Report to Hudson River Sloop Clearwater

Regarding the cleanup of Hudson River PCBs

October 5, 2011

ESC, LLC

This report addresses the topics raised by Clearwater and the cooperating organizations regarding the PCB cleanup of the Hudson River by GE. Here we address the following topics:

Dredging at CU 19 and the allocation of capping allowance at CU 19

Air monitoring

Daily monitoring reports

Habitat restoration

Status of the PCB residuals post Phase I

CU19

According to the *Phase 2 Final Design Report*, revised in April 2011, dredging in the 4.98 acre CU19 is expected to be completed in year one of the Phase 2 dredging operations (Arcadis 2011, p. 65). Water depth, shoreline structures, and complications with or lack of equipment have affected the dredging process. CU19 characteristics have also made the area exempt from certain dredging protocols and capping limitations.

Shallow water depth in the western portion of CU19, requires specialized dredging treatment in the area to minimize disturbance and sediment resuspension (Parsons 2011, p. 2-11, p. 2-5). According the *Remedial Action Work Plan for Phase II*, CU19 may only be dredged when river water levels are elevated, allowing CU19 to be dredged in an "opportunistic fashion," outside of the typical upstream to downstream sequence (Parsons 2011, p. 2-14). Daily oversight reports of dredging activities, however, indicate that dredging activities in CU19's western shallow area were underway, off and on, from at least August 11th (the earliest daily report that we have received) through August 23rd. Complications with equipment, and a lack of appropriate equipment, have hampered the dredging activities at CU19. On August 16th through 18th, daily oversight reports state that dredging in the western shallow portion of CU19 was not performed or was limited due to a lack of large boats, needed to trans-load material from smaller boats used in the area. Dredging activities were limited again on August 19th, as the dredge was "inoperable" for most of the day due to a hydraulic leak and computer issues. Daily oversight reports, which describe the most recent dredging activities, do not present information about current dredging activities at a level of detail which would allow us to determine the exact dredging/ capping locations and the amount of dredged material removed from the CUs on a daily basis.

Although Section 2.3.3.1 of the *Phase 2 Final Design Report* states that the total area capped may not exceed 11 percent of the total Phase 2 dredge area, certain exceptions exist. Portions of the CUs may be capped and not considered as part of the total capped area if factors, such as structural offsets, underlying bedrock, and shoreline stability, impede feasible implementation of effective dredging activities. Capped shoreline areas are not considered as part of the total 11 percent either (Arcadis 2011, p. 49). To avoid potential damage to a timber bulkhead which supports shoreline stability in CU19, no dredging will occur within a 15-foot offset area (Arcadis 2011, p. 81). The total dredge prism figure 17,096 cubic yards listed in Table 2-6 does not take into account the offset area, and the offset area is "not subject to capping limits" (Arcadis 2011, p. 81).

Air Quality Monitoring

Procedure

As stated in the *Remedial Action Work Plan for Phase 2*, GE is continuously conducting air quality monitoring for PCBs in ambient air at stations located near dredging operations, while operations are underway. Additionally, air quality is monitored at the sediment processing facility and unloading area and at a permanent background station. According to August 11 through September 20, 2011, daily oversight reports, ambient air monitoring for PCBs was conducted in CU's undergoing dredging activities. There are several exceptions however. On August 16 and 23, and on September 9, 10, 13, and 14, air monitoring was not conducted in all of the CUs undergoing dredging activities. Air monitoring for PCBs was largely not conducted in CUs receiving backfill materials or undergoing capping activities (LBG/US EPA/USACE 2011).

Twenty-four hour average PCB samples are compared to air quality performance standards as listed in the *Hudson River PCBs Superfund Site Quality of Life Performance Standards* document (Parsons 2011, p. 5-2). The air quality standards include separate residential area and commercial/industrial "concern levels" which are 80% of their respective standard for 24-hour PCB concentration averages. The residential concern level for PCBs in ambient air is 0.08 μ/m^3 and 0.21 μ/m^3 for commercial/industrial areas (Arcadis 2011, p. 18).

