimate the number of persons actually exposed. However, ATSDR and NYS DOH estimate that 216,682 persons are potentially exposed to site-related contaminants. This estimate, based on the 1990 census, is the total populations of the Towns of Salina and Geddes and the City of Syracuse bordering Onondaga Lake.

A. Completed Exposure Pathways

Fish - Onondaga Lake Pathway

Data from as early as 1970 have shown that many species of fish from Onondaga Lake contain mercury and other contaminants. Prior to closing the lake to public fishing in 1970, people did fish in the lake and it is assumed that some fish were eaten. Prior to 1970, fish in Onondaga Lake most likely contained mercury and possibly other contaminants. In 1986, the fishing ban was dropped and the NYS DOH issued and has maintained a public health advisory not to eat fish from Onondaga Lake (refer to Appendix C). These actions are believed to have significantly reduced the amount of fish from Onondaga Lake which are eaten, although it is likely that some fish are still eaten.

Surface Water Pathway

Although swimming in the lake has been discouraged for quite some time and there are no permitted bathing beaches, the lake is used for recreational and commercial boating. Exposure to contaminants in lake water can occur via water skiing, wind-surfing, spray, handling fish, splashes from oars and paddles, capsizes, wading, etc. Reportedly, swimming has occurred in the lake. Prior to 1920, swimming routinely occurred in the lake, and people were most likely exposed to chemical and bacteriological contamination. However, water quality and sediment contamination at that time were not characterized and the public

health implications of past exposures from swimming in the lake prior to 1920 can not be evaluated.

B. Potential Exposure Pathways

Shoreline Pathway

A great deal of the shoreline, including soil, along Onondaga Lake is accessible to the public who could be exposed to contaminants by dermal contact, inhalation and ingestion. Soils along the shoreline have not been analyzed for chemical contaminants, and this is a data gap which prevents evaluation of possible past, present and future human exposure pathways to contaminants in soil. Reports of dredging spoils being used as fill just north of Ninemile Creek suggests that parts of the shoreline may be contaminated. Some of the waste beds in the southern portion of the lake are basic (i.e., alkaline) and are accessible to the public. The tar beds are in an industrial area and are fenced and posted. Therefore, they are not readily accessible to the public.

Sediments Pathway

Onondaga Lake sediments that contain elevated levels of PAHs were mostly localized in areas at the southeastern portion of the lake. This portion of the lake shoreline has not been developed for public beaches, swimming, or wading. Thus, potential exposure to PAHs in sediment is considered to be minimal at present. Persons could be exposed to PAHs in sediments if the sediments are dredged and placed in an area where they may be available for human contact, or if swimming in the lake occurs in the future. Therefore, a future potential human exposure pathway exists to PAHs in sediments of Onondaga Lake.

Fish Beyond the Northwest Outlet of the Lake and in the Tributaries

Water leaves the lake at the Northwest corner (Figure 1, Appendix A), and reportedly fishing occurs in this area. Fish in this region have not been well characterized for potential chemical contaminants and there is some evidence that fish originally caught in Onondaga Lake have migrated to the outlet and beyond. This is a data gap that prevents evaluation of possible past, present, and future exposure pathways through ingestion of fish beyond the lake boundary. Limited sampling of fish from tributaries to Onondaga Lake is inadequate to characterize possible past, present and future exposures through ingestion of fish from the tributaries.

Air

Ambient air quality at and near the lake and shoreline has not been well characterized. The tar beds tend to affect the air quality in the region and depending on the prevailing winds may impact air near the lake. In addition, odors from the tar beds can be detected two to three miles away, including within the City of Syracuse. Since the air quality near the lake

has not been characterized, this is a data gap that prevents the evaluation of possible past, present, and future exposure pathways to contaminants from the tar beds through inhalation.

Waterfowl Pathway

Hunting of waterfowl at and near Onondaga Lake has been reported to occur and it is assumed that waterfowl are eaten. Some of the waterfowl in the region are migratory. The accumulation of contaminants from the lake in waterfowl is unknown, and this presents a data gap that prevents the evaluation of possible past, present, and future human exposure to lake contaminants through ingestion of waterfowl.

C. Eliminated Exposure Pathways

Groundwater

The lake is a local groundwater discharge point and groundwater flows into the lake. Groundwater flow conditions could be temporarily reversed during flood conditions. However, the effects of flooding are not expected to result in significant flow reversals. Commercial, industrial and other properties closer to the lake are served by public water. The nearest homes using groundwater for drinking are more than one mile away. The potential for exposure to contaminants in groundwater is not expected to occur and this human exposure pathway is considered to be eliminated and will not be evaluated further in this PHA.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluation

An analysis of the toxicological implications of the completed and potential human exposure pathways of concern is presented below. To evaluate the potential health risks from contaminants of concern associated with the Onondaga Lake site, the NYS DOH assessed the potential risks for cancer and noncancer health effects. The potential health risks are related to contaminant concentration, exposure pathway, exposure frequency and duration. For additional information on how the NYS DOH determined and qualified potential health risks applicable to this site, see Appendix D.

1. Ingestion of fish.

   Since the 1970's, fish in Onondaga Lake have been found to be contaminated with mercury and PCBs. Chlorinated benzenes and cadmium have also been observed at moderate concentrations on various occasions. Prior to 1970, there was no ban on fishing, and fish were presumably caught and eaten. Between 1970 and 1986, fishing was banned, and this most likely had a significant effect in reducing consumption of contaminated fish. Since 1986, fishing has been permitted. However, the NYS DOH

has maintained an advisory to eat no fish caught in the lake and its tributaries, to the first barrier impassable to fish (Appendix C). The amount of fish that might still be consumed is not known; however, the NYS DEC reports that fishing pressure is light. Fish in Onondaga Lake have been contaminated for an undetermined period of time and with a variable degree of contamination. Exposure will vary depending on species, number, size, and method of preparing and cooking the fish.

In the environment, natural biological processes convert mercury into methylmercury. Most mercury accumulated in fish tissues is methylmercury. This form is one of the most toxic forms of mercury and is readily absorbed by the intestine in man. In the human body, mercury accumulates in the liver, kidney, brain, and blood and can cause both acute and chronic health effects (ATSDR, 1992). Symptoms of chronic mercury poisoning include loss of appetite, weight loss, birth defects, and central nervous system and kidney damage. Consumption of fish containing relatively high levels of methylmercury has been associated with the widespread poisoning of fishermen and their families in Minamata, Japan. Other poisonings associated with the consumption of methylmercury-contaminated fish and grain have provided substantial data regarding the level of methylmercury consumption associated with adverse health effects. Pregnant women who eat a meal containing one-half pound of fish caught in Onondaga Lake containing approximately 1 mg/kg mercury exceeds the ATSDR's acute minimal risk level for developmental effects on the unborn child. The risk of adverse health effects to an unborn child by a pregnant woman eating mercury-contaminated fish from Onondaga Lake is high. These health effects could include brain damage, behavioral and developmental effects. The risk of adverse health effects to other people who eat one half-pound meal per week of fish from Onondaga Lake is low.

PCBs cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1991a). Whether PCBs cause cancer in humans is unknown. However, chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans exposed to lower levels over long periods of time. Based on the results of animal studies, the estimated increased risk of developing cancer from consuming one-half pound per week of fish from Onondaga Lake containing PCB contamination at 0.8 to 1.5 mg/kg is high. However, the existing information suggests that very few people, if any, are eating the fish.

Human health effects reported after occupational exposure to PCBs include skin, eye, and respiratory tract irritation and, less frequently, effects on the liver and the nervous and digestive systems (ATSDR, 1991a). Maternal exposure to PCBs may produce developmental effects on the unborn child. A New York State Health Department study of women exposed to PCBs in their workplace found evidence of a link between PCB exposure and lower birthweight children. There may be a link between a mother's increased exposure to PCBs and slight effects on her child's

birthweight and behavior (ATSDR, 1991a; Rogan and Gladen, 1991, 1992). Recent evidence suggests that some behavioral anomalies and low birthweights occurred in infants whose mothers had a relatively high exposure to PCBs and other contaminants from the consumption of Great Lakes sportfish for many years before pregnancy. Neurological effects were also noted in some of the same children when they were 5 years old. In a second study conducted in North Carolina, behavioral anomalies, but not low birthweights, were found in newborns of women who had elevated blood PCB levels. Some of these same children showed neurological effects at 6, 12 and 24 months, but not at 3, 4 or 5 years of age. In both studies, the possibility that the women may have been exposed to other toxic chemicals was not completely examined. The effects of PCBs in animals include low birthweight, skin disorders, liver problems and damage to the immune and nervous systems. Chemicals that cause adverse health effects in humans and/or animals following high level exposure may also increase the risk of adverse health effects in humans exposed to lower levels over long periods of time. Although the risks of non-carcinogenic adverse effects from ingestion of PCB-contaminated fish are not completely understood, the existing data suggests that the increased risk of non-carcinogenic adverse health effects from eating one-half pound of fish per week containing approximately 0.8 to 1.5 mg/kg of PCBs exceeds the ATSDR's chronic minimal risk level. The risk of adverse health effects from eating one-half pound per week of PCB contaminated fish is high.

2. Ingestion, dermal and inhalation exposure to surface water (recreational use)

Exposure to lake water has been fairly restricted and only limited exposure during recreational activities is presumed to occur. The lake water is contaminated with fecal bacteria at levels which intermittently exceed the NYS DOH public bathing beach standards. Fecal coliform bacteria is an indicator of potential contamination by other bacteria and other organisms that can produce diseases such as gastrointestinal illness, hepatitis A, giardiasis, and shigellosis (i.e., dysentery). Recreational use of the lake, particularly swimming and wading activities poses a risk of serious adverse health effects when fecal coliform bacteria are elevated.

3. Potential ingestion, dermal, and inhalation exposure to PAHs in sediments.

The lake sediments are contaminated with PAHs. PAHs can produce immunosuppression, bone marrow depression, reproductive/developmental effects and skin disorders in animals. The risks of non-carcinogenic adverse effects from PAH contamination of sediment is estimated to be minimal when associated with recreational use of the lake. Some PAHs have been reported to produce gastric, lung and skin tumors in animals (ATSDR, 1993). Whether PAHs which cause cancer in animals cause cancer in humans is not known. However, chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans exposed to lower levels over longer periods of time. Due to the limited access to lake

sediments, the estimated increased risk of developing cancer from exposure to lake sediments during recreational activities is very low.

If the contaminated sediment is used as fill in residential or non-residential settings, the increased risk of cancer could be high; the increased risk of non-cancer effects could be moderate.

B. Health Outcome Data Evaluation

The NYS DOH evaluated cancer incidence in Clay, New York and concluded that for all cancer sites (combined) there was not a significantly different number of cancer cases for males or females than would be expected in other upstate New York communities (NYS DOH, 1985). Only the number of kidney cancers showed a statistically significant excess in males. Of the four kidney cancers observed, there were three different types. It was concluded by the investigators that the different cell types have different epidemiologic characteristics and that it was unlikely that they were associated with a common environmental cause.

The NYS DOH also evaluated the incidence of cancer in the Towns of VanBuren and Camillus (NYS DOH, 1990) in response to community health concerns about possible health affects related to a nearby dumpsite. For all cancer sites combined, the total incidence of cancer for both sexes in the study area was not significantly different from expected rates based on comparable communities.

The NYS DOH also has two other cancer incidence studies in progress in this area. For the first study, the study area is the Town of Geddes, which corresponds to census tract 128. This area borders on Onondaga Lake to the southwest. The study is expected to be completed in early 1996.

The second study in progress includes the Village of North Syracuse and parts of the Town of Clay and the Town of Cicero (census tracts 105, 106, 107, 108, 109, 110.01 and 110.02). The closest that this area comes to Onondaga Lake is about 1 1/2 miles from the lake. The study is expected to be completed in late 1996 or early 1997.

C. Community Health Concerns Evaluation

This PHA has been prepared, in part, to address community health concerns about past exposures to contaminants at and near Onondaga Lake and the risk of developing cancer. Past studies of cancer occurrence in communities near Onondaga Lake by the NYS DOH have not shown statistically significant findings that might be related to a common environmental cause.

Community health concerns about 1) recreational use of the lake, 2) fishing and use of the shoreline, 3) odors emanating from the tar beds, and 4) possible impacts of the Oil City

contamination and rehabilitation effort related to the lake and shoreline have been discussed previously in this PHA.

Recreational use of the lake represents a potential health hazard largely because of the fecal bacteria contamination. Ingestion of fish caught in Onondaga Lake represents a health hazard due to mercury and PCBs in the fish. The NYS DOH has issued an advisory recommending that people eat no fish caught in Onondaga Lake or its tributaries to the first barrier impassable to fish. Appendix C of this PHA contains a copy of the complete health advisory for 1994/1995. Contamination of shoreline soils in the area known as Oil City and elsewhere along the Lake has not been adequately characterized to evaluate potential health hazards. This PHA includes a recommendation that additional investigations be conducted to determine the degree and extent of contamination of the lake shoreline. The NYS DOH will review additional data that is developed for the Onondaga Lake site to evaluate the possible public health significance associated with use of the shoreline. The chemicals responsible for the tar bed odor have not been identified and an evaluation of possible related health implications has not been completed as part of this PHA. However, this PHA includes a recommendation that the chemicals contributing to the odors from the tar bed be identified. The NYS DOH will review data that is developed to evaluate the possible public health significance associated with odors from the tar beds. Additionally, the NYS DOH and the NYS DEC are negotiating with Allied Chemical for a temporary cover over the tar bed to reduce the odors.

