The Hudson River PCB Cleanup – A Light at the End of the Tunnel

by Manna Jo Greene

Photo courtesy of Clearwater

In all its glory, the replica sloop Clearwater sails the Hudson River Valley on its mission to educate the public about the river's history and environmental challenges.

It's been a very long time coming, but there's finally some measurable progress in the Hudson River PCB remediation project. The problem of PCB contamination has dominated the Hudson River Valley for more than 40 years. Listed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on the National Priorities List in 1984, this 200-mile stretch of Hudson River is one of nation's largest Superfund sites. After much negotiation and litigation, in 2002 the US Environmental Protection Agency (EPA) issued a Record of Decision (ROD) requiring General Electric (GE) to remediate PCB-contaminated sediment "hot spots" along a 40-mile stretch of the Upper Hudson, north of the Federal Dam at Troy. Since then, the remedial design process has proceeded slowly, often tediously, but there is now tangible progress with dredging scheduled to begin in 2009.

To become familiar with the issue of PCBs in the Hudson, extensive background information can be found on the EPA's Hudson River Superfund Site website: www.epa.gov/hudson; the Clearwater website: www.clearwater.org/pcbs/index.html; or Scenic Hudson's website: www.scenichudson.org/whatwedo/resourcecenter/pcbs.

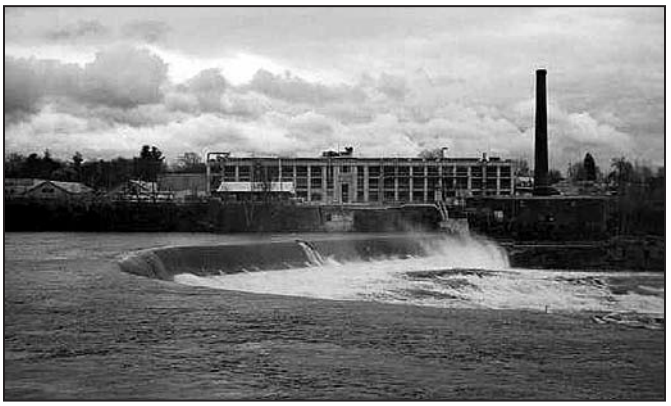

Photo courtesy of Clearwater

GE manufacturing plant at Hudson Falls is one of two cited from which 1.3 million pounds of PCBs were discharged into the Upper Hudson River for over 30 years until banned in 1977.

Uses of PCBs

The 209 related chemical compounds, or congeners, of polychlorinated biphenyls (PCBs) were used industrially in various mixtures trademarked Aroclors. In addition to being used as dielectric fluids (insulating oil), PCBs were historically used in the first carbonless paper and in various adhesives and caulking compounds. One congener, IUPAC-11, is a by-product of pigment that is not yet banned, although its manufacture was recently discontinued from a facility along the Hudson.

Lower chlorinated PCBs are more water-soluble than more heavily chlorinated forms. Some congeners are arranged in a coplanar pattern while others are rotated into non-coplanar configurations, each having different properties and effects.

PCBs are hydrophobic, moving out of water by adhering to sand, silt or decaying organic debris. Because of this, they are relatively easily filtered from water and eight municipalities take their drinking water from the Hudson River. They include the City of Poughkeepsie, the Towns of Lloyd, Esopus and Rhinebeck, and New York City's backup water supply at Chelsea – all located below the Troy dam; as well as Waterford and Halfmoon, both located in the Upper Hudson.

PCBs also are lipophilic – they tend to be stored in fatty tissue and are highly persistent. They are only minimally metabolized and can be harbored for a lifetime in the body. They bioaccumulate in the food chain and can be a million times more concentrated in fatty tissue of top predators, where they are found several orders of magnitude greater than in the blood. They also have an affinity for lipid-rich brain and nervous system tissue.

General Electric used PCB as insulating oil in the manufacture of electrical capacitors at plants located at Hudson Falls and Fort Edward on the Hudson River, and in transformers manufactured in Pittsfield along the Housatonic River, as well as in many other facilities across the US. The EPA estimates that 1.3 million pounds of PCBs were actively discharged by GE from both Upper Hudson plants into the river between 1947 until 1977, when the compounds were banned under the Toxic Substances Control Act (TSCA). When the Clean Water Act of 1972 required GE to limit, then lower, its discharge, GE was permitted continued use of PCB oil to flood-fill capacitors until 1977. Plant workers handling this equipment wore no gloves or other personal protective gear and were reminded only by posted signage to wash their hands before eating.

