ONONDAGA LAKE PRE-DESIGN INVESTIGATION: PHASE VI WORK PLAN - ADDENDUM 5 SMU 8 PECQ SEDIMENT SAMPLING Syracuse, New York

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APRIL 2010

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BSQV	bioaccumulation-based sediment quality value
CPOI	chemical parameters of interest
GPS	global positioning system
mg/kg	milligrams per kilogram
MNR	monitored natural recovery
NYSDEC	New York State Department of Environmental Conservation
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PEC	probable effects concentration
PECQ	probable effects concentration quotient
PDI	pre-design investigation
ppm	parts per million (1 ppm is the same as 1 mg/kg in sediment)
QA/QC	quality assurance/quality control
ROD	Record of Decision
SMU	sediment management unit
SOP	standard operating procedure
TOC	total organic carbon
USEPA	United States Environmental Protection Agency

Note**:** One cm (cm) of length is approximately equivalent to 0.4 inch. One inch is approximately equivalent to 2.5 cm. Fifteen cms is approximately equivalent to 6 inches or 0.5 foot.

PHASE V PDI WORK PLAN
ADDENDUM 5 – SMU 8 PECQ SEDIMENT SAMPLING

SUMMARY

The Record of Decision (ROD) for the Onondaga Lake bottom (NYSDEC and USEPA, 2005) specifies that areas of sediment management unit (SMU) 8 where the mean probable effects concentration quotient (PECQ) currently exceeds 1 will need to be thin-layer capped. Forty sediment sampling locations have been identified. Sediment samples need to be collected and analyzed from these 40 locations early during the 2010 field season so results are available to include in the design analysis of thin-layer capping for SMU 8 being prepared during 2010 for submittal to the agencies by late November 2010.

1.0 INTRODUCTION

This addendum describes sediment sampling and analyses to be conducted in SMU 8 as part of the Phase VI (2010) pre-design investigation (PDI) for Onondaga Lake. Unless otherwise stated, the activities described in this addendum will be conducted in accordance with the procedures outlined in the Phase I PDI Work Plan (Parsons, 2005a).

The overall purpose of the Phase VI PDI is to collect information required to conduct remedial design activities specified in the ROD. One of the remedial design activities for SMU 8 is to assess contaminant concentrations in shallow sediment to help determine if any additional remedial measures, such as additional thin-layer capping, will be needed in SMU 8. SMU 8 accounts for approximately 65 percent of the lake's sediment surface area where water depths exceed 9 meters (30 ft.).

2.0 PECQ SAMPLING SCOPE AND OBJECTIVES

The remedy for Onondaga Lake as specified in the ROD (NYSDEC and USEPA, 2005) includes placement of a thin-layer cap over areas of SMU 8 based on the following:

- Areas of sediment that currently exceed a mean PECQ of 1;
- Areas of sediment predicted to exceed the mercury probable effects concentration (PEC) of 2.2 parts per million (ppm) at the end of the 10-year monitored natural recovery (MNR) period (i.e., the year 2027 assuming dredging and capping are completed by late 2016); and
- Additional thin-layer capping areas as needed to implement the bioaccumulation-based sediment quality value (BSQV) requirement specified as part of the lake bottom remedy. As specified in the ROD, the BSQV of 0.8 mg/kg for mercury is a means to assess areas of the lake that may be contributing to exceedances of the fish tissue

remediation goals for the lake. As part of the remedy, the BSQV will be applied on an area-wide basis.

This work will provide additional data needed to refine delineation of areas of SMU 8 where the sediment mean PECQ exceeds 1 and to confirm that the sediment mean PECQ has not increased above 1 over time since the lake remedial investigation samples were collected beginning in 1992. The sampling focus is on sediment that could possibly affect aquatic life within the lake (i.e., the top 6 inches of sediment). Information from this work will be factored into the initial design for SMU 8 which is due to be submitted during November 2010.

Shallow sediment cores will be collected at 41 locations as shown on Figure 1. These sampling locations are adjacent to areas shown previously to have mean PECQs above 1, and they will provide widespread distribution throughout SMU 8 with emphasis on locations near the sources of chemical parameters of interest (CPOI) in the southern half of the lake. Twenty two of the 2010 sampling locations (shown in Figure 1) were sampled previously. Eight locations sampled during 1992 will be sampled again during 2010, and four of those eight locations to be sampled again (i.e., S85, S63, S32, and S31 from north to south) were not analyzed for polynuclear aromatic hydrocarbons (PAH) in 1992 (see Table 1).