CONCLUSIONS

1. Based on the information reviewed, the Onondaga Lake site is a public health hazard. ATSDR places sites in one of five categories (see Appendix E). The public health hazard category is appropriate for this site because evidence exists that exposures have occurred to substances that can cause adverse health effects. Fish from the site are contaminated with mercury and PCBs at levels which could cause a high risk of adverse health effects. Prior to 1970, when fishing in the Lake was banned, people who ate fish from Onondaga Lake were most likely exposed to mercury and PCBs. Since 1986, when fishing was reopened in the Lake, the NYS DOH has issued and maintained an advisory recommending that no fish from Onondaga Lake be eaten. Although ingestion of contaminated fish may still be occurring, existing reports suggest that fishing pressure is light. In addition, fecal contamination of the lake continues to be a problem, especially during combined sewer overflows (CSOs). Fecal bacterial contamination of the lake poses a potential health hazard to recreational users, particularly swimmers. Swimming in the lake is minimized since public beaches have not been permitted along the shoreline. Because the primary routes of exposure to site-related contaminants are due to recreational activities at the lake, it is difficult to estimate the number of persons actually exposed. However, ATSDR and NYS DOH estimate that 216,682 persons are potentially exposed to site-related contaminants. This estimate, based on the

1990 census, is the total populations of the Towns of Salina and Geddes and the City of Syracuse bordering Onondaga Lake.

2. The lake sediments contain several contaminants, including PAHs and mercury. Although exposure to sediments is limited, it appears that some dredging of sediments occurred and they were used as fill material north of Ninemile Creek. The mercury present in the sediments, largely from prior industrial activity, may be contributing to the contamination of fish.

3 Odors emanating from the tar beds have been detected up to three miles away. The compound(s) responsible for the odor have not been adequately characterized.

4. Mercury is entering the lake from Ninemile Creek and the Metro wastewater plant discharge and may be contributing to the contamination of fish and sediment.

5 Petroleum hydrocarbons were detected at high concentrations in the sediment in the southern portion of the lake. The hydrocarbons were not adequately characterized to conduct a toxicological evaluation. The petroleum storage facilities are a possible source of the petroleum hydrocarbons that are detected in the lake sediment.

6. There are insufficient data to assess the potential contamination and health implications from exposures to soil along most of the shoreline, air, waterfowl, sediments in the outlet from the lake, fish in the outlet of the lake including the Seneca River, and fish in the tributaries to the lake.

7 An interim remedial measure is collecting and treating chemical contaminants (e.g., chlorobenzene, dichlorobenzene) along a portion of the southwestern shoreline.

8. The compounds 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethyl-phenyl)-ethane have been detected in fish, sediment and water. The concentrations of these compounds and their toxicological significance are not known. A potential source of these compounds is the tar beds.

9. The evaluation of TRI-reported emissions from industrial facilities within 2.5 miles of Onondaga Lake for 1992 showed that contaminant levels in ambient air near the lake would not exceed the screening criteria.

RECOMMENDATIONS

1 Additional investigations should be conducted to determine the extent and degree of contamination of the lake shoreline, air, waterfowl or other species in the area hunted for food, and the sediments in the Barge Canal at the lake outlet.

2. Consideration should be given to better characterize potential contaminants in fish caught in the northwest outlet of the lake and the Seneca River and in the tributaries entering the lake.

3. The possible contamination of dredged sediments used as fill north of Ninemile Creek should be investigated. The potential for the public to access this area should also be evaluated. Any future dredging activities should be closely monitored to make sure that the dredging spoils are not distributed in a way that would significantly increase exposure to contaminants of concern in sediment.

4. Additional investigations should better identify the source of the petroleum hydrocarbon mixture detected in the lake sediments and evaluate measures to reduce or eliminate the discharge.

5. Monitoring of fish from Onondaga Lake for contaminants (including mercury, PCBs, and possibly chlorinated dibenzofurans, chlorinated dibenzodioxins and chlorinated benzenes) should be conducted and/or continued. Consideration should be given for measuring PAH concentrations in fish from Onondaga Lake and an appropriate reference lake.

6. The compound(s) contributing to the odors from the tar beds should be identified, and efforts to eliminate odors and contaminant air releases from the tar beds should be considered.

7. Measures to further reduce mercury from entering the lake should be considered.

8. Measures to eliminate combined sewer overflows and fecal contamination of the lake should be considered.

9. Investigations should be conducted to identify sources of PCBs and possibly chlorinated dibenzofurans in fish.

10. Additional investigations should address the magnitude of contamination by and the toxicological significance of 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethylphenyl)-ethane.

11. Additional data that are developed for the Onondaga Lake site should be reviewed to evaluate the possible public health significance of human exposure to contaminants in the environment.

HEALTH ACTIVITIES RECOMMENDATION PANEL (HARP) RECOMMENDATIONS

The data and information developed for the public health assessment for the Onondaga Lake site, Syracuse, New York, has been reviewed by ATSDR's Health Activities Recommendations Panel (HARP) to determine appropriate follow-up actions. Because of past exposure, and possible current exposures to persons eating contaminated fish, the panel determined that follow-up health activities are indicated for this site. Specifically, the panel determined that community health education is needed. The NYS DOH, however, has educated, and will continue to educate, the community regarding the health hazards posed by the site as needed. In addition, the NYS DOH should contact a physician regarding his concern over the incidence of cancer in the area. No other follow-up health activities are indicated at this time.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Onondaga Lake site contains a description of actions to be taken by ATSDR and/or the NYS DOH at and near the site, following completion of this public health assessment. For those actions already taken at the site, please see the Background section of this Public Health Assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from past, present and/or future exposures to hazardous substances at or near the site. Included is a commitment on the part of ATSDR and/or the NYS DOH to follow up on this plan to ensure that it is implemented. The public health action plan to be implemented by ATSDR and/or the NYS DOH is as follows:

1 ATSDR and the NYS DOH will coordinate with the appropriate environmental agencies to develop plans to implement the recommendations contained in this public health assessment.

2. ATSDR will provide follow-up to the PHAP, outlining the actions completed and those in progress. This follow-up report will be placed in repositories that contain copies of this public health assessment, and will be provided to persons who request it.

3. The NYS DOH will continue community health education to the affected populations, including annual reviews and updates to the state fish and game consumption advisories, as needed.

4. The NYS DOH will evaluate measures to a) notify the public about the possible health risks associated with eating fish from Onondaga Lake, and b) provide information to the public and people who fish in the Lake about how to obtain

copies of this public health assessment. The NYS DOH will contact a physician regarding his concern over cancer incidence in the area.

5. ATSDR will initiate a literature review of available toxicological data of the compounds 1-phenyl-1-(4-methylphenyl)-ethane and 1-phenyl-1-(2,4-dimethyl-phenyl)-ethane that were detected in fish, sediment and water from the Onondaga Lake.

6. The NYS DOH will review additional data that are developed as part of on-going investigations of Onondaga Lake. If warranted, the NYS DOH will complete additional follow-up health activities based on these reviews.

ATSDR will reevaluate and expand the Public Health Action Plan when needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at this site.

CERTIFICATION

The Public Health Assessment for the Onondaga Lake site was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.

Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Public Health Assessment and concurs with its findings.

for Division Director, DHAC, ATSDR

PREPARERS OF REPORT

Daniel Luttinger
Research Scientist II
Bureau of Toxic Substance Assessment
New York State Department of Health

and

Joel H. Kaplan
Research Scientist I
Bureau of Toxic Substance Assessment
New York State Department of Health

and

Lani Rafferty
Public Health Specialist II
Bureau of Environmental Exposure Investigation
New York State Department of Health

ATSDR REGIONAL REPRESENTATIVE

Arthur Block
Senior Regional Representative
Region II
Office of Regional Operations, ATSDR

ATSDR TECHNICAL PROJECT OFFICER

Greg Ulirsch
Environmental Health Engineer
Division of Health Assessment and Consultation
Superfund Site Assessment Branch

REFERENCES

The following reports were reviewed in the preparation of this PHA.

Adriano, D.C. 1986. Trace Elements in the Terrestial Environment. Springer-Verlag, New York.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993a. Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs). Update Draft. U.S. Department of Health and Human Services. Atlanta, Georgia: U.S. Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993b. Toxicological Profile for Selected PCBs. ATSDR/TP-92/16. U.S. Department of Health and Human Services. Atlanta, Georgia: U.S. Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological Profile for Mercury. Update Draft. U.S. Department of Health and Human Services Atlanta, Georgia: U.S. Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1991a. Toxicological Profile for Selected PCBs. Update Draft. U.S. Department of Health and Human Services. Atlanta, Georgia: U.S. Public Health Service.

Armstrong, R.W., and R.J. Sloan. 1980. Trends in Levels of Several Known Chemical Contaminants in Fish from New York State Waters. DEC Publication Technical Report 80-2. June.

Blasland and Bouck Engineers, P.C. 1990. Waste Bed Feasibility Study. Allied-Signal, Inc. Solvay, New York. February.

Blasland, Bouck and Lee. 1989. Hydrogeological Assessment of the Allied Waste Beds in the Syracuse Area. Allied-Signal Inc. Solvay, New York. Volume 1.

CDR Environmental Specialists. 1991. Environmental Assessment of Lower Reaches of Nine Mile Creek and Geddes Brook, Oswego Watershed, New York. Volume 1 (Environmental Assessment). July.

Clarke, L., C. Hudson, G. Laccetti, W. Stone and B. Ungerman. 1985. Study of metal concentrations in soil and surface sand of seven New York counties. Albany, NY: New York State Department of Health, Bureau of Toxic Substance Assessment. September, 1985.

Connor, J., N.F. Shimp and J.F. Tedrow. 1957. A spectrographic study of the distribution of trace elements in some podzolic soils. Soil Science. 83: 65-73.

Davis, D.J.A. and B.G. Bennett. 1983. Exposure Commitment Assessments of Environmental Pollutants, Vol. 30. Summary exposure assessments for copper, vanadium, antimony. London: Monitoring and Assessment Research Centre, Chelsea College, University of London.

Dragun, J. 1988. The Soil Chemistry of Hazardous Material. Hazardous Materials Control Research Institute. Silver Springs, Maryland.

Driscoll, C.J. and W. Wang. 1994. Concentrations and Transport of Mercury in Onondaga Lake. Final Report Submitted to Onondaga Lake Management conference. January 25.

Edwards, N.T. 1983. Polycyclic Aromatic Hydrocarbons (PAH's) in the Terrestial Environment - A review. J. Environ. Qual. 12: 427-441.

Estabrooks, F. 1992. New York State Department of Environmental Conservation (NYS DEC) Memorandum to Peter Mack on Ley Creek - Dioxin. May 22, 1992.

Frank, R., K. Ishida and P. Suda. 1976. Metals in agricultural soils in Ontario. Can. J. Soil Science. 56: 181-196.

Groundwater Technology, Inc. 1993. DNAPL delineation and hydrogeologic analysis report. Allied Signal, Inc. Syracuse Works Facility, Solvay, New York. April 27, 1993

Hassett, J.P. Sources of Organic Contaminants to Onondaga Lake Progress Report, February, 1994. SUNY College of Environmental Science and Forestry.

McGovern, E.C. 1988. Background concentrations of 20 elements in soils with special regard for New York State. Albany, NY: New York State Department of Environmental Conservation.

Menzie, C.A., B.B. Potocki and J. Santodonato. 1992. Exposure to Carcinogenic PAHs in the Environment. Environ. Sci. Technol. 26: 1278-1284.

New York State Department of Environmental Conservation (NYS DEC). 1994. Fish Contamination Database.

New York State Department of Environmental Conservation (NYS DEC). Inactive Hazardous Waste Disposal Sites in New York State, Annual Report, April 1994.

New York State Department of Environmental Conservation (NYS DEC). 1989. Engineering Investigations at Inactive Hazardous Waste Sites. Phase II Investigation. Mercury Sediments-Onondaga Lake, Volume I, August.

New York State Department of Environmental Conservation (NYS DEC). 1987. Toxic Substances in Fish and Wildlife Analyses since May 1, 1982. Vol. 6, September.

New York State Department of Environmental Conservation (NYS DEC). 1987. An Overview of Mercury Contamination in the Fish of Onondaga Lake. July.

New York State Department of Environmental Conservation (NYS DEC). 1981. Toxic Substances in Fish and Wildlife. May 1 to November 1, 1981. Vol 4, No. 2, December.

New York State Department of Environmental Conservation (NYS DEC). 1978. Toxic Substances in Fish and Wildlife, 1977 Annual Report, Vol. 1, March.

New York State Department of Health (NYS DOH), Bureau of Cancer Epidemiology. 1985. Incidence of Cancer in Clay (Onondaga) New York.

New York State Department of Health (NYS DOH), Bureau of Cancer Epidemiology. 1990. Incidence of Cancer Around Warner's Dumpsite in the Towns of VanBuren and Camillus (Onondaga) New York.

New York State Department of Health (NYS DOH), Bureau of Environmental Exposure Investigation. Project Files: Onondaga Lake (site #734030) - Onondaga County; 1987-1994.

New York State Department of Law and Department of Environmental Conservation. 1990. Proceedings of the Onondaga Lake Remediation Conference held February 5-8, 1990 at Sagamore Conference Center, Bolton Landing, New York.

O'Brien and Gere Engineers, Inc. 1993. Remedial Investigation of Ley Creek Dredged material Area, Inland Fisher Guide Division, General Motors Corporation, Syracuse, New York, September.

Onondaga Lake Management Conference. 1993. Onondaga Lake A Plan for Action, November.

PTI Environmental Services. Onondaga Lake RI/FS Workplan, December 1991

PTI Environmental Services. 1993a. Onondaga Lake RI/FS Substance Distribution Investigation Data Report Volume I, June.

PTI Environmental Services. 1993b. Onondaga Lake RI/FS Bioaccumulation Investigation Data Report, April.

