DRAFT ONONDAGA LAKE SEDIMENT CONSOLIDATION AREA (SCA) CIVIL AND GEOTECHNICAL INITIAL DESIGN SUBMITTAL

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TABLE OF CONTENTS

TABLE OF CONTENTS
(CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (CONTINUED)

LIST OF APPENDICES

LIST OF ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
cm/sec	centimeter per second
CY	Cubic yards
ft	feet
EPDM	Ethylene propylene diene monomer
gpm	gallon per minute
HDPE	High density polyethylene
IDS	Initial Design Submittal
LLDPE	Linear low density polyethylene
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operation, maintenance, and monitoring
OU	Operable unit
PP	Polypropylene
RAO	Remedial action objectives
RDWP	Remedial Design Work Plan
ROD	Record of Decision
SCA	Sediment consolidation area
SMU	Sediment management unit
SOW	Statement of work
SPDES	State Pollution Discharge Elimination System
USEPA	United States Environmental Protection Agency
WTP	Water treatment plant

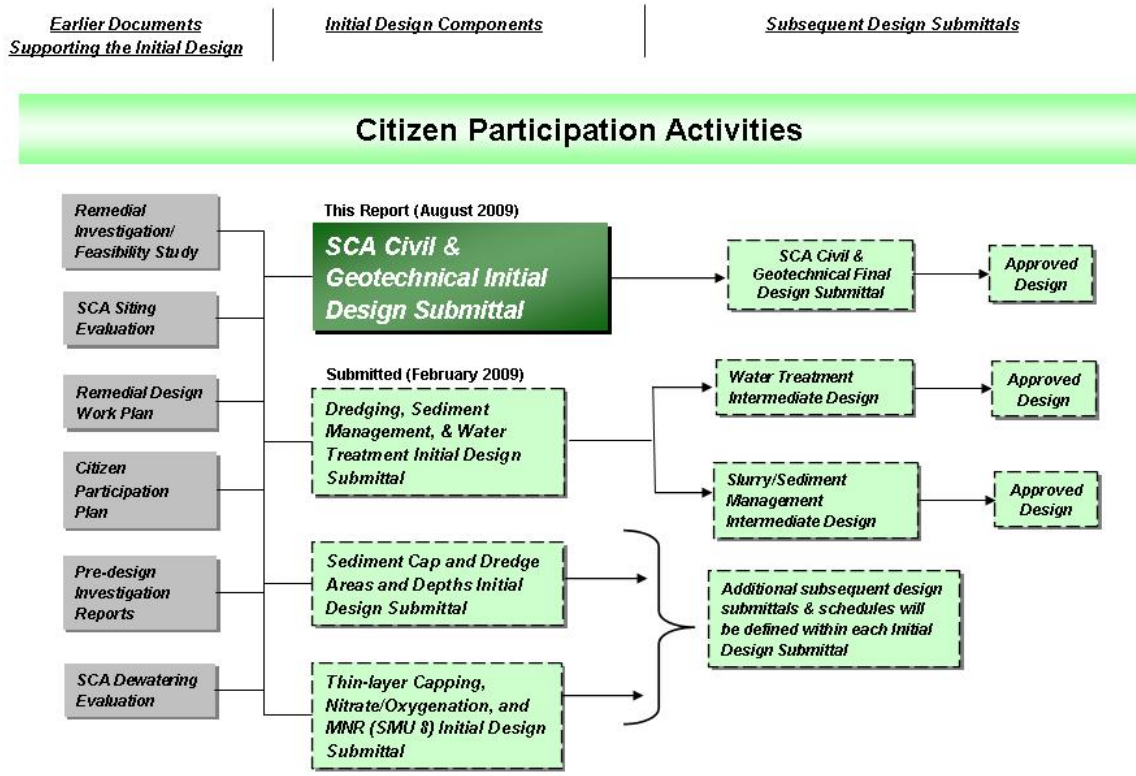
EXECUTIVE SUMMARY

Honeywell continues its progress toward achieving the goals of the Record of Decision (ROD) (NYSDEC and USEPA, 2005), and the community's vision for a restored Onondaga Lake, with the development of this Draft Sediment Consolidation Area (SCA) Civil & Geotechnical Initial Design Submittal (IDS). In collaboration with a design team consisting of nationally recognized experts from various universities, research institutions, specialty engineering firms, and with input from community stakeholders, Honeywell is developing a Remedial Design which will meet the objectives as outlined in the ROD, provide long-lasting protection to the local community and environment, and restore Onondaga Lake to the community.

Honeywell prepared this IDS in accordance with the Remedial Design Work Plan (RDWP) for the Onondaga Lake Bottom Subsite (Parsons, 2009b). As detailed in the RDWP, the remedial design will include the preparation of four IDSs, submitted separately, which will address various elements of the remedy. Separating the design into four submittals allows for a compressed schedule for design submittals associated with critical path activities (e.g., SCA and water treatment) to facilitate the aggressive timeline associated with initiating remedial construction activities in 2012, consistent with the Consent Decree (United States District Court, Northern District of New York, 2007) (89-CV-815). This IDS Report constitutes the *SCA Civil & Geotechnical IDS.* The *Dredging, Sediment Management, & Water Treatment IDS* has already been prepared and submitted separately, and the *Sediment Cap & Dredge Areas and Depths IDS* and the *Thin-Layer Capping, Nitrate Addition/Oxygenation, and MNR IDS* (Sediment Management Unit [SMU] 8) will also be submitted separately in accordance with the schedule presented in the RDWP.

The graphic below illustrates how these four IDS documents fit in with the overall Onondaga Lake design process. As illustrated below, several earlier supporting documents (e.g., remedial investigation/feasibility study reports, remedial design work plan, citizen participation plan, etc.) provide the basis for the preparation of the four IDS documents. Combined, these four IDS documents will provide initial design level details for all components of the Onondaga Lake remedy.

Public protection and feedback received through the community participation process remain a significant factor in the evaluation process for the Remedial Design. Community input has influenced design-level decisions for the SCA civil and geotechnical design, including the selection of geotextile tubes for dewatering the dredged sediments from the lake bottom, the selection of the SCA location, and the SCA layout. Section 2 provides discussion on these design-level decisions which reflect incorporation of community input.



Honeywell evaluated potential locations for building and operating an SCA to contain sediment removed from Onondaga Lake during the remedial action, as documented in the *Onondaga Lake SCA Siting Evaluation* (Parsons, 2006). Each of Honeywell's Solvay Wastebeds was considered as a potential location for the SCA. Wastebed 13 was selected based on accessibility, estimated capacity, current and future site use, geotechnical considerations, and distance from the community.

As Honeywell moves forward with the design elements for the restoration of Onondaga Lake, community input will remain a vital component for a successful program. Honeywell is committed to working with community leaders, interested stakeholders, and citizens to include input, recommendations, comments, and perspectives into the technical designs. As part of the New York State Department of Environmental Conservation's (NYSDEC) Citizen Participation Plan (CPP) (NYSDEC, 2009), community members will have the opportunity to provide input during the design, construction, and post-construction periods.

The engineering analysis and design included in this IDS Report are based on extensive design-related investigation activities at Wastebed 13, including the following:

- approximately 180 cone penetration test locations;
- approximately 60 borings (not including piezometer installations);

- approximately 50 piezometer installations;
- a 1-acre field settlement pilot study, which included installation of instruments (i.e., settlement plates, piezometers, and inclinometers), placement of 10 ft of fill material over the 1-acre area, and monitoring of the instrumentation;
- hundreds of index tests (e.g., moisture content, grain-size, Atterberg limits); and
- dozens of performance laboratory tests (i.e., strength and consolidation tests).

The results of these investigations have been presented in data summary reports which have been submitted to the regulatory agencies and are available in the public document repositories. These data have been used to obtain an understanding of Wastebed 13, including thickness and engineering properties of the Solvay waste contained within the wastebed, and the geometry and properties of the existing perimeter dikes.

The major components of the SCA civil and geotechnical design presented in this report are as follows:

- SCA capacity;
- slope stability;
- settlement;
- liner and liquid collection system design;
- surface water control system design;
- preliminary cover system design;
- construction phasing; and
- monitoring.

The current design provides capacity to contain up to 2,653,000 cubic yards (CY) of dredge material. Stability evaluations indicate overall stability of the SCA will be maintained during construction, operations, and post-closure. The settlement evaluation indicates that the liner and liquids management system will function as required following settlement due to liner, geotextile tube, and final cover placement. In addition, the construction phasing for the base liner system will meet the dredging schedule required per the Consent Decree.

An earlier IDS submitted to the NYSDEC, *Dredging, Sediment Management, & Water Treatment Initial Design Submittal* (Parsons *et al.*, 2009), discusses the process of dredging sediments from the lake and getting those sediments to the SCA. That IDS describes how the dredged sediment, once reaching the SCA, may undergo a series of pre-processing steps. Following applicable pre-processing steps, the sediment will be pumped into geotextile tubes for dewatering. The use of geotextile tubes provides several advantages (e.g., improved odor control) as compared to an open settling basin. These tubes will be managed within the lined SCA, which will collect and manage water that will drain from them.

Once water generated by hydraulic dredging has passed through the geotextile tubes, it will flow into an underlying gravel drainage layer within the lined SCA. The SCA drainage layer will be sloped to direct water to collection points, where it will be routed to the equalization and storage basin. All construction-contact water, including effluent from the geotextile tube dewatering process, decontamination water, water collected from the management and/or cleaning of debris management, and water coming into contact with dredged material, will be treated at an onsite water treatment facility.

This IDS Report expands the discussion of the SCA by presenting the civil and geotechnical aspects of the SCA design, including location and layout, liner system, slope stability, settlement, liquids management, surface water management, preliminary final cover design, and construction phasing. This report presents the SCA design, along with the design and performance criteria consistent with the requirements set forth in the ROD and associated Consent Decree Statement of Work (SOW), and a summary of the supporting engineering analyses.

The processes necessary to accomplish the Onondaga Lake remedy are well proven and have been successfully implemented on multiple projects. Because of the large volume of sediment that is being dredged and managed, and the relative complexity of the management steps, developing an integrated design that looks at the processes as a continuous system will be important to ensuring an effective and efficient design. The Honeywell design team will interact with the field crews and construction personnel who will execute the civil and geotechnical construction of the SCA to assure that the final design components are complete, implementable, and meet the project objectives.

SECTION 1

BACKGROUND AND DESIGN PROCESS OVERVIEW

This Onondaga Lake Sediment Consolidation Area (SCA) Civil and Geotechnical Initial Design Submittal (IDS) Report has been prepared on behalf of Honeywell International Inc. (Honeywell). The lake bottom is on the New York State Registry of Inactive Hazardous Waste Sites and is part of the Onondaga Lake National Priorities List (NPL) Site. Honeywell entered into a Consent Decree (United States District Court, Northern District of New York, 2007) (89-CV-815) with the NYSDEC to implement the selected remedy for Onondaga Lake as outlined in the Record of Decision (ROD) issued on July 1, 2005. The following documents are appended to the Consent Decree: ROD, Explanation of Significant Differences, Statement of Work (SOW), and Environmental Easement.

