
**ONONDAGA LAKE
SEDIMENT CONSOLIDATION AREA (SCA)
FINAL COVER DESIGN REPORT**

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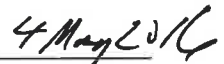
May 2016

CERTIFICATION STATEMENT

ONONDAGA LAKE SCA FINAL COVER DESIGN REPORT

Pursuant to Item 28 of the Consent Decree, the following certification is provided, signed by a licensed professional engineer in New York:

I, John F. Beech, am currently a registered professional engineer licensed by the State of New York, and I certify that this Sediment Consolidation Area Final Cover Design was in my professional opinion, prepared in substantial conformance with the Consent Decree between the State of New York and Honeywell International, Inc. dated January 4, 2007.



John F. Beech, P.E.
New York State Professional Engineer
License No. 066337

Date



*Unauthorized alteration or addition to this engineering document is a violation of
Section 7209. Provision 2 of the New York State Education Law.*

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(Same as submitted and approved as part of the SCA Final Cover Design Report 2015 Construction [Parsons and Beech and Bonaparte 2015], except for an addendum that has been included as an update.)

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LIST OF ACRONYMS

ACAP	Alternative Cover Assessment Program
CHASP	Community Health and Safety Plan
CQAP	Construction Quality Assurance Plan
DMA	Debris Management Area
LLDPE	Linear low density polyethylene
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operation, Maintenance and Monitoring
PCCP	Post-Closure Care Plan
ROD	Record of Decision
SCA	Sediment Consolidation Area
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

The development of this Sediment Consolidation Area (SCA) Final Cover Design Report (SCA Final Cover Design) is part of Honeywell's continuing effort to achieve the goals of the Record of Decision (ROD) and the community's vision for a restored Onondaga Lake and adjacent properties. Dredging in Onondaga Lake and sediment transport to the SCA were completed in 2014. Placement of the leveling layer of the SCA final cover began in 2015 in accordance with the approved SCA Final Cover Design Report 2015 Construction (Parsons and Beech and Bonaparte 2015). For completeness, this report contains the SCA final cover design components for both the construction activities completed in 2015 and those anticipated in 2016.

The New York State Department of Environmental Conservation (NYSDEC) Green Remediation and the United States Environmental Protection Agency (USEPA) Region 2 Clean and Green policies were considered during development of this SCA Final Cover Design. This report presents design calculations, plans, and specifications associated with the final cover components. The detailed final East and West Basin design and the approach for removing and discharging stormwater from the basins will be developed in conjunction with the Wastebed 9 through 15 Closure Program. The schedule for completion of wastebed closure has not been established yet. The current use of the East and West Basins, the sediment processing area, and water treatment plant will continue at least until an end use is determined for these areas. The stormwater from these areas is considered non-contact and will be collected and discharged to Outfall 018 in accordance with the State Pollutant Discharge Elimination System (SPDES) permit. Once an end use is determined, any changes will be discussed with NYSDEC and approved prior to implementation. Based on requests from the Audubon Society and SUNY College of Environmental Science and Forestry regarding restoration, Honeywell has considered approaches that could enhance the habitat value of the area as part of this design.

The major design elements and considerations for the SCA Final Cover Design include:

- Cover system elements and grading
- Gas venting
- Leachate management
- Stormwater management
- Construction quality assurance

SCA final cover system construction began in spring 2015 with leveling layer placement. Implementation of the remaining components presented herein is anticipated to begin in spring 2016.

SECTION 1

INTRODUCTION

1.1 OVERVIEW

This Onondaga Lake Sediment Consolidation Area (SCA) Final Cover Design Report (SCA Final Cover Design) 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 (89-CV-815, filed in the United States District Court, Northern District of New York, 2007) with the New York State Department of Environmental Conservation (NYSDEC) to implement the selected remedy for Onondaga Lake, as outlined in the Record of Decision (ROD) issued on July 1, 2005.