General descriptions of daily air quality monitoring data are posted on EPA's Hudson River Superfund Site Dredging Data Website. According to the website, on September 7, 8, 19, 20, and 21, 2011 PCB concentrations in ambient air exceeded standard levels at the processing facility. Additionally, on Sep. 7 and 21 PCB concentrations exceeded "control" levels in River Section C, but remained under standard and "control" levels at other monitored locations. "Control" levels were exceeded at the processing facility on September 10 (EPA 2011, website). The information on the website is vague and does not indicate if concentrations were above residential standards (0.08 μ/m^3) or above commercial/industrial standards (0.21 μ/m^3) during noted "exceedances." Also, "control" levels are denoted as PCB concentration values "within 20% of the standard." This definition could possibly describe concentrations within 20% above or below the standard level. It seems most likely that "control" levels coincide with "concern levels," defined as 80% of the standard level in the *Phase 2 Final Design Report*, but, again, the term “control” level is not explicated defined in this way on the air quality monitoring website (Arcadis 2011, p.19).

Dredging operations were conducted in CU15 and CU16 on Sep. 7, the date of the first control exceedance in River Section C, and in CU16, CU20, and CU21 on Sep. 21, the date of the second control exceedance in River Section C. Based on information in daily oversight reports, the exceedances were likely related to dredging in CU16. On Sep. 19, 20, and 21, the respective daily oversight reports noted that “BMP measures were employed [in CU16] due to high PCB sediment.” On Sep. 26 the report identified CU16 as a “high PCB concentration area;” measures were taken to contain and collect sheen on the 26th (LBG/US EPA/USACE 2011).

Locations

Air monitoring locations were established based on a three-tiered approach. The approach considered receptor locations and predominant wind direction (as established from meteorological data collected at the processing facility and the Glen Falls Airport station). The approach also considered US EPA and USACE particulate sampling guidelines, which include guidance on sampler placement in relation to other objects that may obstruct sample collection, and logistical concerns related to worker safety and electrical accessibility. Where monitoring is not feasible, modeling which considers land use, hourly meteorological data, wind patterns, and chemical diffusion characteristics, will be used to predict PCB concentrations (Anchor QEA, LLC 2011, p. 159-160). Figure 5.4-1 in the *2011 Remedial Action Monitoring Quality Assurance Procedure Plan (2011 RAM QAPP)* illustrates the locations of the four PCB monitoring stations located on the perimeter of the processing facility. The figure also shows the location of a monitoring station across from the processing facility on the east side of the Champlain Canal. Monitoring station locations within the dredging corridor are not detailed in the *2011 RAM QAPP*. Dredging corridor locations change according to where daily dredging operations are taking place. These locations are intended to represent the receptors located nearest to the dredging activity (Anchor QEA, LLC 2011, p. 161). Additionally, the PCB monitoring station located across from the loading wharf will collect air samples when sediment is at the unloading wharf for more than 2 days (Anchor QEA, LLC 2011, p. 163).

Method

Consistent with the *2011 RAM QAPP*, the technical memorandum released December 13, 2010 and titled *Quality of Life Performance Standards – Phase 2 Changes*, indicates that Phase 2 air monitoring activities will remain largely the same as Phase 1 air monitoring activities. As in Phase 1, low volume samplers (EPA method TO-10A) are used at the majority of monitoring locations, including the dredging corridor locations, Lock 7, and at the unloading wharf, with a sample turnaround time of 72 hours during normal operations and 48 hours for expedited samples (E & E 2010, p. 2). High volume samplers (EPA method TO-4A) will be used at four sampling locations at the processing facility perimeter (Anchor QEA, LLC 2011, p. 161). Best management practices (BMPs) to mitigate PCBs emissions are to be implemented in areas expected to have elevated PCB emission concentrations. These areas are identified through past data analysis and modeling.

