Interim Remedial Measure Outboard Area of the Wastebed B/Harbor Brook Site Subsite of the Onondaga Lake Site

Onondaga County, New York

January 2012

PURPOSE OF THIS DOCUMENT

This Proposed Response Action Document (PRAD) describes the response actions considered for addressing the release of contaminants into Harbor Brook and/or Onondaga Lake under an Interim Remedial Measure (IRM)[1] and identifies the preferred response action.

This document was developed by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA). NYSDEC and EPA are issuing this document as part of its public participation responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The response actions summarized here are described in more detail in the Wastebed B/Harbor Brook Outboard Area Engineering Evaluation/Cost Analysis (EE/CA)[2] (Parsons, 2011a). NYSDEC and EPA encourage the public to review the EE/CA to gain a more comprehensive understanding of the proposed response action.

This document is being provided as a supplement to the EE/CA to inform the public of NYSDEC and EPA's preferred response action and to solicit public comments pertaining to the response actions that were evaluated, including the preferred response action.

NYSDEC and EPA's preferred response action consists of the removal of soils and wetland sediments between the Harbor Brook barrier walls (East and West Walls) and Onondaga Lake; placement of an isolation cap; and restoration of the area as wetlands.

The response action described in this document is the *preferred* response action for the "Outboard Area" of the Wastebed B/Harbor Brook (WBB/HB) Site ("site"). (See description of "Outboard Area" under the section, IRM Description.) Changes to the preferred response action or a change from the preferred response action to another response action may be made if public comments or additional data indicate that such a change will result in a more appropriate response action. NYSDEC and EPA are soliciting public comment on all of the response actions considered in the detailed analysis of the EE/CA because NYSDEC and EPA may select a

[1] The use of the term "Interim Remedial Measure" throughout this document is not intended to mean that this removal action is a "remedial action" as that term is defined in the federal law CERCLA. An IRM is an activity that is necessary to address either emergency or non-emergency site conditions, which in the short-term, needs to be undertaken to prevent, mitigate or remedy environmental damage or the consequences of environmental damage attributable to a site. An IRM is equivalent to a non-time critical removal under the CERCLA removal program pursuant to 40 C.F.R ' 300. 415(b)(2).

[2] The EE/CA was developed consistent with EPA's December 1993 *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*. (OSWER Directive 9360.0-32).

response action other than the preferred response action. The final decision regarding the selected response action will be made after NYSDEC and EPA have taken into consideration all public comments and will be documented in a Response Action Document (RAD), the document that will formalize the selection of the response action.

COMMUNITY ROLE IN SELECTION PROCESS

NYSDEC and EPA rely on public input to ensure that the concerns of the community are considered in selecting an effective response action for each Superfund site. To this end, the EE/CA and this document have been made available to the public for a public comment period which begins on January 20, 2012 and concludes on February 20, 2012.

A public availability session and public meeting will be held during the public comment period at the Martha Eddy Room in the Art and Home Center at the New York State Fairgrounds on February 1, 2012 (in case of severe weather, notice will be given to local media outlets that the meeting will be postponed until February 9, 2012 at the same time and location). The public meeting will be held at 7:00 PM and an open house will be held from 6:00 – 7:00 PM to answer questions on the response actions presented in this PRAD, further elaborate on the reasons for recommending the preferred response action, and to receive public comments.

Comments received during the comment period will be considered and incorporated into the responsiveness summary supporting the RAD.

The EE/CA and other site documents, which contain the information upon which the selection of the response action will be based, are available at the following locations:

Onondaga County Public Library
Syracuse Branch at the Galleries
447 South Salina Street
Syracuse, NY 13202-2494
Telephone: (315) 435-1800

Atlantic States Legal Foundation
658 West Onondaga Street
Syracuse, NY 13204-3711
(315) 475-1170
Please call for hours of availability

Solvay Public Library
615 Woods Road
Solvay, NY 13209
Phone: (315) 468-2441

NYSDEC Central Office
625 Broadway
Albany, NY 12233-7013
(518) 402-9676
Hours: M – F 8:30 a.m. – 4:45 p.m.
Please call for an appointment

NYSDEC Region 7 Office
615 Erie Boulevard West
Syracuse, NY 13204-2400
(315) 426-7400
Hours: M – F 8:30 a.m. – 4:45 p.m.
Please call for an appointment

Written comments should be addressed to:

Mr. Tracy A. Smith
Wastebed B/Harbor Brook IRM – Public Comments
New York State Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7013
e-mail: DERweb@gw.dec.state.ny.us
(Indicate "WBB/HB Outboard Area IRM Comments" in the subject line of the e-mail)

SITE BACKGROUND

Scope and Role of Operable Unit

Since many Superfund sites are complex and have multiple contamination problems and/or areas, they are often divided into several operable units to manage the site-wide response actions. Section 300.5 of the NCP defines an operable unit as "a discrete action that comprises an incremental step toward comprehensively addressing site problems." This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action, or they may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site."

On June 23, 1989, the Onondaga Lake Site was added to the New York State Registry of Inactive Hazardous Waste disposal sites. On December 16, 1994, Onondaga Lake and its tributaries and the upland hazardous waste sites which have contributed or are contributing contamination to the lake (subsites) were added to EPA's National Priorities List (NPL). NYSDEC and EPA have, to date, organized the work for the Onondaga Lake NPL Site into 11 subsites (See Figure 1). These subsites are also considered by EPA to be operable units of the NPL site. The WBB/HB Site is one of the subsites at the Onondaga Lake NPL Site. The status of the other subsites is discussed below. This PRAD focuses only on the Outboard Area of the WBB/HB Subsite of the Onondaga Lake Superfund site. The Outboard Area IRM for the WBB/HB Subsite is intended to be consistent with, and an integral part of, the final WBB/HB site-wide remedy.

Status of Other Onondaga Lake NPL Subsites

Onondaga Lake Bottom Subsite

In July 2005, NYSDEC and EPA issued a Record of Decision (ROD) for the Onondaga Lake Bottom Subsite of the Onondaga Lake NPL Site. The selected remedy includes dredging an estimated 2.65 million cubic yards (CY) (2.03 million cubic meters [m^3]) of contaminated sediments and isolation capping of an estimated 425 acres in the littoral zone (water depths ranging from 0 to 30 ft), thin-layer capping of an estimated 154 acres in the profundal zone (water depths exceeding 30 ft), and monitored natural recovery (MNR) in the profundal zone. It is anticipated that the most highly contaminated materials would be treated and/or disposed of off-Site. The balance of the dredged sediment would be placed in the Sediment Consolidation Area (SCA) at Wastebed 13. In January 2007, Honeywell International Inc. (Honeywell) entered into a consent decree with the State of New York whereby Honeywell committed to implement the remedy at the Onondaga Lake Bottom Subsite. Extensive pre-design investigations commenced in September 2005 and are ongoing, along with remedial design and remedial construction activities (Parsons, 2008). Dredging in the lake is scheduled to begin in 2012.

Other Subsites

In September 2000, NYSDEC issued a ROD for the LCP Bridge Street Subsite. In March 2002, Honeywell entered into an administrative consent order whereby Honeywell committed to implement the remedy. The remediation was substantially completed in 2007 (some additional excavation work is being performed in 2011). Remedial construction included the removal of contaminated sediments from the West Flume, on-site ditches, and wetlands; restoration of wetlands; installation of a low-permeability cutoff wall around the site; installation of an interim low-permeability cap; and capture of contaminated groundwater inside the cutoff wall.

The Ley Creek PCB Dredgings Subsite ROD was issued in 1997 and remedial construction activities were completed in 2001.

The Semet Residue Ponds Subsite ROD was issued in 2002. Construction activities associated with a portion of the groundwater remedy component (lakeshore barrier wall/collection system for the shallow and intermediate zones) were completed in 2007. Construction of the remaining portion (groundwater collection system adjacent to Tributary 5A) is ongoing. Honeywell, NYSDEC and EPA are evaluating a potential modification to the portion of the remedy that addresses the pond residues.

The Town of Salina Landfill Subsite ROD was issued in March 2007. The ROD called for the capping of two individual landfilled areas. During the design, it was determined that one of the landfills does not contain significant hazardous substances. In September 2010, NYSDEC and USEPA executed a ROD amendment for the excavation and consolidation of the two landfilled areas into one landfilled area north of Ley Creek prior to capping. Site mobilization for remedial construction commenced in November 2010; the remedy is scheduled for completion in 2013.