This SCA Final Cover Design provides the drawings and specifications required to complete construction of the SCA final cover system. Placement of the leveling layer of the SCA final cover began in 2015 in accordance with the approved SCA Final Cover Design Report 2015 Construction (Parsons and Beech and Bonaparte 2015). For completeness, this report contains the SCA final cover design components for both the construction activities completed in 2015 and those anticipated in 2016.

This document was prepared in accordance with the Remedial Design Work Plan for the Onondaga Lake Bottom Subsite (Parsons 2009) and is based on extensive information and data gathered for the SCA Civil and Geotechnical Final Design (Parsons and Geosyntec 2011), along with data obtained during SCA construction and operations. The remainder of this introductory section presents background information on the SCA, including details regarding the SCA-specific remediation objectives and goals. Section 2 presents the existing conditions and SCA monitoring, and Section 3 presents the design and construction elements.

1.2 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. As documented in the Consent Decree Statement of Work (SOW), 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.

The SCA footprint consists of two phases, as shown on Figure 1.2. Phases I and II are both approximately 1,700 ft long (east to west) by 700 ft wide (north to south), for a total area of about 55 acres (Geosyntec 2012a; Geosyntec 2013). The debris management area (DMA) is part of Phase II and is approximately 1.3 acres. The East and West Basins, which are also shown on Figure 1.2,

occupy approximately 4 acres and 2.4 acres, respectively (Parsons 2011; Geosyntec 2012b). Details regarding Phases I and II and the basins, which were constructed in 2010, 2011 and 2012, are included in the approved certification reports (Geosyntec 2012a; Geosyntec 2012b; Geosyntec 2013). Dewatering operations using geotextile tubes occurred at the SCA from late July 2012 until November 2014, except during winter shutdown periods (i.e., November 19, 2012 through April 8, 2013, and November 22, 2013 through April 7, 2014).

1.3 REMEDIATION OBJECTIVES AND GOALS

The underlying objective of the activities associated with the Onondaga Lake remediation, including final cover installation at the SCA, is to protect 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, and goals, referred to as preliminary remedial goals, 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 (e.g., odor mitigation, redundancy of operations, leachate containment, dewatering, traffic, beneficial use, and groundwater monitoring)
- 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, which is included as Attachment A of the SCA Civil and Geotechnical Technical Memorandum in Appendix A of the Onondaga Lake Sediment Consolidation SCA Civil and Geotechnical Final Design (Parsons and Geosyntec 2011), and has been approved by the NYSDEC.

1.4 REMEDY OF RECORD

The ROD for the lake bottom describes the remedy selected by NYSDEC and the United States Environmental Protection Agency (USEPA). The design elements of the selected remedy were listed in the SOW. Those that are relevant to the SCA final cover design are summarized as follows:

- The majority of “dredged sediment [will be placed]... 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.”

- Institutional controls will be implemented “including the notification of appropriate governmental agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy.”
- The final component is “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 Wastedbed 13 as much as possible so as to limit wastedbed cut and fill requirements and the associated need for a large volume of imported soil fill. Preloading and stabilization of the wastedbed 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 rates sufficient to reduce precipitation infiltration rates to acceptably low levels.”

The first two design elements listed above were addressed in Section 4 of the SCA Civil and Geotechnical Final Design (Parsons and Geosyntec 2011). The SCA cover design and long-term operation of the leachate collection system are addressed in Section 3 of this document.

SECTION 2

EXISTING CONDITIONS AND SCA MONITORING

Dredging from Onondaga Lake was completed in November 2014. During dredging operations, sediment was hydraulically dredged and pumped to the SCA via an approximately 4.5-mile piping system. After processing at the sediment process area, the sediment was pumped into geotextile tubes where it was dewatered. Water that weeps from the geotextile tubes and stormwater that comes in contact with the tubes are collected and treated at an onsite water treatment plant.

