

**ONONDAGA LAKE SUPERFUND SITE (SYRACUSE, NY)  
(MCSS DATABASE PROJECT 02-23)**

**Site Description**

Onondaga Lake is a federal Superfund Site located northwest of and adjacent to Syracuse, NY. The lake has a surface area of about 3,000 acres, an average depth of 36 ft (maximum depth of about 65 ft), covers a drainage basin of about 233 square miles, and discharges to the northwest into the Seneca River. Ninemile Creek and Onondaga Creek are the lake's two largest tributaries, contributing 30.4% and 31.4%, respectively of the total flow into the lake. The Onondaga County Metropolitan Wastewater Treatment Plant contributes approximately 19% of the water flow into the lake.

Onondaga Lake was added to the federal Superfund program in 1994 but its investigation and cleanup are being lead by the State of New York Department of Environmental Conservation (NYSDEC). In November 2004, Honeywell International (Honeywell) submitted a final revised feasibility study to the agencies that identified multiple subsites to should be addressed including identifying lake bottom sediments as a separate subsite. The feasibility study further divided the lake-bottom sediment subsite into eight Sediment Management Units (SMUs) for investigational and remedial purposes based on water depth, sources of water entering the lake, and physical, ecological, and chemical characteristics as follows:

SMU 1 is located at the southern end of Onondaga Lake and encompasses the majority of the In-lake waste deposit (ILWD).

SMU 2 is located in the southern portion of the lake offshore from the causeway formerly used by Honeywell for loading and unloading materials.

SMU 3 is located offshore of Honeywell's inactive Solvay Wastebeds 1 through 8, which were used to dispose of wastes from the manufacturing of soda ash via the Solvay process.

SMU 4 is located along the shore of Onondaga Lake west of SMU 3 and includes the delta where Ninemile Creek discharges into the lake.

SMU 5 includes the littoral zone (water depths range from 0 to 9 meters (m) (30 feet [ft])) along the northern and western shores of the lake. Sawmill Creek and Bloody Brook discharge into SMU 5.

SMU 6 extends approximately 5,000 ft (1,500 m) along the eastern end of Onondaga Lake from the mouth of Ley Creek to 700 ft (213 m) south of the mouth of Onondaga Creek, and includes where Ley Creek, Onondaga Creek, and Metro discharge into Onondaga Lake.

SMU 7 is located at the southern corner of Onondaga Lake and includes the littoral zone located between SMU 1 and SMU 6.

SMU 8 includes the entire profundal zone (water depths exceed 9 m (30 ft)) of Onondaga Lake, where the water depth is greater than 30 ft (9 m).

Dividing the lake-bottom sediments into separate SMUs allowed for the development and evaluation of remedial alternatives unique to each area. The remedial alternatives evaluated for each SMU were then used in combination to develop comprehensive, lake-wide remedial alternatives targeted at reducing site risks to humans and the environment.

Based on the 2004 feasibility study results, in November 2004 a Proposed Plan was issued for the Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site that included a public comment period extending from November 29, 2004 to March 1, 2005. Additionally, the National

Remedy Review Board (NRRB) reviewed the Proposed Plan and issued its recommendations in a memorandum dated February 18, 2005. In an EPA letter dated March 25, 2005, EPA and NYSDEC provided joint responses to the NRRB recommendations. In July 2005 NYSDEC and EPA jointly issued a Record of Decision (ROD) for the Onondaga Lake Bottom Subsite that included the dredging of contaminated sediment/waste from Onondaga Lake and placement of the majority of the dredged material in a Sediment Consolidation Area (SCA) constructed on one or more of the Allied Chemical Solvay wastebeds with the most highly contaminated materials would be treated and/or disposed at an off-site permitted landfill. Additionally, the recommended remedy also includes thin-layer capping, isolation capping, monitored natural recovery, and habitat restoration.

### **Site History**

Sources of contamination to the lake are numerous, primarily historical point and nonpoint discharges from industrial processing plants and municipal wastewater treatment plants. These upland sites are targeted for remedial actions as subsites within the Onondaga Lake Superfund Site. Subsites identified to-date are: (1) Allied Chemical (now Honeywell International, "Honeywell") Solvay Waste Beds; (2) Ley Creek PCB Dredgings (remediated in 1999-2000); (3) LCP Bridge Street (mercury discharges); (4) Semet Residue Ponds (VOC discharges); (5) Geddes Brook/Ninemile Creek; General Motors: Inland Fisher Guide; (6) Niagara Mohawk (Erie Boulevard); (7) Niagara Mohawk (Hiawatha Boulevard); (8) Onondaga Lake Bottoms; (9) Salina Town Landfill; (10) Maestri 2; (11) Willis Avenue Plant (previously owned and operated by Allied Signal, now Honeywell; (12) American Bay and Metal; and (13) Lockheed Martin-Electronics Park (Bloody Brook). Additionally, the Metropolitan Sewage Treatment Plant and about 20 combined sewer overflows (CSOs) continue to discharge to the lake.