Rogan, W.J. and B.C. Gladen. 1991. PCBs, DDE and Child Development at 18 and 24 Months. Ann. Epidemiol. 1: 407-413.

Rogan, W.J. and B.C. Gladen. 1992. Neurotoxicology of PCBs and Related Compounds. Neurotoxicology. 13: 27-36.

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soil and other surficial materials of the conterminous United States. U.S. Geological Survey Professional Paper 1270. Washington, DC: U.S. Government Printing Office.

Stearns and Wheler. 1993. Bioaccumulation of Organic Compounds in Fish Flesh in Onondaga Lake, January.

United States Army Corps of Engineers. Buffalo District. 1992. Technical Report Onondaga Lake, New York Main Report, March.

United States Environmental Protection Agency (US EPA). Office of Enforcement and General Counsel. 1973. Report of Mercury Source Investigation, Onondaga Lake, New York and Allied Chemical Corporation, Solvay, New York.

APPENDIX A

FIGURES

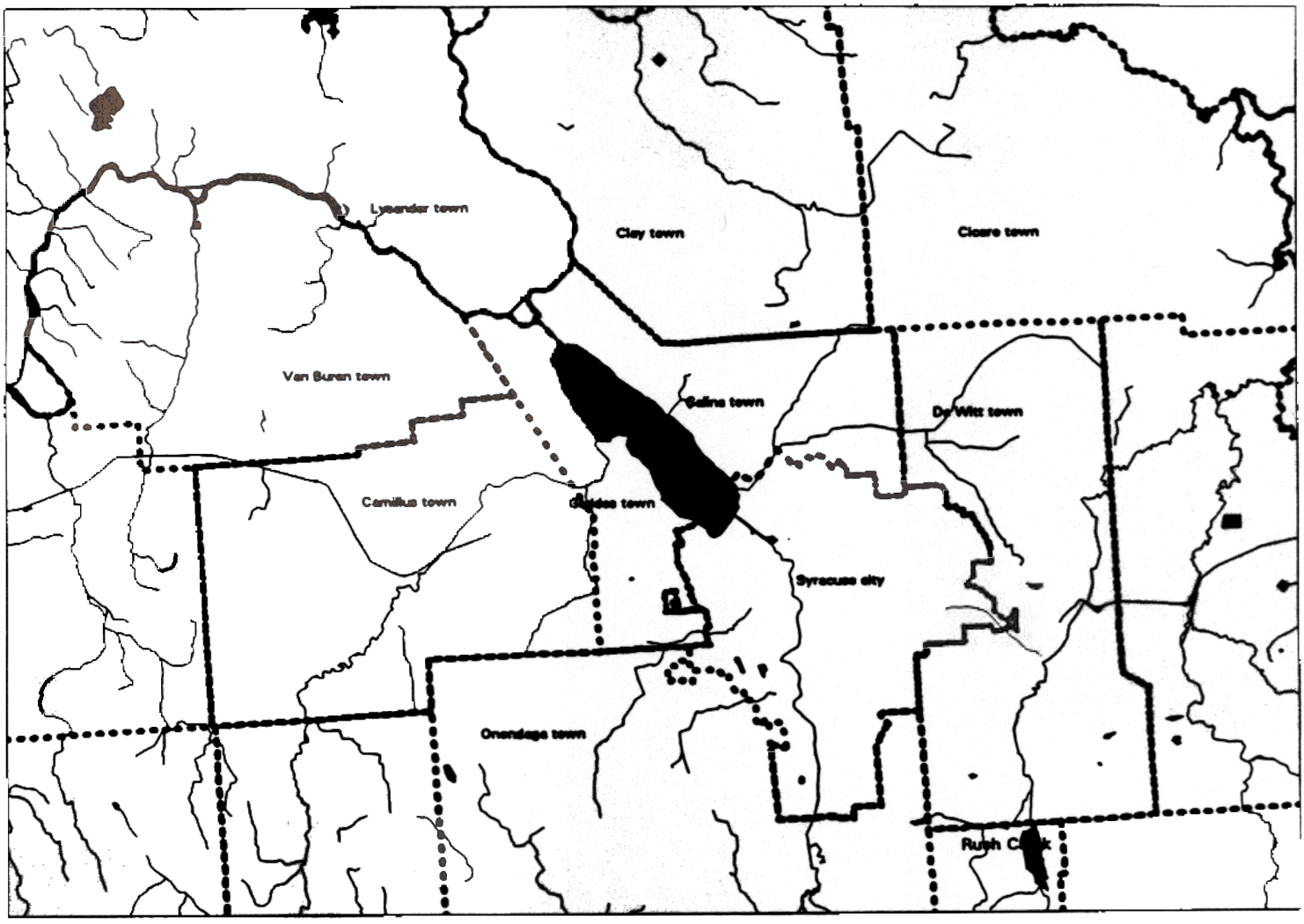
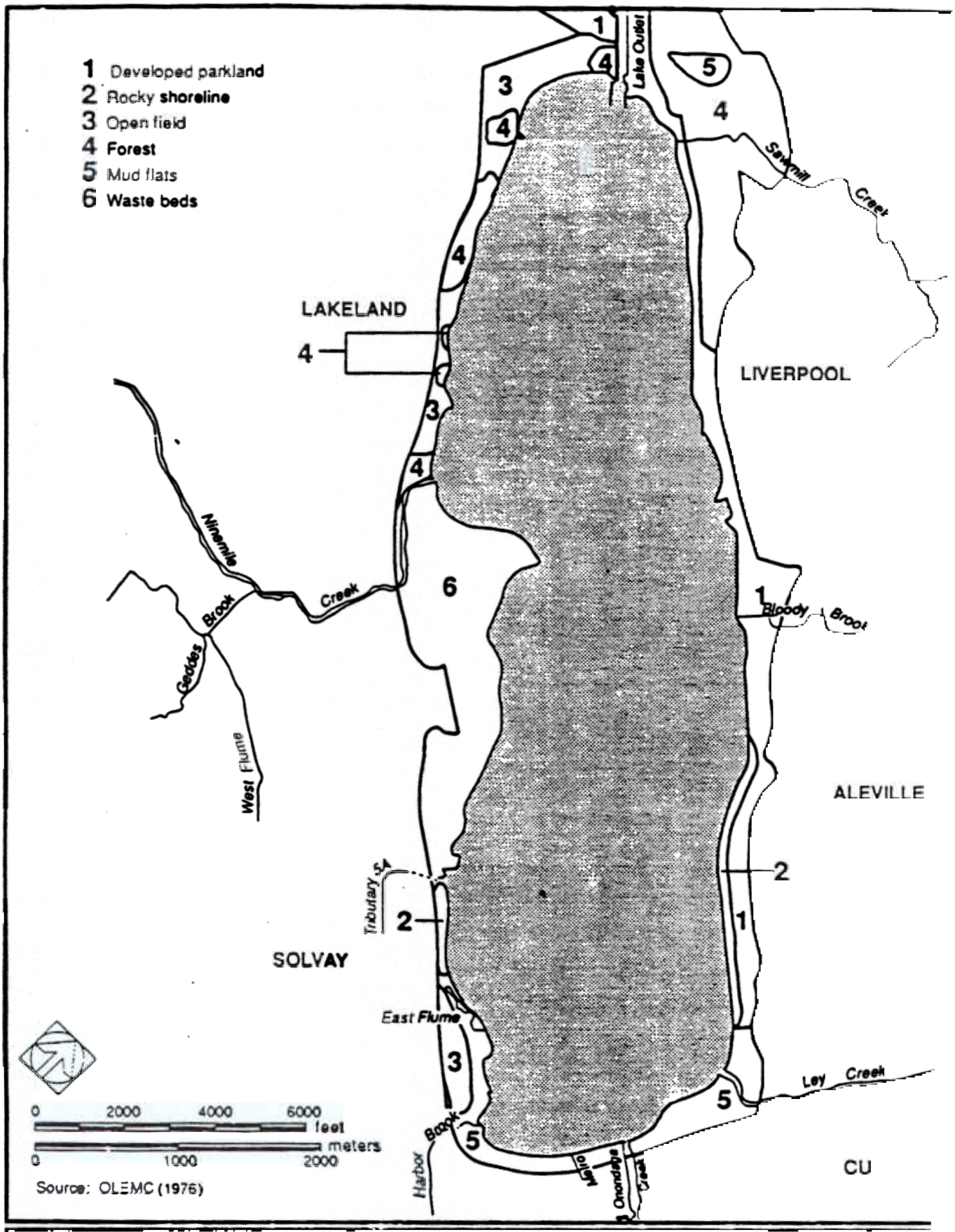


Figure 1: Location of Onondaga Lake, Onondaga County, New York (NYSDOH, 1994)



Figur Onondaga Lake and Shoreline PTI 99

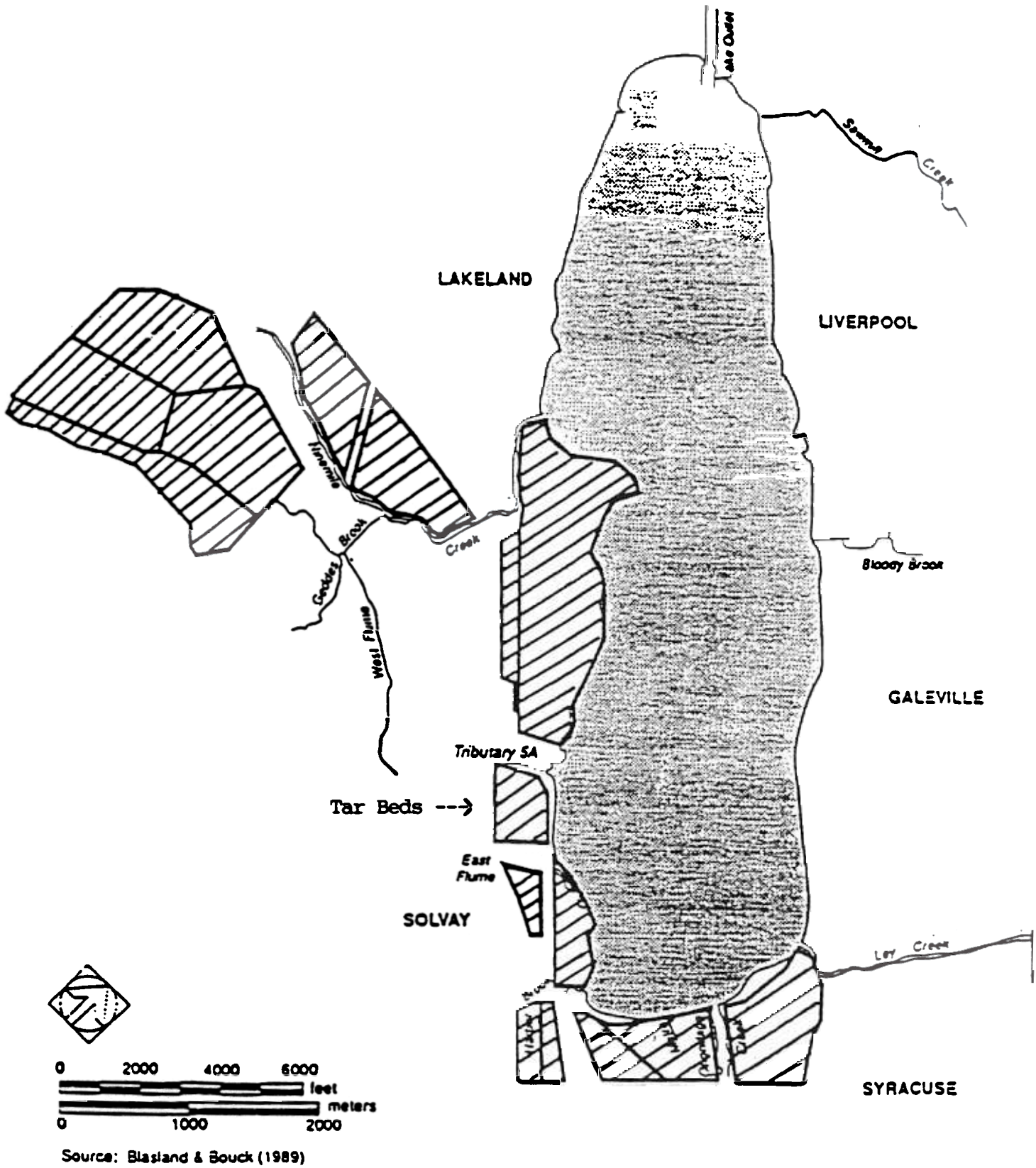
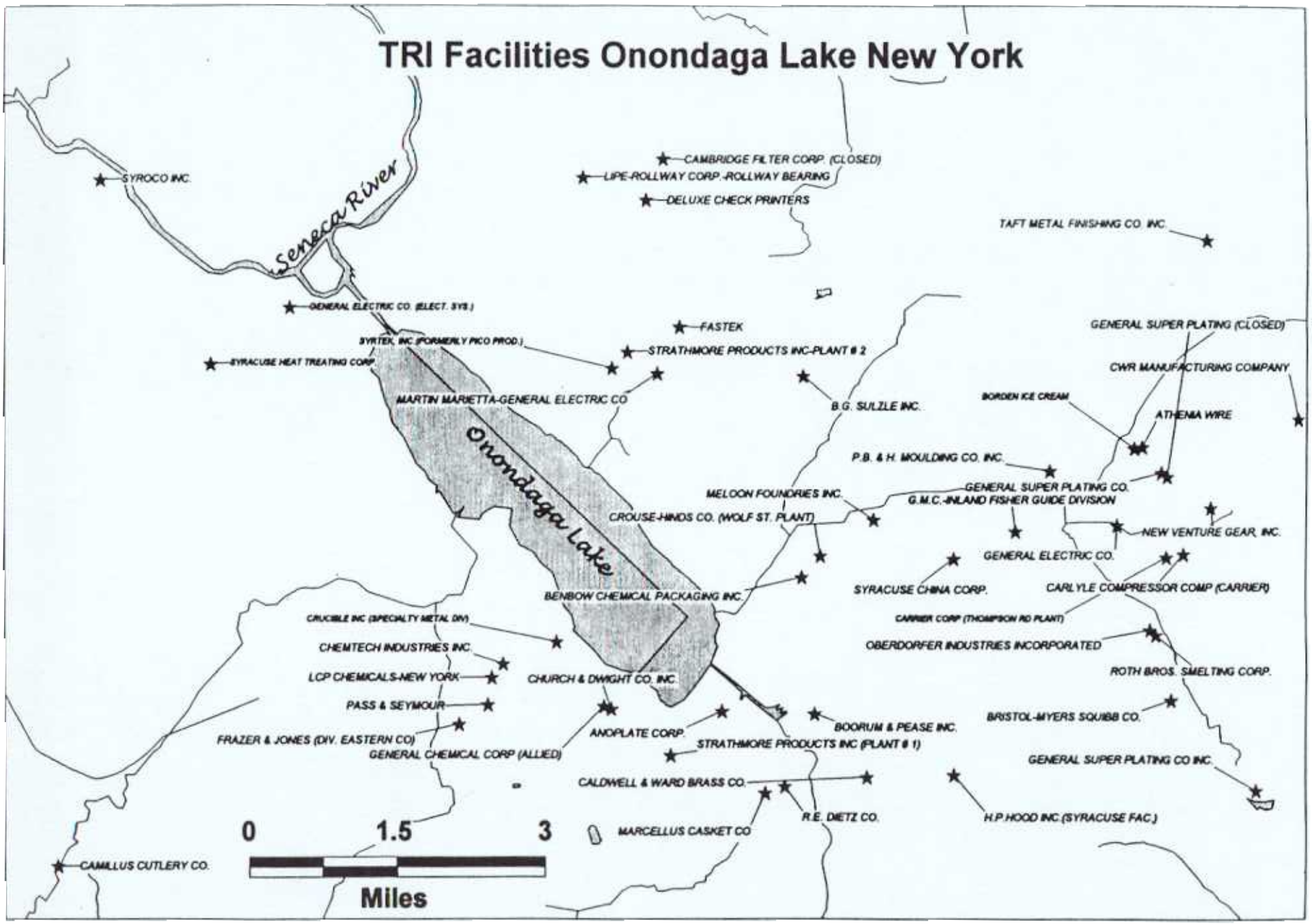