RODs for two portions of the Geddes Brook/Ninemile Creek Subsite were signed in April and October 2009. The selected remedies include the dredging/excavation and removal of an estimated 120,000 CY (92,000 m^3) of contaminated channel sediments and floodplain soils/sediments over approximately 30 acres. Depending on the location, clean materials, consisting of a habitat layer and, if needed, backfill, will be placed in the dredged/excavated areas. Contaminated sediments and soils removed from the stream and floodplains will be disposed of at either the LCP Bridge Street Subsite containment system, which was designed and constructed pursuant to the requirements of a September 2000 ROD, or the SCA, which is being constructed at Wastebed 13 as part of the remediation of the Onondaga Lake Bottom subsite in accordance with the 2005 ROD. Excavation of sediment and floodplain soil and restoration of the stream and floodplain/wetland at Geddes Brook under an IRM commenced in May 2011 and is scheduled for completion in July 2012.

A ROD for the Niagara Mohawk – Hiawatha Boulevard – Syracuse Former MGP Subsite was signed on March 31, 2010. The selected remedy calls for contaminated soil in the northeastern portion of the Subsite that could leach contaminants to ground water to be solidified in place and ground water along the northern perimeter of the Subsite to be treated using enhanced bioremediation. The design for the remedy is currently underway and is anticipated to be completed by mid-2012.

In addition to the remedial investigation/feasibility study (RI/FS) ongoing at the Wastebed B/Harbor Brook Subsite, RI/FSs are presently being performed at four other subsites: General Motors: Inland Fisher Guide and Ley Creek Deferred Media, Wastebeds 1-8, Willis Avenue; and Lower Ley Creek. It is anticipated that the RI/FSs for these sites will be completed in the next few years.

Site Location and Setting

The WBB/HB Subsite is located to the north and south of Interstate Route I-690 in the City of Syracuse and Town of Geddes, Onondaga County. It consists of Harbor Brook, Lakeshore Area (including Wastebed B and the East Flume), Penn-Can Property, Railroad Area, and areas of study (AOS #1 and AOS #2) east of Harbor Brook (See Figure 2). Wetland SYW-12, located north of Onondaga Creek, is being investigated under the WBB/HB Subsite RI/FS.

History of Site Operations

Wastebed B is a former Solvay wastebed which received Solvay waste (generated by Allied Chemical Corporation operations) from approximately 1898 to 1926. Wastebed B covers approximately 28 acres and was engineered to receive waste by construction of a bulkhead into Onondaga Lake. The Penn-Can Property has historically been used for the production and storage of asphalt products. The Barrett Division of the Semet Solvay Company of Allied Chemical Corporation (predecessor to Honeywell) operated at the property from 1919 to approximately 1978. Barrett produced various asphalt emulsions and some coal tar-based products used in road construction. The Railroad Area is situated to the south of the Penn-Can Property and is bounded to the north, south and east by railroad tracks.

Summary of Site Investigations

Investigations at the WBB/HB Subsite indicate that four primary source areas are present. The areas are the Penn-Can Property, Dredge Spoil Area (DSA) #1, DSA#2, and stained material at AOS #1/Lakeshore Area wetlands. The contaminants of concern in site media include benzene, toluene, ethylbenzene, xylene (BTEX), chlorinated benzenes, naphthalene and other polycyclic aromatic hydrocarbons (PAHs), phenolic compounds, polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-dioxins/polychlorinated dibenzo-furans (PCDD/PCDFs).

An apparent source of coal tar residues, including non-aqueous phase liquids (NAPL), was identified in the eastern central portion of the Penn-Can Property. The coal tar residues are associated with the historic operations of the former paving facilities that were located on the central and eastern portions of the Penn-Can Property. These residues are likely present due to releases from the former Barrett Paving facility previously located on the property. Residues from this source area migrated into the subsurface and then down slope through coarse lenses of marl and along the top of low-permeability (confining) geologic units (*i.e.*, silt/clay and till) to depths of at least 20 feet (ft) (6.1 meters [m]) below ground surface (bgs) in the area of lower Harbor Brook. As shown on Figure 3, these residues, including NAPL, appear to have migrated to the vicinity of Wastebed B and Harbor Brook. Ground water has also been impacted in areas associated with the NAPL. Soils, sediments and surface water have been impacted in areas where shallow and intermediate ground water discharge to surface water bodies (Harbor Brook, I-690 drainage ditch, and other site related ditches). The primary constituents associated with the NAPL include BTEX, and naphthalene and other PAHs.

IRM Description

The Outboard Area is a 16-acre strip of land that lies between the barrier walls that are being installed as part of the WBB/HB East and West Wall IRMs (see below) and Onondaga Lake (including the mouth of Harbor Brook and areas of wetlands along the shoreline). The proposed Outboard Area IRM would include the removal of soil and wetland sediments from the area between the barrier wall and Onondaga Lake (See Figures 4A and 4B), placement of a chemical isolation cap, and restoration as wetlands. The Outboard Area IRM is the subject of this PRAD.

Other Wastebed B/Harbor Brook Site Areas/Media

In 2003, Honeywell and NYSDEC entered into an Order on Consent (Index #D7-0008-01-09) to conduct an IRM for WBB/HB. The IRM scope includes a vertical barrier to be installed along the Onondaga Lake shoreline perimeter of Wastebed B and upstream along the west bank of Harbor Brook with a ground water collection system installed along the vertical barrier. The location of the barrier wall to the west of Harbor Brook ("West Wall") is identified in the final design approved by NYSDEC on December 3, 2009 (See Figure 4A), and the location of the barrier wall to the east of Harbor Brook ("East Wall"), as required by the May 2011 RAD, is identified in the final design approved by NYSDEC on July 29, 2011.

The East Flume is being addressed under an IRM pursuant to an April 2002 Consent Order with NYSDEC. This included slip-lining a 72-inch pipe which conveyed storm water to the East Flume. The pipe was also extended to discharge the storm water directly to Onondaga Lake. The slip-lining was done to prevent contaminated groundwater from entering into the pipe and discharging into Onondaga Lake. A 42-inch sewer will be abandoned and replaced. The design for the replacement of the 42-inch pipe is ongoing, and this construction is scheduled to take place in 2012. A 60-inch pipe, which also discharged to the East Flume, was abandoned. The pipe is being used as a carrier for four smaller pipes placed within it. The annular space within the 60-inch pipe was filled with flowable grout to prevent ground water from migrating within it. The four smaller pipes may be used, in part, for water conveyance from the Lakeshore Area to the Willis Avenue Ground Water Treatment Plant. Other site areas and media will be addressed under the WBB/HB Subsite RI/FS.

SUMMARY OF SITE RISKS

A Streamlined Risk Evaluation (SRE) was prepared for the Outboard Area of the WBB/HB Subsite. The objective of the SRE was to provide a concise evaluation of potential risks to human and ecological receptors, assuming no removal or clean-up actions would be taken at the Outboard Area. The SRE relates to exposure to the contaminated media being addressed by this IRM and the contribution that these media may have made to unacceptable risks in the Outboard Area. A summary of the human health and ecological evaluations are provided below.

Human Health Evaluation

The intended future use of a portion of the Outboard Area is for habitat enhancements, including wetland improvements. In addition, the area will also likely be used for recreational activities (*e.g*., biking, running, walking along a trail). Current and future exposure scenarios in the area which were considered in the SRE include trespassers, construction workers, surveillance workers, and recreational visitors. Although unlikely, potential future industrial/commercial workers and residents were also considered in the SRE.

A conservative screening process was applied to identify constituents of potential concern (COPCs) in the surface soil, subsurface soil, and sediment that may pose potential risk to current and future receptors. Some of these COPCs were also previously identified as risk drivers in the Lake based on consumption of fish. Specifically, the SRE identified arsenic, dioxins/furans (2,3,7,8-TCDD equivalents), mercury, and PCBs as being among the COPCs for surface soil and Harbor Brook sediment, with dioxins/furans exceeding its screening criterion by approximately two or more orders of magnitude. Arsenic, mercury, and PCBs were also identified as COPCs for subsurface soil, with arsenic exceeding its respective screening criterion by more than two orders of magnitude. PCBs were also identified as COPCs for subsurface soil. In the baseline Human Health Risk Assessment (HHRA) for the Lake Bottom Subsite, it was determined that arsenic, dioxins, mercury, and PCBs were the primary risk drivers associated with the consumption of fish from the Lake (TAMS, 2002a). EPA's acceptable risk thresholds were exceeded for both potential

cancer and noncancer risks (*i.e.*, potential cancer risks exceed the 10^{-4} to 10^{-6} risk range and potential noncancer risks exceeded a hazard index [HI] of 1).

Ecological Evaluation

Constituents of potential ecological concern (COPECs) for surface soil, and Harbor Brook sediment were identified by screening the maximum detected concentrations in Outboard Area media against recommended conservative ecologically-based screening criteria and/or guidance values.