Groundwater sampling and analytical testing have been performed throughout SCA construction and operations, as summarized in the SCA Environmental Monitoring Plan (O'Brien and Gere 2014) and quarterly monitoring reports. In addition, geotechnical monitoring has been conducted to evaluate settlement, slope stability, and water levels in and around the SCA. The geotechnical monitoring system includes the following elements:

- Twenty-nine settlement cells to monitor settlement
- Sixty settlement monuments to monitor settlement (removed prior to leveling layer placement in spring 2015)
- Six inclinometers to monitor stability
- Twenty-three piezometers to monitor groundwater levels

During operations and leveling layer placement, NYSDEC has been provided with weekly updates regarding the data obtained from these instruments. A summary memorandum has been provided to NYSDEC each month. General conclusions drawn from these are as follows:

- Settlement cells, settlement monuments (abandoned spring 2015), inclinometers, and piezometers are operating as intended.
- Settlement monument data are generally consistent with settlement cell data.
- Inclinometer and piezometer data are providing an understanding of how subsurface materials are responding to loading and precipitation events.
- Monitoring data are confirming subsurface material behavior and will support long-term predictions.

Section 3 and Appendix A-1 provide additional details regarding how these data are being used to predict future subsurface material behavior. Appendix A-1, which was submitted and approved as part of the SCA Final Cover Design Report 2015 Construction (Parsons and Beech and Bonaparte 2015), used survey data obtained in December 2014. The survey data collected in April 2015 have been compared with the December 2014 data, and the assumptions made in Appendix A-1 are still considered valid. In addition, the subsurface is behaving as predicted. Additional detail regarding comparisons between various surveys is provided in addendums to Appendix A-1.

SECTION 3

DESIGN AND CONSTRUCTION ELEMENTS

3.1 OVERVIEW

This SCA Final Cover Design includes the following components:

- Design Evaluations (Appendices A-1 through A-10)
- Drawings (Appendix B)
- Specifications (Appendix C)
- Construction Quality Assurance Plan (CQAP) (Appendix D)
- Post-Closure Care Plan (Appendix E)
- Field Change Forms (Appendix F)

These components are discussed in the following subsections in terms of the main design considerations, which include the cover system elements and grading, gas venting, leachate management, and stormwater management. Considerations associated with site preparation and controls, construction water, quality assurance during construction, OM&M, and schedule are also presented. As part of the restoration design, Honeywell has considered requests from the Audubon Society and SUNY College of Environmental Science and Forestry regarding enhancing the habitat value of the area. To the extent practical, their requests have been incorporated into the restoration design.

Grading plans presented in this design are based on an aerial survey that was conducted on December 7, 2014, by Thew Associates. As indicated in Section 2, another survey was completed in April 2015 and confirmed the assumptions made based on the December 2014 survey. The grading plans have therefore not been changed. The SCA will be resurveyed again in spring 2016. If necessary, based on the results of the 2016 survey, modified grading plans will be prepared and provided to the NYSDEC for approval via field change submittals. It is anticipated that the general shape and slopes shown in this design submittal will not change.

3.2 COVER SYSTEM ELEMENTS AND GRADING

As discussed in Section 1.3, the construction of a final cover over the SCA is required to maintain the effectiveness of the remedy. When completed, the final cover will measure approximately 50 acres. The multi-layer final cover will consist of the following elements, as shown on Contract Drawing C-011, from the top down:

- Vegetative soil layer (6 inches thick) (Section 02250)
- Protective soil layer (18 inches thick) (Section 02235)
- Geocomposite drainage layer (Section 02735) with pipes
- 40-mil, linear low density polyethylene (LLDPE) geomembrane (Section 02740)
- Strips of geocomposite for gas venting (Section 02735)

- Geotextile cushion layer (Section 02710)
- Leveling layer, as required (Section 02200)

Quantities for each of the above soil layers have been calculated and are provided in Appendix A-2. The hydraulic performance of the cover and the hydraulic transmissivity calculations for the geocomposite above the geomembrane are evaluated in Appendix A-3. The strips of geocomposite used for gas venting below the geomembrane are discussed in Section 3.3 below. A veneer stability analysis was performed to establish minimum allowable internal/interface shear strength parameters for the final cover. Supporting calculations and the detailed veneer stability analyses are provided in Appendices A-4 and A-5, respectively.