Figure 3: Locations of Solvay waste beds.
(Adapted from PTI, 1991).


TRI Facilities Onondaga Lake New York
Seneca River
Onondaga Lake
SYROCO INC.
CAMBRIDGE FILTER CORP. (CLOSED)
LIPE-ROLLWAY CORP.-ROLLWAY BEARING
DELUXE CHECK PRINTERS
TAFT METAL FINISHING CO. INC.
GENERAL ELECTRIC CO. (ELECT. SYS.)
SYRTEK, INC.(FORMERLY PICO PROD.)
SYRACUSE HEAT TREATING CORP.
FASTEK
STRATHMORE PRODUCTS INC-PLANT # 2
MARTIN MARIETTA-GENERAL ELECTRIC CO
B.G. SULZLE INC.
GENERAL SUPER PLATING (CLOSED)
CWR MANUFACTURING COMPANY
BORDEN ICE CREAM
ATHENA WIRE
P.B. & H. MOULDING CO. INC.
GENERAL SUPER PLATING CO.
G.M.C.-INLAND FISHER GUIDE DIVISION
MELOON FOUNDRIES INC.
CROUSE-HINDS CO. (WOLF ST. PLANT)
NEW VENTURE GEAR, INC.
GENERAL ELECTRIC CO.
SYRACUSE CHINA CORP.
CARLYLE COMPRESSOR COMP (CARRIER)
CARRIER CORP (THOMPSON RD PLANT)
BENBOW CHEMICAL PACKAGING INC.
CRUCIBLE INC (SPECIALTY METAL DIV)
CHEMTECH INDUSTRIES INC.
LCP CHEMICALS-NEW YORK
CHURCH & DWIGHT CO. INC.
PASS & SEYMOUR
FRAZER & JONES (DIV. EASTERN CO)
GENERAL CHEMICAL CORP (ALLIED)
ANOPLATE CORP.
STRATHMORE PRODUCTS INC (PLANT # 1)
BOORUM & PEASE INC.
OBERDORFER INDUSTRIES INCORPORATED
ROTH BROS. SMELTING CORP.
BRISTOL-MYERS SQUIBB CO.
GENERAL SUPER PLATING CO INC.
CALDWELL & WARD BRASS CO.
R.E. DIETZ CO.
MARCELLUS CASKET CO
H.P.HOOD INC.(SYRACUSE FAC.)
CAMILLUS CUTLERY CO.
0
1.5
3
Miles

TRI Facilities in Onondaga Lake Area

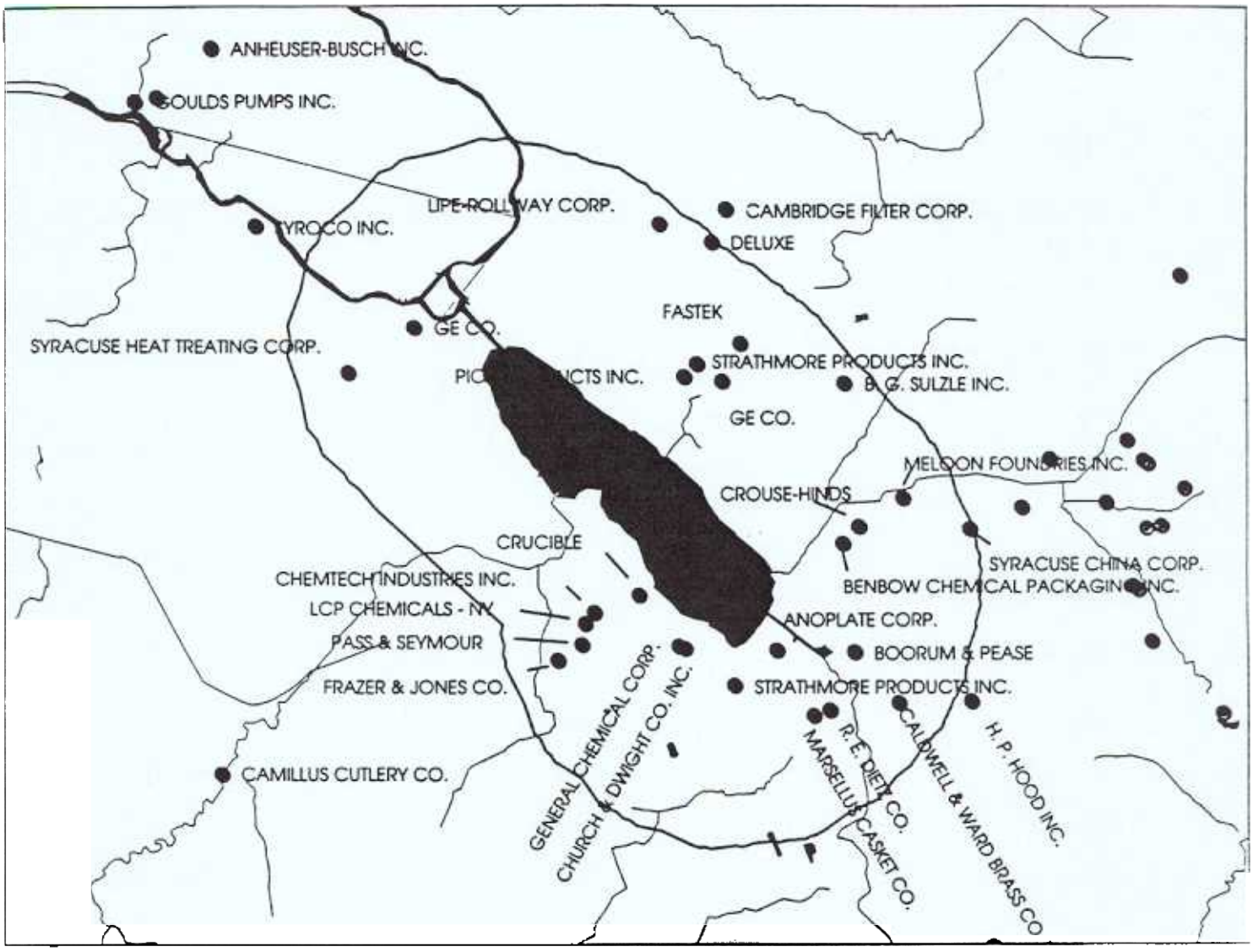


Figure 5: Approximate 2.5 mile radius around Onondaga Lake, Onondaga County, New York. (NYSDOH, 1994).

APPENDIX B

TABLES

Table 1

Onondaga Lake Site, Onondaga County, New York
Public Health Assessment Comparison Values for Recreational Exposure to Antimony and Manganese in Surface Water
[All values in micrograms per liter (mcg/L)]

	Comparison Values			
Contaminant	Cancer*	Basis**	Noncancer*	Basis**
antimony			2,353	EPA RfD
manganese			29,410	EPA RfD

*Comparison values are determined for a 21 kilogram child who swallows while swimming/wading 0.05 liters of surface water per day, 2 days per week for 3 months per year.

**EPA RfD = EPA Reference Dose

Indicates "not applicable"

Table 2.

Bacteriological Water Quality Standards of Interest to Onondaga Lake

Application	Indicator	Standard	Source
bathing beaches	TC	"the total number of organisms of the total coliform group shall not exceed a logarithmic mean of 2400/100 ml for a series of five or more samples in any 30 day period, nor shall 20% of total samples during the period exceed 5000/100 ml. When the above prescribed standards are exceeded, the permit-issuing official shall cause an investigation to be made to determine and eliminate the source or sources of pollution, or	Chapter I. State Sanitary Code, Part 6, Subpart 6-2, bathing beaches (1988)
bathing beaches	FC	the fecal coliform density from the five successive sets of samples collected daily on five different days shall not exceed a logarithmic mean of 200 per 100 ml. When fecal coliform density of any sample exceeds 1,000 per 100 ml, consideration shall be given to closing the beach daily samples shall immediately be collected and analyzed for fecal coliform for at least two consecutive days"	Chapter I. State Sanitary Code, Part 6, Sub-part 6-2, bathing beaches (1988)
quality standards for class B and C waters	TC and FC	"the monthly median coliform value for 100 ml of sample shall not exceed 2,400 from a minimum of five examinations, and provided that not more than 20% of the samples shall exceed a coliform value of 5,000 for 100 ml of sample and the monthly geometric mean FC value for 100 ml of sample shall not exceed 200 from a minimum of five examinations. This standard shall be met during all periods when disinfection is practiced."	Section 701.19, Classifications and Standards of Quality and Purity (1986)

Table 3.
Onondaga Lake Site, Onondaga County, New York
Public Health Assessment Comparison Values for Contaminants Found in Sediments
[All values in milligrams per kilogram (mg/kg)]

Contaminant	Typical Background Range*	Comparison Values			
		Cancer**	Basis***	Noncancer**	Basis***
Organics:					
benzene	ND	674	EPA CPF	410	NYS RfG
bis(2-ethylhexyl)phthalate	ND	1,393	EPA CPF	11,660	EPA RfD
1,4-dichlorobenzene	ND	813	EPA HEAST	52,470	EPA RfD
hexachlorobenzene	ND	9.3	NYS CPF	466	EPA RfD
monochlorobenzene	ND	--	--	11,600	EPA RfD
petroleum hydrocarbons	ND	--	--	--	--
1-phenyl-1-(4-methyl-phenyl)ethane	ND				
1-phenyl-1-(2,4-dimethyl-phenyl)ethane	ND				
PCBs	<0.01-0.04	2.5	EPA CPF	12	ATSDR MRL
polycyclic aromatic hydrocarbons (PAHs)+					
carcinogenic	<1-3[a]	1.4[b]	NYS CPF	--	--
noncarcinogenic	<1-13[c]	--	--	17,490	EPA RfD[d]
toluene	ND	--	--	116,600	EPA RfD
Metals:					
antimony	0.6-10	--	--	233	EPA RfD
barium	300-500	--	--	40,810	EPA RfD
cadmium	<0.5-1	--	--	410	ATSDR MRL
chromium	10-40	--	--	2,915	EPA RfD
copper	<1-25	--	--	75,790	EPA HEAST
lead	10-300	--	--	--	--
manganese	500-3,000	--	--	81,600	EPA RfD
mercury	0.01-3.4	--	--	175	EPA HEAST
nickel	<5-20	--	--	9,900	EPA RfD
zinc	50-100	--	--	174,900	EPA RfD

ND = not determined
[a]Based on reported background levels for total carcinogenic polycyclic aromatic hydrocarbons (Menzie et al., 1992).
[b]Used cancer potency factor for benzo(a)pyrene. This chemical can be considered a surrogate for carcinogenic PAHs.
[c]Based on reported background levels for total PAHs of <1 to 13 milligrams per kilogram in soil (Edwards, 1983).
[d]Used oral reference dose (RfD) for pyrene. This chemical can be considered a surrogate for many noncarcinogenic PAHs.
*ATSDR (1993b); Adriano (1986); Clarke et al. (1985); Connor et al. (1957); Davis and Bennett (1983); Dragun (1988); Frank et al. (1976); McGovern (1988); Schacklette and Boerngen (1984)
**There is evidence that in the past, sediments were dredged from Onondaga Lake and placed in the park area. Comparison values for cancer risk are determined for a 70 kilogram adult who ingests 50 mg of soil per day, 2 days per week for 3 months per year; comparison values for noncancer risk are determined for a 21 kilogram child who ingests 100 mg of soil per day, 5 days per week for 6 months per year.
***EPA CPF = EPA Cancer Potency Factor
EPA RfD = EPA Reference Dose
EPA HEAST = EPA Health Effects Assessment Summary Tables
NYS CPF = NYS Cancer Potency Factor
NYS RfG = NYS Reference Guideline
ATSDR MRL = ATSDR Minimal Risk Level
-- Indicates "not applicable"
+Contaminant selected for further evaluation

Table 4.