The 0 to 4 cm and 4 to 15 cm intervals of sediment will be submitted for laboratory analyses. The top 4 cm represent the current mixed layer of sediment in SMU 8, as defined previously for the monitored natural recovery (MNR) model (Parsons, 2004). The top 15 cm represent the depth to which bioturbation might occur if overlying water became oxygenated. Samples will be analyzed for the chemical constituents used to quantify the PECQ: total mercury, ethylbenzene, xylenes, chlorinated benzenes, polynuclear aromatic hydrocarbons (PAHs), and total polychlorinated biphenyls (PCBs) based on Aroclors. In addition, results for benzene, toluene, and phenol will be reported. Each sample will also be analyzed for total organic carbon (TOC). Analyses will be conducted using standard United States Environmental Protection Agency (USEPA) methods and the Lloyd-Kahn procedure for TOC. Each of these laboratory methods has been employed previously within the Onondaga Lake PDI (see Table 2 for USEPA method numbers).

Figure 1 shows SMU 8 locations and mean PECQ results available to date for the top six inches of SMU 8 sediment. Results for SMU 8 shown on this figure are sediment results available from the top six inches or less analyzed for all of the elements and chemicals that make up the PECQ. Additional basis for quantifying mean PECQs at previously-sampled SMU 8 locations is presented in Table 1.

Note from Figure 1 that sediment mean PECQ values for much of SMU 8 are based on samples collected during 1992 from the 0 to 2 cm sediment depth interval. The 1992 results from the top 2 cm can be used to define areas of sediment that currently exceed a mean PECQ of 1. Three facts are important for demonstrating utility of the 1992 results:

(1) Based on historical operations, sediment deposited in SMU 8 since 1992 (four years after the last former Honeywell industrial operation ceased) is cleaner than sediment deposited during former Honeywell operations. Former Honeywell industrial operations at the Main Plant and at the Willis Avenue and Bridge Street plants were terminated by 1988. Furthermore, the most significant mercury releases were greatly reduced in 1970 and further reduced in 1977.

(2) There are four SMU 8 locations where sediment was collected in 1992 from 0 to 2 cm sediment depths and where sediment was later collected and analyzed in 2006 or 2007 (see concentric circles in Figure 1). Comparisons of mean PECQs at these four locations are as follows:

- North Basin (deep area): 1.6 during 1992 (0 to 2 cm), 0.55 during 2006 (0 to 15 cm), and 1.2 during 2007 (0 to 2 cm)
- South Basin near SMU 3: 1.1 during 1992 and 0.85 during 2006
- South Basin near SMU 3: 1.1 during 1992, 0.67 during 2006, and 0.89 during 2007
- South Corner (near middle): 1.1 during 1992 and 1.0 during 2006

(3) Total mercury concentrations in SMU 8 surface sediment are declining based on a comparison of results from 1992 with results from PDI work beginning in 2005. Throughout the South Basin and the North Basin, average sediment mercury concentrations in the top 2 cm have declined by over 50 percent from 1992 to 2005-2007. The decline in the South Basin was from 3.1 to 1.5 ppm (52 percent), while the decline in the North Basin was from 2.6 to 1.0 ppm (62 percent). The most recent results from the 2008 high-resolution cores are lower than the average results from 2005-2007.

Thus, the 1992 data from the top 2 cm do not underestimate the current mean PECQ and can be used to help delineate the area exceeding a mean PECQ of 1.

3.0 SAMPLING AND ANALYSIS PROCEDURES

3.1 Mobilization and Sample Location Positioning

The vessel to be used to collect the sediment samples will be a small barge similar to what was used to place microbeads within SMU 8 in 2009. The barge will be able to effectively collect surface sediment samples from throughout SMU 8.

Barge positioning and the determination of as-cored sample locations will be accomplished utilizing a real-time kinematic global positioning system (GPS) receiver (or equivalent) interfaced with a navigation and data logging system. Differential GPS coordinates and water depth will be reported for each sediment sampling location.

The gravity corer used successfully during the 2009 SMU 8 microbead marker work (Parsons, 2008) will be used to collect sediment samples for this effort. The diameter of the core barrel may need to be increased to provide sufficient sediment sample quantities for laboratory analyses.

Sediment samples will be collected during relatively calm wind conditions to the extent practical in order is to sample as close to each desired location as practical.