Even after 1977, PCBs continued to leak from a failing underground storage tank into the fractured bedrock under the Hudson Falls plant, and from outfalls near the Fort Edward Plant, and were released by erosion of remnant deposits. These sources of PCB are currently being addressed under the site remediations overseen by the New York State Department of Environmental Conservation (NYSDEC), but PCBs have not yet been removed from the Hudson River itself.

Making Matters Worse

In 1973, a former hydroelectric dam at Fort Edward was determined to be unsafe and was removed. Large volumes of PCB-contaminated sediment up to 18 feet in depth, which had

continued on page 2

continued from page 1

accumulated behind the dam, were released upon its removal – rapidly dispersing over a 40-mile distance to the Federal Dam at Troy. Following the hydrodynamics of the river, this contaminated material settled into a series of "hot spots," which are now targeted for dredging. With hindsight it is now clear that reinforcing the dam, rather than removing it, would have limited the spread of contaminated sediment and greatly reduced the estimated $600 million cost of remediation, which GE will bear.

Until the PCB sediments are actually removed from the Upper Hudson, it is estimated that 500 pounds each year wash over the Troy dam to the Lower Hudson, which is also part of this 200-mile Superfund site; however, this section of the river will not be included in the remediation. Any additional costs for disposing of contaminated sediment removed from the Lower Hudson for navigational purposes will be incurred by municipalities, the NY/NJ Port Authority, and local marina and dock owners.

The collapse of a wooden gate at the Allen Mill at the Hudson Falls plant in 1991 added to the concentrations of PCBs in the Upper Hudson. This structure had diverted water that contained oil-phase PCBs from flowing into the Hudson. After its collapse, GE had removed approximately 45 tons of PCB oil and sediment that had leaked from fractured bedrock into a tunnel under the plant, with NYSDEC supervision from 1993 to 1995.

EPA Actions

After EPA's initial assessment and a "No Action" interim decision in 1984, a 1989 Reassessment, which led to a Remedial Investigation/ Feasibility Study, ultimately resulted in the 2002 Record of Decision (ROD). During the Reassessment, GE attempted to avoid a cleanup by engaging in a public relations campaign and a series of legal battles, which were estimated to cost somewhere between $60 and $100 million dollars – approximately one-tenth to one-fifth of the projected cost of remediation. The 2002 ROD called for a phased-in cleanup, with an assessment of Phase 1 to be completed before Phase 2 is implemented. GE can opt out of the remediation for Phase 2, if they choose; however, EPA could then complete the cleanup and charge its cost, with triple penalties, back to GE. It also called for out-of-state disposal after earlier attempts to site landfills for contaminated dredge spoils were deemed unacceptable in this region. Clearwater and other environmental organizations called for contained facilities to prevented volatilization (evaporation) of PCBs from sediments to air, which was partially incorporated into the present design. They also recommended treatment of the sediments, as opposed to disposal in hazardous waste landfills. The EPA, however, did not require treatment (other than basic dewatering) so the contaminated material will be shipped out of the Hudson River ecosystem to hazardous waste landfills in Texas, where it will be stored indefinitely.

Health Effects of PCBs: As early as the 1930's, chloracne rashes appeared in workers and in their families who came into contact with PCBs on workers' clothing. A 1937 study published in *Journal of Industrial Hygiene and Toxicology* by Harvard researcher, Cecil K. Drinker, indicated PCBs cause liver tumors in rats. PCBs are now known to be probable human carcinogens, to cause skin irritations, developmental effects including low birth weight, neurological disorders, including lowered IQ and poor short-term memory, as well as hormonal disruption and suppressed immune response. In Japan and Taiwan, hundreds of people were exposed to PCB-contaminated rice oil in 1968 and 1979. Children born to women up to seven years after the incidents showed developmental delays and behavioral problems. In addition, Dr. David Carpenter, professor at the Environmental Health and Toxicology Division of the University of Albany School of Public Health, cites additional studies showing dose-related responses for diabetes and cardiovascular disease and possible correlations with arthritis and intervertebral disc disease.