As indicated previously, the top of geotextile tube grading plan and the subsequent grading plans (i.e., Contract Drawings C-004 through C-007) were developed based on an aerial survey conducted on December 7, 2014. Guidelines have been developed for the required slopes. Specifically, the minimum slope will be one percent on the top, as shown on Contract Drawing C-007. The one percent slope is appropriate for the following reasons:

- Settlement of the underlying subgrade at the SCA (i.e., the Solvay waste) is well understood based on the site-specific data that have been collected during construction and operations (Section 2). These data have been used to calibrate parameters used in the long-term settlement calculations provided in Appendix A-1. As shown by the post-settlement grades shown in the Appendix A-1 settlement calculations, positive drainage of stormwater toward the basins will be maintained.
- The cover includes a drainage system that will limit head buildup on the geomembrane liner, as described in Appendix A-3.
- Post-closure care will include ongoing maintenance and inspections of the final cover. If necessary, fill placement will be used to address localized ponding (Section 3.9.3).
- Since placement of fill material above the geotextile tubes will result in additional settlement that impacts the base liner grades and the top of final cover grades, it is advantageous to limit the fill placement to the extent practical. With a final cover slope of one percent, drainage to the sumps along the base liner system is maintained after settlement, as shown in the Appendix A-1 settlement calculations.
- A one percent slope limits the height of the SCA, which is aesthetically advantageous.
- Limiting the amount of fill material (i.e., leveling layer) required to be transported and placed at the SCA results in a more sustainable and green remedy.

Global slope stability analyses were also performed for the SCA and indicate acceptable factors of safety for the critical cross sections that were evaluated (Appendix A-6).

3.3 GAS VENTING

Appendix A-7 presents the assumptions and evaluations required to estimate the potential gas quantity generated by the dredge material in the geotextile tubes and materials placed in the DMA. This evaluation suggests that a gas management system is required as part of the SCA cover system. A surficial passive gas management system has been designed based on estimated gas quantities associated with the assumed decomposable material in the geotextile tubes and the

DMA. This system includes a network of geocomposite gas venting strips and vent pipes, as shown on Contract Drawing C-018. As part of restoration, it is anticipated that the gas vents will be incorporated into the vegetative landscape of the SCA.

3.4 LEACHATE MANAGEMENT

For purposes of this document, residual liquids contained within the SCA after cover installation are defined as leachate. During final cover installation, leachate collected in the two existing collection sumps will be pumped directly to the onsite water treatment plant. As leachate volumes decline over time, adaptive management may be employed in terms of how the leachate is handled and where it is treated. The final configuration of the East and West Basins will be developed in conjunction with the Wastedbed 9 through 15 Closure Program. The schedule for completion of wastedbed closure has not been established yet. The current use of the East and West Basins and the water treatment plant will continue at least until an end use is determined for these areas. The stormwater from these areas is considered non-contact and will be collected and discharged to Outfall 018 in accordance with the State Pollutant Discharge Elimination System (SPDES) permit. Once an end use is determined, any changes will be discussed with NYSDEC and approved prior to implementation. As indicated previously, the cover system hydraulic performance evaluation, which provides an estimate of potential long-term leachate generation, is provided in Appendix A-3. Pump sizing calculations for the post-closure period are provided in Appendix A-8.