3.2 2009 SMU 8 Shallow Sediment Sampling

Sample management, equipment decontamination, and other field procedures not specified in this work plan will follow procedures provided in the *Onondaga Lake PDI Standard Operating Procedures* (Parsons, 2005b). Appendix A provides a sediment sampling and processing procedure updated from the procedure applied for Honeywell in recent SMU 8 sediment sampling efforts.

Corer penetration at each sample location will be to a depth of at least 9 to 12 in. below the top of sediment. SMU 8 shallow sediments are generally very soft and fluffy. Sample recovery with the selected gravity corer is expected to be at or near 100 percent. If shallow sediment samples cannot be collected to the desired depth or in a relatively undisturbed condition, the corer will be moved approximately 10 ft. to a new location where a second attempt will be made to collect a suitable sample. If the second attempt is also not successful, a third attempt will be made at a location approximately 10 ft. away from the original sample location in another direction.

4.0 HEALTH AND SAFETY

Parsons ranks health and safety as the highest priority. Parsons' *Project Safety Plan* (revised annually based on Parsons, 2005a, Appendix C) and subcontractors' safety plans will be used for this investigation and will be strictly followed by all personnel. Any task outside of the current scope defined in the *Project Safety Plan* will have a new job safety or activity hazard analysis completed before the work activity begins. Copies of the *Project Safety Plan* and the subcontractor safety plans will be maintained at the support zone onshore and on the sampling boat. The various relevant activity hazard analyses prepared for PDI work will be reviewed prior to initiating sample collection work.

This sampling will require personnel with 40-hour OSHA and 8-hour refresher training to operate under modified Level D personal protection.

5.0 QUALITY ASSURANCE

The support zone and other onshore facilities established during the Phase I/II PDI will be used for this PDI effort. Decontamination and waste management activities will be conducted as needed in accordance with *Phase I PDI Work Plan* (Parsons, 2005a, Appendix A). Laboratory procedures will be conducted in accordance with the *Phase I PDI Quality Assurance Project*

Plan (Parsons, 2005a, Appendix B). Field quality assurance and quality control will consist of the collection and analysis of field duplicates, and matrix spike/matrix spike duplicate samples in accordance with the *Phase I PDI Work Plan* (Parsons, 2005a). Since the samples will be collected from dedicated tubes/liners, rinse blanks will be collected at a rate of one per batch of dedicated sampling equipment.

6.0 SAMPLE AND DATA MANAGEMENT AND REPORTING

Sample names, quality assurance/quality control (QA/QC) procedures, sample collection, data entry, and data validation for this portion of the work will be conducted in accordance with the *Phase I PDI Work Plan* (Parsons, 2005a, Appendix A and Appendix B). Any deviations from these procedures will be discussed with the New York State Department of Environmental Conservation (NYSDEC) prior to execution of the work.

Analytical data generated during this investigation will be reviewed and validated for usability in accordance with pre-established data validation procedures summarized in the *Phase I PDI Work Plan* (Parsons, 2005a). The results will be incorporated into the Honeywell LocusFocus database following validation.

Once the sample collection and processing, laboratory analyses, and data evaluation efforts are completed, a data summary will be prepared and submitted to NYSDEC that describes results from this PECQ sampling effort.

7.0 REFERENCES

Honeywell, Parsons, and O'Brien & Gere (OBG). 2008. Honeywell Syracuse Portfolio Health and Safety Program. Updated June 2008.

NYSDEC and USEPA Region 2. 2005. *Record of Decision. Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site*. July 2005.

Parsons. 2004. *Feasibility Study Report for Onondaga Lake.* Prepared for Honeywell. November 2004. (MNR is described in detail in Appendix N.)

Parsons. 2005a. *Onondaga Lake Pre-Design Investigation: Phase I Work Plan*. Prepared for Honeywell. September 2005.

Appendix A *Phase I Sampling and Analysis Plan*

Appendix B *Quality Assurance Project Plan*

Appendix C *Project Safety Plan* Updated March 2007.

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TAMS Consultants and YEC, Inc. 2002. *Onondaga Lake Remedial Investigation Report.* Prepared for the State of New York Department of Environmental Conservation. Based on an original document prepared by Exponent for Honeywell. December 2002.

USEPA. 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* EPA-540-R-05-012. Office of Solid Waste and Emergency Response. OSWER 9355.0-85. December 2005.