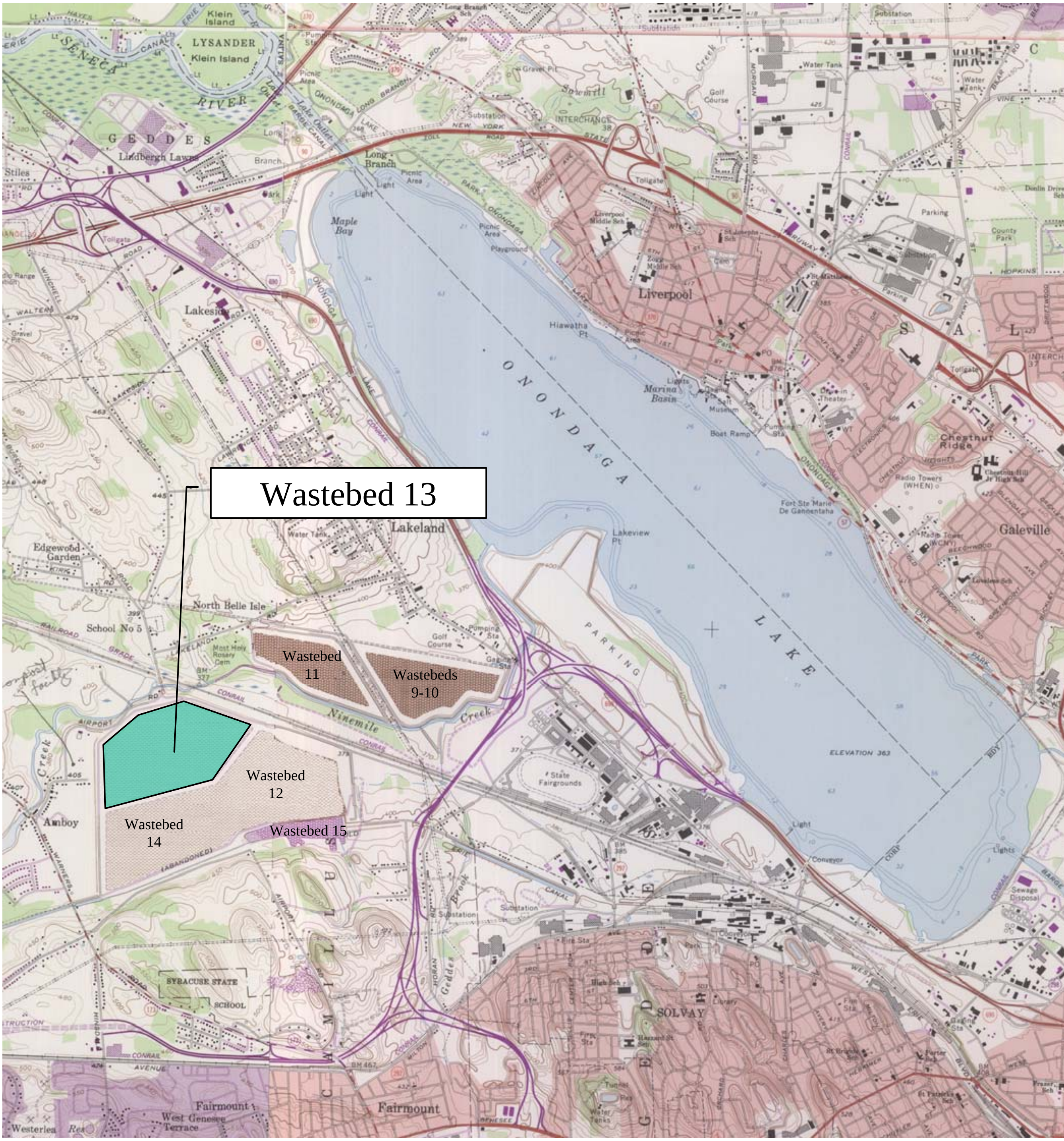
The purpose of this IDS Report is to provide an intermediate level design for the civil and geotechnical components of the SCA. Regulatory and public feedback will be obtained on this design and addressed during further development and finalization of the design.

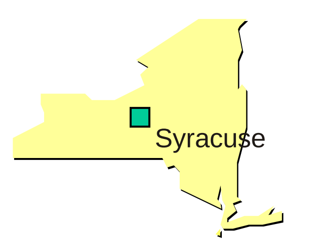
This IDS Report was prepared in accordance with the Remedial Design Work Plan (RDWP) for the Onondaga Lake Bottom Subsite (Parsons, 2009b), and is based on extensive information and data gathered during design-related investigations.

1.1 BACKGROUND

Onondaga Lake is a 4.6 square mile (3,000 acre) lake located in Central New York State immediately northwest of the City of Syracuse (Figure 1.1). As specified in the ROD, a major component of the selected lake remedy includes the dredging and onsite consolidation of sediments removed from the lake. Potential locations for building and operating an SCA to contain sediment removed from Onondaga Lake during the remedial action were evaluated, as documented in the *Onondaga Lake SCA Siting Evaluation* (Parsons, 2006). Each of Honeywell's Solvay Wastebeds was evaluated as a potential location for an SCA based on accessibility, estimated capacity, current and future site use, geotechnical considerations, and distance from the community. Based on the evaluation results, and as documented in the SOW of the Consent Decree, Wastebed 13 was selected for building and operating the SCA (Figure 1.1).

Wastebed 13 is located in the Town of Camillus and encompasses approximately 163 acres. It is bordered to the north by Ninemile Creek and the CSX Railroad tracks; to the west by an Onondaga County Garage property and a former gravel excavation owned by Honeywell; and to the east and south by Wastebeds 12 and 14, respectively. Wastebed 13 was originally designed as a settling basin for the disposal of Solvay waste and has recently been used by the State University of New York College of Environmental Science and Forestry (SUNY ESF) for willow pilot test plots. These test plots now occupy several acres along the southern border of the wastebed (Figure 1.2).





New York
Quadrangle

LATITUDE: N 43° 5' 57"
LONGITUDE: W 76° 10' 41"

N

SOURCE: U.S.G.S.
SYRACUSE WEST
QUADRANGLE

FIGURE 1.1

Honeywell

Sediment Consolidation Area
Onondaga Lake Bottom Subsite
Remedial Design

SITE LOCATION MAP

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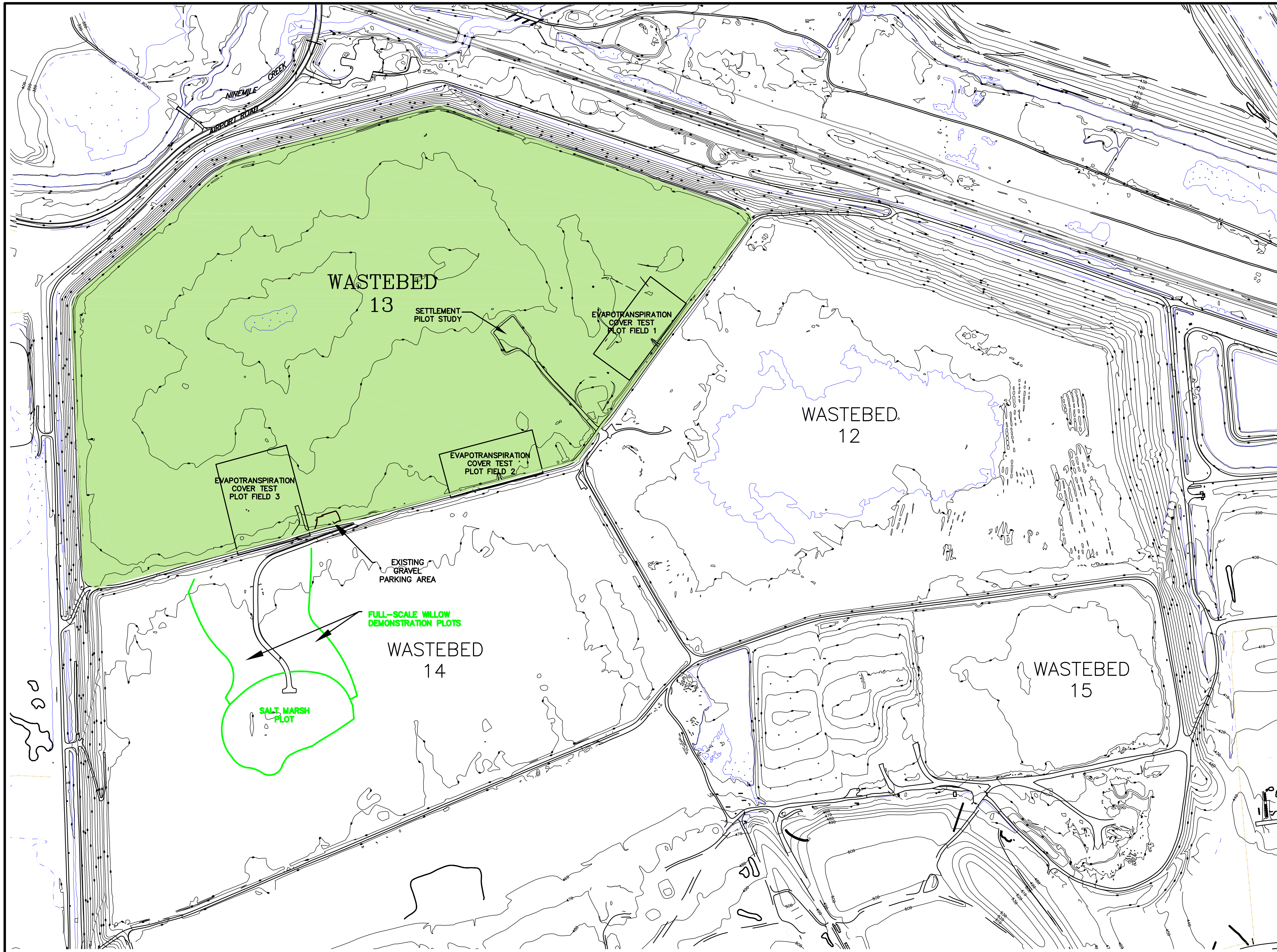
P:\Honeywell -SYR\444853 - Lake Detail Design\09 Reports\9.6 SCA IDS\Figures\Figure 1 (Site Map).ppt



NOTE:

1. BASE MAP PROVIDED BY D.W.HANNIG L.S., P.C.; SURVEYED 6/10/08

PRELIMINARY DRAFT

600 300 0 600 1200

SCALE: 1"=600'

FIGURE 1.2

Honeywell

SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM SUBSITE REMEDIAL DESIGN
CAMILLUS, NEW YORK

WASTEBEDS 12–15
EXISTING SITE PLAN

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301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NEW YORK 13212 315-451-9560

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1.2 REMEDIATION OBJECTIVES AND GOALS

The underlying objective of all activities associated with the Onondaga Lake remediation, including construction of the SCA, is to ensure protection of the surrounding community, the environment, and onsite workers from potential hazards associated with the execution of the remedy. The ROD also provides more specific objectives—referred to as remedial action objectives (RAOs)—and goals (referred to as preliminary remedial goals [PRGs]) for the lake remedy. The specific objectives related to the SCA design include the following:

- Design the SCA for the efficient and secure containment of sediments dredged as part of the Onondaga Lake remedy in a manner protective of human health and the environment.
- Incorporate dredging, SCA operations, and water treatment into the SCA civil and geotechnical design.
- Incorporate stakeholder (i.e., regulatory agencies and the community) input in the process to identify design criteria (i.e., odor mitigation, redundancy of operations, leachate containment, dewatering, traffic, beneficial use, groundwater monitoring, etc.).
- Incorporate value engineering and constructability in the design process from the earliest stages to assure overall value in the facility.

These objectives are also presented in the Basis of Design (BOD), which is included as Attachment A of the *SCA Civil and Geotechnical Technical Memorandum* (Parsons, 2009c) in Appendix A and has been approved by the NYSDEC.

1.3 REMEDY OF RECORD

The ROD for the lake bottom describes the remedy selected by NYSDEC and the United States Environmental Protection Agency (USEPA). The SOW, presented as Appendix C of the Consent Decree, further describes design-related elements for the implementation of the remedy, such as the development of dredging areas and volumes, and isolation cap areas, models and components; design of the profundal zone (sediment management unit [SMU] 8) remedy; management of dredged sediments; design of the water treatment system; and development of the design and construction schedule. According to the ROD and SOW (United States District Court, 2007 – appendices to the Consent Decree), the components of the selected remedy relevant to the civil and geotechnical aspects of the SCA design, which is the focus of this IDS Report, are summarized as follows:

- "Dredging of as much as an estimated 2,653,000 CY of contaminated sediment/ waste …."
- Placing the majority of "dredged sediment … in one or more SCAs, which will be constructed on one or more of Honeywell's Solvay wastebeds that historically received process wastes from Honeywell's former operations. The containment area will include, at a minimum, the installation of a liner, a cap, and a leachate collection and treatment system."

- "Implementation of institutional controls including the notification of appropriate governmental agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy."
- "Implementation of a long-term operation, maintenance, and monitoring (OM&M) program to monitor and maintain the effectiveness of the remedy."