Both TO-4A and TO-10A are EPA methods commonly used to sample for PCBs in ambient air. A high volume sampler, such as the Tisch TE-1000 (or an operational equivalent) included as part of the TO-4A method in the *2011 RAM QAPP*, collects large volumes of air samples at a flow rate of 280 L/min (Tisch Environmental, Inc. 2007, website). High volume sampling techniques collect larger air volumes and are often preferable to low volume samplers. High volume samplers, however, require a source of electricity and are therefore not practical in many sampling situations. Therefore, the low-volume SKC Leland Legacy personal sampling pump (or an operational equivalent) is used at the majority of sampling stations, as part of the TO-10A method, and collects air at a flow rate of 5 to 15 L/min (SKC Inc.).

After collection, air samples are analyzed for PCBs through the SW-846 Method 8082. The method involves extracting PCBs from air samples through a gas chromatography technique followed by election capture detection (US EPA 2007, p. 8082A-1). A single column analysis is used on the majority of samples. A dual column analysis will be used on samples collected in areas where higher PCB concentrations are anticipated, based on past analyses or modeling results (Anchor QEA, LLC 2011, p. 171). EPA guidance states that “compound identification based on single-column analysis should be confirmed on a second column, or should be supported by at least one other qualitative technique” (US EPA 2007, p. 8082A-2). Table 5.4-1 in the 2011 RAM QAPP indicates that a GC/ECD (gas chromatography/ election capture detector) method will be used to analyze the collected air samples for PCBs. ECD is an appropriate follow-up technique to single column GC analysis, because ECD effectively responds to the presence of chlorinated compounds, such as PCBs, in air samples (UNEP 1999, p. 15). Both testing methods, TO-4A and TO-10A, yield a detection limit of 0.03 $\mu g/m^3$, which is greater than residential and commercial standards and concern levels (Anchor QEA, LLC 2011, p.171)

Habitat Construction

After Phase 2 dredging has been completed, GE will perform Habitat Construction activities. These activities are to include planting riverine fringing wetland vegetation, planting submerged aquatic and floating vegetation, repairing and planting on shoreline areas above the 119-foot elevation if they were disturbed during dredging operations, monitoring plantings, and re-planting the following year (Parsons 2011, p. 1-7). The Phase 2 habitat construction plan has not been finalized, as stated in the *Phase 2 Remedial Action Work Plan.* Tentative details, however, are included in the *Phase 2 Final Design Report*. NOAA and the U.S. Fish and Wildlife Service have documented concerns about the Phase 2 Habitat Construction in the *Hudson River Remedy Part II: Habitat Replacement and Reconstruction and the Implications for Restoration* poster.

As currently described in the FDR, the following issues may affect the effectiveness of the habitat construction plan:

- Backfill material may not be suitable for aquatic plant growth
- Capping may cause river bottom to harden
- Mussel habitat will be destroyed, and there are no plans for reintroduction after dredging completion
- River channel sides with steep slopes may undergo greater erosion than sides with more gradual slopes
- Only about 1/3 of dredged area is to be replanted
- Backfilling will not return all areas to original depths
- Some riverine fringing wetland areas are only being seeded with annual seeds, where a perennial seed mix would be preferable
- Stabilization may harden shoreline
- Grass or a herbaceous mix are to be planted in areas where trees and shrubs are preferable
- No woody debris will be placed in the river to mimic habitat conditions prior to dredging

Until habitat construction plans are finalized, it remains uncertain that these issues will be addressed.

Mussels

Because of freshwater mussels' importance as a keystone species in the Hudson River ecosystem, the NOAA and the USFWS have expressed concern over the destruction of mussel beds during the dredging process (Rosman et al. 2011, poster). As described in the *Phase 2 Final Design Report*, the Phase 2 habitat construction plan does not include any action to harvest mussels prior to dredging or reseeding mussel beds after dredging is complete (Arcadis 2011 p. 86-87). Mussels are an integral part of the Upper Hudson River ecosystem as mussel beds provide other aquatic species with habitat, food, and clean water (USFWS 2010, website). Certain mussel species' larvae depend on symbiotic relationships with certain fish species (NHDES 2005, p. 1). Damaging and drastically altering mussels' habitats will most likely affect these crucial relationships and affect endemic mussel populations and distribution. Additionally, inadequate mussel habitat construction may promote the colonization of invasive mussel species, such as the zebra mussel (Brosnan and Foley 2011, letter).