Table 1
Summary of Mean PECQs to Date
for Onondaga Lake SMU 8 Sediment

Location ID	MEAN PECQ	Field Sample ID	Sample Date	Sample Depth	Mercury	Chlorinated Benzenes	PAHs	PCBs	BTEX
S102	0.86	S00640	9/16/1992	0-2 cm	X	X	NA	X	X
S103	0.69	S00604	8/11/1992	0-2 cm	X	X	X	X	X
S106	0.50	S00639	9/16/1992	0-2 cm	X	X	NA	X	X
S107	0.34	S00638	9/16/1992	0-2 cm	X	X	NA	X	X
S24	1.10	S00610	8/12/1992	0-2 cm	X	X	X	X	X
S25	0.94	S00611	8/12/1992	0-2 cm	X	X	X	X	X
S27	1.09	S00586	8/7/1992	0-2 cm	X	X	X	X	X
S30	0.70	S00647	9/17/1992	0-2 cm	X	X	NA	X	X
S31	0.68	S00649	9/17/1992	0-2 cm	X	X	NA	X	X
S32	0.50	S00648	9/17/1992	0-2 cm	X	X	NA	X	X
S33	0.47	S00651	9/17/1992	0-2 cm	X	X	NA	X	X
S40	0.78	S00587	8/7/1992	0-2 cm	X	X	X	X	X
S41	0.78	S00633	9/15/1992	0-2 cm	X	X	NA	X	X
S42	0.67	S00634	9/15/1992	0-2 cm	X	X	NA	X	X
S43	0.64	S00635	9/15/1992	0-2 cm	X	X	NA	X	X
S44	0.67	S00636	9/15/1992	0-2 cm	X	X	NA	X	X
S49	0.67	S00632	9/15/1992	0-2 cm	X	X	NA	X	X
S50	0.88	S00631	9/15/1992	0-2 cm	X	X	NA	X	X
S51	0.56	S00585	8/7/1992	0-2 cm	X	X	X	X	X
S52	0.77	S00630	9/15/1992	0-2 cm	X	X	NA	X	X
S56	1.09	S00588	8/7/1992	0-2 cm	X	X	X	X	X
S57	1.14	S00622	9/14/1992	0-2 cm	X	X	NA	X	X
S58	0.84	S00623	9/14/1992	0-2 cm	X	X	NA	X	X
S59	0.65	S00626	9/14/1992	0-2 cm	X	X	NA	X	X
S60	0.85	S00629	9/15/1992	0-2 cm	X	X	NA	X	X
S63	0.81	S00658	9/18/1992	0-2 cm	X	X	NA	X	X
S64	0.45	S00657	9/18/1992	0-2 cm	X	X	NA	X	X
S65	0.42	S00656	9/18/1992	0-2 cm	X	X	NA	X	X
S69	0.76	S00659	9/18/1992	0-2 cm	X	X	ND	X	X
S70	0.51	S00597	8/10/1992	0-2 cm	X	X	X	X	X
S78	0.66	S00662	9/18/1992	0-2 cm	X	X	NA	X	X
S79	0.49	S00654	9/17/1992	0-2 cm	X	X	NA	X	X
S80	0.37	S00652	9/17/1992	0-2 cm	X	X	NA	X	X
S85	0.86	S00664	9/18/1992	0-2 cm	X	X	NA	X	X
S86	0.99	S00606	8/11/1992	0-2 cm	X	ND	X	X	ND
S88	0.65	S00663	9/18/1992	0-2 cm	X	X	NA	X	X
S89	0.82	S00661	9/18/1992	0-2 cm	X	X	NA	X	X
S90	0.67	S00605	8/11/1992	0-2 cm	X	X	X	X	X
S91	0.67	S00660	9/18/1992	0-2 cm	X	X	NA	X	X
S96	0.73	S00645	9/16/1992	0-2 cm	X	X	NA	X	X
S97	1.64	S00644	9/16/1992	0-2 cm	X	X	NA	X	X
S98	0.63	S00643	9/16/1992	0-2 cm	X	X	NA	X	X
S99	0.58	S00642	9/16/1992	0-2 cm	X	X	NA	X	X
S302	0.83	SF0048	8/12/2000	0-15 cm	X	X	X	X	NA
S303	0.79	SF0038	8/12/2000	0-15 cm	X	X	X	X	NA
S327	1.71	SF0099	8/5/2000	0-15 cm	X	X	X	X	X
S354	0.87	SF0155	8/10/2000	0-15 cm	X	X	X	X	X
S355	0.92	SF0157	8/10/2000	0-15 cm	X	X	X	X	X

PECQ - probable effects concentrations quotient as defined on page 37 of the lake bottom ROD (NYSDEC and USEPA; 2005)
X - included in PECQ calculation
A blank entry indicates the analyte was not analyzed. "Naph only" indicates only naphthalene was analyzed.
ND - analyzed but not detected (and not included in PECQ calculation)