The Consent Decree also states that "Honeywell shall design, operate, and maintain the SCA in accordance with the substantive requirements of NYSDEC Regulations Part 360, Section 2.14(a) (industrial monofills)." In addition, the SCA shall have the following elements:

- **"***Impermeable Liner* – Honeywell shall design and install an impermeable liner system. The grading design for the SCA shall utilize the existing surface topography of Wastebed 13 as much as possible so as to limit wastebed cut and fill requirements and the associated need for a large volume of imported soil fill. Preloading and stabilization of the wastebed shall only be required to the extent necessary to ensure the integrity of the SCA components and underlying Solvay waste foundation, based upon the remedial design."
- **"***Leachate Collection* – The impermeable liner shall be overlain by a leachate collection system. The type of system will be determined during Remedial Design. A laterally-transmissive sand or geosynthetic liquid collection layer may be considered by DEC for inclusion in the system. The system shall convey leachate by gravity drainage to collection sumps where the leachate will be pumped via force main to a water treatment plant."
- **"***SCA Cover* - The SCA cover shall be designed pursuant to applicable regulations and guidance including the USEPA Alternative Cover Assessment Program ("ACAP"). If appropriate based upon the Remedial Design, the SCA cover may utilize a soil layer and ecological plant community to produce evapotranspiration rate sufficient to reduce precipitation infiltration rates to acceptably low levels."

Each of these design elements is addressed in Section 4 of this document.

1.4 DESIGN PROCESS OVERVIEW

This document focuses on the civil and geotechnical aspects of the SCA design, but the entire Onondaga Lake remedy consists of many elements. The design overview that follows is provided to put the SCA design in context with the rest of the remedy.

The primary elements of the selected Onondaga Lake remedy, as documented in the ROD include the following:

- sediment removal (dredging) and transport to the SCA;
- SCA construction, operation, and closure;
- sediment capping (isolation and thin-layer) including remedial area determination and definition of dredge areas, depths, and volumes;
- water treatment system;

- oxygenation of the hypolimnion;
- monitored natural recovery (MNR);
- habitat restoration and enhancement;
- institutional controls; and
- long-term operation, maintenance, and monitoring.

For most of the remedial elements listed above, design-related investigations, engineering assessments, and evaluation reports have already been completed to assess specific elements of the remedy, advance design decisions, and to obtain concurrence with NYSDEC and USEPA on critical path components (through a series of work group meetings and conference calls). A summary of the documents pertinent to this IDS Report that are available in the document repositories is included as Table 1.1.

Due to interaction between the various remedial elements, and varying design durations associated with specific components, it was necessary to separate the design into four distinct submittals. Collectively, the four IDS reports will address all of the remedial elements listed above. Separating the design into four submittals allows for accelerated design submittals, as well as agency review, for critical path activities (e.g., SCA and water treatment) in order to facilitate the schedule for starting and completing the remedial action consistent with the Consent Decree. Future design submittals and their associated submittal schedules will be developed and presented in each of the IDS Reports. The extent of this design component consolidation will be influenced by several critical factors such as schedule constraints, component design progress, and contracting strategies. For example, the design for the SCA and water treatment system can be completed on an expedited schedule to allow construction to finish in advance of the dredging, scheduled to begin in the Spring of 2012.

The content of the four IDS Reports is as follows:

- The *SCA Civil & Geotechnical IDS* (this report) includes the civil and geotechnical design elements (e.g., liner system) required for construction of the SCA.
- The *Dredging, Sediment Management, and Water Treatment IDS* (Parsons *et al.*, 2009) provides initial design-level information pertaining to operational components of the remedy including the dredging, transportation, and dewatering of impacted lake sediments, and treatment of construction water generated during the process. This IDS was submitted to the NYSDEC in February 2009 and is in the public document repositories.
- The *Sediment Cap & Dredge Areas and Depths IDS* will include the proposed, conceptual level, design detail for the sediment cap component of the remedy. This submittal will also include the design details pertaining to habitat restoration, and will provide dredging volumes and removal areas/depths.

TABLE 1.1

ONONDAGA LAKE HISTORICAL DOCUMENTS

Date	Name of Document
2009, July	Wastebed 13 Settlement Pilot Study Monitoring Data - Year 3
2009, April	Draft Onondaga Lake Pre-Design Investigation: Phase III Data Summary Report
2009, February	SCA Dewatering Evaluation Report
2009, March	Remedial Design Work Plan for the Onondaga Lake Bottom Subsite
2009, March	Citizen Participation Plan for the Onondaga Lake Bottom Subsite Remedial Design Program
2008, December	Wastebed 13 Settlement Pilot Study Monitoring Data - Year 2
2008, October	Draft Onondaga Lake Pre-Design Investigation: Phase II Data Summary Report
2008, June	Onondaga Lake PDI: Phase IV Work Plan
2008, June	Onondaga Lake PDI: Wastebed 13 Settlement Pilot Study Data Summary Report
2007, October	Onondaga Lake Phase III Pre-Design Investigation Work Plan, Addendum 4
2007, July	Onondaga Lake Phase III Pre-Design Investigation Work Plan, Addendum 1
2007, May	Onondaga Lake Pre-Design Investigation: Phase I Data Summary Report
2007, May	Onondaga Lake Phase III Pre-Design Investigation Work Plan
2006, September	Onondaga Lake Pre-Design Investigation. Phase II Work Plan
2006, September	Onondaga Lake Sediment Consolidation Area (SCA) Siting Evaluation
2005, August	Onondaga Lake Pre-Design Investigation: Wastebed 13 Settlement Pilot Study Work Plan
2004, November	Onondaga Lake Feasibility Study Report. Draft Final

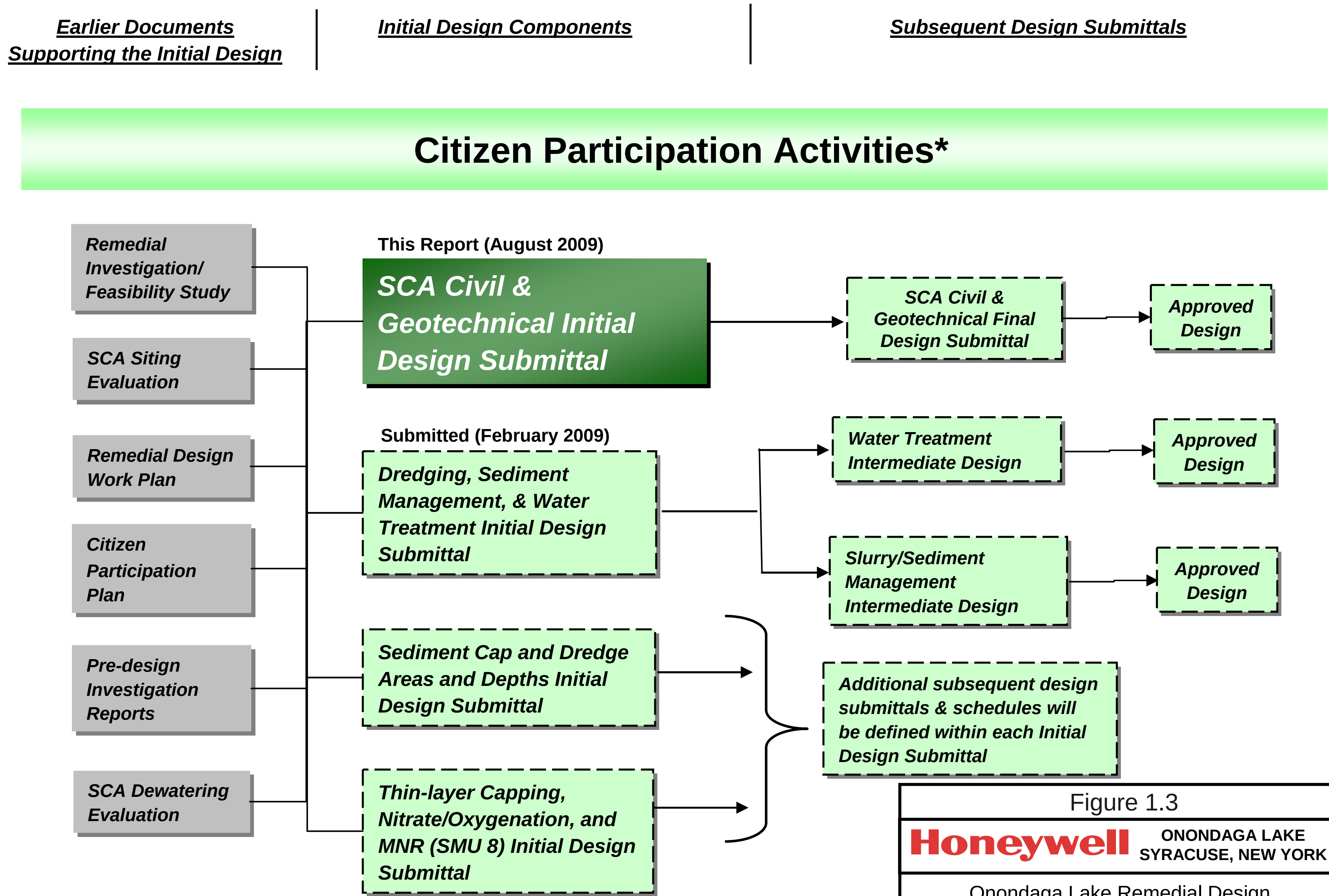
- The *Thin-Layer Capping, Nitrate Addition/Oxygenation, and MNR (SMU 8) IDS* focuses on the deep water areas of the lake, and will provide initial design-level details pertaining to thin-layer capping (including locations, extent, materials, and sequencing), nitrate addition and/or oxygenation for the purposes of inhibiting the formation of methylmercury within the lake, and the approach to monitoring natural recovery in specific areas of the lake.

Figure 1.3 illustrates the relationships between the various Remedial Design Components for the Onondaga Lake project and illustrates the importance of citizen participation throughout the entire design process.

1.5 INITIAL DESIGN SUBMITTAL ORGANIZATION

This IDS Report is organized into eight sections and 14 appendices.

- Section 1: Background and Design Process Overview – Presents background information, site description, remedial goals, and a summary of the overall design process.
- Section 2: Community Considerations and General Project Requirements – Highlights Honeywell's efforts to incorporate community considerations into the design and presents general requirements applicable to many aspects of the project, including various federal, state, and local requirements, ordinances, and regulations applicable to the design.
- Section 3: Summary of Previous Investigations – Presents and summarizes data collected as part of design-related investigations, and describes the existing conditions at Wastebed 13, including subgrade properties.
- Section 4: Engineering Analysis & Design – Presents the technical evaluations and design for the civil and geotechnical aspects of the SCA design.
- Section 5: Plans – Presents the outlines for the various plans that will be required during the construction and operation of the SCA.
- Section 6: Subcontracting Strategy – Summarizes the anticipated work scope packaging and anticipated subcontracting strategy for each work package.
- Section 7: Design Submittal and Construction Schedule – Presents the schedule for additional design submittals associated with the SCA civil and geotechnical design, and presents the anticipated construction schedule.
- Section 8: References – Lists the references used to prepare this IDS Report.



*Citizen Participation input and outreach activities, as outlined in the Onondaga Lake Citizen Participation Plan, will be included throughout the remedial design process

Figure 1.3

Honeywell ONONDAGA LAKE SYRACUSE, NEW YORK

Onondaga Lake Remedial Design Components

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SECTION 2

COMMUNITY CONSIDERATIONS AND GENERAL PROJECT REQUIREMENTS

Overall protection of members of the community and the consideration of community input are of paramount importance in designing the lake remedy. Section 2.1 of the *Dredging, Sediment Management, and Water Treatment IDS* (Parsons *et al.*, 2009) and the *Onondaga Lake Citizen Participation Plan* (CPP) (NYSDEC, 2009) provide details regarding community safety and involvement for the entire remedial program. Community considerations and project requirements that pertain specifically to the SCA civil and geotechnical design and construction aspects of the remedy are discussed below in Sections 2.1 and 2.2, respectively.

2.1 COMMUNITY CONSIDERATIONS

Public protection and feedback received through the community participation process have influenced design-level decisions associated with the SCA. Specific examples, which are discussed in more detail in Section 2.1.1, include:

- selection of dewatering method;
- SCA location; and
- SCA buffer zone.

Honeywell is working with community leaders to develop work plans specifically designed to ensure that the protection of the surrounding community and environment is maintained throughout the execution of the remedy. The work plans directly applicable to the SCA construction are discussed in Section 2.1.2.