Onondaga Lake Site, Onondaga County, New York
Public Health Assessment Comparison Values
for Contaminants Found in Fish
[All values in milligrams per kilogram (mg/kg)]

	Comparison Values			
Contaminant	Cancer*	Basis**	Noncancer*	Basis**
benzene	0.1	EPA CPF	1.5	NYS RfG
bis(2-ethylhexyl) phthalate	0.2	EPA CPF	44	EPA RfD
cadmium			1.5	NYS RfG
DDT	0.0006	NYS CPF	1.1	EPA RfD
1,4-dichlorobenzene	0.1	EPA HEAST	197	EPA RfD
hexachlorobenzene	0.001	NYS CPF	1.8	EPA RfD
lead				
mercury+			0.01 0.7	ATSDR MRL*** EPA RfD
monochlorobenzene			44	EPA RfD
PCBs+	0.0003	EPA CPF	0.04	ATSDR MRL
1-phenyl-1-(4-methylphenyl)ethane				
1-phenyl-1-(2,4-dimethylphenyl)ethane	--	--	--	--

*Comparison values are determined for a 70 kilogram adult who eats 32 grams of fish per day, except for acute exposures.
**EPA RfD = EPA Reference Dose
EPA CPF = EPA Cancer Potency Factor
EPA HEAST = EPA Health Effects Assessment Summary Tables
NYS RfG = NYS Reference Guideline
NYS CPF = NYS Cancer Potency Factor
ATSDR MRL = ATSDR Minimal Risk Level
***ATSDR MRL for acute (short-term) exposures based on one 224 gram meal.
-- Indicates "not applicable"
+Contaminant selected for further evaluation

Table 5.

Summary of Annual Contaminant Air Emissions and Releases for the Year 1992 from Facilities Near the Onondaga Lake Site as Reported in the US EPA Toxic Chemical Release Inventory (TRI) Database, Onondaga County, New York.
(Page 1 of 2)

Facility Name	Approx. Distance From Site[+]	Chemical Name	Contaminant Emissions (lbs/yr) Stack/ Point Source	Fugitive/ Non-Point	Total (#) Maximum
Syracuse Heat Treating Corp.	1.5	Ammonia	500-999	11-499	1,498
General Chemical Corp. (929 ft.)	0.18	Ammonia	None	96	96
Caldwell & Ward Brass Company	2.0	Copper	None	589	589
Chemtech Industries	0.83	Sulfuric acid	11-499	10	509
Marcellus Casket Co.	1.16	Xylene	None	31,109	31,109
Pass & Seymour	1.16	Xylene	None	2,516	2,516
Church & Dwight Company, Inc.	0.33 (1742 ft.)	Ammonia	29,000	1,000	30,000
		Glycol ethers	5	4	9
		Sulfuric acid	None	4	4
Strathmore Products, Inc. (Plant #2)	1.0	Acetone	11-499	1,085	1,579
		1,1,1-Trichloro-ethane	None	2,009	2,009
		Glycol ethers	1-10	134	144
		Methyl ethyl ketone	11-499	1,440	1,939
		Ethylbenzene	11-499	263	762
		Methyl isobutyl ketone	11-499	1,066	1,565
		Xylene	11-499	2,964	3,463
		Toluene	11-499	4,505	5,004
Boorum & Pease, Inc.	1.16	1,1,1-Trichloro-ethane	13,900	None	13,900
Syracuse China Corp.	2.65	Lead	500-999	11-499	1,498
Meloon Foundries, Inc.	1.83	Copper	None	1,400	1,400
Anoplate Corp.	0.33 (1,742 ft.)	Hydrochloric acid	11-499	11-499	998
		Sulfuric acid	None	11-499	499
		Nitric acid	11-499	1-10	509
		1,1,1-Trichloro-ethane	19,910	1-10	19,920
Crouse-Hinds Co. (Wolf Street Plant)	1.16	Methylene chloride	13,000	700	13,700
		Styrene	38	None	38
		Toluene	13,000	None	13,000
		Hydrochloric acid	1,200	None	1,200
B.G. Sulzle, Inc.	2.16	1,1,1-Trichloro-ethane	None	19,300	19,300
		Trichloroethene	66,500	3,500	70,000

Table 5.

Summary of Annual Contaminant Air Emissions and Releases for the Year 1992 from Facilities Near the Onondaga Lake Site as Reported in the US EPA Toxic Chemical Release Inventory (TRI) Database, Onondaga County, New York.
(Page 2 of 2)

Facility Name	Approx. Distance From Site+	Contaminant Emissions (lbs/yr) Chemical Name	Stack/ Point Source	Fugitive/ Non-Point	Total (#) Maximum
Martin Marietta-General Electric Co.	1.16	Acetone	4,200	6,300	10,500
Syrtek, Inc. (formerly Pico Products, Inc.)	0.83	Ammonia	2	2	4
Deluxe Check Printers	2.33	1,1,1-Trichloro-ethane	726	20,794	21,520
Crucible Inc. (Specialty Metals Division)	0.09 (470 ft.)	Manganese (total)	374	374	748
		Nickel	158	158	316
		Chromium	643	622	1,265
		Cobalt (total)	28	24	52
		Copper	71	71	142
		Hydrochloric acid	None	11,800	11,800
		Nitric acid	None	4,800	4,800

Adapted from: Toxic Chemical Release Inventory (TRI), Calendar Year 1992.

Note: All emissions data reported in pounds/year (lbs/yr).
- Indicates no emissions/release data reported.
# Indicates estimated worst case emissions based on reported data.
+ Distance is in miles; in some cases, the distance in feet is also provided in parentheses

Refer to Figure 4 (Appendix A) for facility locations.

Table 6.

Summary of Annual Contaminant Releases for the Year 1992 to Surface Water or Publicly Owned Treatment Works (POTW) from Facilities Near the Onondaga Lake Site as Reported in the US EPA Toxic Chemical Release Inventory (TRI) Database, Onondaga County, New York.

Facility Name	Approx. Distance From Site[+]	Chemical Name	Contaminant Discharges (lbs/yr) to: Surface Water	POTW*
Crucible Inc. (Specialty Metals Division)	0.09 (469.9 ft.)	Manganese	128	
		Nickel	251	
		Chromium	194	
		Cobalt	74	
		Copper	33	
General Chemical Corp.	0.18 (929.3 ft.)	Ammonia	562	
Syracuse China Corporation	2.65	Lead	11	1
Benbow Chemical Packaging, Inc.	0.98	Phosphoric acid		1-10
H.P. Hood, Inc.	2.84	Phosphoric acid		14,033
Syrtek, Inc. (formerly Pico Products, Inc.)	0.83	Ammonia		2
Crouse-Hinds Co. (Wolf St. Plant)	1.16	Zinc Compounds		1,300
Church & Dwight Company, Inc.	0.33 (1,742 feet)	Glycol Ethers		700
		Ammonia	2,000	300,000

Adapted from: Toxic Chemical Release Inventory (TRI), Calendar Year 1992.

Note: All emissions data reported in pounds/year (lbs/yr).

[+]Distance is in miles; in some cases, the distance in feet is also provided in parentheses.

*POTW - Publicly owned treatment works.

Refer to Figure 4 (Appendix A) for facility locations.

Blank space indicates "not applicable".

APPENDIX C

FISH ADVISORY

Hea th Advisory

CHEMICALS IN SPORTFISH AND GAME

1994

1995

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Center for Environmental Health 2 University Place Albany, New York 12203-3399

ERRATA

1. The advisory for the Hudson River from the "Bridge at Catskill south to and including the New York Harbor area" should read "All species except American shad, **Atlantic sturgeon**, blueback herring, bluegill, pumpkinseed, and yellow perch, Eat no more than one meal per month".

2. The following are corrected addresses/telephone numbers for New York State Department of Environmental Conservation Regional Offices:

Region 4
1150 N. Westcott Rd.
Schenectady, NY 12306
(518) 357-2234

Region 5
Route 86
Ray Brook, NY 12977
(518) 897-1200

Region 6
State Office Bldg.
Watertown, NY 13601
(315) 785-2239

Region 9
270 Michigan Ave.
Buffalo, NY 14203
(716) 851-7000

cap/94182PRO0587

1994-1995 Health Advisories: Chemicals in Sportfish or Game

Summary

The New York State Department of Environmental Conservation (DEC) routinely monitors contaminant levels in fish and wildlife. The New York State Department of Health (DOH) issues advisories on eating sportfish and wildlife because some of these foods contain chemicals at levels which may be harmful to your health. The health advisories are: (1) general advice on sportfish taken from waters in New York State; (2) advice on sportfish from specific waterbodies; and (3) advice on wildlife. The advisories are developed and updated yearly.

Background

Fish and wildlife are nutritious and good to eat. But some fish may take in contaminants from the water they live in and the food they eat. Wildlife, too, may take in contaminants from their food and water. Some of these contaminants build up in fish and wildlife--and you--over time. These contaminants could harm people, so it is important to keep your exposure to these contaminants as low as possible. This advisory helps you plan what fish and wildlife to keep as well as how often and how much to eat. This advisory is not intended to discourage you from eating fish or wildlife, but should be used as a guide to minimize your exposure to contaminants.

Health Benefits

When properly prepared, fish provide a diet high in protein and low in saturated fats. Almost any kind of fish may have real health benefits when it replaces a high-fat source of protein in the diet. You can get the health benefits of fish and reduce unwanted contaminants by following this advisory.

Contaminants in Fish and Wildlife

Long-lasting contaminants, such as PCBs, DDT and mercury, build up in your body over time. It may take months or years of regularly eating contaminated fish to build up amounts which are a health concern. Health problems which <u>may</u> result from the contaminants found in fish range from small changes in health that are hard to detect to birth defects and cancer. Mothers who eat highly contaminated fish and wildlife for many years before becoming pregnant may have children who are slower to develop and learn. The meal advice in this advisory is intended to protect children from these potential developmental problems. Adults are less likely to have health problems at the low levels that affect children.

Some contaminants cause cancer in animals. Your risk of cancer from eating contaminated fish and wildlife cannot be predicted with certainty. Cancer currently affects about one in every three people; primarily due to smoking, diet and hereditary risk factors. Exposure to contaminants in the fish and wildlife you eat may not increase your cancer risk at all. If you follow this advisory over your lifetime, you will minimize your exposure and reduce whatever cancer risk is associated with these contaminants.

The federal government establishes standards for chemical residues in food. When establishing these standards for fish, the federal government assumes that people eat about one-half pound of fish each month. The contaminant levels are measured in a skin-on fillet which has not been trimmed; this sample is used in determining whether or not the fish exceeds standards. Fish and wildlife cannot be legally sold if they contain a contaminant at a level greater than its standard. When sportfish from a waterbody contain contaminants at levels greater than the federal standards, the DOH issues a specific advisory.

General Advisory

The general health advisory for sportfish is that you eat no more than one meal (one-half pound) per week of fish taken from the state's

freshwaters, the Hudson River estuary, or the New York City harbor area (the New York waters of the Hudson River including Upper and Lower Bays, Arthur Kill, Kill Van Kull, Harlem River, and the East River to the Throgs Neck Bridge). This general advisory is to protect against eating large amounts of fish that haven't been tested or contain unidentified contaminants. The general advisory does not apply to fish taken from marine waters. Ocean fish, although less tested, are generally less contaminated than freshwater fish. In addition, fish that live further out from shore may be less contaminated than those that live close to the shore.

Specific Freshwater Advisories

Over 50 waterbodies in New York have fish with contaminant levels that are greater than federal standards and have their own advisories. The DOH recommendations suggest either limiting or avoiding eating a specific kind of fish from a particular body of water. In some cases, enough information is available to issue advisories based on the length of the fish. Older (larger) fish are often more contaminated than younger (smaller) fish.

Health advice is also given for infants, children under the age of fifteen and women of childbearing age. The DOH recommends that they not eat any fish species from the specific waterbodies listed in the advisory. The reason for this specific advice is that chemicals may have a greater impact on developing organs in young children or in the fetus. They also build up in women's bodies and are often passed on in mother's milk. Waters which have specific advisories have at least one species of fish with an elevated contaminant level, which means that a contamination source is in or near the water.

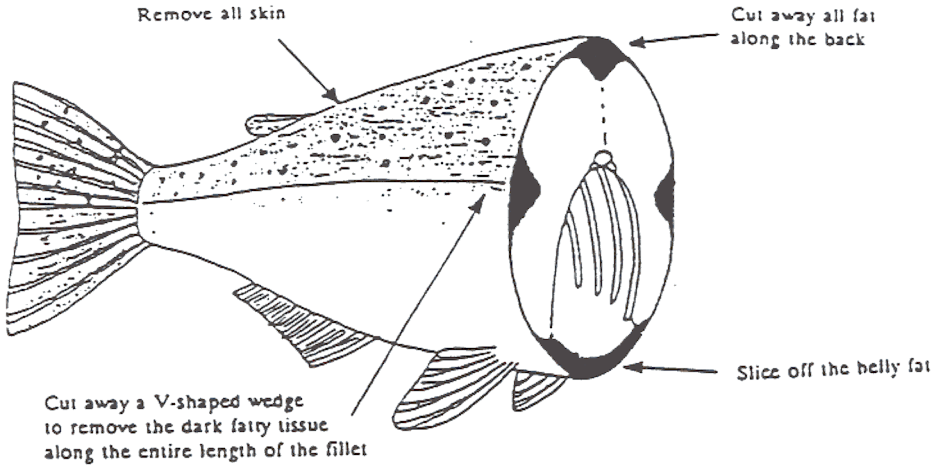
People who regularly eat sportfish, women of childbearing age and children, are particularly susceptible to contaminants that build up over time. If you fall into one of these categories, you should consider if you need to space fish meals out according to the advisory table that follows. Your body can get rid of some contaminants, such as mercury, over time. Spacing the meals out helps prevent some of the contaminants from building up to harmful levels in the body.