In surface soil, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, zinc, cyanide, dichlorobenzenes, trichlorobenzenes, xylenes, PAHs, DDT and metabolites, dieldrin, and PCBs exceeded screening criteria, with chromium, iron, lead, mercury, and 4,4'-DDT exceeding their respective criteria by approximately two or more orders of magnitude. These metals and compounds also were identified as surface soil contaminants of concern (COCs) in the Onondaga Lake Baseline Ecological Risk Assessment (BERA; NYSDEC 2002b). In addition, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc were among the risk drivers associated with the potential for phytotoxic effects in soil.

Sediment COPECs included metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), benzene, ethylbenzene, toluene, xylenes, chlorobenzenes, PAHs, hexachlorobenzene, phenol, dieldrin, and heptachlor/heptachlor epoxide. These COPECs were also identified as sediment COCs in the Onondaga Lake BERA. Mercury, 2-methylnaphthalene, fluorene, naphthalene, phenol, and chlorobenzene exceeded their respective screening criteria by approximately 2 or more orders of magnitude. In addition, PCBs and dioxins/furans (2,3,7,8-TCDD equivalents) were detected in the Outboard Area sediment and have been identified as sediment COCs in the Onondaga Lake BERA (TAMS, 2002b).

Key results of the Onondaga Lake BERA indicate that comparisons of measured tissue concentrations and modeled doses of chemicals to toxicity reference values show exceedances of hazard quotients for site-related chemicals throughout the range of the point estimates of risk. Site-specific sediment toxicity data indicate that sediments are toxic to benthic macroinvertebrates on both an acute (short-term) and chronic (long-term) basis. Many of the contaminants in the Lake are persistent and, therefore, the risks associated with these contaminants are unlikely to decrease significantly in the absence of remediation. On the basis of these comparisons, it has been determined through the Onondaga Lake BERA that all receptors of concern are at risk. Contaminants and stressors in the Lake have either impacted or potentially impacted every trophic level examined in the Onondaga Lake BERA (NYSDEC and EPA, 2005).

Conclusions

The identification of constituents of potential concern to human health (*i.e.*,COPCs) and potential ecological concern (*i.e.*,COPECs) indicate that there is a potential threat to human health and the environment. Many of these COPCs and COPECs are also identified as COCs in the Onondaga Lake HHRA and BERA. Therefore, the SRE results indicate that there is a clear potential threat to human health from exposure to some constituents found in surface soil, subsurface soil, and sediment. Likewise, there is a potential threat posed to ecological receptors from exposure to surface soil and sediment. Response actions in the Outboard Area being evaluated by the EE/CA are warranted based on the following factors acknowledged in 40 CFR Section 300.415 (b)(2):

- Potential threat of exposure to nearby human populations, animals, and the food chain from COPCs and COPECs;
- Unacceptable potential risks due to elevated levels of COPCs and COPECs in soils and sediment;
- Potential threat to public health, welfare, or the environment;

• High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate; and
• Actual or potential contamination of sensitive ecosystems.

The proposed IRM for the Outboard Area calls for remediation and restoration of impacted soil and sediments and is intended to eliminate, to the extent practicable, continued migration of COCs into Onondaga Lake and Harbor Brook. In addition, the potential ecological and human health risks associated with exposure to surface water will be addressed by the elimination of contamination sources from soil (from runoff) and sediment, which can impact water quality. Consequently, the proposed remediation and restoration activities will eliminate, to the extent practicable, potential human health and ecological impacts associated with Site-related constituents of concern.

RESPONSE ACTION OBJECTIVES

The WBB/HB Outboard Area IRM objectives are to:

- Eliminate, to the extent practicable, releases of contaminants from the Outboard Area;
- Eliminate, to the extent practicable, potential impacts to human health and to the environment (*e.g.,* to fish and wildlife resources)

IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

Potentially applicable remedial technology types and process options for each general response action were identified and screened in the EE/CA. Technologies and process options were screened on the basis of technical implementability. Technical implementability for each identified process option was evaluated with respect to contaminant information, physical characteristics, and areas and volumes of affected media.

The remedial technologies and process options remaining after the initial screening were evaluated further in the EE/CA according to the criteria of effectiveness, implementability, and cost.

SUMMARY OF RESPONSE ACTIONS

Four potential response actions to address the Outboard Area IRM were developed, as described below.

Common Components

Each response action, with the exception of the No Action Response Action, includes the following common components:

- Removal of surface materials;
- Soil/sediment management;
- Placement of an isolation cap;
- Habitat restoration;
- Implementation of institutional controls; and

- Implementation of a long-term maintenance and monitoring (M&M) program[3].

With the exception of Response Action 1 (No Action), the response actions evaluated involve different scenarios for the removal of Outboard Area materials over the entire footprint of the Outboard Area prior to cap placement. While the removal depths may vary for each response action, the remaining components would be the same. These methods are proven environmental cleanup methods that would address contamination in the Outboard Area. The cap would include a suitable habitat layer for plants, animals, and fish to use without impacting the chemical isolation layer. The cap would also provide long-term chemical and physical isolation of underlying material from the lake and would resist erosive forces such as wind/wave-generated currents, tributary and other inflows, and ice.

A description of the soil/sediment management, cap, habitat restoration, institutional controls, and M&M program for Response Actions 2, 3, and 4 is provided below.

Soil/Sediment Management

A portion of the dry soil/sediment (materials located above the average lake level) removed from the Outboard Area would be placed on the WBB/HB site inboard of the IRM barrier wall and groundwater collection system. The remaining soil/sediment removed from the Outboard Area would be hydraulically dredged and transported via pipeline and consolidated at the SCA at Wastebed 13 as part of the Onondaga Lake Bottom Subsite remedy. This would take advantage of the infrastructure that is being constructed to support the implementation of the Lake remedy. These materials would be compatible with the materials that will be dredged from Onondaga Lake and the related additional volume would be within the design capacity of the SCA. The SCA would be designed, constructed, operated, and maintained in accordance with the substantive requirements of NYSDEC Part 360, Section 2.14(a) (industrial monofills) and would include an impermeable liner, leachate collection system, and cover. Trucks would not be used for transporting Outboard Area soils/sediment to the SCA.

For the purpose of cost estimating, the total estimated volume of dry materials to be removed and placed on WBB for Response Actions 2, 3 and 4 is 35,000 CY (27,000 m^3). The exact volume of dry material would be determined as part of the IRM design. The dry material would be mechanically excavated, relocated to an area inboard of the barrier wall and groundwater collection trench at the WBB/HB Subsite, and covered. The remaining materials to be removed from the Outboard Area (between approximately 155,000 CY (119,000 m^3) and 245,000 CY (187,000 m^3), depending on the response action) would be hydraulically dredged and transported via pipeline to the SCA in conjunction with the adjacent lake dredging using the same equipment and transport system that would be constructed to support the lake dredging activities.

Approximately 35,000 CY (27,000 m^3) of material was recently relocated at the WBB/HB Subsite as part of the site regrading work required for the WBB/HB West Wall installation. The final disposition of these materials, as well as Outboard Area soils relocated upgradient of the wall, would be evaluated during the FS and ROD for the site.

An evaluation of other soil/sediment management options for the IRM is included in the EE/CA.

As part of the designs for the East and West barrier walls, comprehensive geotechnical analyses were conducted to determine if and what kind of impacts future excavation activities within the Outboard Area might have on the stability of the walls and nearby structures (e.g., railroads, sewer lines). Based on the results of the geotechnical analyses, limitations on the size and depth of Outboard Area excavations have been established to maintain the stability of the walls and the nearby structures. Outboard Area excavation limitations are presented in the EE/CA and have been considered during the development of the potential response actions evaluated below.

[3] The term M&M is used here and elsewhere in lieu of Operation and Maintenance (O&M) which is cited in the NCP since the response actions do not include facilities which will need operation.

Isolation Cap

Based on the remedial action objectives established for the Outboard Area, the functions of the cap include the following:

- Physical isolation of the contaminated sediment/soil from the environment;
- Reduction or elimination of the flux of dissolved contamination into the upper layers of the cap;
- Stabilization of contaminated sediment/soil, preventing resuspension and transport of contaminants to the lake; and
- Restoration and enhancement of habitat in the onshore areas of Onondaga Lake.

To ensure that habitat restoration and chemical isolation goals are met and that the cap provides long-term protection of human health and the environment, the cap would include specific layers dedicated to various purposes. These layers would include a habitat layer, an erosion protection layer (where necessary), a chemical isolation layer, and an allowance for mixing of the bottom of the chemical isolation layer with the underlying sediment.

During the design of the IRM that is ultimately selected, removal depths and cap thicknesses will consider the base removal and hot-spot removal depths/elevations and cap thicknesses in the near-shore areas of the in-lake waste deposit (ILWD) to ensure slope stability during dredging and placement of a multi-layered cap. The final lake dredge design will address the transition between the Outboard Area and Onondaga Lake.