2.1.1 Community Involvement

Community input was considered in the selection of the sediment dewatering method to be used within the SCA. The dewatering method presumed during the issuance of the ROD was a large open settling basin; however, officials from the Town of Camillus raised concerns pertaining to the odor generation potential of this dewatering method. In response to these valid concerns, Honeywell performed an extensive evaluation comparing the geotextile tube and settling basin dewatering methods based on ten site-specific dewatering objectives. This comparison and the decision to use geotextile tubes as the dewatering method are documented in the *SCA Dewatering Evaluation* (Parsons, 2009a), which has already been approved by the NYSDEC and is available at the public document repositories. This document is also provided herein as Appendix B.

Some site-specific benefits of using geotextile tubes as compared to settling basins include the following:

- significant reduction of the potential for odor generation as compared to an open settling basin;
- primary containment of the dredged sediments within the geotextile tubes;
- reduction in required berm height and preloading requirements as compared to an open settling basin, thereby reducing scale of construction activities and associated truck traffic and noise levels;
- reduction in required footprint as compared to an open settling basin because of lower SCA perimeter dike height; thereby reducing the visibility of the SCA and related construction activities to nearby residential areas; and
- reduction in time to closure.

The selection of the SCA location on Wastebed 13 was conducted with careful consideration for minimizing impacts on the local community. Based on the size of the area and storage capacity required for dredged sediment management and the geographical layout of the wastebeds, Wastebed 13 was selected because it requires the least amount of fill for construction, as compared to the other wastebeds. In addition, it provides the maximum buffer distance from nearby residential areas and public facilities.

Another example of how input from the community influenced the final SCA design is the request from the Town of Camillus for a 500-ft wide buffer zone between sediment dewatering activities and the Wastebed 13 western boundary. The design, as presented in Section 4, in response to those concerns, includes a 500-ft buffer zone from the western boundary to provide further protection of vicinity communities from nuisance impacts associated with the operation of the SCA (light, noise, odors). In addition, a 200-ft buffer zone from the northern boundary of Wastebed 13 to the SCA has also been incorporated in the design to increase the overall buffer zone between the SCA and the surrounding community.

2.1.2 Community Protection Plans

As part of the *Slurry/Sediment Management Final Design*, Honeywell will develop and present work plans that detail how community protection measures will be implemented. Plans specific to the SCA civil construction will include, but are not necessarily limited to:

- Site Security & Community Protection Plan – The Site Security & Community Protection Plan will outline health and safety considerations including provisions for physical security for the site to minimize risks to persons, property, and the environment. Physical security planning will include remedial activities at the SCA. A vulnerability assessment will be included to identify potential security challenges, prioritize those challenges, and describe appropriate control measures. Security measures to be implemented will be specified, and may include fences, gates, signs, remote cameras, security patrols, and lighting. Additionally, posting requirements for appropriate warning signs, barricades, and caution tape to protect members of the public from accidentally accessing the site will be outlined.

- Traffic Management Plan – Traffic associated with the delivery of material, equipment, and supplies to the SCA will be necessary. A Traffic Management Plan will be created to specify traffic patterns to route construction vehicles to appropriate roads.

Continued community involvement, as discussed in the CPP (NYSDEC, 2009), is a critical component to the successful implementation of these work plans.

2.2 GENERAL PROJECT REQUIREMENTS

Details of specific requirements pertaining to the SCA design are provided in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"). General requirements pertaining to the civil and geotechnical aspects of SCA design and construction are discussed in the subsections that follow.

2.2.1 Sustainability

Honeywell is committed to minimizing the carbon footprint of construction activities. During the SCA design phase, evaluations will be conducted to identify and evaluate opportunities to incorporate sustainability concepts, including those presented in the *Clean and Green Policy* (USEPA, 2009). To the extent practicable, use of renewable energy sources, utilization of locally produced/sourced materials and supplies, reduction/elimination of waste and inefficient use of resources and energy, and other practices, will be specified in the design and implemented during construction. Further details pertaining to the incorporation of sustainable practices will be included in the Final Design.

2.2.2 Federal and State ARARs

Compliance with federal and state applicable or relevant and appropriate requirements (ARARs) will ensure that the existing resources are protected during operations and provide for overall protection of human health and the environment. A comprehensive list of chemical-specific, action-specific, and location-specific ARARs is included in the ROD. Regulatory requirements, including ARARs, applicable to implementation of the SCA construction are summarized in Table A-1 of the RDWP (Parsons, 2009b). Compliance with federal and state ARARs frequently involves formal permit application and approval processes. Details pertaining to these processes applicable to Onondaga Lake are outlined in the Consent Decree.

2.2.3 Local Ordinances and Regulations

Table A-1 of the RDWP (Parsons, 2009b) also includes local ordinances and regulations. The ordinances and regulations that apply to SCA construction include requirements pertaining to noise, site development, and site planning.

2.2.4 Health and Safety Requirements

The health and safety of site personnel, visitors, and members of the public are considered paramount. Written safety plans will be developed for SCA construction, and they will be developed and updated as needed to address changing activities and site conditions. The health and safety record of all bidding contractors will be evaluated as part of the bidding process. At a minimum, selected Remedial Contractors will be required to prepare Project Safety Plans which will address potential safety issues associated with the specific tasks the contractor will be performing. Specific requirements, including audit procedures, employee drug and alcohol screening programs, and near-miss reporting protocols will also be specified within the Final Design.

2.2.5 Property and Site Access and Right-of-Way Entry

SCA construction and operation are not expected to require the use of non-Honeywell owned property.

SECTION 3

SUMMARY OF PREVIOUS INVESTIGATIONS

Design-related investigation activities were conducted using a phased approach. This approach allowed the data from one phase to be interpreted and used to develop the appropriate scope for the next phase of investigation. This process ensures the overall quality and usefulness of the data and ensures that data gaps are identified and filled. Phase I, Phase II, Phase III, and Phase IV design-related investigation field efforts were conducted from 2005 to 2009, and were performed in accordance with NYSDEC-approved work plans.

This section provides a summary of the field investigations and laboratory testing performed for the design and construction of the SCA. Referenced documents are available at the public document repositories outlined in the Consent Decree.

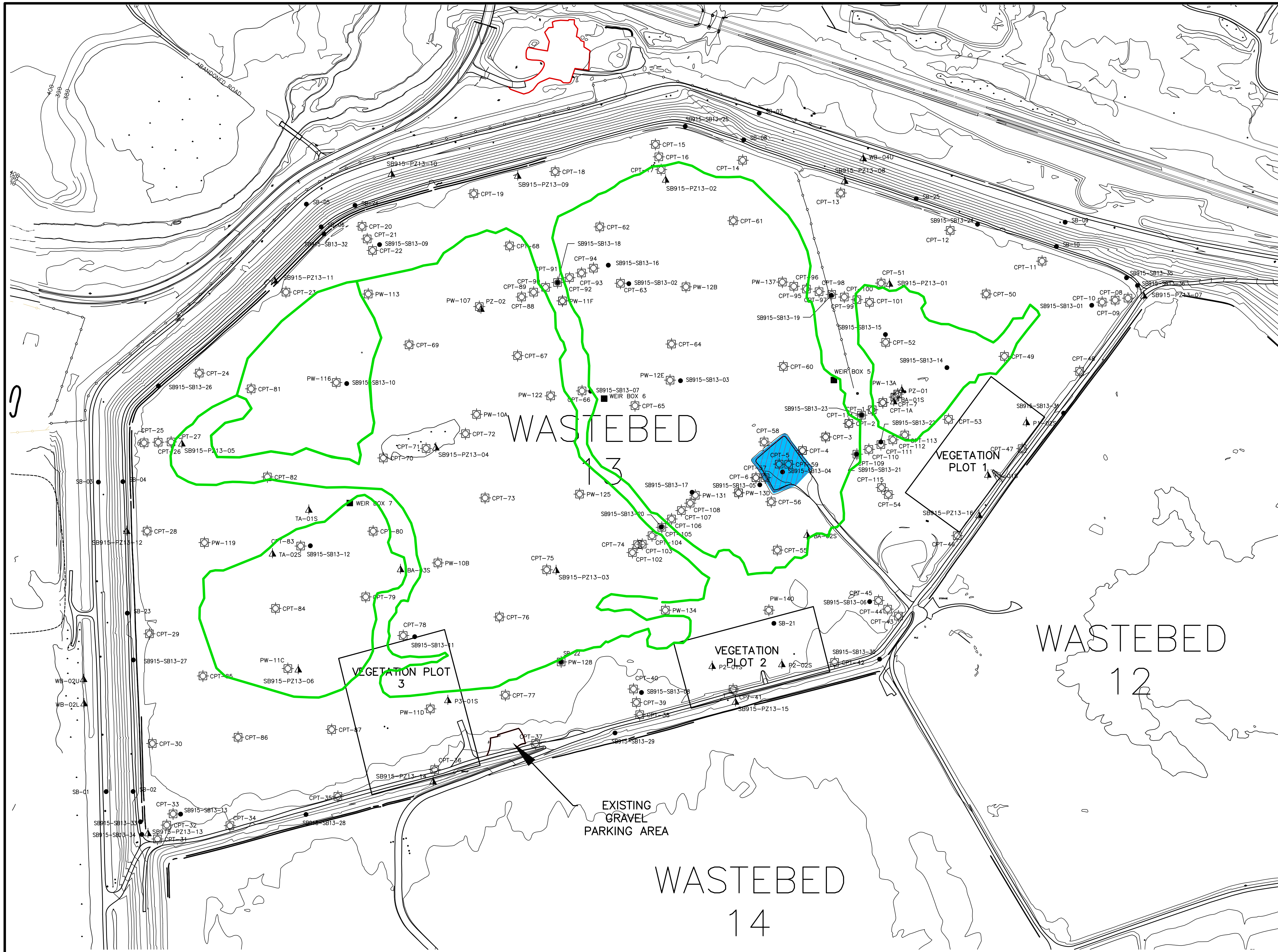
3.1 PRE-DESIGN INVESTIGATIONS AND SUBSURFACE CONDITIONS

Data related to subsurface conditions were collected during the Phase I, II, and III design-related investigation activities at Wastebed 13 and included the following (Figure 3.1):

- approximately 180 cone penetration test locations;
- approximately 60 borings (not including piezometer installations);
- approximately 50 piezometer installations;
- a 1-acre field settlement pilot study, which included installation of instruments (settlement plates, piezometers, and inclinometers), placement of 10 ft of fill material over the 1-acre area, and monitoring of the instrumentation;
- hundreds of index tests (moisture content, grain-size, Atterberg limits); and
- dozens of performance laboratory tests (strength and consolidation tests).

The data obtained from the investigation activities listed above were used to develop a Data Package titled "Subsurface Stratigraphy Model of Wastebed 13 for the Design of SCA," which has been approved by the NYSDEC and is included herein as Attachment B to Appendix A, "SCA Civil and Geotechnical Technical Memorandum." This Data Package includes the following:

- a summary of the site investigation activities conducted in Wastebed 13 to date;
- interpretation of material characteristics and subsurface stratigraphy in Wastebed 13 based on the results of the site investigations;
- interpretation of material properties (i.e., index properties, shear strength, and compressibility) based on the results of the laboratory tests, the field settlement pilot test, and the empirical correlations;



NOTE:

1. BASE MAP PROVIDED BY D.W.HANNIG L.S., P.C.; SURVEYED 6/10/08

LEGEND:

SETTLEMENT PILOT STUDY (2005)

CPT LOCATIONS

BORING LOCATIONS

PIEZOMETER LOCATIONS

EXISTING WEIR BOX LOCATIONS

APPROXIMATE DELINEATION OF PITS (1972/ 1973)

PRELIMINARY DRAFT

FIGURE 3.1

Honeywell

SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM SUBSITE REMEDIAL DESIGN
CAMILLUS, NEW YORK

WASTEBED 13
INVESTIGATION ACTIVITIES

PARSONS
301 PLAINFIELD ROAD • SUITE 350 • SYRACUSE, NEW YORK 13212 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\444853 - LAKE DETAIL DESIGN\10 TECHNICAL CATEGORIES\10.1 CAD\SCA RDI\441598SK002.DWG
PLOT DATE: 8/12/2009 8:10 AM PLOTTED BY: RUSSO, JILL

- recommendations on material properties to be used for the SCA design; and
- verification of the interpreted subsurface model and compressibility of Solvay waste (SOLW) using the field settlement test results.

Honeywell has prepared summary reports for each of these investigations, and the reports have been submitted to NYSDEC. Once they are finalized by Honeywell and approved by the NYSDEC, the reports will be provided to the public document repositories.

