ONONDAGA LAKE PRE-DESIGN INVESTIGATION: PHASE I WORK PLAN

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PHASE I WORK PLAN

INTRODUCTION

Onondaga Lake is a 4.6-mi^2 (2900-acre) lake located northwest of the City of Syracuse in central New York State (Figure 1). The Lake, its tributaries, and the upland hazardous waste sites related to the Lake that were affected by former Honeywell operations have been identified as a federal Superfund site on USEPA's National Priorities List (CERCLIS NYD986913580). A remedial investigation (RI) was completed in 2002 and a feasibility study (FS) was completed in November 2004 for Onondaga Lake. Additional investigation and design efforts are now required to move forward with the selected remedial actions. Additional details regarding the site can be found in the FS (Parsons, 2004).

NYSDEC and USEPA issued a Record of Decision (ROD) on July 1, 2005. The ROD describes the recommended remedy for Onondaga Lake. Primary components of the remedy, as detailed in the ROD, are dredging, isolation and thin-layer capping, monitored natural recovery (MNR), sediment placement and consolidation in an upland sediment consolidation area (SCA), water treatment, oxygenation pilot testing, and habitat enhancements.

Before any of these measures are implemented, additional information is required to allow detailed design of the remedy. This information will be collected in a phased Pre-Design Investigation (PDI). This document is the Phase I PDI Work Plan; it describes the tasks related to the Phase I PDI. It is anticipated that Phase I of the PDI will be conducted during 2005 (field work) and early 2006 (reporting). Additional phases of the PDI may be required following completion of Phase I activities. These tasks will be detailed in subsequent work plan submittals.

Pre-design work usually commences after execution of a consent order that specifies the necessary remedial activities. However, Honeywell is committed to working with NYSDEC to expedite remedial activities associated with the Lake. Therefore, Honeywell is voluntarily proceeding with the activities described here before execution of a consent order.

This Phase I PDI Work Plan provides an overview of the activities that will be completed during Phase I. Sample types, locations, numbers, and field methods for the field work activities are provided in the Sampling and Analysis Plan (SAP, Appendix A). The chemical analysis of samples, data management, and laboratory requirements are listed in the Quality Assurance Project Plan (QAPP, Appendix B). Field activities will be conducted in accordance with the Project Safety Plan (PSP, Appendix C). The testing conducted as part of the emissions and odor evaluation is outlined in a work plan (Appendix D).

PROJECT OBJECTIVES

The main purpose of the PDI is to collect information required to conduct remedial design activities. The scope of the Phase I activities was prioritized to address issues that have the

largest potential impact on the remedy or the upcoming schedule. A summary of those issues and objectives includes the following: bathymetric and geophysical surveys for more recent site data, sediment sampling for chemical concentrations and MNR evaluations, geotechnical sampling for stability concerns in SMU 1, porewater samples to evaluate various sample collection methods and groundwater discharge, surface water samples to evaluate impacts from Wastebeds 1 through 8, sampling to evaluate the presence of NAPL in SMU 2, and geotechnical and bench scale testing for treatability, settling, elutriate, consolidation and emissions and odor. More details regarding the location and primary activities are outlined on Table 1.

In addition, a settlement pilot test related to construction of the SCA at Wastebed 13 commenced on August 16, 2005. The activities associated with this pilot test were detailed in a separate work plan.

INVESTIGATION ACTIVITIES

As part of the FS, Onondaga Lake was divided into eight SMUs based on water depth, sources of water entering the Lake, ecological and chemical risk drivers, and other factors (Figure 2). The scope of the Phase I PDI was determined by ranking the pre-design activities and their potential impact on the remedy and schedule.

OVERVIEW OF FIELD WORK ACTIVITIES

The Phase I PDI scope of work includes the following:

- Lake bottom profiling, including geophysical and bathymetric surveys
- Sediment investigations for chemical characterization, including surface sediment sampling using grab and tube sampling techniques, and subsurface sediment sampling using coring and drilling techniques
- Geotechnical investigations using cone penetrometer tests (CPT), standard penetration tests (SPT), vane shear tests, triaxial strength testing, seepage-inducted consolidation testing (SICT), odometer consolidation tests, and index testing collected with both disturbed and undisturbed sediment sampling techniques and grab sample techniques
- Porewater and surface water sampling
- NAPL evaluation using sediment borings, a membrane interface probe (MIP), and associated sampling and analyses
- Deep borings along the proposed offshore barrier wall alignment (currently under consideration by Honeywell and NYSDEC)
- Groundwater discharge evaluation
- Column settling and effluent elutriate testing
- Supernatant characterization and treatability testing
- Bulk sampling for odor and emissions evaluations.