### **Potentially Responsible Parties (PRPs)**

The known PRPs at the site are Honeywell, General Motors, Linden Chemicals and Plastics, Inc. (now owned by Hanlin Group), Niagara Mohawk (now known as National Grid), and Onondaga County. The primary PRP designing and implementing the Lake Bottom Subsite remedy is Honeywell due to the historical contamination originating from the Allied Chemical Solvay wastebeds.

### **Threats and Contaminants**

Mercury and other heavy metals, PCBs, pesticides, creosotes, PAHs and VOCs are the primary contaminants of concern in the lake.

Surface water is contaminated primarily with mercury. Sediments are contaminated with PCBs, pesticides, creosotes, heavy metals (Pb, Co, and Hg), PAHs, and VOCs. In addition, groundwater at the Willis Avenue Plant is reportedly contaminated with a dense non-aqueous phase liquid (DNAPL) containing chlorinated benzenes, BTEX, naphthalene and other PAHs, and mercury that has migrated northeastward to the lake. As a result of elevated levels of mercury measured in lake fish, public fishing was banned in 1970, although a catch and release program was instituted in 1986. NYSDEC currently has fish advisories in place due to continuing elevated levels of mercury in fish tissue. NYSDEC recommends not to eat more than once per month all species except walleye; they recommend walleye not be eaten at all.

Over 100 sediment core samples were collected from Onondaga Lake in 1992 and 2000 as part of the Superfund site investigation. Sample results showed the upper six feet of sediment in nearly the

entire lake to be contaminated with a wide variety of chemicals, with generally decreasing levels from deeper to shallower sediment. A comparison of the contaminant concentrations found in the upper one-foot of sediment (1992 samples) to NYS sediment criteria indicated mercury levels exceeded the NYS “severe effects level” criterion by up to 34 times and that PCBs exceeded the NYS chronic toxicity to aquatic organisms and bioaccumulation in wildlife by up to 24 and 323 times, respectively. Additionally, a Remedial Investigation (RI) was completed at the site in 2002 and resulted in the collection of over 6,000 environmental samples (e.g., sediment, water, groundwater, biota). The results of the RI indicated mercury contamination in sediment throughout the lake with the highest concentrations being found in Ninemile Creek delta sediment and in the ILWD located in the southwest area of the lake.

Source control efforts for the Lake are continuing by means of continuing investigations and remedy implementation at the other subsites associated with the Onondaga Lake Superfund Site. For example, (1) in September 2005, a \$16 million cleanup of the LCP Bridge Site subsite was completed which included the removal of more than 7 tons of mercury that remained in the ground with final site restoration ongoing in 2007, (2) in March 2002 a ROD was issued for the Salina Landfill subsite which has yet to be implemented, and (3) an interim remedial measure was implemented at the Willis Avenue plant subsite to control the flow of DNAPL from the site into the Lake.

For the Lake, in October 2006 Honeywell began the installation of a 1.5 mile long sheet pile barrier wall to block contaminated groundwater from entering the lake from polluted properties in Solvay and Geddes that were once part of the Allied Chemical complex. Upon completion of the barrier wall, the areas that extend into the lake (typically up to 50 feet) will be backfilled with sand and gravel to create a new shoreline. The barrier was relocated from the original location (dry land next to Interstate 690) due to concerns with stability of the Interstate and interference by underground utilities.

### **Selected Remedy**

The selected remedy for sediment as described in the July 2005 ROD addresses all areas of the lake where surface sediments exceed a mean probable effect concentration quotient (PECQ) of 1 or a mercury PEC of 2.2 milligrams per kilogram (mg/kg). The selected remedy also is intended to (1) attain a 0.8 mg/kg bioaccumulation-based sediment quality value (BSQV) for mercury on an area-wide basis for the lake and for other applicable areas of the lake to be determined during the remedial design and (2) achieve lake-wide fish tissue mercury concentrations ranging from 0.14 mg/kg, which is for protection of ecological receptors, to 0.3 mg/kg, which is based on EPA's methylmercury National Recommended Water Quality criterion for the protection of human health for the consumption of organisms.

The major components of the selected remedy include:

- Dredging of as much as an estimated 2,653,000 cubic yards (cy) of contaminated sediment/waste from the littoral zone in SMUs 1 through 7 to a depth that will prevent the loss of lake surface area, ensure cap effectiveness, remove NAPLs, reduce contaminant mass, allow for erosion protection, and reestablish the littoral zone habitat. Most of the dredging will be performed in the ILWD (which largely exists in SMU 1) and in SMU 2.
- Dredging, as needed, in the ILWD to remove materials within areas of hot spots (to improve cap effectiveness) and to ensure stability of the cap.
- Placement of an isolation cap over an estimated 425 acres of SMUs 1 through 7.