Table 1
Summary of Mean PECQs to Date
for Onondaga Lake SMU 8 Sediment

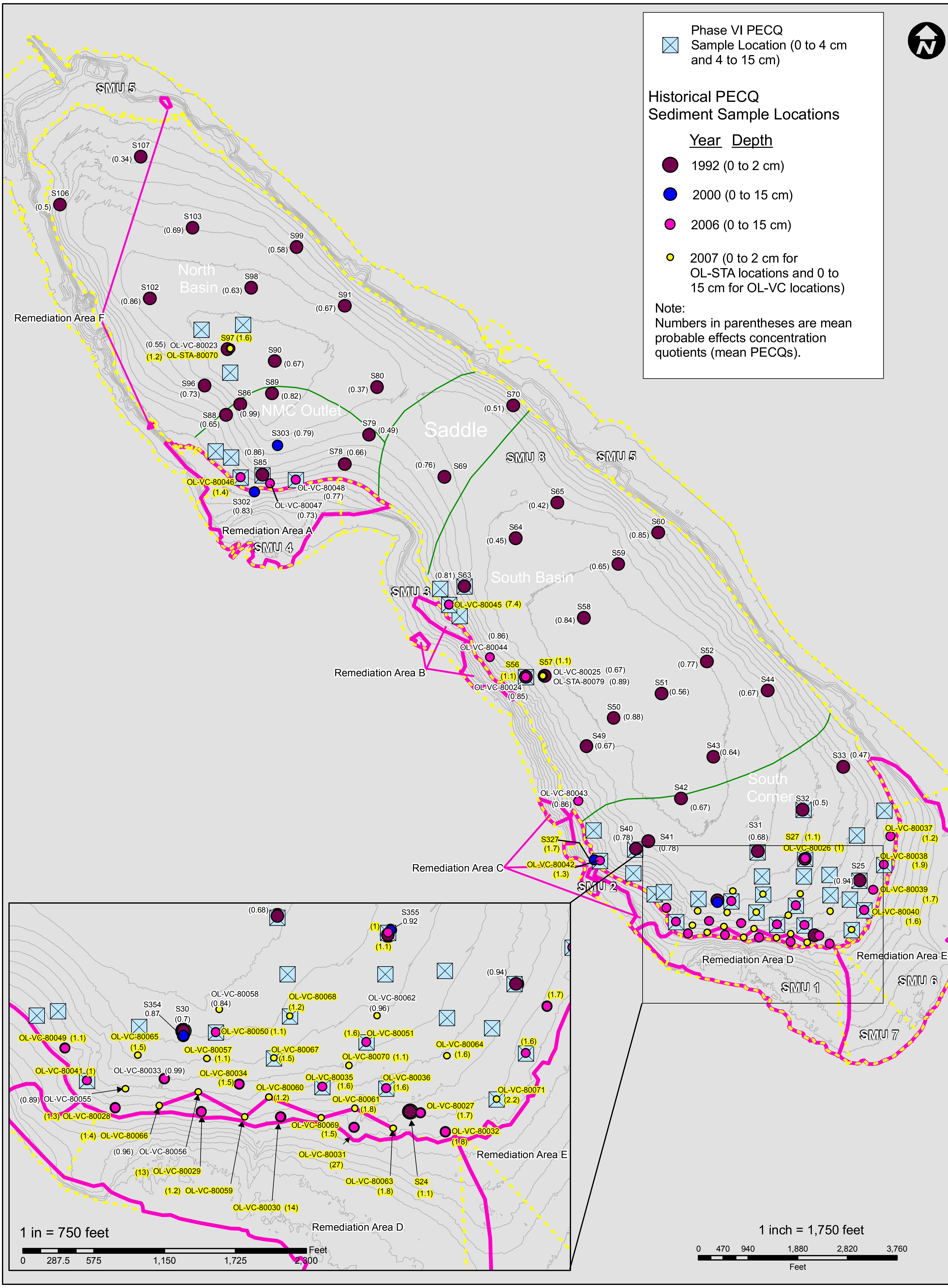
Location ID	MEAN PECQ	Field Sample ID	Sample Date	Sample Depth	Mercury	Chlorinated Benzenes	PAHs	PCBs	BTEX
OL-STA-80070	1.20	OL-0462-09	11/12/2007	0-2 cm	X	X	X	X	X
OL-STA-80070	2.45	OL-0462-10	11/12/2007	2-4 cm	X	X	X	X	X
OL-STA-80070	5.10	OL-0462-11	11/12/2007	4-10 cm	X	X	X	X	X
OL-STA-80070	1.79	OL-0462-12	11/12/2007	10-15 cm	X	X	X	X	X
OL-STA-80079	0.89	OL-0462-13	11/12/2007	0-2 cm	X	X	X	X	X
OL-STA-80079	1.18	OL-0462-14	11/12/2007	2-4 cm	X	X	X	X	X
OL-STA-80079	2.03 / 1.33	OL-0462-15	11/12/2007	4-10 cm	X	X	X	X	X
OL-STA-80079	10.7	OL-0462-16	11/12/2007	10-15 cm	X	X	X	X	X
OL-VC-80023	0.55	OL-0207-17	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80024	0.85	OL-0207-02	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80025	0.67	OL-0207-03	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80026	1.04	OL-0207-04	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80027	1.68	OL-0207-05	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80028	1.30	OL-0207-10	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80029	12.5	OL-0207-18	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80030	13.8	OL-0208-06	10/9/2006	0-15 cm	X	X	X	X	X
OL-VC-80031	26.7	OL-0210-01	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80032	1.79	OL-0210-09	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80033	0.99	OL-0210-16	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80034	1.50	OL-0211-06	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80035	1.55	OL-0211-13	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80036	1.55	OL-0215-01	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80037	1.17	OL-0206-01	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80038	1.89	OL-0206-03	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80039	1.65	OL-0206-05	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80040	