To protect the sensitive and integral freshwater mussel species, measures, which may include harvesting mussels before dredging and transplanting them to reconstructed mussel beds or reseeding reconstructed mussel beds, would promote a more complete post-dredging habitat restoration.

The White Sulphur Springs National Fish Hatchery's Aquatic Resources Recovery Center (ARRC) in West Virginia (part of the Northeast Region U.S. Fish and Wildlife Service) has supplied mussels and assisted in mussel habitat recovery at various sites, including sites in the Ohio River and James River (USFWS 2010, website). ARRC propagates and raises over 30 freshwater mussel species, and states its mission to "work with partners to recover and maintain mussels, fish and other aquatic resources at self-sustaining levels for the benefit of the American Public" (USFWS 2009, p. 1). Working with ARRC during Phase 2 habitat construction might be a feasible option, assuming that the center can provide endemic mussel species, which may include *Anodonta implicate, Lampsilis cariosa,* and *Ligumia nasuta* (NatureServe 2010, website). A field survey documenting location and mussel species within the Phase 2 area or similar areas would provide valuable information on species appropriate for reintroduction (Brosnan and Foley 2011, letter).

Nearby Health Investigations

Results of studies on the Hudson River PCBs Superfund Site's relationship with nearby resident health have been presented at Community Advisory Group meetings. At the last CAG meeting, held on September 22, 2011, the New York State Department of Health (NYSDOH)'s *Residential Proximity to the Hudson River and Hospitalization Rates for Ischemic Heart Disease and Stroke: Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Columbia, Greene, Rensselaer, Albany, Washington and Saratoga Counties, New York: 1990-2005* was presented (NYSDOH 2011). The full report can be accessed online at the NYSDOH's website http://www.health.state.ny.us/environmental/outdoors/hudson_river_pcb/docs/health_consultation. At the December 2010 CAG meeting, *The Hudson River Communities Project*, prepared by the NYSDOH, was presented. The project evaluated environmental exposure to and nervous system effects of PCBs among older residents of communities along the Hudson River in New York State (NYSDOH 2010). Visit the Project website http://www.health.state.ny.us/environmental/pcb/ for more information.

Deposition and Scouring

To determine the baseline PCB concentrations in surface sediment and to "identify the spatial extent, concentration, and mass of Aroclor PCBs that are deposited in areas downstream from dredging," a Baseline Surface Sediment Study and a Downstream PCB Deposition Study are being conducted prior to/during the first year of Phase 2 dredging (Anchor QEA, LLC 2011, p. 243-244).

The EPA is "in the process of evaluating this data and GE will be providing a formal report [2011 Downstream Deposition Special Study] to EPA at the end of the season," as stated by Gary Klawinski (EPA, Region 2) in an email sent on August 18, 2011. Two figures, one describing surface grab locations and PCB concentrations and the other describing PCB concentrations in sediment collected from sediment traps, were attached to email and will be included in the *2011 Downstream Deposition Special Study Report.* The figures include the only Phase 2 sediment deposition data that we currently can access, and the figures do not include data describing soil volumes contained in the downstream sediment traps. Sediment volume data is necessary to understand the scouring and deposition patterns caused by dredging activities and natural forces. The sediment special studies, as described in the 2011 RAM QAPP, should include such information.

A *Non-Target Downstream Area Contamination Study* was conducted during Phase 1. The study measured the amount of material resuspended by dredging activities that settled in areas downstream. The results indicated that Phase 1 sediment accumulation ranged from 50 to 400 g/m2/day, increasing in areas farther downstream (Anchor QEA, LLC 2009, p. 66).