3.2 COMPATIBILITY AND INTERFACE TESTING

As described in *Onondaga Lake Pre-Design Investigation: Phase IV Work Plan – Addendum 6 Bulk Sediment Collection And Dewatering Treatability Study* (Parsons, 2008), compatibility tests were performed to monitor the physical properties of potential geotextile tube and geomembrane materials immersed in sediment from the lake. Interface direct shear testing was also performed on the geotextile tube material and potential liner system options to establish reasonable strength values to be used in slope stability analyses, which are discussed in Section 4.

During the compatibility testing, the condition of the materials was monitored as a function of cumulative exposure time by means of dimensional measurements and physical property tests. Compatibility tests were performed on the polypropylene (PP) geotextile tube material in accordance with ASTM D6389. Geomembrane compatibility tests were performed in accordance with ASTM D5747 on materials that will be considered for construction of the SCA base liner, including high density polyethylene (HDPE), linear low density polyethylene (LLDPE), ethylene propylene diene monomer (EPDM), and PP (polypropylene) liner materials.

Results of the compatibility testing are presented in Appendix C, "Compatibility Test Results." As indicated in the appendix, all four geomembrane types performed well, with the LLDPE and HDPE performing the best. Measured properties were relatively consistent. The PP and EPDM absorbed the most extractables and volatiles which resulted in variation in strength properties. Based on the results of the testing, all four geomembrane types will be retained for further screening. The selection of the geomembrane type will be done as part of the final design and will consider chemical resistance, interface shear strength, and elongation properties. Both the high strength geotextile and the thread for the geotextile tubes also performed well and are considered suitable for the project.

Interface direct shear testing, in accordance with ASTM D5321, was performed on the geotextile tube material to evaluate the strength (both peak and residual) of the interface between two tubes. This testing was also performed on the liner system to establish a reasonable interface strength value (both peak and residual) for the liner system. Strength parameters based on these test results were used in the slope stability analyses, which are presented in Section 4.

For the direct shear test on the liner system, the following components layered from top to bottom were used for modeling purposes:

- concrete sand;

- non-woven geotextile;
- geomembrane; and
- compacted clay (from source anticipated for construction).

Testing was performed for each type of geomembrane (i.e., smooth HDPE, textured HDPE, EPDM, and PP). As anticipated, the weakest interface for all the liner system cases was the non-woven geotextile to geomembrane interface. The complete test results are provided in Appendix D, "Direct Shear Interface Test Results."

3.3 DATA GAPS

Based on the data evaluations performed during preparation of the Data Package and review of the compatibility and interface test results, no additional data needs for the SCA design have been identified. Therefore, no additional field work at Wastebed 13 has been proposed as part of the Phase V investigation.

SECTION 4

ENGINEERING ANALYSIS AND DESIGN

The key assumptions (e.g., dredge volume) required to proceed with the SCA layout design and engineering analyses are presented first in this section. After the key assumptions, the SCA layout and the basis for that layout are presented, followed by a discussion of the engineering analyses performed on that layout and the impact of those results on the design. Since the overall objectives for the SCA design are discussed in Section 1.2, and the detailed requirements and criteria of the civil and geotechnical aspects of the design are provided in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), they are not repeated here; however, as applicable, they are incorporated into the discussions of the engineering analyses. The engineering analyses in this section focus on slope stability, settlement, the liner and liquid management system, the surface water control system, and preliminary final cover design concepts. Finally, the anticipated base liner system construction phasing, preloading, and construction material transportation and placement are discussed. The SCA design drawings that were developed using the engineering evaluations discussed in this section are provided in Appendix E, "Drawings."

4.1 KEY ASSUMPTIONS

The two key assumptions that were required for the development of the SCA design are associated with the dredge volume and the dewatering process. The assumptions associated with these issues are discussed in the following subsections.

4.1.1 Dredge Volume

The Onondaga Lake ROD (NYSDEC and USEPA, 2005) specifies that dredging of up to 2,653,000 CY of impacted sediments will be completed as part of the remedy. Therefore, the design volume stated in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum") and the design presented herein is based on a dredge volume of up to 2,653,000 CY. The flexibility included in the design to accommodate a change in final volume is described in Section 4.2.2.

4.1.2 Slurry Dewatering

The *Onondaga Lake Dredging, Sediment Management, and Water Treatment IDS* (Parsons *et al.*, 2009) presented a baseline operational scenario for dredging and sediment dewatering that includes hydraulic dredging followed by a potential dredged slurry conditioning system prior to geotextile tube dewatering in the SCA. Whether or not slurry conditioning is performed, it is anticipated that the slurry will return to near *in situ* (pre-dredging) solids by weight once it has undergone at least initial dewatering in the geotextile tubes. If gravel and sand-size particles are removed from the slurry during a slurry conditioning step, they will be stockpiled and periodically transferred to the SCA. These particles would also be at or above their *in situ* solids content by weight. Therefore, the volume to be contained in the SCA is expected to be approximately equal to or less than the *in situ* volume prior to dredging, which is consistent with a 1.0 bulking factor that is assumed in the BOD (Attachment A of Appendix A, “SCA Civil and Geotechnical Technical Memorandum”).

Based on the required dredge rate, total sediment volume, and experience with similar applications, it is anticipated that geotextile tubes approximately 80 to 90 ft in circumference with a maximum length of 300 ft will be used. Each geotextile tube is modeled to be 300 ft by 40 ft by 6 ft after initial dewatering (i.e., dredge material is at or near pre-dredging solids content by weight). Since the model is not particularly sensitive to the geotextile tube dimensions, changes in these dimensions will only have a minimal impact on the design presented herein. The geotextile tubes will be arranged in a series of rows and columns to most efficiently use the SCA and meet loading restrictions.

4.2 SCA LAYOUT

In addition to the dredge volume and slurry dewatering assumptions discussed previously, there are several other factors that were considered in the development of the SCA layout (i.e., footprint), which is shown on Drawing C-002. These factors included the following:

- proximity to the community;
- capacity for the required dredge volume;
- Wastebed 13 surface and subsurface characteristics;
- minimizing excavation and import of fill into Wastebed 13; and
- operational requirements.

A discussion of each of these factors and how it was incorporated into the SCA layout design is provided in the subsections that follow.

4.2.1 Proximity to Community

A minimum buffer zone of 500 ft to the western dike and 200 ft to the northern dike of Wastebed 13 was maintained in the SCA layout (see Section 2.1.1 for details). The footprint of the SCA was designed to be large enough so that the geotextile tube height and the resulting final elevation of the SCA will be consistent with the surrounding terrain (i.e., Wastebeds 12, 14, and 15). Specifically, the highest anticipated elevation of the SCA (including the soil cover) will be at least 20 ft lower than the Camillus Construction and Demolition Landfill on Wastebed 15 after settlement. The anticipated final grades after settlement are discussed in more detail in Section 4.3.2.

To the extent practical, existing trees and other vegetation around the perimeter of Wastebed 13 will be left in place during SCA construction and operation to provide a visual barrier. As appropriate, additional trees will be planted to enhance the existing visual barriers. Upon completion of dredging and dewatering activities, a vegetated cover will be constructed on the SCA.

An assessment was performed during the spring of 2009 to evaluate where additional visual barriers may be required. This assessment included installing poles at the four corners of the proposed SCA footprint. Flags were attached to the top of the poles to represent, approximately, the post-settlement elevation of the SCA after final closure. After the poles were in place, the visibility of these flags from offsite was assessed. As part of the final design, planting additional trees in certain areas will be considered to block lines of sight.

4.2.2 SCA Capacity

There are several considerations that could affect the final SCA required capacity. First, as indicated in Section 4.1.2 and the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), a bulking factor of approximately 1.0 is anticipated following self-weight consolidation; therefore, the dredge volume is approximately equal to the required capacity. Next, as discussed in the *Onondaga Lake Dredging, Sediment Management, and Water Treatment IDS* (Parsons *et al.*, 2009), further characterization of dredging areas has indicated that the extent and depth of impacted material are less than were previously assumed. As a result, the actual volume of sediment dredging needed to accomplish the remedial goals will likely be less than 2,653,000 CY. Finally, the contaminated soils and sediment from Ninemile Creek may be placed in either the containment system at the LCP Bridge Street site or the SCA according to the ROD for Geddes Brook/Ninemile Creek site OU1 (NYSDEC and USEPA, 2009a) and the *Proposed Plan for Geddes Brook/Ninemile Creek Site OU2* (NYSDEC and USEPA, 2009b). The estimated volumes to be excavated from Ninemile Creek are 59,000 CY for OU1 and 58,000 CY for OU2, for a total of 117,000 CY.

As discussed in Section 4.4 and shown on Drawing C-003, flexibility in the SCA capacity is included in the design through a phased construction approach. The calculations provided in Appendix F, "Volume Calculations for SCA Design" indicate that the fully constructed (i.e., three phases) 72-acre SCA has a total design capacity for up to 2,653,000 CY of dredge material with an assumed stacking height of five geotextile tubes (i.e., approximately 30 ft).

4.2.3 Wastebed 13 Surface and Subsurface Conditions

As discussed in the Data Package (Attachment B of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), the potential for settlement varies across Wastebed 13 due to subsurface characteristics, including thickness and properties of underlying Solvay waste, and buried dikes. Therefore, the SCA location within Wastebed 13 was selected so that the existing grades already slope to low areas where liquids (i.e., filtrate and consolidation water from dewatering sediment and surface water) can be collected, and these slopes can be maintained even after settlement is taken into consideration. In addition, the location and footprint of the SCA were selected to preserve existing surface water flows outside of the SCA, as discussed in Section 4.3.4.

4.2.4 Excavation and Import of Fill into Wastebed 13

Minimizing the need for excavation and importing of fill were both considerations in the development of the SCA layout to reduce impacts to the community (e.g., truck traffic). Additionally, the minimization of excavation and import of fill is a requirement that is stated in Section 5 of the SOW, as follows: "The grading design for the SCA shall utilize the existing surface topography of Wastebed 13 as much as possible so as to limit wastebed cut and fill requirements and the associated need for a large volume of imported soil fill. Preloading and stabilization of the wastebed shall only be required to the extent necessary to ensure the integrity of the SCA components and underlying Solvay waste foundation, based upon the remedial design." By locating the SCA in an area of Wastebed 13 that already slopes to two low points, the layout presented herein minimizes, to the extent possible, the amount of excavation and fill placement that will be required during construction.

4.2.5 Operational Requirements

Geotextile tubes will be used to dewater the dredged slurry within the SCA. The slope of the area to be used for geotextile tube placement, the anticipated geotextile tube stacking height, and the control of liquids within the SCA are aspects of operations that were taken into consideration in developing the SCA layout. These considerations are discussed in the paragraphs that follow.

Geotextile tubes are typically operated on drainage areas that are relatively flat. For this application, a drainage system underlying the tubes that slopes to low points was also required. Therefore, to achieve a balance between these two requirements while minimizing cut and fill requirements, an area at Wastebed 13 with fairly uniform, gentle slopes towards two low points was selected.

Tube stacking height is mostly a consideration under capacity; however, it is also important in terms of operations. As presented in Section 4.3.1, slope stability analyses were conducted using estimated strength properties of the subsurface materials in Wastebed 13, potential geomembrane and geotextile tube materials, and dredge material. The slope stability analyses indicate that geotextile tubes can be safely stacked five high in a given year; however, depending on the results of monitoring (e.g., settlement and pore water pressures) and general observations during construction, it may be operationally advantageous to adjust the number of tubes stacked in a year and/or the active dewatering area. This operational flexibility was taken into consideration when developing the layout and the phased base liner construction that is discussed in Section 4.4.

The required dike height around the SCA to contain the filtrate water from the geotextile tubes and to prevent surface water from running onto or off of the SCA was also a consideration. Given the SCA grading at the selected location and the fact that the liquid management system will be continuously collecting and removing liquid from the SCA, a minimum dike height of 5 ft above existing grade was selected.

An additional consideration in terms of operations and the layout design was the potential need for a temporary staging area. Prior to dredging areas in the lake, some debris will be removed. Portions of that debris will be recycled (as practical), and other portions of the debris may be placed in a temporary staging area on Wastebed 13. In addition, slurry conditioning (which may be conducted prior to slurry transfer to the SCA) may include gravel and sand-sized particle separation with the resulting materials also being placed in the temporary staging area. During operations, these materials would be transferred to the SCA for permanent containment. In developing the layout, the placement of this staging area to handle these temporary stockpiles was considered. If required, the location will be determined based on anticipated material quantities and accessibility to the SCA.