- Construction/operation of a hydraulic control system along the SMU 7 shoreline to maintain cap effectiveness. In addition, the remedy for SMUs 1 and 2 will rely upon the proper operation of the hydraulic control system, which is being designed under IRMs presently underway (this includes the 1.5-mile sheet pile barrier wall discussed above) at the Semet Residue Ponds, Willis Avenue, and Wastebed B/Harbor Brook subsites to control the migration of contamination to the lake via groundwater from the adjacent upland areas.
- Placement of a thin-layer cap over an estimated 154 acres of the profundal zone (SMU 8).
- Treatment and/or off-site disposal of the most highly contaminated materials (e.g., pure phase chemicals segregated during the dredging/handling process). The balance of the dredged sediment will be placed in one or more Sediment Consolidation Areas (SCAs), which will be constructed on one or more of Honeywell's Solvay wastebeds that historically received process wastes from Honeywell's former operations. The containment area will include, at a minimum, the installation of a liner, a cap, and a leachate collection and treatment system. [*As of late 2007, Wastebed 13 is the selected location for the SCA.*]
- Treatment of water generated by the dredging and sediment handling processes to meet NYSDEC discharge limits.
- Completion of a comprehensive lakewide habitat restoration plan.
- Habitat reestablishment will be performed consistent with the lakewide habitat restoration plan in areas of dredging/capping.
- A pilot study will be performed to evaluate the potential effectiveness of oxygenation at reducing the formation of methylmercury in the water column, while preserving the normal cycle of stratification within the lake. An additional factor which will be considered during the design of the pilot study will be the effectiveness of oxygenation at reducing fish tissue methylmercury concentrations. If supported by the pilot study results, the pilot study will be followed by full-scale implementation of oxygenation in SMU 8. Furthermore, potential impacts of oxygenation on the lake system will be evaluated during the pilot study and/or the remedial design of the full-scale oxygenation system.
- Monitored natural recovery (MNR) in SMU 8 to achieve the mercury PEC of 2.2 mg/kg in the profundal zone and to achieve the BSQV of 0.8 mg/kg on an area-wide basis within 10 years following the remediation of upland sources, littoral sediments, and initial thin-layer capping in the profundal zone. An investigation will be conducted to refine the application of an MNR model and determine any additional remedial measures (e.g., additional thin-layer capping) needed in the profundal zone.
- Investigation to determine the appropriate area-wide basis for the application of the BSQV of 0.8 mg/kg. During remedy implementation, additional remedial measures may be needed (e.g., thin-layer capping) to meet the BSQV on an area-wide basis.
- Implementation of institutional controls including the notification of appropriate government agencies with authority for permitting potential future activities that could impact the implementation and effectiveness of the remedy.
- Implementation of a long-term operation, maintenance, and monitoring (OM&M) program to monitor and maintain the effectiveness of the remedy.

The affected area includes 579 acres of contaminated lake bottom. The lead contractors and primary equipment for the dredging and capping efforts have not yet been selected but will take place during the projected five-year design period.

The estimated cost to implement the remedy is approximately \$451 million NPV. This is comprised of the cost to construct the remedy (estimated at \$414 million) and the average annual operation and maintenance cost (estimated at \$3 million).

An Explanation of Significant Difference (ESD) was agreed upon in December 2006 that modified the ROD-selected remedy by allowing the relocation of a sheet pile wall designated to be built in SMU 2 and a small area of SMU 1, and therefore allowing an additional volume of contaminated sediment that will now exist behind the new wall location to remain in-place and be covered with overburden instead of being removed as specified in the original design. Additionally, a Consent Decree between New York State and Honeywell was lodged in Federal Court on January 4, 2007 for Honeywell to implement the remedy for the Lake Bottom.

### **Future Activities**

The design of the Lake Bottom Subsite remedy is currently underway and is anticipated to take four years to complete. Multiple contractors are involved with the design effort including Parsons Corporation, Liverpool, NY and O'Brien & Gere, Syracuse, NY.

During the four-year design phase for the Lake Bottom subsite, NYSDEC will continue to investigate and implement remedies at the other Onondaga Lake Superfund Site upland subsites to eliminate to the extent practical the potential impacts these subsites may be having on the Lake prior to implementing the Lake Bottom subsite remedy. For example, RI/FS work is continuing at six of the upland subsites with the RI/FS work at all six subsites being targeted for completion by the end of 2008. Additionally, Administrative Consent Orders have been signed between NYS and Honeywell for Honeywell to perform IRMs at several of the upland subsites.

### **References**

Consent Decree (including Explanation of Significant Differences) between NYSDEC, NYS Department of Law, and Honeywell International, January 4, 2007, <http://www.dec.ny.gov/chemical/34998.html>

EPA and NYSDEC Responses to National Remedy Review Board Recommendations for the Onondaga Lake Superfund Site, March 25, 2007, <http://www.dec.ny.gov/chemical/8994.html>.

National Remedy Review Board Recommendations for the Onondaga Lake Superfund Site, February 18, 2005, <http://www.dec.ny.gov/chemical/8994.html>.

Onondaga Lake, New York, EPA ID#: NYD986913580, EPA Region 2, July 25, 2007, [http://www.epa.gov/region02/cleanup/sites/nytoc\\_sitename.htm](http://www.epa.gov/region02/cleanup/sites/nytoc_sitename.htm).

Proposed Plan - Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site, Syracuse, New York, New York State Department of Environmental Protection, November 29, 2004, <http://www.dec.ny.gov/chemical/8994.html>.

Record of Decision – Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site, New York State Department of Environmental Protection and EPA, July 2005, <http://www.dec.ny.gov/chemical/34481.html>.