Women beyond their childbearing years and men face fewer health risks from contaminants such as mercury. However, if you are in this group you should also follow the advisory to reduce your total exposure to contaminants. For these groups, it is the total number of meals that you eat during the year that becomes important and many of those meals can be eaten during a few months of the year. If most of the fish you eat are from the "One Meal a Week" category, you should not exceed 52 meals per year. Likewise, if most of the fish you eat are in the "One Meal a Month" category, you should not exceed 12 meals per year. Remember, eating one meal of fish from the "One Meal a Month" group is comparable to eating four meals from the "One Meal a Week" group.

The primary contaminants (mercury, cadmium, PCBs, chlordane, dioxin, DDT and mirex) are listed next to each advisory. You should review the advisories together if you eat fish from more than one waterbody. For example, if you eat a meal of Saw Mill River carp, you should not eat American eel from Kinderhook Lake for the rest of that month since both of these fish species have eat no more than one meal per month advisories and both are based on PCB contamination.

Marine Waters

The DOH issues specific advisories for marine waters. These apply to striped bass, bluefish, and American eels and are the only marine fish advisories in effect. Striped bass, bluefish, and eels have specific habits or characteristics which make them more likely to have contaminants than other marine species.



An advisory has been issued for striped bass because of PCB contamination. Saltwater fish are generally less contaminated than freshwater fish. However, fish like striped bass which spend time in Hudson River waters can be contaminated at levels above food standards. The advisory for striped bass is divided into three geographical areas. For striped bass taken from the Hudson River from the Federal Dam at Troy south to the bridge at Catskill, the DOH recommends against any consumption. For striped bass from the Hudson River from the bridge at Catskill south to and including the lower New York Harbor and Long Island Sound west of Wading River, the advisory is to eat no more than one meal per month. The general advisory applies to striped bass from eastern Long Island Sound, the Peconic/Gardiners Bays and Long Island South Shore waters. Women of childbearing age, infants and children under fifteen should not eat striped bass from the Hudson River, lower New York Harbor, or western Long Island Sound.

The DOH has extended the general advisory to bluefish and American eels. They are contaminated with PCBs, although to a lesser extent than striped bass from the Hudson River, New York Harbor, and western Long Island Sound. The recommendation for bluefish and American eels caught in New York State's marine waters is to eat no more than one meal (one-half pound) per week, with additional recommendations to not eat American eels from the Harlem or East Rivers and eat no more than one meal per month of American eels from the Hudson River or New York City harbor area.

Cleaning and Cooking Your Fish

Many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish meal by properly trimming, skinning and cooking your catch. Remove the skin and trim all the fat from the areas shown on the DIAGRAM ABOVE: the belly flap, the line along the sides, the fat along the back and under the skin.

Cooking does not destroy contaminants in fish, but heat from cooking melts some of the fat in fish and allows some of the contaminated fat to drip away. Broil, grill or bake the trimmed, skinned fish on a rack so that the fat drips away. Do not use drippings to prepare sauces or gravies.

These precautions will not reduce the amount of mercury or other metals. Mercury is distributed throughout a fish's muscle tissue (the part you eat), rather than in the fat and skin. Therefore, the only way to reduce mercury intake is to reduce the amount of contaminated fish you eat.

Other Advisories

The DOH also issues special advisories for crabs in the Hudson River due to cadmium and PCB contamination and for snapping turtles and waterfowl statewide because they contain PCBs and other contaminants. Cooking methods are recommended that minimize the

amount of contaminants which would be eaten. The complete advisory is at the end of this brochure.

The health implications of eating deformed or cancerous fish are unknown. Any obviously diseased fish (marked by tumors, lesions or other abnormal condition of the fish skin, meat or internal organs) should be discarded.

Shellfish

All foods of animal origin, such as meat, poultry, seafood and dairy products, should be thoroughly cooked before eaten. The DOH specifically recommends that the public not eat raw or partially cooked clams or oysters. This advice is not because of chemical contamination. Raw or partially cooked shellfish illegally harvested from waters contaminated with sewage have been linked to gastrointestinal illness and hepatitis A, caused by bacteria or viruses.

Should I Be Concerned About Medical-type Waste and Garbage Affecting Fish?

The wash-up of medical-type waste and garbage on New York and Long Island beaches has not affected the sanitary condition of marine fish, lobster and crabs. Furthermore, fish do not carry the AIDS virus. Consumers need not worry about eating these foods because of these problems. Good sanitary practices should be followed when preparing any fish. Fish should be kept iced or refrigerated until cleaned and filleted and then refrigerated until cooked. Hands, utensils, and work surfaces should be washed before and after handling any raw food, including fish. Seafood should be cooked to an internal temperature of 140°F.

What Can I Do To Reduce My Exposure To Chemical Contaminants From Fish?

Fish is an important source of protein and is low in saturated fat. Naturally-occurring fish oils lower plasma cholesterol and triglycerides, thereby decreasing the risk of coronary heart disease. Increasing fish consumption is useful in reducing dietary fat and controlling weight. By eating a diet which includes food from a variety of protein sources, an individual is more likely to have a diet which is adequate in all nutrients.

Although eating fish has some health benefits, fish with high contaminant levels should be avoided. When deciding whether or not to eat fish which may be contaminated, the benefits of eating those fish can be weighed against the risks. For young women, eating contaminated fish is a health concern not only for herself but also to any unborn or nursing child, since the chemicals may reach the fetus and can be passed on in breastmilk. For an older person with heart disease the risks, especially of long-term health effects, may not be as great a concern when compared to the benefits of reducing the risks of heart disease.

Everyone can benefit from eating the fish they catch and can minimize their contaminant intake by following these general recommendations:

1 Choose uncontaminated species from waterbodies which are not listed in the DOH advisories.

2 Use a method of filleting the fish which will reduce the skin, fatty material and dark meat. These parts of the fish contain many of the contaminants.

3. Choose smaller fish, consistent with DEC regulations, within a species since they may have lower contaminant levels. Older (larger) fish within a species may be more contaminated because they have had more time to accumulate contaminants in their bodies.

4 For shellfish, such as crab and lobster, do not eat the soft green substance found in the body section (mustard, tomalley, liver or hepatopancreas). This part of the shellfish has been found to contain high levels of chemical contaminants, including PCBs and heavy metals.

5 Cooking methods such as broiling, poaching, boiling and baking, which allow contaminants from the fatty portions of fish to drain out, are preferable. Pan frying is not recommended. The cooking liquids of fish from contaminated waters should be avoided since these liquids may retain contaminants.

1994-1995 Health Advisories

The following recommendations are based on contaminant levels in fish and wildlife. To minimize potential adverse health impacts, the DOH recommends:

Eat no more than one meal (one-half pound) per week of fish from the state's freshwaters, the Hudson River estuary, or the New York City harbor area including Upper and Lower Bays, Arthur Kill, Kill Van Kull, East River to the Throgs Neck Bridge and Harlem River, except as recommended below.

Women of childbearing age, infants and children under the age of 15 should not eat any fish species from waters listed below.

Follow trimming and cooking advice.

Observe the following restrictions on eating fish from these waters and their tributaries to the first barrier impassable by fish.

Water (County)	Species	Recommendations	Chemical(s) of Concern
Barge Canal: Tonawanda Creek, Lockport to Niagara River (Erie & Niagara) [5]	Carp	Eat no more than one meal per month	
Belmont Lake (Suffolk) [52]	Carp	Eat no more than one meal per month	Chlordane, PCB
Big Moose Lake (Herkimer) [30]	Yellow perch	Eat no more than one meal per month.	Mercury
Buffalo River and Harbor (Erie) [7]	Carp	Eat none	
Canadice Lake (Ontario) [10]	Lake or brown trout over 21"	Eat none	PCB
Canandaigua Lake (Ontario & Yates) [12]	Lake trout over 24"	Eat no more than one meal per month	PCB
Carry Falls Reservoir (St. Lawrence) [21]	Walleye	Eat no more than one meal per month	Mercury
Cayuga Creek (Niagara) [3]	All species	Eat none	Dioxin
Delaware Park Lake (Erie) [6]	Carp	Eat no more than one meal per month	
East River (NYC) [46]	American eel	Eat none	PCB
Eighteen Mile Creek (Niagara) [4]	All species	Eat none	

Waters with changes from the 1993-94 Health Advisories are underlined.
Numbers in brackets refer to map on page 10.

Water (County)	Species	Recommendations	Chemical(s) of Concern
Ferris Lake [33] (Hamilton)	Yellow perch over 12"	Eat none	Mercury
	Smaller yellow perch	Eat no more than one meal per month	Mercury
Fourth Lake (Herkimer & Hamilton) [32]	Lake trout	Eat none	
Francis Lake (Lewis) [24]	Yellow perch	Eat no more than one meal per month	Mercury
Gill Creek: Mouth to Hyde Park Lake Dam (Niagara) [2]	All species	Eat none	PCB, Dioxin
Grasse River: Mouth to Massena Power Canal (St. Lawrence) [37]	All species	Eat none	
Halfmoon Lake (Lewis) [23]	Yellow perch	Eat no more than one meal per month	Mercury
Hall's Pond (Nassau) [48]	Carp, goldfish	Eat none	Chlordane
Harlem River (NYC) [44]	American eel	Eat none	
Hoosic River (Rensselaer) [38]	Brown and rainbow trout	Eat no more than one meal per month	
Hudson River: [42]			
Hudson Falls to Troy Dam	All species	No fishing	PCB
Troy Dam south to bridge at Catskill	All species except American shad	Eat none	
Bridge at Catskill south to and including the New York Harbor area	All species except American shad, blueback herring, bluegill, pumpkinseed, and yellow perch	Eat no more than one meal per month	
	Blue crab	Eat no more than 6 crabs per week	Cadmium, PCB
	--hepatopancreas (mustard, tomalley, or liver)	Eat none	Cadmium, PCB
	--cooking liquid	Discard	Cadmium, PCB

Waters with changes from the 1993-94 Health Advisories are underlined.
Numbers in brackets refer to map on page 10.

	Species	Recommendations	
Indian Lake (Lewis) [18]	All species	Eat no more than one meal per month	Mercury
Irondequoit Bay [9]			PCB, Mirex
		Eat no more than one meal per month	
Kinderhook Lake (Columbia) [41]	American eel	Eat no more than one meal per month	
Koppers Pond (Chemung) [11]	Carp	Eat no more than one meal per month	
Lake Champlain: [35]			
	Lake trout over 25", Walleye over 19"	Eat no more than one meal per month	
Bay within Cumberland Head to Valcour Island	American eel, brown bullhead	Eat no more than one meal per month	
Lake Ontario & Niagara River Below the falls [8]	American eel, channel catfish, carp, lake trout, chinook salmon, coho salmon over 21", rainbow trout over 25", brown trout over 20"	Eat none	PCB, Mirex, Dioxin
	White sucker, smaller coho salmon, rainbow and brown trout	Eat no more than one meal per month	PCB, Mirex, Dioxin
West of Point Breeze	White perch	Eat none	PCB, Mirex, Dioxin
East of Point Breeze	White perch	Eat no more than one meal per month	PCB, Mirex, Dioxin
Loft's Pond (Nassau) [50]	Carp, goldfish	Eat no more than one meal per month	Chlordane
Long Pond (Lewis) [22]			Mercury
[51]	White perch	Eat no more than one meal per month	
Massena Power Canal (St. Lawrence) [31]		Eat no more than one meal per month	PCB

Waters with changes from the 1993-94 Health Advisories are underlined.
Numbers in brackets refer to map on page 10.