4.3 ENGINEERING ANALYSES

The following subsections present the engineering analyses required to develop the drawings included in Appendix E. These design elements include slope stability, settlement, liner and liquids management, surface water control, and the preliminary final cover.

4.3.1 Slope Stability Analyses

Detailed slope stability analyses of the SCA under both interim (i.e., during SCA construction and operation) and long-term (i.e., post-closure) conditions are provided in Appendix G, "Slope Stability Analyses for SCA Design." The following subsections provide a summary of this evaluation, which indicates that the SCA, as designed, is stable.

4.3.1.1 Design and Performance Criteria

The stability of a slope is reported in geotechnical engineering terms as the factor of safety. A factor of safety of 1.0 or greater is required for a slope to be stable. Due to the inherent variability in the engineering properties of soils, slopes are typically designed with a factor of safety greater than 1.0. Appropriate factors of safety for a given set of conditions were developed for the SCA considering the importance of the facility, and guidance provided by:

- U.S. Army Engineer Waterways Experiment Station Technical Report D-77-9 (Hammer and Blackburn, 1977), and
- U.S. Army Corps of Engineers Engineering Manual EM 1110-2-1902 (USACE, 2003).

As discussed in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), based on these guidance documents, a factor of safety of 1.3 was selected as an appropriate value to be used for interim static conditions (i.e., during construction and operation). In addition, a factor of safety of 1.5 was selected as an appropriate value to be used for long-term static conditions (i.e., post-closure). This factor of safety for long-term static conditions is consistent with NYSDEC Regulations Section 360-2.7(b)(6), which indicates a factor of safety of 1.50 for the final cover system under long-term static conditions. The site is not located in a seismic impact zone; therefore, a seismic slope stability analysis is not required.

4.3.1.2 Methodology

Slope stability analyses were performed using Janbu's and Spencer's method in the computer program SLIDE version 5.039 (Rocscience, 2006). Four potential slip modes were evaluated in the analyses: (i) block slip mode along geotextile tube interfaces, (ii) block slip mode along the liner system; (iii) circular slip surfaces through dredge material contained in geotextile tubes and Wastebed 13 foundation materials; and (iv) circular slip surfaces through existing Wastebed 13 perimeter dikes.

Information required for the static slope stability analyses included the slope geometry, the subsurface soil stratigraphy, the groundwater table elevation, the material properties of the subsurface soils, dredge material, liner and cover system materials, and the external surface loading, if any, at the selected cross section locations. Material properties obtained from previous investigations, as discussed in Section 3.1, and the results from recently performed interface testing on potential liner materials, as described in Section 3.2, were used in the analyses. In terms of geometry, it was assumed typical geotextile tube practices would be employed, which include stacking tubes such that each successive layer of tubes is approximately 20 ft shorter in total length than the tubes in the layer below, and the tubes in upper layers straddle the underlying tubes.

4.3.1.3 Results

As indicated previously, four potential slope stability slip modes were evaluated. Two cross sections were analyzed for each slip mode (i.e., one running perpendicular and one running parallel to the long direction of the geotextile tubes - see Figure 2 of Appendix G, "Slope Stability Analyses for SCA Design"). Interim conditions were analyzed for each slip mode, with up to five layers of geotextile tubes and a final cover. Final conditions were also analyzed for each slip mode for five layers of geotextile tubes with a final cover.

The calculated factors of safety for all four slip modes met or exceeded the appropriate values under both interim and long-term conditions (see Tables 2, 3, and 4 of Appendix G). When five layers of geotextile tubes and the final cover are placed within the same season, it is assumed that the consolidation time would not be sufficient for strength gain to occur in the underlying Solvay waste. Under this condition, field consolidation will be monitored to confirm that strength gain has occurred before the final cover is placed. An outline for the geotechnical instrumentation monitoring plan is provided in Section 5. The overall Wastebed 13 perimeter dike has an appropriate factor of safety for potential slip surfaces that pass through the proposed SCA. During final design, the condition of the Wastebed 13 perimeter dike surface will be evaluated. The final design will include methods for addressing areas that are identified as requiring restoration and/or erosion protection.

In terms of the strength properties for the geotextile tubes and the geosynthetics in the liner system that were assumed in the slope stability analyses, these were based on laboratory testing of representative materials. Once the actual materials are delivered to the project site, samples will be tested to confirm that the materials meet the range of acceptable liner system and geotextile tube to geotextile tube interface strength parameters (both peak and residual) that are provided in Appendix G.

4.3.2 Settlement Analysis

Detailed settlement analyses of the SCA under both interim (i.e., during SCA construction and operation) and long-term (i.e., post-closure) conditions are provided in Appendix H, "Settlement Analyses for SCA." The following subsections provide a summary of this evaluation, which indicates that the liner system will perform properly during operations, closure, and post-closure. Once the filling sequence and operational issues associated with access and filtrate management have been finalized, additional settlement analyses will be performed, as needed, to confirm that positive drainage towards the sumps will be maintained during operations, closure, and post-closure. These additional analyses will be included in the final design.

4.3.2.1 Design and Performance Criteria

As detailed in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), settlement calculations were required to evaluate the magnitude of settlement in the Solvay waste underlying the SCA and in the dredged material inside the geotextile tubes. Based on these settlement calculations, tensile strain was evaluated and compared to the maximum recommended tensile strain of 5% for the geomembrane liner (Berg and Bonaparte, 1993). In addition, the effect of settlement on grading was evaluated. In particular, the focus was on maintaining the liner grading towards the sumps and positive cover grading under operation and post-closure conditions.

4.3.2.2 Methodology

Conventional one-dimension (1-D) primary consolidation settlement and secondary compression settlement calculation methods were used to estimate the settlement due to SCA perimeter dike, liner, geotextile tube, and final cover placement. The foundation and dredged material settlement was calculated at the time of closure (i.e., at the end of year 4 or the fourth year of dredging) and 30 years after closure.

For purposes of the foundation settlement calculations, it was assumed that geotextile tubes containing all four years of dredged material were placed at the beginning of operations (i.e., year 1). For the dredged material settlement analyses, it was assumed that the loading was increased incrementally (i.e., geotextile tubes containing the first year of dredged material were placed at the beginning of year 1, etc. for subsequent years). Thus, the loading from subsequent years of tubes was included in the settlement calculations for the dredged material in the bottom tubes.

For the post-cover settlement calculations, the deformed geometry of the liner system, SCA perimeter dike, and the geotextile tubes estimated from the settlement analyses at closure (i.e., before cover placement) became the initial geometry. The proposed final cover system loading was assumed to be placed at the beginning of year 5.

Foundation and cover settlements were calculated using two different models, the surface settlement model (SSM) and the cross-section settlement model (CSM). The SSM produced post-settlement elevation and settlement contour maps for a deformed surface using approximately 2,300 settlement calculation points. The CSM produced similar results along a cross section. The main difference between SSM and CSM is that the CSM considered the load-induced stress distribution within the foundation SOLW and the dredge material in the geotextile tubes, while the SSM did not. The post-settlement contour maps produced using the SSM were used to evaluate whether positive drainage was maintained in the liner system and the final cover system. The post-settlement section figures produced using the CSM were used to evaluate the maximum strain in the geosynthetic components.

4.3.2.3 Results

Using the SSM, the foundation settlement during the operations period was calculated to be 9 to 11 ft, and the settlement of dredge material in the geotextile tubes during the operations period was calculated to be 2.5 ft on average with a maximum of 5 ft. As compared to during operations, relatively small settlements were calculated for the post-closure period. The additional foundation settlement during the post-closure period was calculated to be 1 to 2 ft. The additional settlement of dredge material in the geotextile tubes during the post-closure period was calculated to be 1.5 ft on average with a maximum of 2.5 ft. Contour maps of the calculated post-settlement grades for these cases are provided in Appendix H, "Settlement Analyses for SCA." Based on these results, the liquids management system (i.e., the gravel layer) is anticipated to maintain an adequate slope to the sump areas (i.e., no slope reversals or local ponding) during the closure and post-closure periods. In addition, the proposed final cover is expected to perform properly during the post-closure period by maintaining positive drainage. Any long-term development of local low points will be addressed during maintenance.

Using the CSM, the maximum tensile strain on the liner system was calculated to be 2.7% during the closure and post-closure periods, which is less than the maximum allowable tensile strain of 5% for geomembrane. According to the analyses, liner tensile strains were typically in the sideslope and the SCA perimeter dike areas, not in the areas where the loading is more uniform. The maximum liner tensile strains typically occurred on the inner side of the dike sideslope area.

4.3.3 Liner and Liquids Management System Design

The base liner system, as shown in Drawing C-009, consists of the following components from top to bottom:

- 24-inch (average) drainage layer;
- geotextile cushion;
- geomembrane liner; and
- 12-inch minimum (18-inch minimum at the sumps) low-permeability soil component with top 6 inches compacted to achieve a permeability less than or equal to 1×10^{-6} centimeters per second (cm/sec).

The geomembrane liner type and geotextile will be selected in the Final SCA Civil and Geotechnical Design. The liquids management system includes the drainage layer (which is also part of the base liner system), pumps, sumps, and risers. The design and performance criteria for these systems and the assumptions made and calculations performed to develop the liquid management system design are discussed in the subsections that follow.

4.3.3.1 Design and Performance Criteria

As indicated in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"), the liner and liquids management system will be designed in accordance with the requirements of NYSDEC Regulations Part 360, Section 2.14(a). Because of the existing site topography, a "landform" type design will be used. Specifically, the existing site topography will be used, to the extent possible, in designing the grading of the liner and liquids management system. Therefore, the system will be designed so that the drainage layer maintains a positive slope toward the sumps during operations and post-closure. The intent of the liner and liquid collection system is to achieve a head no greater than 1 ft during operations and post-closure; however, consistent with Part 360, Section 2.14 (a), the design may allow for heads greater than 1 ft in the sump areas and for some interim periods, if it can be demonstrated that the overall objectives are met.

4.3.3.2 Liquids Management System Design

The volume of liquids to be handled by the liquids management system will change significantly as the SCA transitions from operation to closure. During operation, the liquids management system will collect filtrate and consolidation water from the geotextile tubes and precipitation that comes into contact with dredged material. For purposes of this discussion, “filtrate” refers to the water released from the tubes during the first 24 hours after filling, and “consolidation water” refers to the water released from the tubes after 24 hours. After SCA closure, the liquids management system will handle remaining consolidation water that is generated by the continuing dewatering of the dredge material within the tubes and precipitation that infiltrates through the SCA cover.

The liquids management system is designed for post-closure conditions. Operational volumes will vary depending on precipitation events, dredge rate, dredge work schedule, and operation of the geotextile tubes. An estimate of the operational flow rates was provided in Appendix G of the *Onondaga Lake Dredging, Sediment Management, and Water Treatment IDS* (Parsons *et al.*, 2009). Since the location, in addition to the intensity, of these flows will vary throughout the four year operational period, in order to maintain a head no greater than 1 ft in the drainage layer, temporary pumps, in combination with the liquids management system, will be used to handle large flows on a temporary basis.

For purposes of calculating the design inflow under post-closure conditions, a 21-inch layer of earthen material with a hydraulic conductivity of $1x10^{-5}$ (cm/sec) was assumed to be in place over the tubes. Since the actual final cover, as discussed in Section 4.3.5, is in the preliminary design phase, this assumption is also considered a minimum requirement for the final cover design and was selected to allow for design of the liquids management system to proceed.

As presented in Appendix I, “Evaluation of Hydraulic Performance for SCA Design”, the Hydraulic Evaluation of Landfill Performance (HELP) software (Version 3.07 developed by the USEPA) was used to calculate a design inflow rate of 15 gallons per minute (gpm) for the entire SCA under this condition. In addition to the 21-inch cover layer assumption, assumptions regarding the hydraulic conductivity of the dredge material and liner system components; SCA cover geometry; and local weather data (adjusted to include a 25-year, 24-hour rainfall) were required for this analysis. The results of this evaluation indicated that the calculated average and peak liquid head on the liner system under these conditions meets the 1 ft or less requirement.