1.62	OL-0206-07	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80041	1.03	OL-0205-03	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80042	1.27	OL-0205-01	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80043	0.86	OL-0204-16	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80044	0.86	OL-0204-14	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80045	7.39	OL-0204-12	10/7/2006	0-15 cm	X	X	X	X	X
OL-VC-80046	1.41	OL-0206-09	10/7/2007	0-15 cm	X	X	Naph only	NA	X
OL-VC-80047	0.73	OL-0207-06	10/9/2007	0-15 cm	X	X	Naph only	NA	X
OL-VC-80048	0.77	OL-0207-08	10/9/2007	0-15 cm	X	X	Naph only	NA	X
OL-VC-80049	1.09	OL-0206-11	10/7/2007	0-15 cm	X	X	X	X	X
OL-VC-80050	1.12	OL-0215-09	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80051	1.56	OL-0217-01	10/10/2006	0-15 cm	X	X	X	X	X
OL-VC-80055	0.89	OL-0369-09	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80056	0.96	OL-0369-06	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80057	1.10	OL-0369-10	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80058	0.84	OL-0369-08	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80059	1.20	OL-0369-07	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80060	1.21	OL-0369-04	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80061	1.79	OL-0369-02	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80062	0.96	OL-0369-05	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80063	1.84	OL-0369-01	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80064	1.59	OL-0369-03	8/17/2007	0-15 cm	X	X	X	X	X
OL-VC-80065	1.46	OL-0376-01	8/22/2007	0-15 cm	X	X	X	X	X
OL-VC-80066	1.39	OL-0376-02	8/22/2007	0-15 cm	X	X	X	X	X
OL-VC-80067	1.48	OL-0374-03	8/21/2007	0-15 cm	X	X	X	X	X
OL-VC-80068	1.19	OL-0374-04	8/21/2007	0-15 cm	X	X	X	X	X
OL-VC-80069	1.51	OL-0374-02	8/21/2007	0-15 cm	X	X	X	X	X
OL-VC-80070	1.11	OL-0374-01	8/21/2007	0-15 cm	X	X	X	X	X
OL-VC-80071	2.22	OL-0374-05	8/21/2007	0-15 cm	X	X	X	X	X