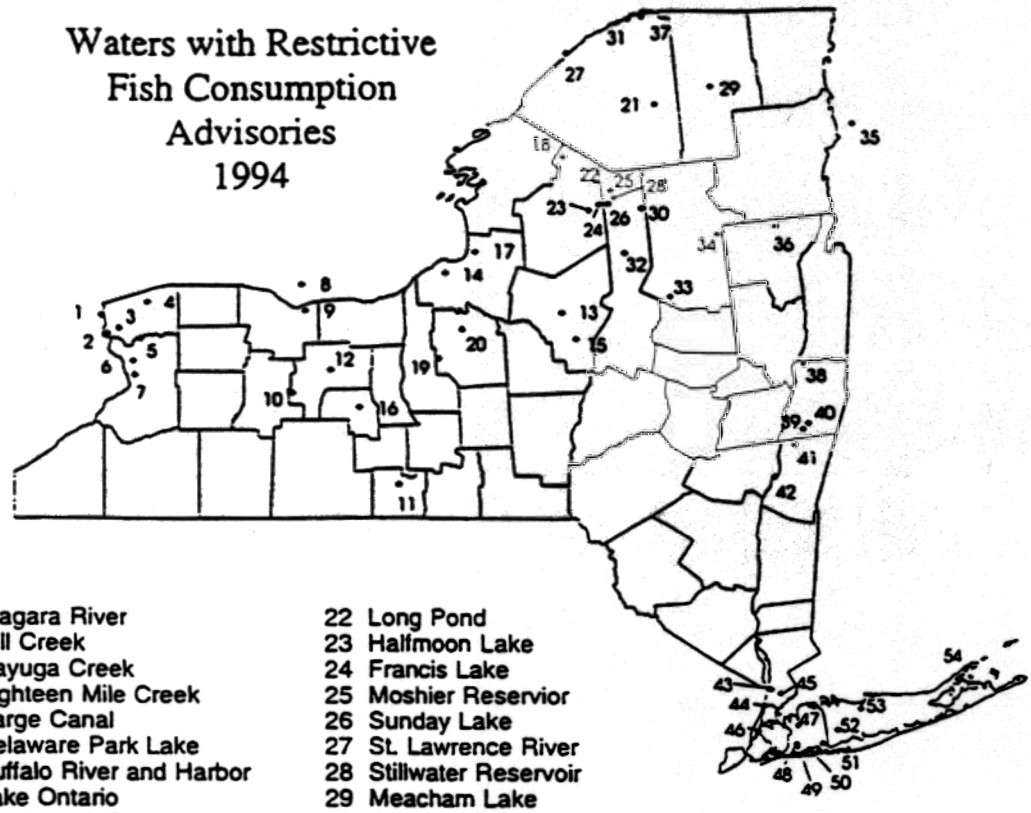
Water (County)	Species	Recommendations	
Meacham Lake (Franklin) [29]	Yellow perch over 12"	Eat none	Mercury
	Smaller yellow perch	Eat no more than one meal per month	Mercury
Mohawk River: Between Oriskany and West Canada Creeks [15]	Carp	Eat none	
Moshier Reservoir (Herkimer) [25]	Yellow perch	Eat no more than one meal per month	Mercury
Nassau Lake (Rensselaer) [39]	All species	Eat none	
Niagara River: [			
Above the falls	Carp	Eat no more than one meal per month	
Below the falls (also see Lake Ontario)	White Perch	Eat none	PCB, Mirex, Dioxin
	Smallmouth bass	Eat no more than one meal per month	PCB, Mirex, Dioxin
Onondaga Lake (Onondaga) [20]	All species	Eat none	Mercury
Oswego River: Oswego power dam to upper dam at Fulton (Oswego) [14]	Channel catfish	Eat no more than one meal per month	
Round Pond: Town of Long Lake (Hamilton) [34]	Yellow perch over 12"	Eat no more than one meal per month	Mercury
St. James Pond (Suffolk) [53]	All species	Eat no more than one meal per month	Chlordane, DDT
St. Lawrence River: [27]			
	American eel, channel catfish, lake trout, carp, chinook salmon, coho salmon over 21", rainbow trout over 25", brown trout over 20"	Eat none	PCB, Mirex, Dioxin
	White perch, smaller Coho salmon, rainbow and brown trout	Eat no more than one meal per month	PCB, Mirex, Dioxin

Waters with changes from the 1993-94 Health Advisories are underlined.
Numbers in brackets refer to map on page 10.

Water (County)	Species	Recommendations	Chemical(s) of Concern
St. Lawrence River - con't. Bay at St. Lawrence - Franklin Co. line	All species	Eat none	
Salmon River: Mouth to Salmon Reservoir (Oswego) (also see Lake Ontario) [17]	Smallmouth bass	Eat none	
Saw Mill River [43]	American eel	Eat no more than one meal per month	PCB
Schroon Lake (Warren & Essex) [36]	Lake trout over 27"	Eat no more than one meal per month	PCB
Sheldrake River (Westchester) [45]	American eel	Eat none	Chlordane, PCB
Skaneateles Creek: From dam at Skaneateles to Seneca River (Onondaga) [19]	Brown trout over 10"	Eat no more than one meal per month	
Smith Pond-Roosevelt Park (Nassau) [49]	American eel	Eat none	Chlordane
	Carp, goldfish	Eat no more than one meal per month	Chlordane
Spring Pond (Suffolk) [54]	Carp, goldfish	Eat none	Chlordane
Stillwater Reservoir (Herkimer) [28]	Splake	Eat no more than one meal per month	Mercury
Sunday Lake (Herkimer) [26]	Yellow perch	Eat no more than one meal per month	Mercury
Threemile Creek (Oneida) [13]	White sucker	Eat no more than one meal per month	
Valatie Kill: Between County Rt. 18 and Nassau Lake (Rensselaer) [40]	All species	Eat none	
Whitney Park Pond (Nassau) [47]	Carp, goldfish	Eat no more than one meal per month	PCB

Waters with changes from the 1993-94 Health Advisories are underlined
Numbers in brackets refer to map on page 10.

Waters with Restrictive Fish Consumption Advisories 1994



1 Niagara River
2 Gill Creek
3 Cayuga Creek
4 Eighteen Mile Creek
5 Barge Canal
6 Delaware Park Lake
7 Buffalo River and Harbor
8 Lake Ontario
9 Irondequoit Bay
10 Canadice Lake
11 Koppers Pond
12 Canandaigua Lake
13 Threemile Creek
14 Oswego River
15 Mohawk River
16 Keuka Lake
17 Salmon River
18 Indian Lake
19 Skaneateles Creek
20 Onondaga Lake
21 Carry Falls Reservoir
22 Long Pond
23 Halfmoon Lake
24 Francis Lake
25 Moshier Reservior
26 Sunday Lake
27 St. Lawrence River
28 Stillwater Reservoir
29 Meacham Lake
30 Big Moose Lake
31 Massena Power Canal
32 Fourth Lake
33 Ferris Lake
34 Round Pond
35 Lake Champlain
36 Schroon Lake
37 Grasse River
38 Hoosic River
39 Nassau Lake
40 Valatie Kill
41 Kinderhook Lake
42 Hudson River
43 Saw Mill River
44 Harlem River
45 Sheldrake River
46 East River
47 Whitney Park Pond
48 Hall's Pond
49 Smith Pond (Roosevelt Park)
50 Loft's Pond
51 Upper Massapequa Reservoir
52 Belmont Lake
53 St. James Pond
54 Spring Pond

Additional Advice

Marine Waters - The general advisory (eat no more than one meal per week) applies to bluefish and American eels but not to other fish from Long Island Sound, Peconic/Gardiners Bays, Jamaica Bay and other Long Island South Shore waters. (Contaminant of concern--PCB)

Marine Striped Bass - Eat no more than one meal (one-half pound) per month of striped bass taken from New York Harbor or Long Island Sound west of Wading River. Eat no more than one meal (one-half pound) per week of striped bass taken from Eastern Long Island Sound, the Peconic/Gardiners Bays and Long Island South Shore waters. The legal minimum length of marine striped bass is 36". (Contaminant of concern--PCB)

Marine Crabs and Lobsters - The hepatopancreas (mustard, tomalley or liver) of crabs and lobsters should not be eaten because it has high contaminant levels. (Contaminants of concern--cadmium, PCB)

Hudson River Shad - The advisory for women of childbearing age, infants, and children under the age of 15 is EAT NONE for all fish (including American shad) from the lower Hudson River because of PCB contamination. However, shad have lower PCB levels than other species. A few meals of Hudson River shad meat and roe, especially using cooking and trimming methods that minimize PCB content, would not pose an unacceptable health risk for women of childbearing age and children assuming this is their only significant exposure to PCBs.

Snapping turtles - Snapping turtles retain contaminants in their fat, liver, eggs and, to a lesser extent, muscle. If you choose to consume snapping turtles, carefully trim away all fat and discard the fat, liver and eggs prior to cooking the meat or preparing soup to reduce exposure. Women of childbearing age, infants, and children under the age of 15 should avoid eating snapping turtles or soups made with their meat. (Contaminant of concern--PCB)

Waterfowl - Mergansers are the most heavily contaminated waterfowl species and should not be eaten. Other waterfowl should be skinned and all fat removed before cooking; stuffing should be discarded after cooking; limit eating to two meals per month. Monitoring data indicate that wood ducks and Canada geese are less contaminated than other waterfowl species with dabbler ducks and then diving ducks having increasingly higher contaminant levels. (Contaminants of concern--PCB, mirex, chlordane, DDT)

Additional Information

New York State Department of Health

For more information on **health effects** from exposure to chemical contaminants, contact:

Environmental Health Information: 1-800-458-1158 (toll-free from New York State telephones). These calls are taken from 8:00-4:30, and after hours callers can record a message. Out of state callers should dial 518/458-6409.

New York State Department of Environmental Conservation

For more information on **fishing**, contact:

Regional Offices

Region 1
SUNY Campus, Bldg. 40
Stony Brook, NY 11794
(516) 444-0441

Region 2
47-40 21st St.
Long Island City, NY 11101
(718) 482-4922

Region 3
21 South Putt Corners Rd.
New Paltz, NY 12561
(914) 255-5453

Region 4
2176 Guilderland Ave.
Schenectady, NY 12306
(518) 382-0680

Region 5
Route 86
Ray Brook, NY 12977
(518) 891-1370

Region 6
State Office Bldg.
Watertown, NY 13601
(315) 785-2513

Region 7
615 Erie Blvd. West
Syracuse, NY 13204
(315) 426-7400

Region 8
Routes 5 and 20
Avon, NY 14414
(716) 226-2466

Region 9
600 Delaware Ave.
Buffalo, NY 14202
(716) 851-7000

For information on **contaminant levels**, contact:

Bureau of Environmental Protection
50 Wolf Road
Albany, NY 12233
(518) 457-6178

Prepared by:
New York State Department of Health
Division of Environmental Health Assessment
#40820042
Revised April 28, 1994

Health Advisory
Chemicals in Sportfish and Game

We always look for ways to improve our environmental risk communication, and we value your suggestions. Please mail this form back to us if you have any comments.

Was the advisory helpful in explaining:

- the problem?

- the risk and benefits of eating sportfish?

Was anything missing? If so, what?

Was it understandable?

Suggestions for improvement:

Thank you for your suggestions.

Please fold this page in thirds, staple and mail to:

New York State Department of Health
Bureau of Toxic Substance Assessment
2 University Place, Room 240
Albany, New York 12203-3399

New York State Department of Health
Bureau of Toxic Substance Assessment
2 University Place, Room 240
Albany, New York 12203-3399

APPENDIX D

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk.

There is no general consensus within the scientific or regulatory communities on what level of estimated excess cancer risk is acceptable. Some have recommended the use of the relatively conservative excess lifetime cancer risk level of one in one million because of the uncertainties in our scientific knowledge about the mechanism of cancer. Others feel that risks that are lower or higher may be acceptable, depending on scientific, economic and social factors. An increased lifetime cancer risk of one in one million or less is generally considered an insignificant increase in cancer risk.

For noncarcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared to a risk reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects) developed by the US EPA, ATSDR and/or NYS DOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptions for
Noncarcinogenic Health Risks

Ratio of Estimated Contaminant Intake to Risk Reference Dose	Qualitative Descriptor
equal to or less than the risk reference dose	minimal
greater than one to five times the risk reference dose	
greater than five to ten times the risk reference dose	moderate
greater than ten times the risk reference dose	

Noncarcinogenic effects, unlike carcinogenic effects, are believed to have a threshold, that is, a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed-effect-level (NOEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOEL is then divided by an uncertainty factor to yield the risk reference dose. The uncertainty factor is a number which reflects the degree of

uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive subpopulations (for example, children or the elderly), extrapolation from animals to humans, and the incompleteness of available data. Thus, the risk reference dose is not expected to cause health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals.

The measure used to describe the potential for noncancer health effects to occur in an individual is expressed as a ratio of estimated contaminant intake to the risk reference dose. If exposure to the contaminant exceeds the risk reference dose, there may be concern for potential noncancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the risk reference dose, the greater the level of concern. A ratio equal to or less than one is generally considered an insignificant (minimal) increase in risk.

APPENDIX E

PUBLIC HEALTH HAZARD CATEGORIES

ATSDR

Public Health Assessment Guidance Manual

March 1992

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Atlanta, Georgia 30333

Table 8.1. Criteria and Actions for Levels of Public Health Hazard

CATEGORY A URGENT PUBLIC HEALTH HAZARD	CATEGORY B PUBLIC HEALTH HAZARD
This category is used for sites that pose an urgent public health hazard as the result of short-term exposures to hazardous substances.	*This category is used for sites that pose a public health hazard as the result of long-term exposures to hazardous substances.*
Criteria:	**Criteria:**
Evidence exists that exposures have occurred, are occurring, or are likely to occur in the future; **and** the estimated exposures are to a substance or substances at concentrations in the environment that, upon short-term exposures (less than 1 year), can cause adverse health effects to any segment of the receptor population. The adverse health effect can be the result of either carcinogenic or noncarcinogenic toxicity from a chemical exposure. For a noncarcinogenic toxic effect, the exposure exceeds an acute or intermediate minimal risk level (MRL) established in the ATSDR Toxicological Profiles or other comparable value; **and/or** community-specific health outcome data indicate that the site has had an adverse impact on human health that requires rapid intervention; **and/or** physical hazards at the site pose an imminent risk of physical injury.	Evidence exists that exposures have occurred, are occurring, or are likely to occur in the future; **and** the estimated exposures are to a substance or substances at concentrations in the environment that, upon long-term exposures (greater than 1 year), can cause adverse health effects to any segment of the receptor population. The adverse health effect can be the result of either carcinogenic or noncarcinogenic toxicity from a chemical exposure. For a noncarcinogenic toxic effect, the exposure exceeds a chronic MRL established in the ATSDR Toxicological Profiles or other comparable value; **and/or** community-specific health outcome data indicate that the site has had an adverse impact on human health that requires intervention.
ATSDR Actions:	**ATSDR Actions:**
ATSDR will expeditiously issue a health advisory that includes recommendations to mitigate the health risks posed by the site. The recommendations issued in the health advisory and/or health assessment should be consistent with the degree of hazard and temporal concerns posed by exposures to hazardous substances at the site. Based on the degree of hazard posed by the site and the presence of sufficiently defined current, past, or future completed exposure pathways, the following public health actions can be recommended: • biologic indicators of exposure study; • biomedical testing; • case study; • disease and symptom prevalence study; (Continued on next page)	ATSDR will make recommendations in the health assessment to mitigate the health risks posed by the site. The recommendations issued in the health assessment should be consistent with the degree of hazard and temporal concerns posed by exposures to hazardous substances at the site. Based on the degree of hazard posed by the site and the presence of sufficiently defined current, past, or future completed exposure pathways, the following public health actions can be recommended: • biologic indicators of exposure study; • biomedical testing; • case study; • disease and symptom prevalence study; • community health investigation; (Continued on next page)

Table 8.1. Continued

CATEGORY A URGENT PUBLIC HEALTH HAZARD (continued)	CATEGORY B PUBLIC HEALTH HAZARD (continued)
• community health investigation; • registries; • site-specific surveillance; • voluntary residents tracking system; • cluster investigation; • health statistics review; • health professional education; • community health education; and/or • substance-specific applied research.	• registries; • site-specific surveillance; • voluntary residents tracking system; • cluster investigation; • health statistics review; • health professional education; • community health education; and/or • substance-specific applied research.