Cap Performance Criteria: To evaluate sediment quality in Onondaga Lake, toxicity of the sediment to sediment-dwelling (benthic) invertebrates was tested. Laboratory tests involved exposing the midge Chironomus tentans and the amphipod Hyalella azteca to Onondaga Lake sediments and observing their growth and survival. Since the results for Chironomus tentans were found to be the more sensitive test, these acute toxicity data were then used to develop the five site-specific sediment effects concentrations and probable effects concentrations (PECs) for each COC.[4] The performance criteria for the cap would be the PEC for each of the contaminants that have been shown to exhibit acute toxicity on a lake-wide basis, as well as the NYSDEC sediment screening criteria for benzene, toluene, and phenol.

Using data obtained from the lake cap design, the anticipated cap thickness in the western Outboard Area would be approximately 4.5 ft (1.4 m). Due to lower pH levels, the anticipated cap thickness in the eastern Outboard Area would be approximately 4 ft (1.2 m). It is anticipated that the western outboard area would require a pH amendment to the isolation cap similar to the adjacent ILWD due to the elevated pH levels. A pH amendment is not anticipated for the eastern portion accounting for the difference in cap thickness between the two areas. These thicknesses are based on a minimum 12-inch (30 centimeter [cm]) chemical isolation layer, a 24-inch (60 cm) habitat layer, and include average over placement that may result to ensure a minimum thickness of each layer is achievable. The actual cap thickness would likely vary based on further detailed analysis and testing conducted during the design.

Restoration

Preliminary habitat restoration plans for this area were developed in the Draft Habitat Plan (Parsons, 2009) which presents the conceptual habitat restoration designs for Onondaga Lake in those portions of the lake and adjacent areas where remediation activities would be conducted. Habitat restoration plans for this area were further developed in the draft Onondaga Lake

[4] More details on the development of sediment effects concentrations and probable effects concentrations can be found in the Onondaga Lake Bottom subsite ROD issued in July 2005.

Capping, Dredging, and Habitat Intermediate Design (Parsons, 2011b). An overview of the restoration for the Outboard Area is shown on Figure 5. The goals that would be used to determine clean soil acceptable for use as suitable habitat layer material would be based on NYSDEC's unrestricted use Soil Cleanup Objectives (6 NYCRR 375-6.8[a]).

Operation, Maintenance and Monitoring

Post-construction M&M of the capped areas would be performed to verify that the overall integrity of the cap is maintained so that it remains physically stable (*i.e.,* would not erode) and chemically protective over time. Long-term monitoring of the cap would include physical monitoring to verify stability and sampling of the cap to verify its chemical integrity. In the unlikely event that the monitoring identifies areas where the cap is not performing consistent with expectations, contingency response actions would be taken to maintain and repair the cap as necessary.

Institutional controls would be needed to ensure long-term effectiveness of the remedy. Institutional controls would include notification of appropriate government agencies with authority for permitting potential future activities which could impact the implementation and effectiveness of the remedy. The duration of these institutional controls would be dependent on lake/wetland conditions and the specifics of the institutional control.

Response Action 1: No Action

Capital Cost	$0
Annual M&M Cost	$0
Present-Worth M&M Cost	$0
Total Present-Worth Cost	$0
Construction Time	0 years

The "No Action" response action would not include the implementation of any physical measures or monitoring. This response action is used as the baseline against which the other response actions are evaluated.

Response Action 2: Removal for Cap Placement and Habitat Restoration

Capital Cost	$22,840,000
Annual M&M Cost	$21,100
Present-Worth M&M Cost	$160,600
Total Present-Worth Cost	$23,000,000
Construction Time	0.5 years

Under this response action, surface materials within the Outboard Area would be removed for placement of an isolation cap and achieving final grades lower than the existing grade elevations to facilitate habitat restoration. Habitat restoration (required under this IRM) in the Outboard Area was designed to take better advantage of the seasonal inundation of emergent wetland areas along the shoreline and create habitat that is more suitable for northern pike reproduction.

To provide suitable conditions over a wide range of lake levels, the wetlands would be designed with a gradual slope from the areas adjacent to the barrier wall out to the Onondaga Lake shoreline. This type of self-designing system would respond to natural changes in water level and patterns of sediment movement. Water levels during the potential northern pike spawning season were evaluated using Onondaga Lake level data from the United States Geological Survey Gauging Station at Liverpool, New York.

Based on the anticipated cap thicknesses and target final grades for the western and eastern Outboard Areas, excavation would be conducted to depths ranging from 1.5 to 3 m (4.9 to 9.8 ft) (an average depth of 2 m [6.6 ft]) in order to facilitate placement of the cap and achieve final target grades.

Figures 6 and 7 illustrate a conceptual cross-section and the anticipated removal depths throughout the Outboard Area under this response action. It is estimated that approximately 190,000 CY (145,000 m^3) of material would be removed under this response action. Approximately 35,000 CY (27,000 m^3) of dry material would be excavated and relocated to an area inboard of the barrier wall and groundwater collection system at the WBB/HB Subsite and the remaining 155,000 CY (120,000 m^3) would be dredged and pumped to the SCA. The anticipated duration of the excavation/dredging, transport of materials and capping is 137 work days[5].

Response Action 3: Removal for Cap Placement, Hot Spot Excavation, and Habitat Restoration

Capital Cost	$23,840,000
Annual M&M Cost	$21,100
Present-Worth M&M Cost	$160,600
Total Present-Worth Cost	$24,000,000
Construction Time	0.5 years

This response action involves the same components as Response Action 2, including an isolation cap and removal of surface materials to achieve a final post-cap grade for habitat restoration. Response Action 3 would also involve additional removal of material in areas where higher concentrations of CPOIs have been detected. These areas are referred to as “hot spots” and are defined as those sediments and or wastes that contain contaminants above the threshold criteria specified in the Onondaga Lake ROD (NYSDEC and EPA, 2005), as listed below.

CPOI	Sediment Hot Spot Criteria (mg/kg)
Benzene	208
Chlorobenzene	114
Dichlorobenzenes	90
Naphthalene	20,573
Xylenes	142
Ethylbenzene	1,655
Toluene	2,625
Mercury	2,924

[5] The actual schedule of work would be dependent on how dredging and capping for this area is incorporated into the schedule for Onondaga Lake.

Only three CPOIs were detected within the Outboard Area at concentrations which exceeded the Lake hot spot criteria. These include chlorobenzene, dichlorobenzene and xylene.

Two hot spot areas (East Flume Hot Spots and DSA Hot Spots) were identified where sediment concentrations have been detected which exceed the lake sediment screening criteria (for dichlorobenzene and xylene) within the 1-m interval below the base excavation required for cap placement and habitat restoration, but above the maximum excavation limits established for stability.

Hot spot delineations were determined based on data indicating that adjacent samples within the same depth interval did not exceed the lake sediment screening criteria. The delineation methods used for the Outboard Area were consistent with those used to delineate hot spot removal areas within Remediation Area D of the Lake, as described in Appendix G of the Lake Sediment Capping, Dredging, and Habitat Intermediate Design Report (Parsons, 2011b).

Under this response action, hot spot excavation/dredging would include removal of an additional 1 m (3.3 ft.) if the hot spot exceedance falls within this additional depth range, consistent with the hot spot approach for the lake. Excavation/dredging for hot spot removal would not extend beyond the maximum excavation limits that are established for stability of existing or proposed features, including the railroad and barrier walls (see Appendix A of the EE/CA). The cap would be designed to isolate remaining sediments and soils that exceed the hot-spot criteria. The restoration design would consider deeper pools for nursery habitat that coincide with the hot spot removal areas as a means of creating variable topography. If appropriate, additional fill materials would be placed within the Outboard Area to achieve the final post-cap target grades.

Figures 8 and 9 illustrate a conceptual cross-section and the anticipated removal depths throughout the Outboard Area under Response Action 3. It is estimated that approximately 199,000 CY (152,000 m^3) of material would be removed under Response Action 3. Approximately 35,000 CY (27,000 m^3) of dry material would be excavated and relocated to an area inboard of the barrier wall and groundwater collection system at the WBB/HB Subsite and the remaining 164,000 CY (125,000 m^3) would be managed at the SCA. The anticipated duration of the excavation/dredging, transport of materials and capping is 140 work days[6].

Response Action 4: Removal to Maximum Excavation Limits, Cap Placement, and Habitat Restoration

Capital Cost	$33,840,000
Annual M&M Cost	$21,100
Present-Worth M&M Cost	$160,600
Total Present-Worth Cost	$34,000,000
Construction Time	1 year

This response action involves the removal of Outboard Area materials to the maximum excavation limits established to maintain site stability. The excavation limitations established for wall and railroad stability during Outboard Area excavation preclude the removal of all contaminated materials. Therefore, this response action represents the maximum removal response action for evaluation.