PECQ - probable effects concentrations quotient as defined on page 37 of the lake bottom ROD (NYSDEC and USEPA; 2005)
X - included in PECQ calculation
A blank entry indicates the analyte was not analyzed. "Naph only" indicates only naphthalene was analyzed.
ND - analyzed but not detected (and not included in PECQ calculation)
NA - not analyzed

TABLE 2

SMU 8 PECQ SEDIMENT SAMPLING AND ANALYSIS SUMMARY FOR 2010

Sampling Locations	See Figure 1
Sample Collection Method	A particular gravity corer with a polycarbonate tube having a diameter large enough to collect sample volume needed to conduct laboratory analyses (see Figure 2)
Number of Sample Locations	41
Sample Depth Intervals for Analyses (2 depth intervals at each location)	0 to 4 cm (0 to 1.6 in.) and 4 to 15 cm (1.6 to 6 in.)
Field Observations	Standard classification
Laboratory Analyses (80 matrix samples)	Total mercury (Method USEPA SW7470A or 7471A) Volatile Organic Compounds: ethylbenzene, xylenes, benzene, toluene, and chlorinated benzenes (USEPA 8260) Semi-Volatile Organic Compounds: PAHs and phenol (USEPA 8270) PCB Aroclors (USEPA 8082) TOC (Lloyd Kahn)
Quality Assurance Samples (field duplicates, matrix spikes, and matrix spike duplicates	Four sets for mercury, VOC, PAH, and PCB Aroclor analyses



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4 ft. Bathymetric Contour

NYSDEC Demarcation for SMU 8

SMU Boundary

Preliminary Potential Remediation Area in Littoral Zone-Final Delineation To Be Determined

(1.2) OL-VC-80030 Sample Locations Where Mean PECQ is 1 or Higher

NOTES

1. Bathymetry in 4 ft. intervals.
2. Water depth based on average lake elevation of 362.82 feet.

FIGURE 1

Honeywell

Onondaga Lake
Syracuse, New York

Phase VI (2010) PDI
SMU 8 PECQ Sediment Sample Locations

PARSONS

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Figure 2

Honeywell

Gravity Corer for SMU 8
Sediment Sampling

PARSONS

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APPENDIX A

STANDARD OPERATING PROCEDURE (SOP) FOR SMU 8 SEDIMENT CORE SAMPLING AND FOR PROCESSING SEDIMENT SAMPLES BY DEPTH

A.1 SMU 8 SEDIMENT SAMPLING PROCEDURE

Based on assessing numerous types of sediment cores for SMU 8-related sampling work, a particular gravity corer was selected and used beginning in 2009 to collect sediment samples from the upper few inches of SMU 8 sediment for microbead placement analyses. The selected gravity corer is manufactured by Eijkelkamp, The Netherlands, and was pre-tested extensively in SMU 8 during 2009. The gravity corer consists of a frame with strengthening ribs, falling weight and sampler. This corer was selected due to its ability to collect samples while not disturbing the surface sediment.

The gravity corer collects sediment samples approximately 2 to 4 inches in diameter that are relatively undisturbed. Weights can be placed over the gravity corer as needed to improve penetration into the sediment. Using a hoisting unit on board of a boat, the sampler can be lowered in free fall. By its own weight and velocity, the apparatus penetrates the submerged soil. The depth of penetration is in part determined by the composition of the submerged soil. Two different cores may need to be collected from each location to provide sufficient quantity of sample for the specified laboratory analyses.

Sample handling, equipment decontamination, and sample management is to be conducted as described in the appropriate standard operating procedures (SOPs) developed for Onondaga Lake PDI work (Parsons, 2005a and b). Suitable gloves are to be used while handling the corer to minimize any potential cuts or scrapes.

1. Check corer condition prior to each use.
2. Measure water depth.
3. Securely attach the corer to a winch with cable or line of sufficient strength to accommodate the weight of the sampler, any additional weights, and sediment to be sampled.
4. Slowly lower the corer using a winch and A-frame or boom arm through a moon pool or over the side of the vessel. Maintain tension on the corer to keep it vertical.
5. After the corer contacts the sediments on the bottom, relax the tension as needed to allow the corer to penetrate into the sediment.
6. Place tension on the cable/line and slowly retrieve the corer and sediment sample.

7. Discard the sample if sample recovery is lower than approximately 90 percent of if there is any sign of sample washout.
8. Set the corer into a bracket on the boat deck to hold the corer in a stable vertical position.
9. Record observations about the suitability of the sample including penetration depth, sample depth, presence of any debris, bubbles, coloring, or evidence of agitation due to sample collection. Also, record any evidence that the surface sediment is undisturbed and intact (e.g., any different color or texture and corresponding depth).
10. Carefully siphon off excess water and cap the top of each tube while minimizing head space.
11. Cap the lower ends of the sediment core tube with a re-usable or disposable cap.
12. Wipe the outside of each tube.
13. Remove the core from the corer apparatus.
14. Seal the top end with a cap.
15. While maintaining the sediment core tube in a vertical position, record any visual variations in sediment characteristics with depth.
16. Label the outside of each core tube with the sample identification (ID) and core orientation with an up arrow. Label the top cap with the sample ID.
17. Maintain cores in a vertical position while transporting to a processing facility.
18. Decontaminate the corer as needed and discard any excess sample in accordance with PDI SOPs established previously. Place any unused sediment residual in an appropriate container on the boat for transfer to shore and proper disposal as non-hazardous waste.