3.5 STORMWATER MANAGEMENT

The stormwater collection and discharge system has been designed as required by NYSDEC Regulations Part 360. The swale materials have been selected to mitigate potential erosion based on the calculated expected velocities and shear stresses for the design storm event. Stormwater will be routed to the East and West Basins through a system of stormwater collection swales, down chutes, and the overall slope of the top of cover (see Contract Drawings C-012, C-014A, C-015, C-016, and C-016A and Appendix A-9). The detailed basin design and approach and detailed design for removing and discharging stormwater from the basins will be developed in conjunction with the Wastedbed 9 through 15 Closure Program. The schedule for completion of wastedbed closure has not been established yet. The current use of the East and West Basins will continue at least until an end use is determined for the area. At that time, any changes will be discussed with NYSDEC and approved prior to implementation.

3.6 VEGETATIVE COVER LAYER

As discussed in the Vegetative Soil Layer Specification (02250), a series of test plots was developed in the borrow area during the 2015 growing season to assess the ability of the material to support plant growth from seed. Results of this investigation are summarized in Appendix A-10.

3.7 SITE PREPARATION AND CONTROLS

The following site preparation activities will be performed prior to the start of 2016 SCA final cover construction activities:

- The existing erosion control elements will be assessed. As necessary, upgrades and repairs will be completed in accordance with Contract Specification 02370, which requires preparation of a Stormwater, Erosion, and Sediment Control Plan for the final cover construction.
- Existing construction support elements (e.g., access roads, decontamination pads, support trailers) will be assessed. As necessary, upgrades and repairs will be made to facilitate final cover construction.

Utilities associated with the long-term leachate collection and pumping system will be protected during the final cover construction.

3.8 CONSTRUCTION WATER MANAGEMENT

During construction, rainfall on disturbed contaminated materials will be considered construction water that will require treatment. Contract Specification Section 02140 presents project requirements for construction water. As defined in this specification, construction water will be treated at the onsite water treatment plant; whereas, stormwater that does not contact impacted materials will not require treatment. Once the leveling layer has been installed, the stormwater will be considered non-contact.

3.9 PLANS

Plans to help ensure proper construction and maintenance of the SCA final cover are required as part of this design. The Community Health and Safety Plan (CHASP), CQAP, and Post-Closure Care Plan (PCCP) are described in the following paragraphs.

3.9.1 Community Health and Safety Plan

The CHASP developed for SCA construction (Parsons 2010) will be used for SCA closure activities. The CHASP includes the traffic management plan.

3.9.2 Construction Quality Assurance Plan

The CQAP presents the procedures and protocols that will assure that construction of the SCA final cover will be executed in accordance with the approved design documents. The CQAP, which was developed in accordance with NYSDEC Regulations Part 360, Sections 2.8 and 2.13, is provided in Appendix D.

3.9.3 Post-Closure Care Plan

The PCCP, which is provided in Appendix E, was developed in accordance with Part 360-2.15(k)(7) requirements and establishes the procedures and protocols for long-term protection and functionality of the SCA final cover.