[6] The actual schedule of work would be dependent on how dredging and capping for this area is incorporated into the schedule for Onondaga Lake.

Under this response action, excavation/dredging would be extended to the maximum excavation depths based on stability considerations, which range from approximately 1 to 4 m. Additional fill materials would be placed within the Outboard Area, as necessary, to achieve the final post-cap target grades.

Figures 10 and 11 illustrate a conceptual cross-section and the anticipated removal depths throughout the Outboard Area under Response Action 4. It is estimated that approximately 280,000 CY (215,000 m^3) of material would be removed under Response Action 4. Approximately 35,000 CY (27,000 m^3) of dry material would be excavated and relocated to an area inboard of the barrier wall and groundwater collection system at the WBB/HB Subsite and the remaining 245,000 CY (188,000 m^3) would be managed at the SCA. The anticipated duration of the excavation/dredging, material transport and capping is 204 work days[7].

EVALUATION OF RESPONSE ACTIONS

To select a response action for a site, a detailed analysis of the viable response actions was conducted. The detailed analysis consists of an assessment of the individual response actions against each of three evaluation criteria (effectiveness, implementability, and cost) and a comparative analysis focusing upon the relative performance of each response action against those criteria.

Effectiveness

This criterion refers to a response action's ability to meet the removal action objectives. The overall assessment of effectiveness is based on a composite of factors, including overall protection of public health and the environment, compliance with Applicable or Relevant and Appropriate Requirements (ARARs), long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, and short-term effectiveness, as follows:

- Overall protection of human health and the environment assesses whether the response actions are protective of public health and the environment. The evaluation will focus on how each response action achieves adequate protection and describe how the response action will reduce, control, or eliminate risks at the site through the use of treatment, engineering, or institutional controls.

- Compliance with ARARs addresses whether or not a response action would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes.

- Long-Term Effectiveness and Permanence involves the evaluation of the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes at the site. This criterion also considers the adequacy and reliability of controls and addresses the need for post-removal site control.

- Reduction of Toxicity, Mobility, and Volume through Treatment includes evaluating the anticipated performance of specific treatment technologies. This evaluation addresses the statutory preference for selecting response actions that employ treatment technologies to permanently and significantly reduce toxicity, mobility, or volume of wastes. Factors that will be considered, as appropriate, include: the treatment or recycling processes the response actions employ and the materials they would treat; the amount of hazardous materials to be destroyed or treated; the degree of reduction expected in toxicity, mobility, or volume; the degree to which the treatment would be

[7] The actual schedule of work would be dependent on how dredging and capping for this area is incorporated into the schedule for Onondaga Lake.

irreversible; the type and quantity of residuals that would remain after treatment; and whether the response action would satisfy the preference for treatment.

- Short-Term Effectiveness examines the effectiveness of response actions in protecting public health and the environment during the construction and implementation period until the removal action objectives have been met. The following factors will be considered: potential for short-term risks to the affected community as a result of the response action; potential impacts on workers during the response action, and the effectiveness and reliability of protective measures that would be taken; potential adverse environmental impacts of the response action, and the effectiveness and reliability of protective measures that would be taken; and time until protection is achieved.

Implementability

Under this criterion, the ease of implementing the response actions will be assessed by considering the following factors: technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional response actions, the ability to monitor the effectiveness of the response action, and the extent to which the removal action contributes to the efficient performance of any long-term remedial action; administrative feasibility, including activities needed to coordinate with other offices and agencies, the ability to obtain necessary approvals and permits from other agencies (for off-site actions), and statutory limits on removal actions; availability of services and materials, including the availability of adequate on or off-site treatment, storage capacity, and disposal capacity and services; and the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; and the availability of prospective technologies for full-scale application. This criterion will also assess support agency and community acceptance, as described below.

- Support Agency Acceptance indicates whether, based on its review of the EE/CA and this document, the New York State Department of Health (NYSDOH) agrees with, opposes, or has no comment on the preferred response action at the present time.

- Community Acceptance, which will be assessed in the Response Action Document, refers to the public's general response to the response actions described in the EE/CA and this document.

Cost

The costs include the capital costs, including both indirect and direct costs; post-removal site control costs, which include annual maintenance and residual disposal costs; and present-worth costs, which include the capital costs plus the present value of 30 years of post-removal site control costs (calculated at a 7 percent discount rate).

Comparative Analysis of Response Actions

A comparative analysis of the response actions based upon the evaluation criteria noted above is provided below.

Effectiveness

The effectiveness of each of the response actions, other than no action, would rely on the ability of the cap, in conjunction with institutional controls and a long-term M&M program, to provide long-term chemical isolation of underlying impacted soil/sediments. With the exception of the No Action Response Action, all of the evaluated Response Actions include restoration consistent with the Habitat Plan and/or subsequent design changes regarding pike spawning habitat for the Outboard Area. Cap design would be based on meeting long-term effectiveness objectives for

protection of human health and the environment; cap design effectiveness would be such that Response Actions 2, 3, and 4 would provide the same degree of protectiveness. Because the cap, institutional controls, and M&M components are the same, the long-term effectiveness associated with Response Actions 2, 3 and 4 is anticipated to be the same.

Data suggests that Response Action 2 removes the majority of materials present within the Outboard Area that exceed the lake sediment hot spot criteria. Response Action 3 removes approximately 9,000 additional CY (7,000 m^3) of material exceeding the lake hot spot criteria reducing the toxicity and mobility of the contaminated sediments/soils; and reliance on the cap to provide protection. Although Response Action 4 removes the largest volume of material, the additional 81,000 CY (63,000 m^3) under Response Action 4 results in the removal of minimal additional amounts that exceeds hot spot criteria and would not increase the protectiveness of the response action.

ARARs and To-Be-Considered criteria (TBCs) are anticipated to be achieved under Response Actions 2, 3 and 4. These ARARs/TBCs include, but are not limited to:

- 6 NYCRR 701 - Classifications - Surface Waters and Ground Waters
- 6 NYCRR Part 703 - Class GA Groundwater Quality Standards
- NYSDEC, Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 (October 1998) - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations
- 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives
- NYSDEC Technical Guidance for Screening Contaminated Sediment (1999)
- 6 NYCRR 663 - Freshwater Wetland Permit Requirements
- New York State Freshwater Wetlands Implementation Program, 6 NYCRR 662 and 665
- New York State Freshwater Wetlands Law, Environmental Conservation Law, Article 24, 71 in Title 23
- Clean Water Act Section 404, 33 Code of Federal Regulations (CFR) Parts 320 - 330
- Clean Water Act Section 404, 40 CFR Parts 230 – 231
- Executive Order 11990 - Protection of Wetlands
- Executive Order 11988 - Floodplain Management
- Policy on Flood Plains and Wetland Assessments for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Actions (OSWER Directive 9280.0-02)
- National Historic Preservation Act, 36 CFR 800 - Preservation of Historic Properties Owned by a Federal Agency
- National Historic Preservation Act, 36 CFR Part 65 - National Historic Landmarks Program
- New York State Historic Preservation Act of 1980, 9 NYCRR Parts 426 - 428
- 33 U.S.C. 1341 - Clean Water Act Section 401, State Water Quality Certification Program
- 6 NYCRR 608 - Use and Protection Of Waters
- 16 USC 661 - Fish and Wildlife Coordination Act
- 33 CFR Parts 330 - Nationwide Permit Program
- 40 CFR Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices
- 6 NYCRR 360 - Solid Waste Management Facilities
- 29 CFR Part 1910.120 - Occupational Safety and Health Standards - Hazardous Waste Operations and Emergency Response
- 29 CFR Part 1926 - Safety and Health Regulations for Construction
- Onondaga Lake Baseline Ecological Risk Assessment ((site specific Sediment Effect Concentrations (SECs) and PECs) (TAMS, 2002b)
- Lake Bottom Subsite ROD (NYSDEC and EPA, 2005) (mean Probable Effect Concentrations Quotient (PECQ) and the Hot Spot threshold concentrations)

Wetlands impacted by these response actions would be restored and any wetlands lost would be mitigated. Response Action 2, 3, and 4, in concert with other remedies, would contribute to meeting surface water ARARs for Onondaga Lake and Harbor Brook.

The potential short-term impacts associated with Response Actions 2, 3 and 4 are similar. Although none of the response actions represents unacceptable short-term risk, the potential for incidents to occur would be dependent on the volume of materials handled which would impact the duration of the construction activities. Potential short-term risks to the community during construction would be associated with dust and vapors. For these response actions, air monitoring would be conducted in accordance with a health and safety plan and community air monitoring plan prepared in accordance with NYSDEC and NYSDOH requirements to ensure the work is protective of on-site workers and the public. Based on the estimated volumes presented in the EE/CA, Response Action 2 represents the least potential short-term risk and Response Action 4 represents the greatest risk of potential short-term impacts. Short-term risks would be minimized through the use of public access restrictions and wetting of the soils, if necessary, to prevent fugitive dust. The risk to workers during construction would include inhalation of dust and vapors and potential direct contact. The risks to workers during construction would be mitigated through use of proper personal protective equipment. The risks to the public and on-Site workers would be mitigated during construction through the implementation of control measures, monitoring, the planning and use of proper procedures, and implementation of a comprehensive site-specific Health and Safety Plan. Adverse environmental impacts would be minimized through appropriate methods such as stormwater management and dust control.