A.2 SMU 8 SEDIMENT SAMPLE PROCESSING (SEGMENTING)

This procedure describes how sediment samples will be segmented from each collected sediment core. Samples for chemical analysis to further assess PECQs are to be discrete depth sections with no transferring of sediment between subsections. This segmenting is essential to obtain accurate depth profiles, and it was tested and used successfully during 2009 to document the presence of microbead markers at various SMU 8 locations.

Contact between sampler gloves and sample must be avoided. For each sample location, the procedure for processing the tubes of sediment is as follows:

<u>Preparation of sediment cores for sub-sampling</u>

Prior to sub-sampling the collected sediment cores, remove the overlying water. Additionally, photograph and document characteristics of each sediment core with particular detail being paid to the following:

- Evidence of disturbance to sediment core, particularly due to gas escaping from the sediment during or after collection.
- Physical features, such as presence of varves (annually laminated sediments).
- Record total sediment depth (or top of sediment position) within each tube and also any settling which may occur between the time sediment depth is recorded on the boat and the time when the samples are processed onshore.

Sample processing procedure

1. Carefully and slowly siphon overlying water from each core using a clean, plastic syringe (or equivalent). Note that the siphoning speed can be adjusted by raising or lowering the discharge hose with the slowest speeds experienced when the discharge is just below the water level inside the core tube. Do not elevate the discharge hose to a level above that of the water in the core tube because this may cause the siphon to reverse direction and cause a jet of water to be directed onto the sediment surface. Slight disturbance of the sediment at or near the outside rim of each core is acceptable when siphoning water, however it is essential that the surface sediment in the center of the core remains undisturbed. Decontaminate the siphoning syringe between each core section in accordance with the appropriate Phase I PDI SOP provided in Parsons, 2005b.

2. Remove the bottom cap of the core and insert a PVC plug into the base of the tube to allow the tube and its contents to be placed on a pedestal. Slowly push down the tube on the pedestal forcing the sediment to be pushed up to extract the necessary intervals.

3. While on the pedestal, use a pre-cut piece of tube measured to the appropriate sample thickness (i.e., 4 cm for the 0 to 4 cm depth interval and 11 cm for the 4 to 15 cm depth interval). Place the pre-cut tube on top of the core tube, and then pull down to extract the sediment into the pre-cut piece. Next, insert a putty knife at the bottom of the pre-cut piece. After inserting the putty knife, the pre-cut piece should be easily removed with little or no loss of sediment. This method of extraction ensures that the proper sample interval is collected and analyzed.

4. Place a small amount of sediment from each of the two depth intervals into the appropriate VOC jar with zero headspace. Be cautious not to collect any sediment that was touching the sides of the sample core tube.

5. Place the remaining sample and putty knife into a clean aluminum pan.

6. To provide the lab with an uncompromised sample, remove the center portion of the sample by inserting a clean, small-diameter plastic tube into the sediment. Remove the outer pre-cut tube and wipe clean from the inner portion of the tube the sediment on the perimeter.

7. Transfer the sediment sample to a clean aluminum pan to homogenize the sediment within a particular sampling interval from a single sampling location. Designate one pan for the 0 to 4 cm vertical interval and another pan for the 4 to 15 cm vertical interval.

8. Homogenize the sediment using plastic spoons or nitrile-gloved hands.

9. Weigh the sediment and place it into appropriate jars for laboratory analysis. Note the chemical laboratory needs approximately 400 grams of sediment to analyze for mercury, PAHs, PCBs, and TOC. Notify the laboratory if sample weights are 400 grams or less. After all sample jars are filled, composite any remaining sediment into an extra sample jar.

10. Place individual subsamples into appropriate jars provided by the laboratory conducting the chemical analyses and label each jar and chain-of-custody.

11. Either send the jarred samples to the laboratory that day or refrigerate at 4 degrees Centigrade as soon as practical.

The above procedure is to be continued until all sample intervals have been processed, ensuring thoroughly clean equipment is used for each core. Any unused sediment is to be properly managed in accordance with the appropriate PDI SOP established previously.

Additional Reference:

Mudroch, A. and S.D. MacKnight (editors). 1994. *Handbook of Techniques for Aquatic Sediments Sampling*. Lewis Publishers (CRC Press). Second edition.