3.10 GENERAL CONSTRUCTION SCHEDULE

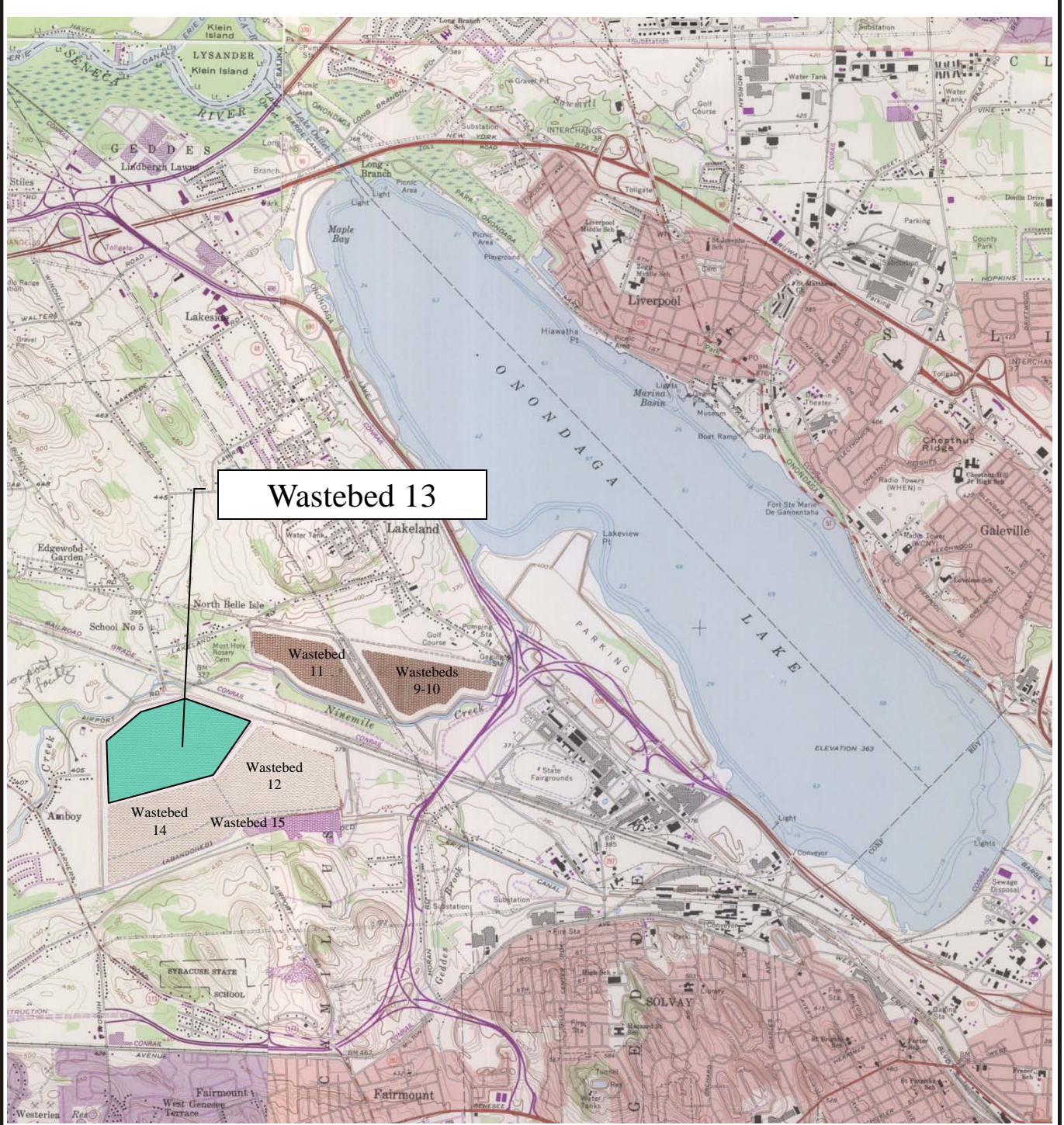
It is anticipated that at least two years will be required for cover construction. The majority of the leveling layer was placed in 2015 and will be surveyed in spring 2016 to validate settlement consolidation. Field change forms corresponding to design modifications that have been required since submittal and approval of the SCA Final Cover Design Report 2015 Construction (Parsons and Beech and Bonaparte 2015) are included in Appendix F. Final grading and completion of leveling layer placement will occur in 2016, followed by the construction of the remainder of the cover system and submittal of a closure completion report per Part 360-2.15(d)(7).