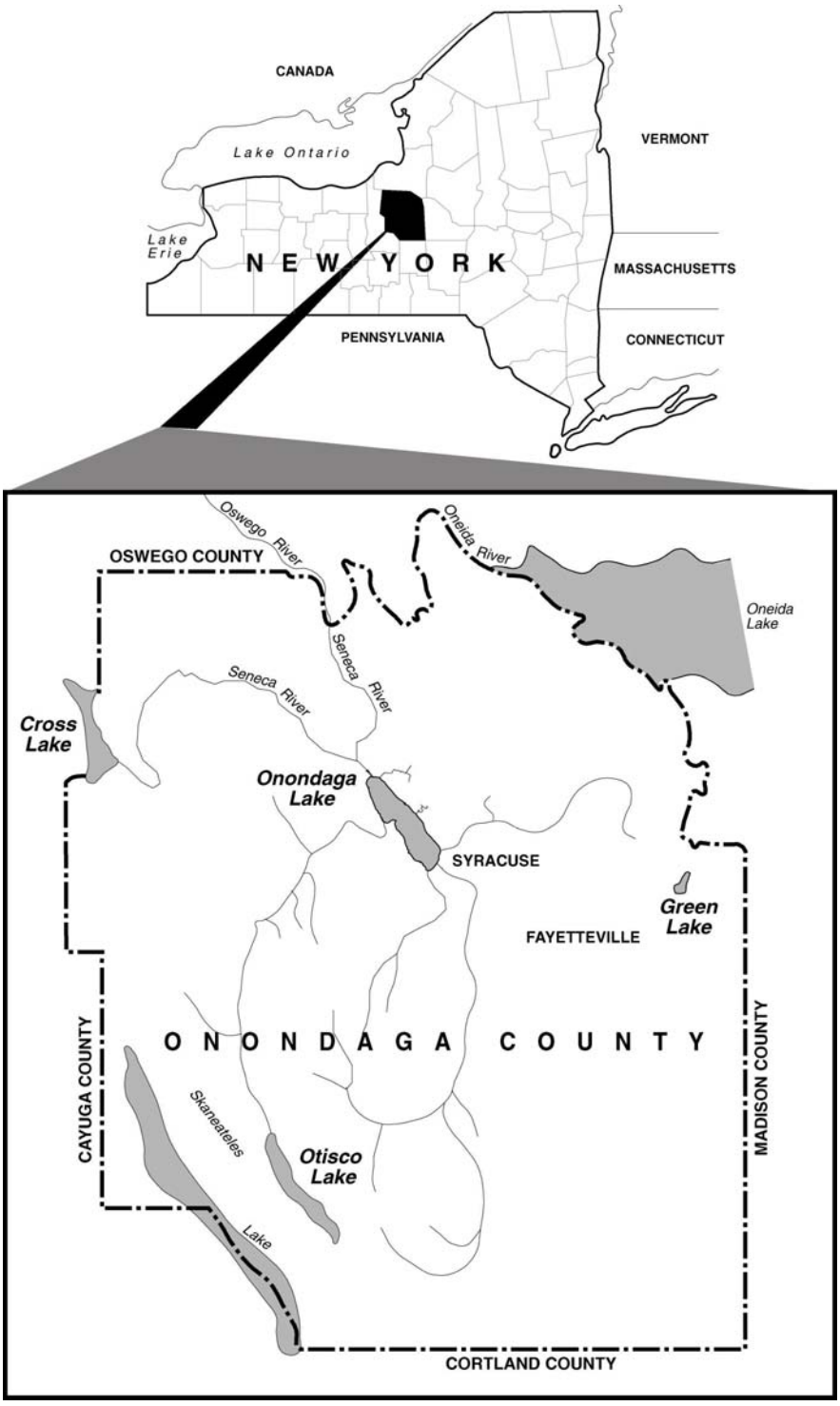
Phase I tasks and the purpose for conducting these tasks are outlined in Table 1. Each task and its primary objective is summarized in subsequent sections of this work plan.