Table 8.1. Continued

CATEGORY C
INDETERMINATE PUBLIC HEALTH HAZARD

This category is used for sites with incomplete information.

Criteria:

The limited available data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects. However, data or information are not available for all environmental media to which humans may be exposed;

and

there are insufficient or no community-specific health outcome data to indicate that the site has had an adverse impact on human health.

ATSDR Actions:

ATSDR will make recommendations in the health assessment to identify the data or information needed to adequately assess the public health risks posed by the site.

Public health actions recommended in this category will depend on the hazard potential of the site, specifically as it relates to the potential for human exposure of public health concern.

If the potential for exposure is high, initial health actions aimed at determining the population with the greatest risk of exposure can be recommended. Such health actions include:

- community health investigation;
- health statistics review;
- cluster investigation; and
- symptom and disease prevalence study.

If the population of concern can be determined through these or other actions, any of the remaining follow-up health activities listed under categories A and B may be recommended.

In addition, if data become available suggesting that human exposure to hazardous substances at levels of public health concern is occurring or has occurred in the past, ATSDR will reevaluate the need for any followup.

CATEGORY D
NO APPARENT PUBLIC HEALTH HAZARD

This category is used for sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.

Criteria:

Exposures do not exceed an ATSDR chronic MRL or other comparable value;

and

data are available for all environmental media to which humans are being exposed;

and

there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health.

ATSDR Actions:

If appropriate, ATSDR will make recommendations for monitoring or other removal and/or remedial actions needed to ensure that humans are not exposed to significant concentrations of hazardous substances in the future.

The following health actions, which may be recommended in this category, are based on information indicating that no human exposure is occurring or has occurred in the past to hazardous substances at levels of public health concern. The following health actions are recommended for sites in this category:

- community health education;
- health professional education;
- community health investigation; and
- voluntary residents tracking system.

However, if data become available suggesting that human exposure to hazardous substances at levels of public health concern is occurring, or has occurred in the past, ATSDR will reevaluate the need for any followup.

Table 8.1. Continued

CATEGORY E
NO PUBLIC HEALTH HAZARD

This category is used for sites that do not pose a public health hazard.

Criteria:

There is no evidence of current or past human exposure to contaminated media;

and

future exposures to contaminated media are not likely to occur;

and

there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health.

ATSDR Actions:

No public health actions are recommended at this time because no human exposure is occurring, has occurred in the past, or is likely to occur in the future that may be of public health concern.

APPENDIX F

SUMMARY OF PUBLIC COMMENTS AND RESPONSES

Onondaga Lake
Summary of Public Comments and Responses

This summary was prepared to respond to the public's comments and questions on the Onondaga Lake draft Public Health Assessment (PHA). The public was invited to review this document during the public comment period which ran from December 29, 1994 to February 24, 1995. Some of the comments with similar concerns have been grouped together. If you have any questions about the responses to public comments for this public health assessment, contact the New York State Department of Health's Health Liaison Program, toll-free at 1-800-458-1158, extension 402.

PUBLIC COMMENTS:

1. COMMENT: A few facilities and firms were inaccurately named in the text (e.g. AlliedSignal Inc., not Allied Chemical).

   RESPONSE: The text has been corrected

2. COMMENT: The size of the Onondaga Lake shoreline wastebeds referred to in Appendix A occupies 716.3 acres, not 1,360 acres as stated in the document.

   RESPONSE: A new Figure 3 has been included which identifies in more detail all of the wastebeds surrounding the lake. The estimate of 1,360 acres was based on adding up the acreage in the Blasland, Bouck and Lee report (1989) for wastebeds labeled A through M and 1 through 8.

3. COMMENT: Most of the benzene levels near the "tar beds" are likely to be due to vehicular exhaust from Route 690 traffic.

   RESPONSE: The reported benzene levels at the tar beds are higher than at other nearby sites (e.g. Sawyer to Miller, Air monitoring data summary/AlliedSignal-Semet Tar Beds, Solvay, NY, November 4, 1992; Mo to Boyce, Semet-Solvay TAGA Survey Data Summary, June 20, 1990) and a 1989 sample of the tar bed wastes contained benzene. Thus the tar beds are one likely source of the benzene. The data are inadequate to evaluate relative contributions from nearby sites.

4. COMMENT: A former division of AlliedSignal that refined coke light oil via fractional distillation placed residue tars in the tar beds; no chlorinated compounds were involved in the process or deposited in the beds. The sludge from refining light oil which was placed in the beds contained benzene, toluene, xylene and polycyclic aromatic hydrocarbons (PAHs). AlliedSignal has signed an

Administrative Consent Order agreeing to a temporary cover over beds 3 and 4 as an interim measure.

RESPONSE: The text has been modified to reflect these comments.

5. COMMENT: An Interim Remedial Measure consisting of product recovery for a solvent containing a mixture of chlorobenzene and dichlorobenzene has been initiated by AlliedSignal Inc.; they are not collecting and treating groundwater in this project as stated in the report.

RESPONSE: The text has been modified to reflect this comment.

6. COMMENT: It is not made clear in the draft report what criteria the State Health Department uses in making the determination that a particular site is a "public health hazard," or what the consequences or implications of such a classification are.

RESPONSE: ATSDR's criteria for determining that a site is a public health hazard have been added in Appendix E, and are referenced in the Conclusions section.

7. COMMENT: The draft report proposes to declare Onondaga Lake a "public health hazard" and raises issues about exposure to a number of potential health hazards in a manner that is likely to be alarming to the general public, but for which there is no apparent supporting documentation.

RESPONSE: The meaning of public health hazard has been clarified in the document (see response 6).

8. COMMENT: The draft report provides no new information documenting human exposure to health hazards in or around the lake. Nor does the draft report provide the basis for taking actions beyond those already in place to prevent or reduce people's exposure to hazardous substances.

RESPONSE: It is true that no new information documenting human exposure to health hazards was identified; however, data necessary to completely evaluate the site and health risks were identified, as well as the consideration of controls to reduce the amount of mercury and fecal contamination entering the lake.

9. COMMENT: The final report should make clear what the State views as actual health risks associated with the site. Based on our reading of the draft, the actual health risks are limited to consumption of fish and exposure to bacteria from water contact following storm events.

RESPONSE: We agree that ingestion of fish and exposure to bacteria from water contact following storm events are known health risks associated with Onondaga Lake. Other health risks that could be present, but are not known with certainty due to limited sample data, include those listed under "Potential Exposure Pathways".

10. COMMENT: The potential placement of hazardous dredge spoils in public parkland should be better described to minimize public misperception. The only dredged material the County is aware of being placed in County parkland is the placement of dredge spoils from the Ninemile Creek delta in 1968. The County is unaware of dredged spoils being put any place else along the shoreline and that should be reflected in the Potential Exposure Pathways section regarding possible shoreline contamination. What are the specific findings that show the lake shore is a health hazard? In the absence of specific information about shore-line contamination, hazards related to use should be omitted from the PHA.

RESPONSE: The Potential Exposure Pathways section has been modified to emphasize that the dredge spoils being discussed along the shoreline north of Ninemile Creek is the only documented case of placement of dredge material. Please note that the shoreline has been identified as a potential exposure pathway because not enough information is available to establish whether or not it represents a completed exposure pathway. The PHA does not state that the shoreline is a public health hazard, but emphasizes that since there are data gaps, more information is needed.

11 COMMENT: Although it would be prudent to characterize the contamination, if any, in the dredge spoils placed north of Ninemile Creek, this area has always been intended for low intensity use.

RESPONSE: We agree that the dredge spoils should be characterized to determine to what extent, if any, contaminants are present. Recommendation #3 has been revised to state that the potential for accessibility to this area should also be evaluated.

12. COMMENT: In the draft report, mercury contamination of the lake seems disproportionately attributed to Ninemile Creek and the Onondaga County Metropolitan Syracuse Wastewater Treatment (Metro) Plant. To our knowledge, there is no documentation that mercury discharges from Metro differ from those attributed to other wastewater facilities of similar size and nature, or that this discharge represents a significant source to the lake relative to the tons of mercury in the sediments due to previous discharges from the chloralkali plant and continued discharges from adjacent wastebeds. The report does not provide information on the amount of mercury attributed to Metro, or its percent contribution relative to other inputs.

RESPONSE: The percentage of mercury input to the lake from Ninemile Creek and Metro has been added to the PHA (see "Off-Site Contamination"). Approximately 48% of the mercury entering the lake is from Ninemile Creek, and approximately 25% is attributed to the Metro plant. The purpose of this PHA is to identify sources of contamination and complete or potential exposure pathways. Whether or not the mercury discharges from Metro differ from other wastewater facilities may be important in making future risk management decisions. We are unaware of mercury entering the lake from the wastebeds. The lake sediments are contaminated with mercury. The role of mercury in the sediments versus the mercury in water entering the lake in contributing to high mercury levels in fish is unclear.

13 COMMENT: The intensity of natural resource uses (e.g. waterfowl hunting, fishing and swimming) is quite low, and this should be specifically stated so as not to overestimate the size of the user group thought to be at risk.

RESPONSE: The text has been modified to reflect this comment.

14. COMMENT: The soft and unstable inshore bottom created by past industrial waste discharges also presents a physical hazard, particularly if swimming was to become a future lake use.

RESPONSE: The text has been modified to reflect this comment.

15. COMMENT: In Conclusion 2, although implied, it should be stated that there is no health hazard associated with the use of Onondaga Lake County Park. The sources or believed sources of PAHs and mercury should be stated as they are in Conclusion 4.

RESPONSE: Based on the levels of mercury and PAHs in current sediments and the potential for exposure, there is no health hazard associated with the use of Onondaga Lake County Park. However, we have no data on contaminant levels along most of the shore, including in dredged sediments used as fill, and are recommending further investigation. The source of mercury in the sediments has been added to Conclusion #2; we do not know the source of PAHs.

16. COMMENT: With regard to the overall recommendations for additional contaminant investigations, how will such work be undertaken and how would it be financed?

RESPONSE: Procedures involved in deciding how the work would be undertaken and financed are the responsibility of the lead environmental agency (in consultation with health agencies and others). Financing is generally the

responsibility of the potentially responsible parties or in their absence, federal or state superfund monies.

17. COMMENT: While waterfowl and additional fish sampling is warranted, there is a virtual absence of contamination data for small mammal, reptile and amphibian species in the immediate Onondaga Lake area. Such analyses would be useful.

RESPONSE: Analysis of small mammals, reptiles and amphibians is not recommended at this time since they are an unlikely exposure pathway for humans. However, a recommendation has been added to examine this potential exposure pathway (Recommendation #1). Please note that there is an advisory in New York State regarding ingestion of snapping turtles due to the potential for them to contain PCBs (refer to Fish Advisory, Appendix C). Whether or not snapping turles from Onondaga Lake are eaten is unknown.

18. COMMENT: Contaminant analysis of migratory or highly mobile animal species is of limited use. Additional animal species sampling should focus on the less migratory inhabitants of the Onondaga Lake system.

RESPONSE: Since waterfowl hunting is reported to occur and these animals may be eaten, they represent a potential exposure pathway. Some evidence has shown that contaminants could be present in waterfowl after they live in a contaminated area, even if the length of time spent in the area was only a few months. Furthermore, some species of waterfowl will live in an area year-round, especially if open water is available to them. Therefore, the recommendation to conduct additional investigations to evaluate this potential exposure pathway was made.

19. COMMENT: A systematic monitoring program for contaminants and species of interest should be developed and implemented to track changes in contaminant concentrations over time.

RESPONSE: We agree that a systematic monitoring program should be developed and address this by recommending additional investigations (see Recommendation #1).

20. COMMENT: The PHA appears to be a literature search that adds very little to the existing knowledge and it provides no analysis or evaluation of the real and potential health issues that it identifies.

RESPONSE: The PHA is an analysis of the public health implications posed by the site. It is an evaluation of relevant environmental data, health outcome data, and community concerns associated with a site where hazardous chemicals have been released. The health assessment identifies populations living or working near hazardous waste sites for which more extensive public health actions or

studies are needed. An analysis or evaluation of the real or potential health issues identified in the PHA are described in the Public Health Implications section.

21. COMMENT: The authors or editors of the NYS DOH, DEC and DOL publications should be identified.

RESPONSE: Since most agency (e.g., NYS DEC, NYS DOH, NYS DOL) documents are compiled by a number of staff, the names of those who worked on a document are rarely identified or provided to us. If information on the author(s) of a specific document is desired, the appropriate agency may be able to identify the authors.