Implementability

Response Actions 2, 3, and 4 involve the mechanical and hydraulic excavation of soil and sediment and the mechanical placement of cap materials. Each of these response actions is technically and administratively feasible and the personnel, equipment, and materials necessary to implement each of these response actions are available.

The degree of difficulty for Response Actions 2, 3 and 4 are dependent on the volume and depth of Outboard Area material to be removed. Based on the removal scenarios presented in the EE/CA, Response Action 2 represents the least difficult response action to implement and Response Action 4 represents the most difficult response action to implement due to the need to remove more material at greater depths, as well as to backfill to meet targeted finish grades. However, all of the response actions are implementable.

NYSDOH provided input on the EE/CA during its preparation and agrees with the preferred response action.

Community acceptance of the preferred response action will be assessed in a decision document following review of the public comments received on the EE/CA and this document.

Cost

The estimated capital, annual M&M costs, and present-worth costs for each of the response actions are presented below.

Response Action	Capital Cost	Annual M&M Cost	Present-Worth M&M Cost	Total Present-Worth M&M Cost
1	$0	$0	$0	$0
2	$22,840,000	$21,100	$160,600	$23,000,000
3	$23,840,000	$21,100	$160,600	$24,000,000
4	$33,840,000	$21,100	$160,600	$34,000,000

As can be seen by the cost estimates, Response Action 1 is the least costly response action with a present-worth cost of $0. Response Action 4 is the most costly response action at an estimated present-worth cost of $34,000,000. Response Action 2 has an estimated present-worth cost of $23,000,000 and Response Action 3 has an estimated present-worth cost of $24,000,000.

PREFERRED RESPONSE ACTION

NYSDEC and EPA's preferred response action, Response Action 3, includes removal for placement of an isolation cap and achieving final grades lower than the existing grade elevations to facilitate habitat restoration. Based on the anticipated cap thicknesses and target final grades for the western and eastern Outboard Areas, the majority of the excavation would be conducted to depths ranging from 1.5 to 3 m (4.9 to 9.8 ft) with additional hot spot excavation/dredging to remove an additional 1 m (3.3 ft) (to a maximum depth of 4 m [13.1 ft]) of Outboard Area materials where higher concentrations of CPOIs have been detected. The cap would be designed to isolate remaining sediments and soils that exceed the hot-spot criteria. Habitat restoration in the Outboard Area would create emergent wetland areas and habitat that is more suitable for northern pike reproduction. The restoration design would consider deeper pools for nursery habitat that coincide with the hot spot removal areas as a means of creating variable topography. If appropriate, additional fill materials would be placed within the Outboard Area to achieve the final post-cap target grades.

It is estimated that approximately 199,000 CY (152,000 m^3) of material would be removed under Response Action 3. Approximately 35,000 CY (27,000 m^3) of dry material would be excavated and relocated to an area inboard of the barrier wall and groundwater collection system at the WBB/HB Subsite and the remaining 164,000 CY (125,000 m^3) would be managed at the SCA.

The Outboard Area IRM would be coordinated with other remedial activities at the WBB/HB Subsite and the Onondaga Lake remediation. The actual schedule of work would be dependent on how dredging and capping for this area is integrated into the schedule for Onondaga Lake.

The environmental benefits of the preferred response action may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green policy[8] and NYSDEC's Division of Environmental Remediation Program Policy *Green Remediation* (DER-31)[9]. This will include consideration of green remediation technologies and practices.

[8] See http://epa.gov/region2/superfund/green_remediation

[9] See http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf

Basis for the Preferred Response Action

Response Action 3 is the preferred response action to address contaminated material within the Outboard Area for the following reasons:

- Response Action 3 provides the same level of protectiveness as Response Actions 2 and 4.
- In comparison to Response Action 2, Response Action 3 involves removing 9,000 additional cubic yards of material from the Outboard Area which exceeds the lake sediment hot spot criteria, thereby reducing the toxicity and mobility of the contaminated sediments/soils and reliance on the cap to provide protection.
- Response Action 4 would not provide additional protection of human health or the environment. Response Action 4 might present a greater risk of potential short-term impacts due to a greater duration of construction activities and it costs $10 million (42 percent) more than Response Action 3.

NYSDEC and EPA believe that the preferred response action would provide the best balance among the response actions with respect to the evaluating criteria. NYSDEC and EPA also believe that the preferred response action would be protective of human health and the environment, would comply with ARARs, and would utilize permanent solutions and response action treatment technologies or resource recovery technologies to the maximum extent practicable.

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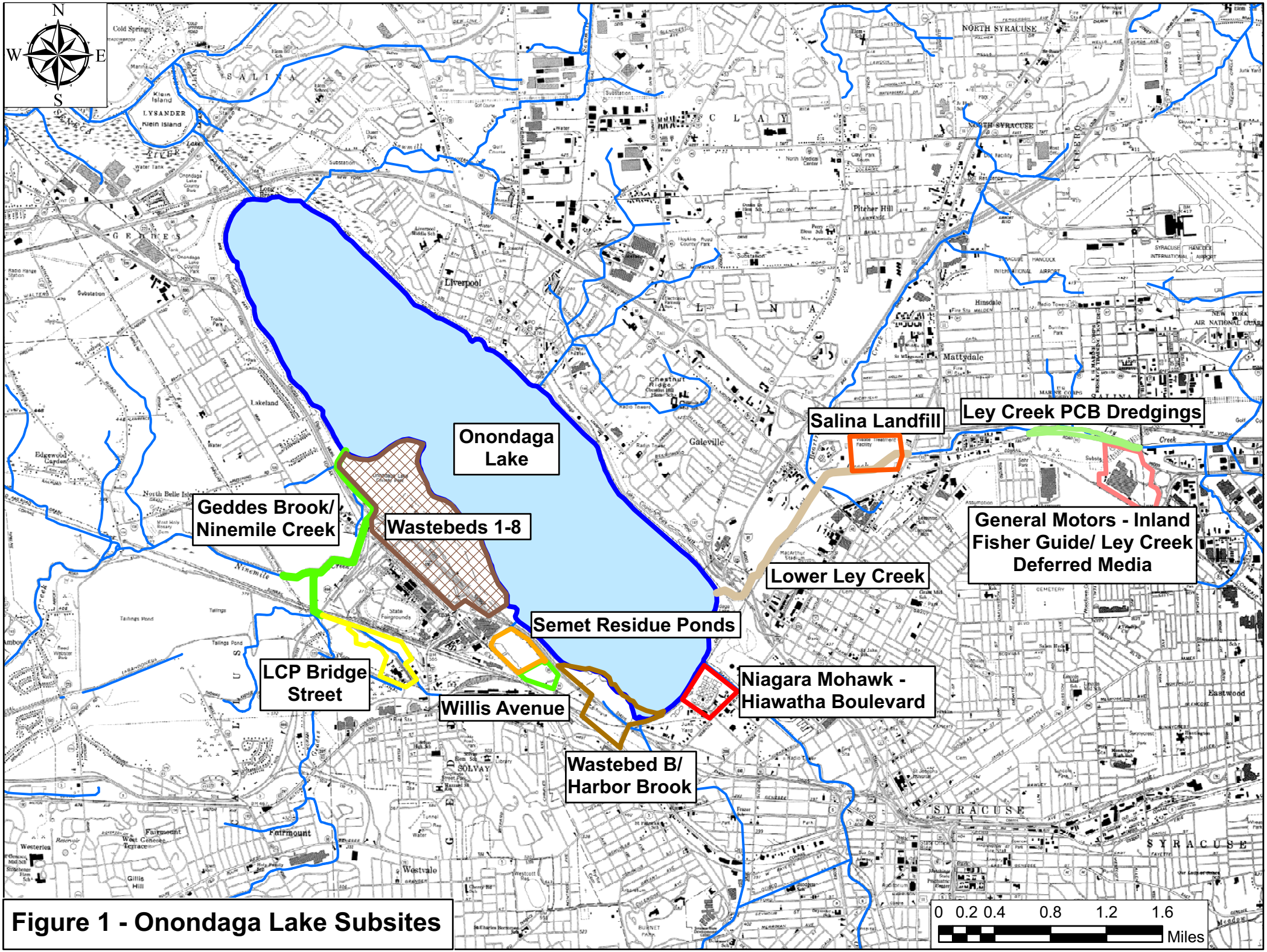