SECTION 4

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FIGURES



Wastebed 13

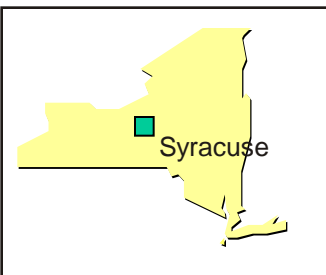
Wastebed 11

Wastebeds 9-10

Wastebed 12

Wastebed 14

Wastebed 15



New York
Quadrangle

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



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

FIGURE 1.1

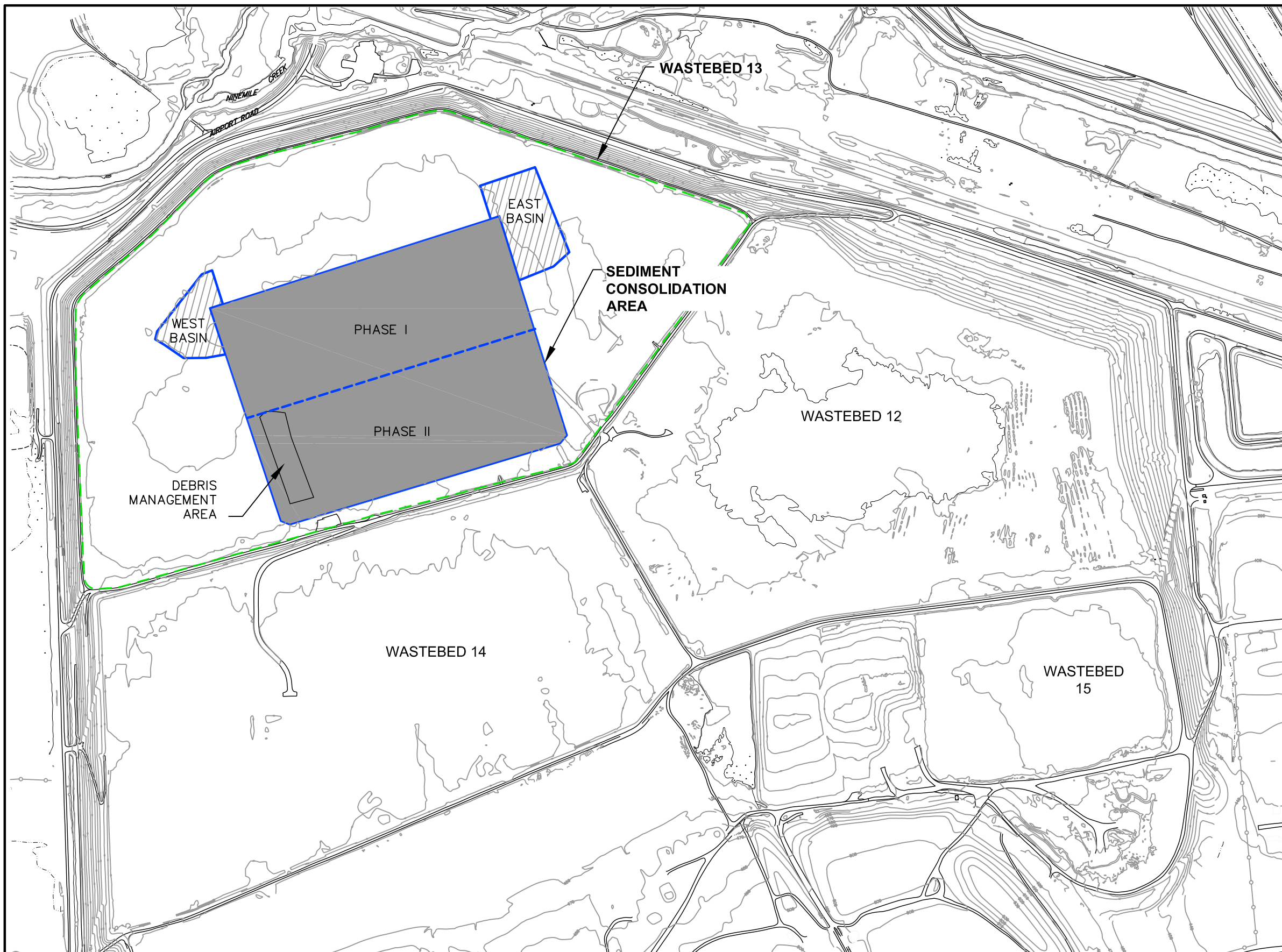
Sediment Consolidation Area
Onondaga Lake Bottom Subsite
Remedial Design

SITE LOCATION MAP



NOTE:

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



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

PARSONS

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