Using the inflow results from above, Appendix J, “Sump and Riser Calculations for SCA Design” presents the detailed analyses required for the design of the pumps, risers, and sumps. Based on an inflow of 15 gpm and the liner grading, inflow values of 10 gpm towards the western sump area and 5 gpm towards the eastern sump area were assumed. The following calculations were performed as part of this design: (i) evaluation of the hydraulic requirements for the riser pipe perforations; (ii) evaluation of the structural stability of the riser pipe; and (iii) calculation of liquid storage volume and filling time for the sump area.

Based on these calculations, the recommended riser pipe is 5 ft in diameter, and the required sump excavation depth is 8 ft into the Solvay waste. The sump area design includes two separate riser pipes with pumps (a main and a backup) and a 10-ft offset between each riser pipe. Drawings C-005 and C-010 in Appendix E provide the detailed design of the sump grading, pumps, and risers of the liquids management system.

4.3.4 Surface Water Control System Design

The conceptual surface water control system design presented herein assumes that the surface water generated from the SCA will be handled separately from the surface water generated by the rest of the wastebed. The following sections describe the management of, and design for, the surface water to be generated by the SCA during construction, operations, and post-closure.

The surface water from the areas outside the SCA will be handled by the existing weir boxes, topographic features, and existing leachate collection system. The long-term effectiveness of the current leachate collection system will be evaluated as part of the closure of Wastebeds 9 through 15.

4.3.4.1 Design and Performance Criteria

The design and performance criteria for surface water management are provided in the BOD (Attachment A of Appendix A, "SCA Civil and Geotechnical Technical Memorandum"). In summary, the surface water management system will be designed to meet the project requirements for both temporary (i.e., during construction, operations, and closure of the SCA) and long-term conditions (i.e., after closure of the SCA). Furthermore, calculations for temporary and permanent surface water control structures will be performed using the 25-year, 24-hour storm event, as indicated in NYSDEC Regulations Section 360-2.7(b)(8)(ii). Finally, the "New York State Standards and Specifications for Erosion and Sediment Control" (NYSDEC, 2005) will be the guidance document used for this design.

4.3.4.2 Surface Water Management During Construction

Erosion and sedimentation control during SCA construction, operation, and winter shutdown will be addressed in a Stormwater Pollution Prevention Plan that will be provided as a pre-construction submittal. This plan will be consistent with the NYSDEC guidance document mentioned previously.

As part of the initial construction activities, Weir Box 6, which is located approximately in the center of Wastebed 13, will be abandoned. As part of the Final SCA Civil and Geotechnical Design, Weir Boxes 5 and 7 will be evaluated to determine if they need to be reinforced prior to SCA loading. During liner construction, surface water generated from lined areas will be non-contact water. This non-contact water will be directed off the wastebed into the existing surface water drainage system at the outside of Wastebed 13 and out through the existing State Pollution Discharge Elimination System (SPDES) discharge points. The SCA perimeter dikes, pumps, and/or temporary above-ground piping will be used to convey the non-contact water to the existing surface water drainage system. The requirements for this system are dependent upon the weather and construction phasing, and therefore the sizing of this temporary system will be done during construction.

Surface water that comes into contact with the surface of Wastebed 13 will be managed similarly to the existing management practices (i.e., surface water infiltrates and is collected by the existing leachate collection system). During construction of the SCA, expedited removal of surface water that has contacted the surface of Wastebed 13 and perched groundwater from sump excavations may be required. This water would also be directed to the existing leachate collection system. During operations, it will be determined if temporary pumps and possibly some above-ground piping will be necessary to convey this water without going through the existing leachate collection system. This redirection of flow will occur as necessary so that the capacity of the existing leachate collection system will not be exceeded. As with the temporary system for conveyance of non-contact water, the sizing of this temporary system depends on construction procedures and will be designed during construction.

4.3.4.3 Surface Water Management During Operations

It is assumed that surface water within the active dewatering area (i.e., area where tubes have been placed) during operations and winter shutdown will be collected in the liquids management system and directed to the SCA Water Treatment Plant (WTP) for treatment. Non-contact water from lined areas will be directed off the wastebed and out through the existing SPDES discharge points, as described in the previous subsection. The use of interim covers on the geotextile tubes is being considered for separating clean and impacted surface water, thus minimizing the volume of liquid that will require treatment. If used, non-contact water collected off the interim covers would be conveyed to the existing surface water drainage system, as described above. As stated in Section 4.3.3, temporary pumps and piping will be used to augment the permanent pumps and piping in the liquids management system to provide adequate capacity to remove the precipitation, filtrate, and consolidation water from the SCA. Since interim covers and sizing of the temporary pumps and piping are an operations issue as opposed to a SCA civil and geotechnical design issue, they will be discussed further in the *Slurry/Sediment Management Intermediate Design*.

4.3.4.4 Surface Water Management Post-Closure

Under the post-closure condition, the SCA will be covered and all surface water runoff will be non-contact water. Appendix K, “Preliminary Final Cover System Surface Water Management System Design” provides the analyses required to develop the surface water management system for the SCA under this condition. This conceptual surface water management system (Drawing C-014), which was developed for a 25-year, 24-hour design storm, includes the following features:

- diversion berms;
- riprap chutes;

- toe drainage channels; and
- perimeter culverts.

The analyses presented in Appendix K use the post-settlement grades calculated in Appendix H, "Settlement Analyses for SCA," as a basis for this design. As SCA operations progress and real-time settlements are obtained using the geotechnical monitoring system (see Section 5.3), this design will be updated.

The non-contact water handled by the surface water management system described above will be directed off Wastebed 13 to the existing surface water drainage system at the outside of Wastebed 13 and out through the existing SPDES discharge points. The details regarding the conveyance of this water from the SCA to the existing system outside of Wastebed 13 will be developed further in the Final SCA Civil and Geotechnical Design. The surface water from the remainder of the wastebed will be handled in a manner consistent with the closure of the other wastebeds.

4.3.5 Preliminary Final Cover Design

The SCA final cover system components and slopes will be designed to account for settlement of the subgrade material, to promote positive drainage, and to minimize erosion. Per the SOW, the cover system will be designed in accordance with NYSDEC Regulations Part 360, Section 2.14(a), which allows modifications to the subpart requirements on a case-specific basis. Further, the SOW indicates, if appropriate, the SCA cover may be in accordance with USEPA Alternative Cover Assessment Program (ACAP) and may utilize a soil layer and ecological plant community to produce evapotranspiration rates sufficient to reduce precipitation infiltration rates to acceptably low levels.

Although the specific components of the cover design will be finalized as the design progresses, certain assumptions regarding the cover have been used throughout this document and to allow for the development of an appropriate post-closure liquids management system. Therefore, these assumptions (specifically, a 21-inch minimum layer of cover soil with a maximum hydraulic conductivity of $1x10^{-5}$ cm/sec) are considered the minimum requirements that will be incorporated into the detailed final cover system design that will be presented in future submittals.

Drawing C-012 in Appendix E shows the estimated grades (average 0.5% slope) of the top of geotextile tube surface prior to final cover placement. These grades were estimated using the settlements calculated in Appendix H, "Settlement Analyses for SCA," for the end of year 4 (i.e., after operations have been completed). As geotextile tube placement proceeds during operations, settlements will be monitored, and these data will be used to finalize the cover design. Although the details of the cover system components are not presented here, the overall approach for the final cover, which included developing the grading for the preliminary cover system, is described. As shown in drawing C-012, a "landform" type design was selected for the final cover. As discussed in the following paragraphs, in addition to landform, two other options were considered for the final grading.

First, a cover system with 4% slopes was considered. Based on the grades shown on Drawing C-012 in Appendix E, it is estimated that approximately 35 ft of material would be required in the center of the SCA to create a 4% slope from the center to the edge. This system was not selected because the additional height would increase the visual impact of the SCA on the community, and the larger fill volume would significantly increase truck traffic and require several years to place on the SCA to avoid loading the underlying subgrade too quickly. Increasing the footprint and using tubes to achieve the slopes would be another option to create greater slopes; however, as discussed in Section 4.2, the footprint was developed based on a rigorous evaluation that took into consideration construction, operation, and post-closure conditions. Therefore, 4% slopes were not considered further.

Second, a saw-tooth pattern was considered. Significantly less material is required for this option as compared to the previous one; however, the variation in loading across the SCA could result in grade reversals in the base liner system because of the highly compressible nature of the foundation SOLW. Because of this concern and the importance of maintaining drainage towards the sumps, this option was not considered further.

Finally, maintaining (in general) the grades that develop due to placement of the geotextile tubes was considered (i.e., a "landform" type design) and selected as the preferred approach. Under this option, the final cover will generally follow the top of the geotextile tube surface, which will be established by the initial base liner grading (gentle sloping grades to two low points), geotextile tube placement, and settlements due to liner and geotextile tube placement. Since the base liner grades at the end of year 4 are sufficient to maintain positive drainage toward the sumps, placement of a relatively uniform final cover will achieve relatively consistent settlement across the SCA, thus maintaining the positive slope. In addition, this method minimizes the amount of required fill material and associated loading.

For the preferred approach, preliminary settlement analyses were performed, as indicated in Section 4.3.2. For purposes of the calculations, a minimum 21-inch cover was assumed. The predicted settlement of the cover system shows positive drainage through the 30-year post-closure period that was evaluated (see Drawing C-013 in Appendix E). The results also indicate that compared to the settlement that occurs prior to final cover placement, the settlement during the post-closure period is relatively small. Therefore, the settlement analyses indicated that average slopes of 0.5% at closure are sufficient to achieve long-term positive drainage. In addition, it is also assumed that low spots due to differential settlement will be regraded prior to completion of the cover, and the Post-Closure Care Plan will address issues related to cover maintenance.

4.4 SCA CONSTRUCTION

The SCA design that was developed based on the calculation packages presented in the previous sections is provided in Appendix E, "Drawings." The following sections describe certain aspects of the design in detail, specifically, the proposed SCA base liner construction phasing, the appropriateness of preloading, the material sources for SCA liner and cover construction, material staging and support areas, and traffic routes. Operational considerations associated with the geotextile tubes (e.g., stability during filling, tube placement sequence) will be addressed in the *Slurry/Sediment Management Intermediate Design*.

4.4.1 Liner Construction Phasing

The SCA liner system will be constructed in phases, which will minimize impacts to the community each year and best allow for the work to be performed within the capabilities of the local construction and material markets. As required each year, additional acreage of liner will be installed to provide adequate space for the upcoming year's proposed dredge volume.

A proposed phasing plan for the SCA base liner construction is presented in Drawings C-003, C-004, and C-006. Under this plan, the Phase I footprint, which is approximately 30 acres, would be sufficient to contain more than one year's dredge volume (i.e., 660,000 CY), if the geotextile tubes are stacked three high. As shown in the drawings, the sump areas, which are located near the center of the wastebed, are within the Phase I footprint. If it is operationally advantageous and settlement and pore water monitoring of the underlying materials indicate it is acceptable, tubes may be stacked up to five high during the first year of operation.

Phase II of the base liner system construction, approximately 21 acres, would be constructed to the south of the Phase I area. The combined footprint of Phases I and II (i.e., 51 acres) would provide sufficient area for the second year of dredged material to be placed in tubes stacked three high across the entire area.

If it is determined that a larger footprint is required, Phase III of the base liner system would be constructed. This Phase III area, up to 21 acres, would be located to the north of the Phase I area (Drawing C-003).

4.4.2 Operation Support Areas

In addition to the SCA, the Wastebed 13 area may also be used for siting of a slurry conditioning operation, temporary staging area (i.e., staging of debris and/or gravel- and sand-sized particles), WTP facility, water storage facilities, and necessary support facilities for these operations. Figure 4.1 presents potential areas for these facilities. The actual areas required for these operations will be established in the *Slurry/Sediment Management Intermediate Design*.

4.4.3 Preloading

As stated in the preceding sections, the SCA has been designed to accommodate the characteristics of the subsurface stratigraphy of Wastebed 13. The SCA is designed to accommodate settlement of the underlying materials and will continue to provide secure containment and a functioning liquids management system. Preloading and stabilization under the SCA or its dikes are not required. If needed, preloading may be used in local areas such as sump locations to temporarily modify grades and to facilitate leaving a larger area around the sumps open during certain operational phases for water management. Further evaluation of this localized preloading will be performed during the final design. If specific preloading is required for WTP or processing equipment, it will be included in the *Slurry/Sediment Management Intermediate Design*. Stockpiling SCA liner material, low-permeability soil, and/or gravel will be considered for support area preloading, if needed.