Discussion of Current PCB Data - to follow in separate memo

References

Anchor QEA, LLC. November 2009. Phase 1 Data Compilation Hudson River PCBs Superfund Site.

Anchor QEA, LLC. Revised May 2011. Hudson River PCBs Site 2011 Remedial Action Monitoring Quality Assurance Procedure Plan.

Arcadis. Revised April 2011. Phase 2 Final Design Report for 2011 Hudson River PCBs Superfund Site. B0031087.2009

Brosnan, T and R Foley. June 21, 2011. Letter from Thomas Brosnan (NOAA) and Robert Foley (Dept. of Interior) to John G. Haggard (General Electric Corporation).

LBG/US EPA/USACE. 2011. Daily Oversight Summary Report. Hudson River PCBs Site, New York, Remedial Action Construction Activities. August 11 through September 23.

NatureServe Explorer. 2010. Accessed online Sep. 26, 2011. http://www.natureserve.org/explorer/servlet/NatureServe

Neves, R. 2004. Propagation of Endangered Freshwater Mussels in North America. Journal of Conchology. Special Publication 3. p. 69-80.

New York State Department of Health (NYSDOH). 2010. PCBs and Health: The Hudson River Communities Project. Presented on Dec. 9, 2010. Accessed online Sep. 29, 2011. http://www.hudsoncag.ene.com/files/NYS%20DOH%20PCB%20Health%20Studies.pdf.

NYSDOH. 2011. Residential Proximity to the Hudson River and Hospitalization Rates for Ischemic Heart Disease and Stroke: Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Columbia, Greene, Rensselaer, Albany, Washington and Saratoga Counties, New York: 1990-2005. Accessed online Sep. 29, 2011. http://www.health.state.ny.us/environmental/outdoors/hudson_river_pcb/docs/health_consultation

NHDES. 2005. Freshwater Mussels in New Hampshire: Hidden Treasures of Our Lakes. Environmental Fact Sheet. Accessed online Sep. 26, 2011
Parsons. Revised April 2011. Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2011 Hudson River PCBs Superfund Site.

Rosman, L, et al. 2011. Hudson River Remedy Part II: Habitat Replacement and Reconstruction and the Implications of Restoration (Poster). Accessed online Sept. 23, 2011. http://www.fws.gov/contaminants/restorationplans/HudsonRiver/docs/HUD_DEL_SETAC%202011habitatposter.pdf.

SKC Inc. Leland Legacy Sample Pump. Publication #1620 Rev 1108. Accessed online Sept. 23, 2011. http://www.skcinc.com/instructions/1620.pdf.

Tisch Environmental, Inc. 2007. TE-1000 PUF (Ambient Air). Accessed online Sept. 23, 2011. http://www.tisch-env.com/Polyurethane-Foam-Sampler-TE-1000.asp.

United Nations Environment Programme (UNEP). 1999. Guidelines for the Identification of PCBs and Materials Containing PCBs. First Issue. Accessed online Sept. 23, 2011. http://www.chem.unep.ch/pops/pdf/PCBident/pcbid1.pdf .

US EPA. 1999a. Compendium Method TO-4A, Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD). Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b.

US EPA. 1999b. Compendium Method TO-10A, Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD). Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b.

US EPA. 2007. Method 8082A, Polychlorinated Biphenyls (PCBs) by Gas Chromatography. Accessed online Sept. 23, 2011. http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/8082a.pdf.

USFWS. 2009. Aquatic Resources Recovery Center. White Sulphur Springs National Fish Hatchery. Accessed online Sep. 26, 2011. http://www.fws.gov/northeast/wssnfh/pdfs/ARRC%20Fact%20Sheet%20Update%2012.09.pdf .

USFWS. 2010. Freshwater Mussels. White Sulphur Springs National Fish Hatchery. Accessed online Sep. 6, 2011. http://www.fws.gov/northeast/wssnfh/mussel.html