TABLE 1

Onondaga Lake Pre-Design Investigation
Phase I Task Summary

TASK	PURPOSE	LOCATION	PRIMARY ACTIVITY
Bathymetry and Geophysical Surveys (side scan sonar, magnetometry, sub-bottom profiling)	Update lake bathymetry from 1992	Lakewide	Single-beam bathymetric survey, sub-bottom profiling, high-resolution magnetometry, and side-scan sonar on transects from 25 to 200-ft spacing with varying frequency settings as required.
	Required for dredge volume and cap design calculations		
	Required for debris survey		
	Development and implementation of the lakewide habitat restoration plan		
	Assist in sample layout and sediment identification		
Nearshore Sediment Chemical Delineation and Geotechnical Properties	Refine dredge volumes and cap areas	SMU 3, 4, 6, 7	Shallow (13 or 20 ft) sediment Vibracore samples analyzed for CPOIs and geotechnical index properties. Deeper borings (33 ft) for stratigraphic profile. Seepage-induced consolidation at select locations.
	Compare barrier wall to targeted dredging in SMU 7		
	Volumes needed for SCA design		
Shallow Chemical Delineation/ Stability of ILWD	Refine dredge volumes and cap areas	SMU 1	Shallow (13 or 20 ft) cores analyzed for CPOIs and geotechnical index testing, deeper (72 ft) cores for geotechnical properties, and CPT locations.
	Volumes needed for SCA design		
Surface Sediment Sampling	Geotechnical properties of surface sediment to use with vane shear results	SMU 3, 4, 6, 7, 8	Surface sediment samples for mercury and geotechnical properties (Vane Shear locations)
	Compare results to existing data to verify current assumptions and identify trends		
Geotechnical/bench-scale testing (settling, elutriate, consolidation, supernatant treatability)	Test results required for operational design of SCA	SMU 1, 6, 7	Bulk sediment samples from various SMUs. Column settling test to estimate SCA settling rates, elutriate test for water quality, and supernatant treatability tests.
Porewater Method Evaluation/Sampling	Determine most appropriate porewater collection techniques	SMU 1, 6	*In situ* and *ex situ* porewater sample collection and analysis for selected CPOIs.
	Utilize suitable site-specific porewater data for input to cap model and design		
Extent/mobility of NAPL	To determine extent and mobility of NAPL	SMU 2	Borings and MIP work coupled with confirmatory chemical analysis of sediments, CPT locations, and geotechnical borings.
	Provide further data to more accurately estimate removal volume		
Bench Scale Emissions and Odor Test and Meteorological Station	Provides data for SCA operational design	SMU 1, 6, 7	Bench scale testing to evaluate emissions and odors from dredged sediments.
	Provide data (in advance of site activities) to interpret/evaluate future odors/emissions from SCA and the Lake		
Groundwater Discharge Evaluation	Calibrate/evaluate assumptions in groundwater model	SMU 3, 4, 6, 7	Deep borings for stratigraphy, porewater sampling for cations/anions (from centrifuged sediment), and shallow water seepage meter installations.
	Quantify groundwater velocities for cap evaluation and design		
	Evaluate seepage meters		
Surface Water Sampling	Identify potential impacts from WB 1-8 to the Lake	SMU 3	Collect surface water samples and analyze for VOCs.

ILWD: In-Lake Waste Deposit
CPT: Cone Penetrometer Test
SCA: Sediment Consolidation Area
MIP: Membrane Interface Probe
SMU: Sediment Management Unit
CPOI: Chemical Parameter of Interest



Source: Modified from TAMS 2002c.