Note: Locations and dimensions are approximate and will be finalized at later stage of the remedial design.

N W E S

New York State Digital Orthoimagery from 2003

450 225 0 450

Feet

FIGURE 4.1

Honeywell

Onondaga Lake
Camillus, New York

Wastebed 13 Support Areas and Accessibility

PARSONS

290 ELWOOD DAVIS RD, SUITE 312, LIVERPOOL, NY 13088 Phone:(315)451-9560

4.4.4 Material Sources

Materials to be used in SCA construction include low-permeability soil, geomembrane, geotextile, gravel, and soil for the vegetated cover and SCA perimeter berms. The general fill, low-permeability soil, gravel, and soil for vegetated cover are expected to be available locally and will be delivered to the site by truck. Approximately 56,400 CY of dike material, 264,000 CY of low-permeability soil, and 207,500 CY of gravel will be required (see Appendix F, "Volume Calculations for SCA Design"). Geomembrane and geotextile will be obtained from yet-to-be determined vendors and will also be delivered to the site via truck. Approximately 3,200,000 SF of geomembrane and geotextile will be required. The quantities provided are for the 72-acre footprint that corresponds to a SCA capacity of 2,653,000 CY and would be phased over three separate construction periods.

4.4.5 Traffic Routes

SCA liner and cover construction materials will be imported by truck. Truck traffic within the Wastebeds 12 through 15 area will follow the existing gravel roads around, and in-between, the wastebeds, so only minimal modifications to those existing gravel roads are expected to be required.

Off-site traffic to and from the Wastebed 12 through 15 area will be via the existing access points as shown on Figure 4.2. Traffic routes that will potentially be utilized to get to and/or from the site are:

- Gere Lock Road (west of 695);
- Warners Road, Belle Isle Road;
- Milton Avenue, Warners Road, Belle Isle Road;
- Airport Road, Armstrong Road, State Fair Blvd; and
- Bridge Street (via LCP site).

Table 4.1 presents the Annual Average Daily Traffic (AADT) on the proposed existing roads mentioned previously, as documented by Syracuse Metropolitan Transportation Council (http://www.smtcmpo.org/data/TrafficCounts):

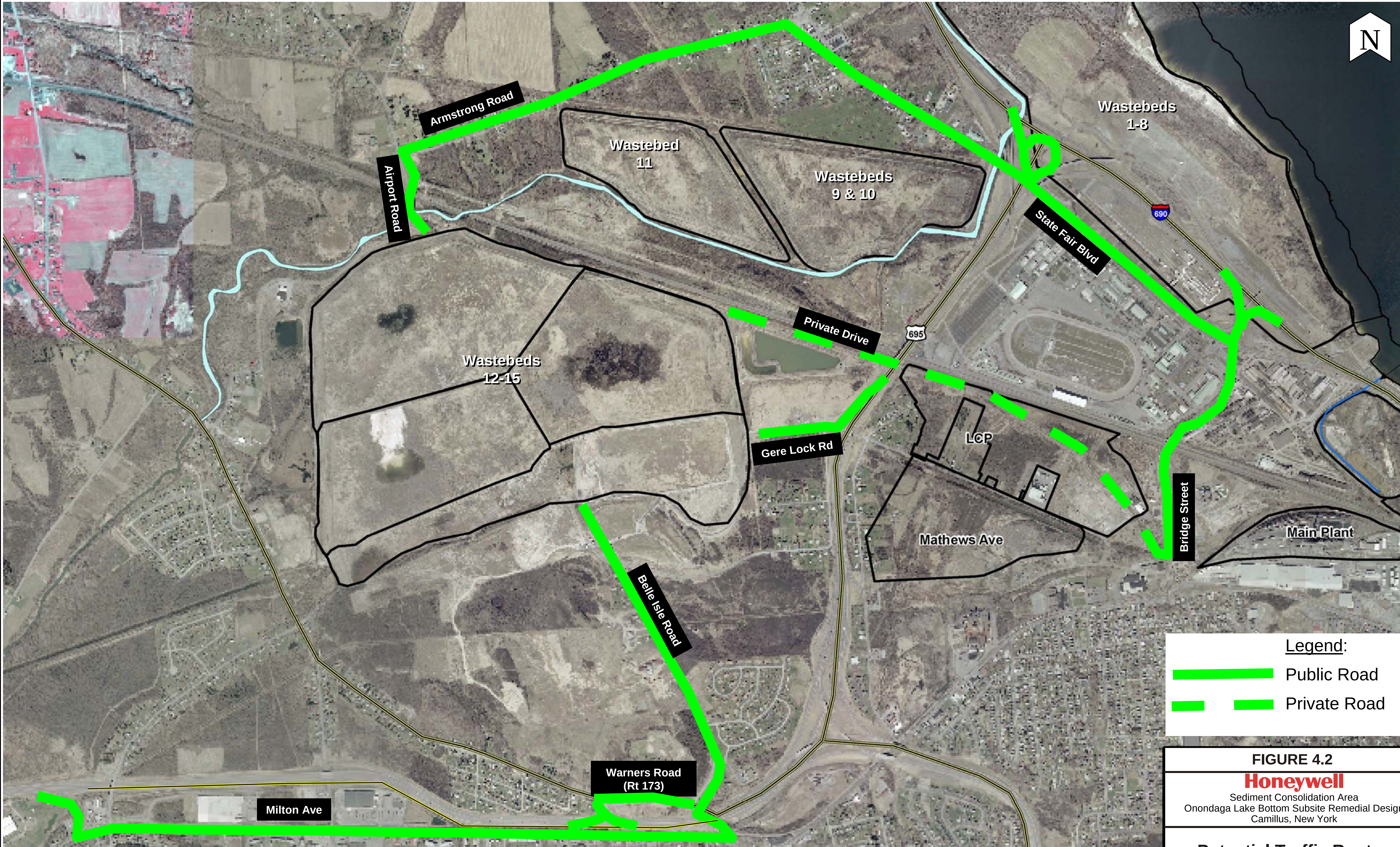


FIGURE 4.2

Honeywell

Sediment Consolidation Area
Onondaga Lake Bottom Subsite Remedial Design
Camillus, New York

Potential Traffic Routes

PARSONS

301 Plainfield Road * Suite 350 * Syracuse, NY 13212 * Phone: (315) 451-9560

P:\Honeywell-syr\444853\10\10.9\figure 4.2.ppt

TABLE 4.1

ANNUAL AVERAGE DAILY TRAFFIC

Road	Segment	Average Annual Daily Traffic (AADT)
Gere Lock Road	Thomas Ave Ext - Solvay Village Line	1,147
Warners Road	Belle Isle - Rte 695 On/Off Ramps	5,997
Belle Isle Road	Warners - Thomas Ave	1,839
Milton Avenue	Hinsdale - Warners	7,606
Airport Road	Airport Rd - 2.2 Mi SSE Of Int 39 - Cr 100/106 Over Conrail	2,900
Armstrong Road	Armstrong Rd - Town Ln - Cr 80	1,750
State Fair Blvd	State Fair Blvd - Rt 690 On Ramps - NY State Fairground Entrance	6,600
Bridge Street	Bridge St - State Fair Blvd - Matthews Ave	8,950

A Traffic Management Plan will be developed that specifies the actual traffic routes that will be used during construction.

As indicated previously, approximately 3,200,000 SF of geomembrane and geotextile will be required. In addition, the total volume of dike and liner earthen materials is 527,900 CY. At a truck volume of 15 CY, this is 35,200 truckloads. As stated in Section 4.4.1, construction is expected to occur in three phases (i.e., three different construction seasons); therefore, the average trucks per day are 65 for three 180-day construction seasons.

Based on the above calculations, the expected average daily truck traffic due to SCA construction is significantly lower than the AADT for each of the proposed traffic routes. Therefore, the impact on the community because of increased truck traffic will be minimal, and all the proposed routes indicated above will be considered in the development of the Traffic Management Plan.

SECTION 5

PLANS

5.1 SCA PLANS

Plans will be developed to ensure proper construction of the SCA, to monitor settlement and water levels during SCA construction and operation, to monitor groundwater quality, and to provide post-closure monitoring of the SCA. Brief descriptions and preliminary outlines (where applicable) for these plans are provided in the subsections that follow.

5.2 CONSTRUCTION QUALITY ASSURANCE PLAN

The Construction Quality Assurance Plan (CQAP) will present the procedures and protocols that will ensure the construction of the SCA will be executed in accordance with the approved design documents. Topics to be covered include the following:

- Introduction - purpose, objectives, organization, site description and history, and design summary;
- Organization and Management – roles and responsibilities, communication procedures, meetings; and
- Construction Oversight Tasks – details for inspections and testing, review, and documentation.

A preliminary table of contents for the CQAP is included in Appendix L.

5.3 GEOTECHNICAL INSTRUMENTATION AND MONITORING PLAN

The Geotechnical Instrumentation and Monitoring Plan will include the procedures for installing, monitoring, and maintaining vibrating wire piezometers, settlement cells, and settlement profilers, which are shown on Drawing C-007. A preliminary table of contents for this plan is provided in Appendix M.

5.4 GROUNDWATER MONITORING PLAN

The detailed groundwater monitoring plan for the SCA will be included as part of the Wastebeds 9 through 15 Groundwater Monitoring Plan. The plan for the SCA will include monitoring wells installed on approximately 500-ft spacing downgradient of the SCA (i.e., along the northern perimeter of Wastebed 13) and 1,500-ft spacing upgradient of the SCA (i.e., in between Wastebeds 12 and 13 and Wastebeds 13 and 14) for a total of approximately 16 monitoring wells, some of which are existing wells. All the wells will be screened in native material. One year of baseline monitoring will be performed prior to dredge material placement in the SCA.

5.5 POST-CLOSURE PLAN

The Post-Closure Plan includes the site monitoring requirements associated with the final cover, liquid management system, surface water control, and geotechnical instrumentation. In addition, the required documentation for the inspection, operation, and maintenance activities that will occur during the post-closure period is provided, along with details regarding citizen participation and site access. A preliminary table of contents for this plan is provided in Appendix N.

SECTION 6

SUBCONTRACTING STRATEGY

An integrated team of in-house resources, teaming partners, and key subcontractors will execute the final design and implementation of the entire remedial action. The design team will interact with the personnel that will execute the construction and operations to assure that the final design components are complete, implementable, and meet the project objectives. In addition, key members of the design team will have functional quality assurance/quality control responsibilities during the construction efforts.

The design and subcontracting strategy for the SCA construction component of the remedy will be a design-bid-build approach. The design under this approach will incorporate agency review with public input into this intermediate design and subsequent final design phases. It is anticipated that subcontractor selection will be completed after approval of the final design. The construction of the SCA will be accomplished in conjunction with surface water controls for the site. Operations of the SCA during sediment dewatering will be subcontracted separately from the SCA construction.

SECTION 7

DESIGN SUBMITTAL AND CONSTRUCTION SCHEDULE

Critical to the success of the lake remedial action is the sequencing of events and interrelations of design and construction activities to assure the process is efficient and completed within the appropriate timeframe. A logical progression of the decisions, analysis, and planning needed to execute the work has been established during the initial design phase. This section outlines the schedule milestones established to accomplish the SCA civil and geotechnical design aspects of the remedial action consistent with the Consent Decree schedule requirements. The schedule is based on receipt of NYSDEC comments within 60 calendar days of submittal.

SCA CIVIL & GEOTECHNICAL DESIGN & CONSTRUCTION MILESTONES	
Submit SCA Civil & Geotechnical Draft Final Design to NYSDEC	1/22/2010
Submit SCA Civil & Geotechnical Final Design to NYSDEC	5/31/2010
Mobilize/Start Site Preparation	8/15/2010
Start Phase I SCA Liner Construction	5/31/2011
Complete Phase I SCA Liner Construction	12/31/2011
Start Dredging	5/31/2012
Start Phase II SCA Liner Construction	5/31/2012
Complete Phase II SCA Liner Construction	12/31/2012
Start Phase III SCA Liner Construction (if needed)	TBD (based on need)
Start SCA Cover Construction	After Completion of Dredging

SECTION 8

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