While eating contaminated fish is the major route of exposure, dermal exposure and inhalation of PCBs that have volatilized into air, are additional pathways. PCBs are stored in fatty tissue and bioaccumulate in the food chain. In *Our Stolen Future,* Theo Colburn, Dianne Dumanoski and John Peterson Myers estimated that PCBs in top predators, such as eagles, gulls and other fish-eating birds, can be as much as 25 million times greater than concentrations found in algae at the bottom of the food chain.

Fish consumption advisories, and catch-and-release fishing is the rule for much of the Upper Hudson.

As early as 1975, the NYS Department of Health issued health advisories to limit consumption of fish from the river due to PCBs. In 1976, the NYSDEC banned all fishing in the Upper Hudson and most commercial fishing, including striped bass fishing, in the Lower Hudson, which has lower average PCB concentrations than are found above the Federal Dam in Troy. There is now a catch-and-release policy in the Upper Hudson to allow recreational fishing without consumption. There is an "eat none" fish advisory for all fish for children under 15, and for women of childbearing age for the entire river. It is an "eat none" for everyone above the Troy dam. Below the Troy dam, it varies from one fish meal per month to one fish meal per week for adult males.

Global Transport: The story of Hudson River PCBs is a classic case of industrial pollution, once widespread in the United States, and increasingly a problem today in developing countries such as China. In the absence of the "precautionary principle" that prohibits chemical discharges until their safety is assured – pesticides such as DDT, PCB, dioxins, and many other persistent organic pollutants (POPs) and heavy metals have been distributed by oceanic and atmospheric transport across the globe. In 1987, Dr. Eric Dewailly went to the northern Canadian Arctic seeking a control group for research about PCB levels in the breast milk of mothers in southern Quebec, near contaminated sites along the St. Lawrence River. Dewailly was astonished to find that PCB levels among Inuit mothers living in this pristine region, far from any industrial sources of pollution, were five times higher than women in the south. PCBs in the Arctic are also partly responsible for the decline of the polar bear, due to endocrine disruption causing reproductive failure (Colburn, Dumanoski and Myers).

More than 50 percent of the PCB-containing sediments that affect New York Harbor have been shown to originate from GE's Upper

continued on page 3

continued from page 2

Hudson facilities. This poses an ongoing challenge to the New York/New Jersey Port Authority to maintain navigation for large commercial shipping vessels.

Remediation and Restoration: Remediation refers to the removal of PCBs from the environment. However, a parallel process, also required as part of CERCLA, looks at the damages that PCB contamination has caused to natural resources and those who benefit by them. The Natural Resource Damage Assessment (NRDA) Trustees, who oversee the assessment, include the NYSDEC, the US Department of the Interior/US Fish and Wildlife and the US Department of Commerce/National Oceanic and Atmospheric Administration (NOAA). Once their assessment is complete and damages have been determined, the Trustees will file an NRD claim against GE to restore damages and lost resources – either through monetary compensation or specific restoration projects. The NRD Trustees and GE could settle the NRD damage claim at any time – even prior to completion of the assessment.

An example of a clamshell dredge that will be used to remove PCB-contaminated sediment from a series of "hotspots" in the river bottom located in a 40-mile stretch of the Upper Hudson.

USEPA

Current Status of PCB Remedial Design

The project is now in the "remedial design phase." During the design phase, the EPA has been meeting with GE to develop engineering and quality of life performance standards (evaluation criteria), intermediate and final remedial design reports, and a consent decree. The cleanup will employ environmental mechanical (sealed-bucket) dredging, rather than hydraulic suction dredging, as many area environmental groups had recommended. It will also allow a significant amount of PCB-contaminated sediment to remain at the shorelines. After more than three years of negotiations, an October 2005 Consent Decree was issued, which allows GE to "opt out" of the cleanup after the first phase of the remediation is completed – with only about 10 percent of the total volume of PCB-contaminated sediment removal accomplished. The remaining phase of the dredging is expected to take five years.

Throughout the remedial design, Clearwater, Scenic Hudson, Riverkeeper, Sierra Club and others in the Friends of a Clean Hudson coalition have participated in the EPA's Community Advisory Group (CAG), along with representatives from upriver municipalities, unions, farmers, tourism, and other interests.