FIGURE 1

Honeywell

ONONDAGA LAKE
SYRACUSE, NEW YORK

LOCATION OF ONONDAGA LAKE

PARSONS

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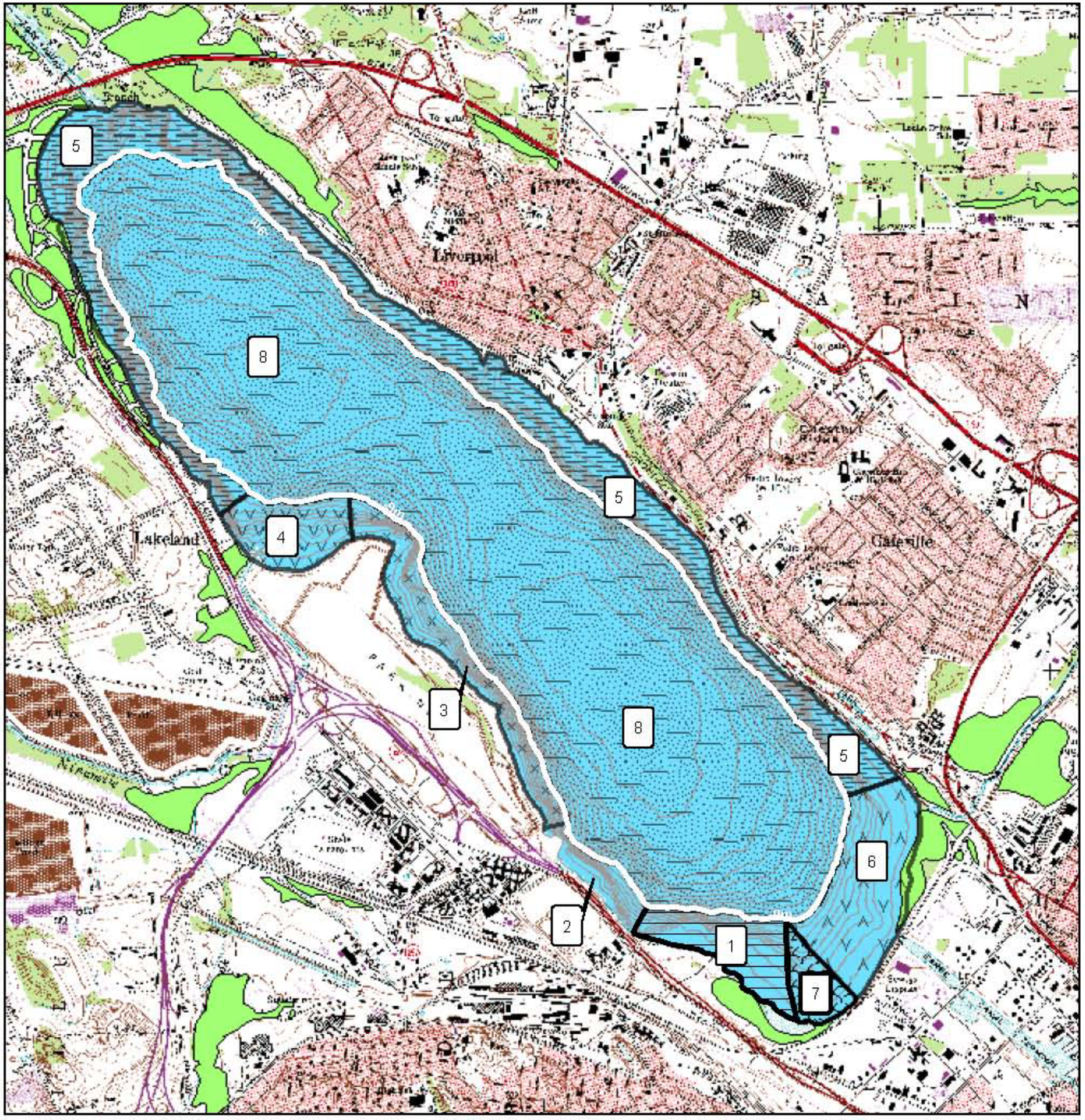
P:\Honeywell -SYR\441797\09 Reports\9.1 Work Plan\Final WP\ 9-1-05\PDI WP Figure 1.ppt



1 SMU 1 - In-Lake Waste Deposit (ILWD)

2 SMU 2 - Causeway Littoral Area

3 SMU 3 - Wastebeds 1-8 Littoral Area

4 SMU 4 - Mouth of Ninemile Creek Littoral Area

5 SMU 5 - Northern Shore Littoral Area

6 SMU 6 - Ley Creek to Onondaga Creek Littoral Area

7 SMU 7 - 700 Feet South of Onondaga Creek to ILWD

8 SMU 8 - Profundal Zone

NOTES

1. Bathymetric contour (9 meter) highlighted in white

2. Boundary between littoral and profundal zone is the 9 meter contour.

0 1,500 3,000

Feet

1:39,000

N

FIGURE 2

Honeywell

Onondaga Lake
Syracuse, New Y

SEDIMENT MANAGEMENT UNITS (SM

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LAKE BOTTOM PROFILING

Bathymetric Survey

A bathymetric survey will be conducted throughout Onondaga Lake to provide an accurate representation of the depth and morphology of the Lake bottom relative to known horizontal and vertical data. Data will be collected using a precision echo sounder linked to a digital global positioning system (GPS) to obtain accurate geographic locations and digital water depths at each sounding. This information will be used for remedial evaluation, graphic support, and design purposes.