Figure 1 - Onondaga Lake Subsites

FIGURE 2

Honeywell
Onondaga Lake
Syracuse, New York

East Flume, DSA #2, AOS-1 and Wetland Areas

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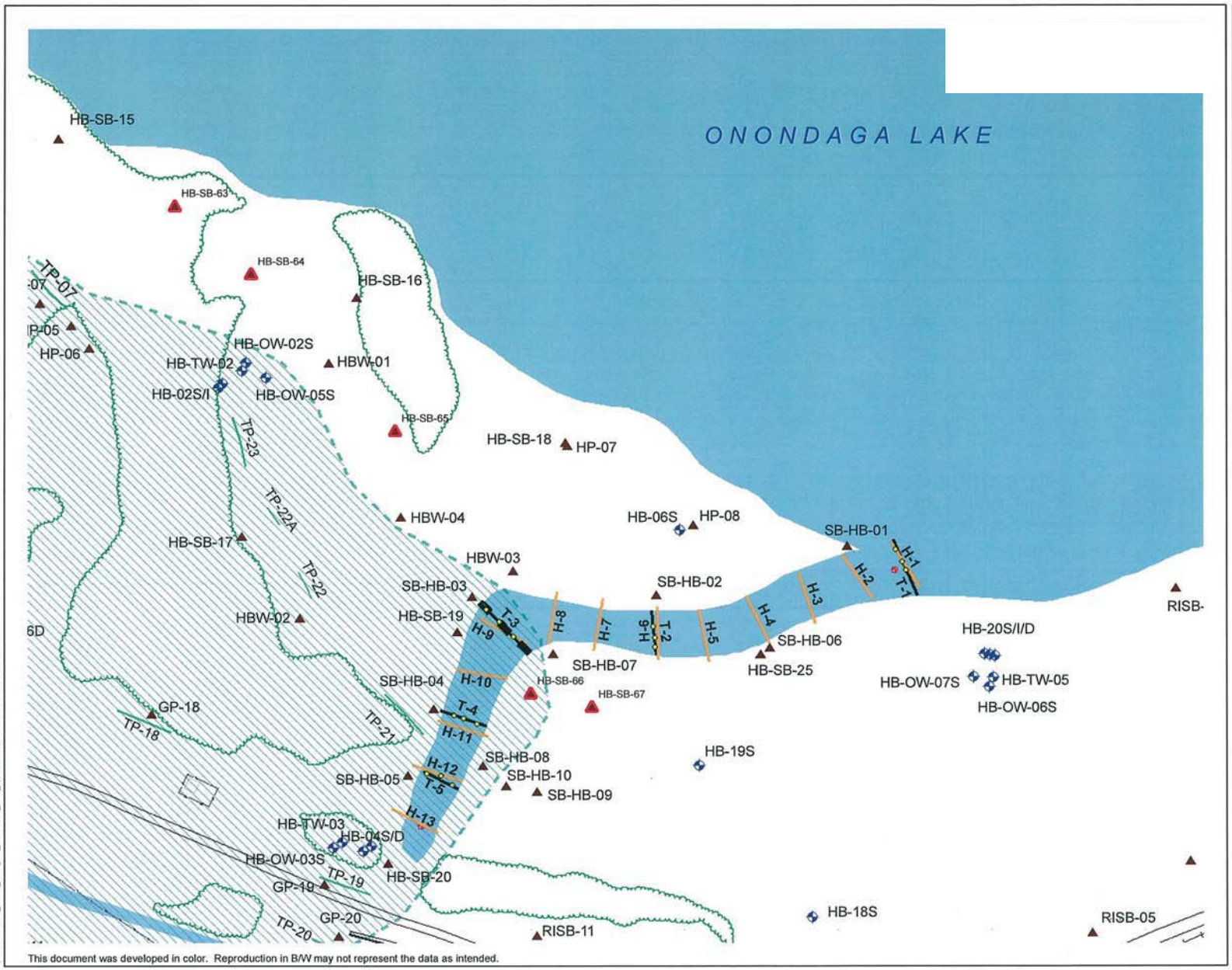
FIGURE 3



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LEGEND

- MONITORING WELLS
- SOIL BORINGS
- RI 2006 Soil Borings (GPS)
- TEST PITS
- SEDIMENT IRM INVESTIGATION SEDIMENT PROBING TRANSECT
- SEDIMENT IRM INVESTIGATION SAMPLING TRANSECT
- SEDIMENT IRM INVESTIGATION SEDIMENT CORE
- APPROXIMATE EXTENT OF NAPL IN MARL

HONEYWELL
WASTEBED B/
HARBOR BROOK SITE
GEDDES AND SYRACUSE, NY

DISTRIBUTION OF NAPL

N
W E
S

0 25 50 100 150 200
Feet

Note: Original base map information obtained from O'Brien & Gere Remedial Investigation Report (November 2007), Figure 107.

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FIGURE 4A

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Syracuse, New York

Wastebed B/Harbor Brook Site and Outboard Area

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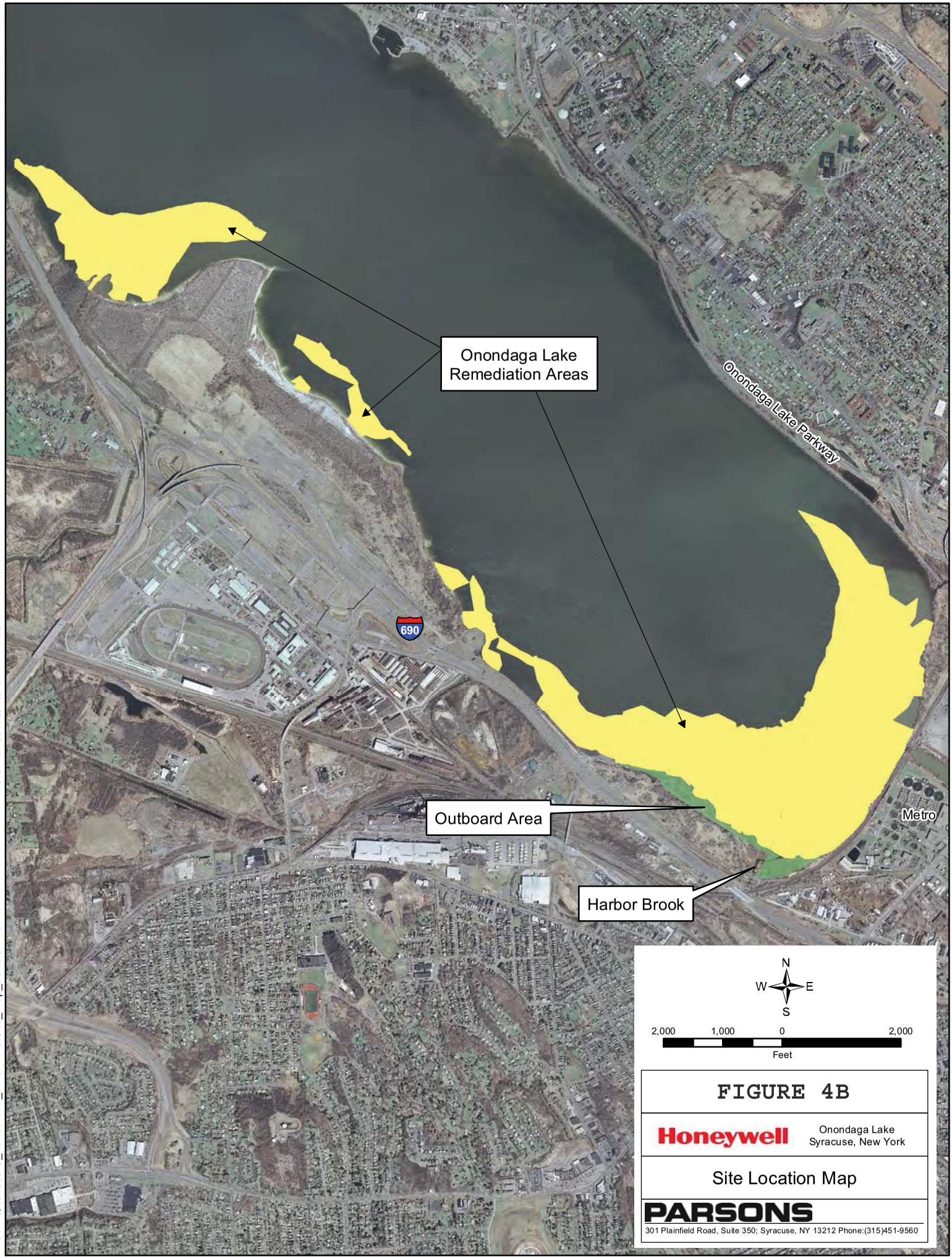