Siting and Building the Dewatering Facility: It is necessary to remove most of the water from the dredged sediment before shipping and disposal. After narrowing the field from 24 possible dewatering sites, a final site was selected in December 2004. The dewatering facility is located in Fort Edward, near where a bulk of the contamination is found. In April 2007, the EPA's Community Advisory Group toured GE's Hudson River Transportation and Sediment Processing Facility. GE has moved quickly and efficiently to implement the construction project on a 114-acre site owned by D.A. Collins along the Champlain Canal, from which they will conduct one of the largest environmental cleanups ever undertaken in the United States.

The treated water, from which PCBs have been removed by sand and charcoal filtration, will be returned to the canal. The dewatered sediment, called filter cake, will be stored with coarser material (stones and cobbles) in separate covered containment areas near a newly constructed rail spur off the Canadian Pacific rail line, where it will be loaded with the dredged debris into rail cars and shipped to a lined hazardous waste landfill in Andrews, Texas for burial. The rail facility is expected to accommodate 81 rail cars every two and a half days. GE is conducting and paying for the work, with EPA oversight.

As quickly as construction is progressing, the project has not been uneventful. During the preliminary site preparation and excavation, contractors discovered multiple boxes of dynamite, which appear to have been buried in the early 1900s during the canal's construction. The site was quickly secured and over a period of several weeks, 4,766 sticks of dynamite were carefully removed and safely burned by the New York State Police Hazardous Devices Unit. Other than this unforeseen situation, GE's internal safety program has been rigorous, with no reported accidents or incidents.

For a virtual tour of the site, visit GE's website: http://hudsondredging.com/, which is devoted to information on the remediation project.

Preparing to Dredge: Once construction is completed and the system is tested, sediment from carefully delineated areas along the river bottom will be dredged (mainly by sealed clamshell dredges), loaded onto barges and transported from the river through Lock 7 of the Champlain Canal to the processing facility. There the dredged materials will be unloaded at a newly constructed wharf, sorted to remove large pieces of debris and coarse sediment, and moved into a contained dewatering facility for further processing.

After considerable dispute between GE and the EPA concerning the dredging areas, GE's Phase One Dredge Area Delineation (DAD) report was released in February 2005, behind schedule. This postponed the start of the dredging until 2009 at the earliest.

In January 2008, GE released its second Dredge Area Delineation (DAD) report for Phase Two, the remainder of the project. As the Poughkeepsie Journal recently reported: "General Electric has convinced federal Environmental Protection Agency officials it can dredge less of the Hudson River and remove more toxic polychlorinated byphenyls [sic] from the river. EPA Project Director David King said recently tests showed contamination was not as deep into the river bottom as first thought. That means less sediment has to be dredged out of any given spot, so the project can expand to cover more of the bottom and capture more PCBs."

Environmental groups, skeptical about this claim, have asked for technical assistance to look into the details. Members of the CAG agreed. At this point, little can be done to influence the process, but questions are still being raised with hope they will be addressed without slowing the progress of the remediation project.

Navigational Dredging Remains a Concern: Dredging conducted by the NYS Canal Corporation, which was required to maintain navigational channel depths in the Upper Hudson, had ceased in 1979 due to the presence of PCB contamination. Under the Record of Decision, GE is only required to undertake environmental dredging to remove the PCB-contaminated sediments, for which they are responsible. However, it makes no sense for GE to perform the

continued on page 4

continued from page 3

required environmental dredging and then restore habitat-supporting conditions, only to have this disturbed later when the Canal Corp resumes navigational dredging. It would be much more efficient to do both environmental and navigational dredging under the present remediation – ideally using some of the same equipment and treatment facilities. Currently, these negotiations are in the hands of the Hudson River Natural Resource Damage Trustees, who are trying to reach an agreement with GE, but no progress has been reported to date. This remains a major concern for all the members of the CAG.

Through all the push-and-pull, the Hudson River CAG continues to monitor the progress of the remedial design, as it will the actual PCB cleanup. While pushing for the process to be as rigorous as possible, the CAG desires to minimize any negative impacts on local communities or the river itself.

Manna Jo Greene is the environmental director for Hudson River Sloop Clearwater, Inc., located in Poughkeepsie, NY. The organization is known for its sailing vessel, the sloop Clearwater, and its activism to raise awareness for cleanup of PCB contamination of the river and watershed issues of the Hudson Valley. Greene may be contacted at: mannajo@clearwater.org or 845-454-7673, ext. 113.

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