Geophysical Investigation

A lakewide geophysical survey will be conducted using remote sensing technology to obtain current sub-bottom stratigraphy, magnetic field intensity, and geomorphological data. These data will be used to interpret subsurface geological conditions for evaluation and design of remedial alternatives. The data can also be used to identify subsurface utilities or debris at future sampling and dredging locations and to identify potential cultural resources. The survey will be conducted using instruments linked to a digital GPS for accurate geographic locations. The following lakewide geophysical activities will be conducted as part of the Phase I PDI:

Sub-bottom profiling to detect and map surficial lakebed features and the subsurface stratigraphic sequence of the sediments

Magnetometry to locate buried ferrous metallic debris, pipelines, or other obstructions that may affect field efforts

Sidescan sonar to evaluate surficial sediment texture and uniformity and to identify surficial debris, pipelines, or other obstructions that may affect remedial efforts.

SEDIMENT INVESTIGATION

Surface and subsurface sediments will be sampled using a variety of methods to obtain representative samples for geotechnical and chemical analyses. The details regarding each sample station are outlined in the SAP. Sampling methods will include the following:

Vibracoring (sediment core sampling) for chemical analysis, geotechnical index properties, column settling tests, water quality evaluations, and odor and emissions testing

Drilling (split spoon sampling, Shelby tube sampling, and lexan/aluminum tubes) for chemical and geotechnical analysis

Surface grab sampling (various clam shell, box core, gravity core, and push tube samples) for chemical analysis and geotechnical index testing

Vane shear testing for determining undrained shear strength properties of the sediment

Cone penetrometer testing (CPT) for geotechnical analysis

Membrane interface probe (MIP) for NAPL screening and mobility evaluation.

Geotechnical Investigation

Each SMU has specific data needs and identified data gaps to fill. The primary objective of the geotechnical investigation is to evaluate physical sediment characteristics in each SMU. The following sampling and tests will be conducted at the SMUs as needed:

Discrete sediment samples will be collected using methods including grab sampling, vibracores, and borings. Grab samples from shallow sediments to a depth of 1 ft will be used for index testing including grain size distribution measurements and other physical analyses. Vibracore samples from shallow to moderate depths up to 20 ft will also be used for index testing and other physical analyses. Split-spoon samples from borings will be used to measure density (with the SPT) and to collect disturbed samples. Shelby tube samples from borings will collect undisturbed samples for such analyses as oedometer (soil compression and swelling) consolidation tests, and triaxial strength tests. Both disturbed and undisturbed samples will be analyzed for SICT and index tests. SICT results will provide compressibility characteristics of the tested sediments.

Cone penetrometer testing will be conducted by pushing a cone that measures sidewall friction and tip resistance on the end of small diameter drill rods. Additionally, pore water pressure measurements will be collected during testing. The data will be used to determine the stratigraphy, relative density, and strength of the sediment.

Vane shear tests will be conducted to measure the *in situ* undrained shear strength and the residual shear strength of the clay and silt sediments.

Chemical Characterization

Sediment samples will be collected and analyzed in several SMUs to identify chemical concentrations. The results will be used in conjunction with other data to refine the areas subject to dredging and/or capping. Sediment samples will be collected using a variety of methods depending on the type of analysis and the sample depth. Some analyses require sediments that are undisturbed and that have not been exposed to oxygen. These will require special handling during collection and shipment. Each sampling method will yield varying sediment volumes and have different capabilities. The sampling methods discussed in the SAP include the following:

Surficial grab equipment will yield samples from the sediment surface to 1 ft in depth, depending upon the sampler used.

Vibracores will yield samples from shallow to moderate depths (up to 20 ft).

Borings will yield samples from shallow to deep depths (SMU 2 NAPL Investigation only).

Sediment samples will be analyzed for some or all of the following parameters:

Mercury	
Target Compound List of VOCs	SMU Specific*
Target Compound List of SVOCs/PAHs	SMU Specific*
Total PCBs	
Total organic carbon/dissolved organic carbon	

* - Refer to Section A.3.2.2 in the SAP for specific list of VOCs for each SMU

Field measurements may also be collected for alkalinity, pH, temperature, oxidation-reduction potential, and dissolved oxygen.

NAPL Evaluation

A Membrane Interface Probe (MIP) will be used at several locations adjacent to other borings to evaluate the potential use of this technology for NAPL identification. The MIP is an innovative field analytical method, therefore it is uncertain whether the results will be sufficient to differentiate between responses representative of residual versus potentially mobile NAPL. Additional investigation to refine the extent of potentially mobile NAPL may be required in subsequent phases of the PDI.

Column Settling Tests and Effluent Elutriate Testing

Column settling tests (CST) and effluent elutriate tests (EET) will be performed on samples from SMUs 1 and 6 to evaluate settling and water quality. Results from these tests will be used for dredging and SCA design.

Supernatant Treatability Testing

Bulk sediment samples will be collected from SMU 1 to characterize and estimate the treatability of the supernatant from the SCA during dredging operations. Results from the treatability testing will be used to support design of the SCA and water treatment system. One composite sample will be collected from several locations in SMU 1 using a Vibracore.

Bulk Sampling for Odor and Emissions Evaluations

Bench-scale tests of bulk sediment samples from SMUs 1, 6, and 7 (where dredging is currently proposed) will evaluate the potential for odor and emissions. Data from these tests will be used to develop a worst-case assessment of potential odors and emissions. A weather station will also be installed at Wastebed 13 to gather the data necessary to model the movement of odors and emissions during the next phase of work. The details regarding the odor and emissions evaluations are outlined in Appendix D of this work plan.

SURFACE WATER AND POREWATER SAMPLING

Bulk surface water samples will be collected from various SMUs for the odor and emissions evaluation, supernatant treatability testing, and geotechnical evaluations. Discrete surface water samples will also be collected in SMU 3 to evaluate the effects of Wastebeds 1-8 on the Lake.

Porewater samples will be collected from SMUs 1, 6, and 7 to support the sediment cap evaluation. The existing upwelling sample stations, centrifuged sediment, and diffusive samplers (three methods) will be utilized to determine the appropriate technology for sampling porewater. Additional samples will be collected from multiple depth intervals in SMUs 3, 4, 6, and 7 and analyzed for cations and anions to support the groundwater model.

GROUNDWATER DISCHARGE EVALUATION

Groundwater discharge to Onondaga Lake will be evaluated in SMUs 4 and 6 to support the design of the selected remedy. The following activities will be conducted to provide data for the groundwater discharge evaluation:

- Conduct preliminary screening surveys for temperature and conductivity to identify potential areas of groundwater upwelling
- Install two transects of shallow water seepage meters to quantify groundwater upwelling and evaluate the technology
- Collect porewater samples for cations/anions from discrete depth intervals to establish chloride profiles and evaluate the origin of the water.

DATA MANAGEMENT AND REPORTING

Phase I of the PDI includes multiple sample locations and analyses for chemical and geotechnical evaluations. A rigorous tracking system will be employed from sample collection and screening through sample processing and laboratory analysis. As discussed in the SAP and QAPP, a database of information will be maintained throughout the project using Locus Focus. Data derived from other field efforts, such as the geophysical surveys, will be managed in a GIS database. A detailed description of the data management, data validation, and reporting are discussed in the SAP and QAPP.

Upon completion of the Phase I PDI field activities and laboratory analyses, Parsons will submit unvalidated and validated electronic data to NYSDEC 30 and 60 days respectively following receipt of analytical data and QA/QC information from the laboratories. The first data package will be submitted to NYSDEC on December 31, 2005. The anticipated schedule for significant submittals is outlined below:

December 31, 2005 – Unvalidated data package

January 31, 2006 – Unvalidated and validated data packages

February 28, 2006 – Validated data package

Additional data for special analyses will be submitted on the same 30/60 day schedule as noted above.

The results from the Phase I investigation will be used in conjunction with the existing data to guide the Phase II efforts.

REFERENCES

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TAMS Consultants, Inc., 2002c, *Onondaga Lake Remedial Investigation Report*. Prepared with YEC, Inc. for NYSDEC, Division of Environmental Remediation, Albany, New York.

APPENDIX A

SAMPLING AND ANALYSIS PLAN

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

APPENDIX C

PROJECT SAFETY PLAN

APPENDIX D

EMISSIONS AND ODOR WORK PLAN