FIGURE 4B

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Onondaga Lake
Syracuse, New York

Site Location Map

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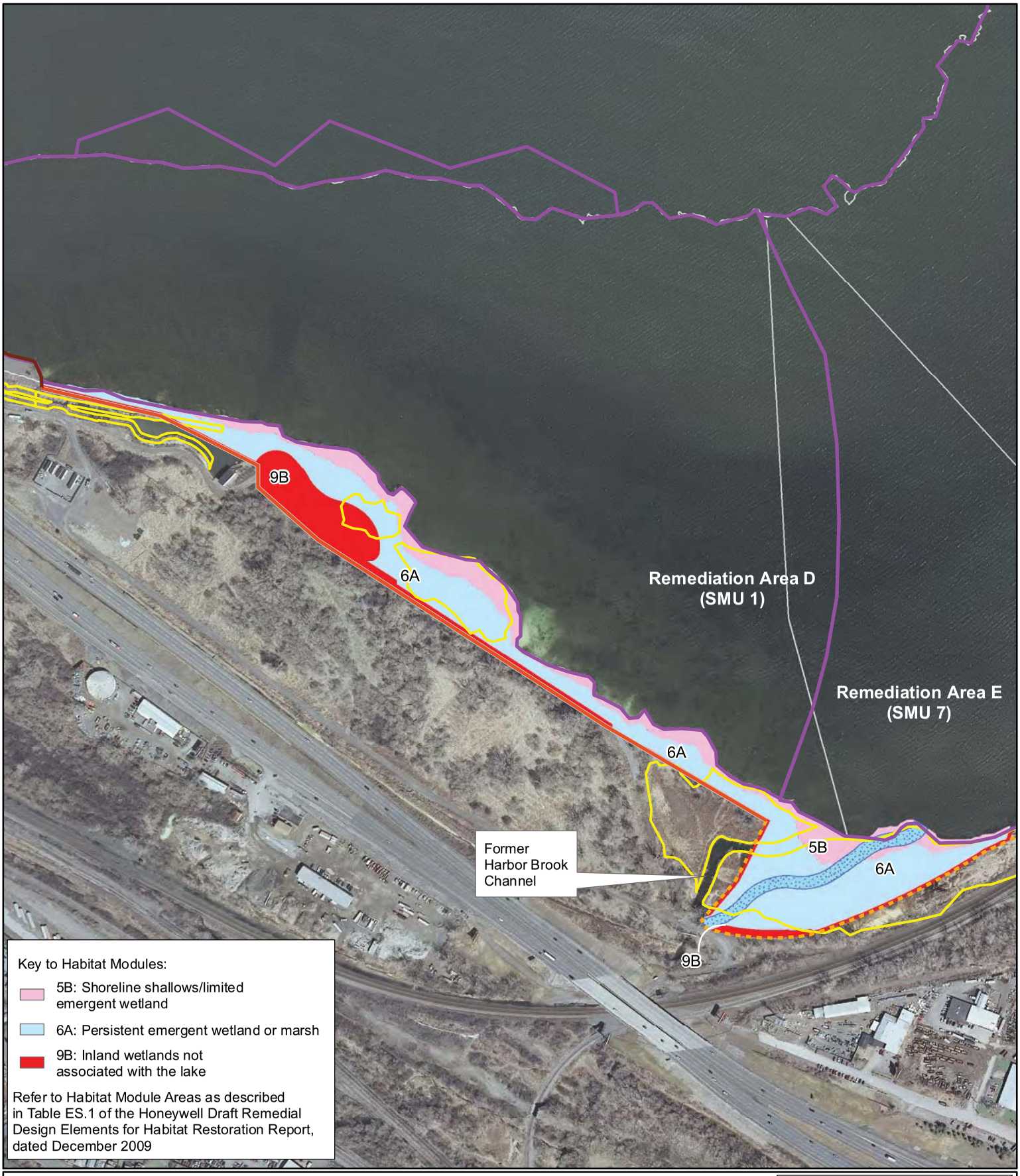

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NYSDEC Approved Wetland Boundaries

Sediment Management Unit (SMU) Boundary

Remediation Area Boundary (Parsons, 2010)

Approximate Final Harbor Brook Channel Alignment

Willis/Semet IRM Barrier Wall

West Wall Portion of the WB-B/HB IRM Barrier Wall

East Wall Portion of the WB-B/HB IRM Barrier Wall

Note: The East Flume has subsequently been filled in to elevation 365 (NAVD 88).

N
W E
S

New York State Digital Orthoimagery from 2009

0 150 300 600

Feet

FIGURE 5

Honeywell

Onondaga Lake
Syracuse, New York

Conceptual Plan for Outboard Area Habitat Restoration

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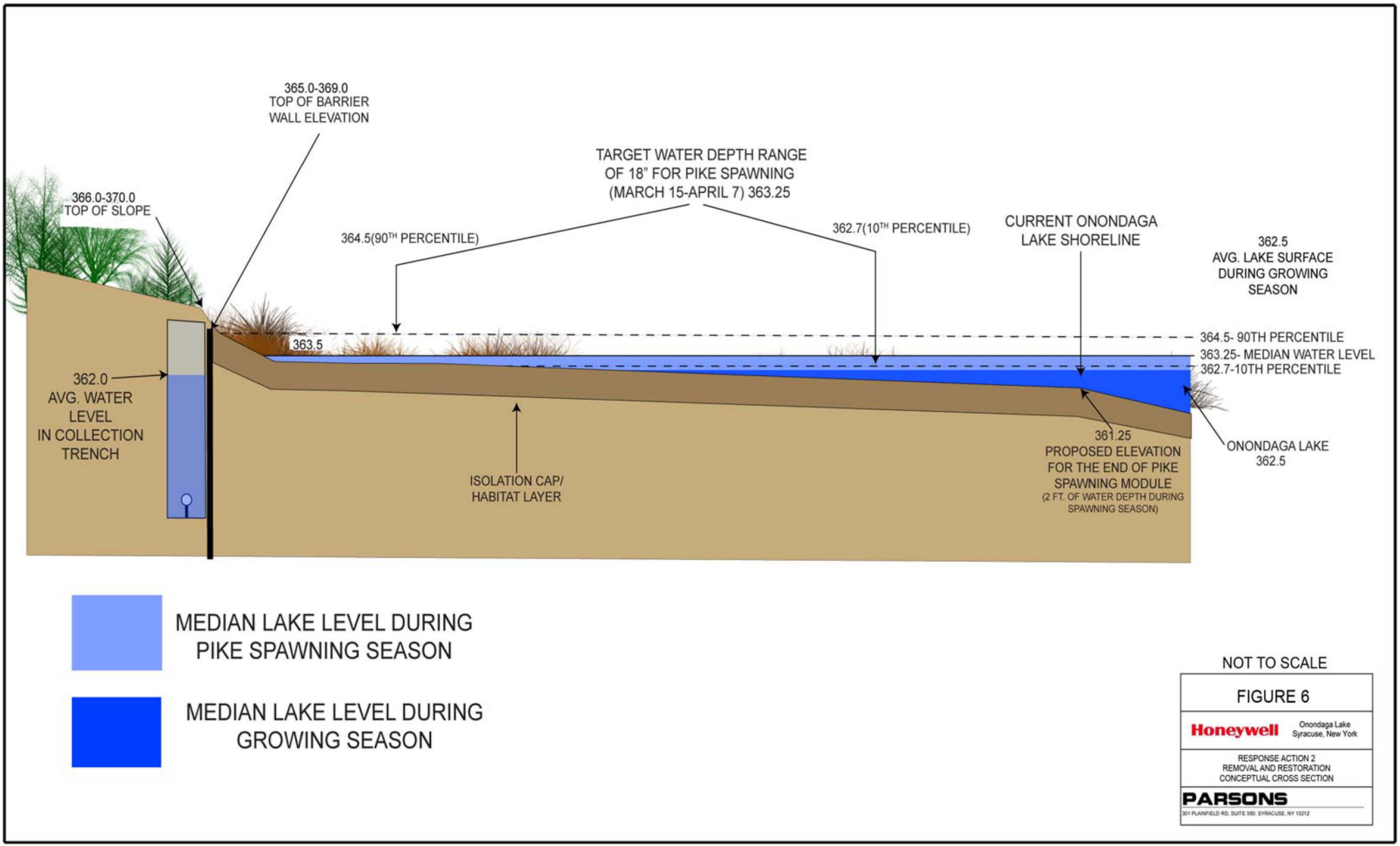

NOT TO SCALE

FIGURE 6

Honeywell Onondaga Lake Syracuse, New York

RESPONSE ACTION 2
REMOVAL AND RESTORATION
CONCEPTUAL CROSS SECTION

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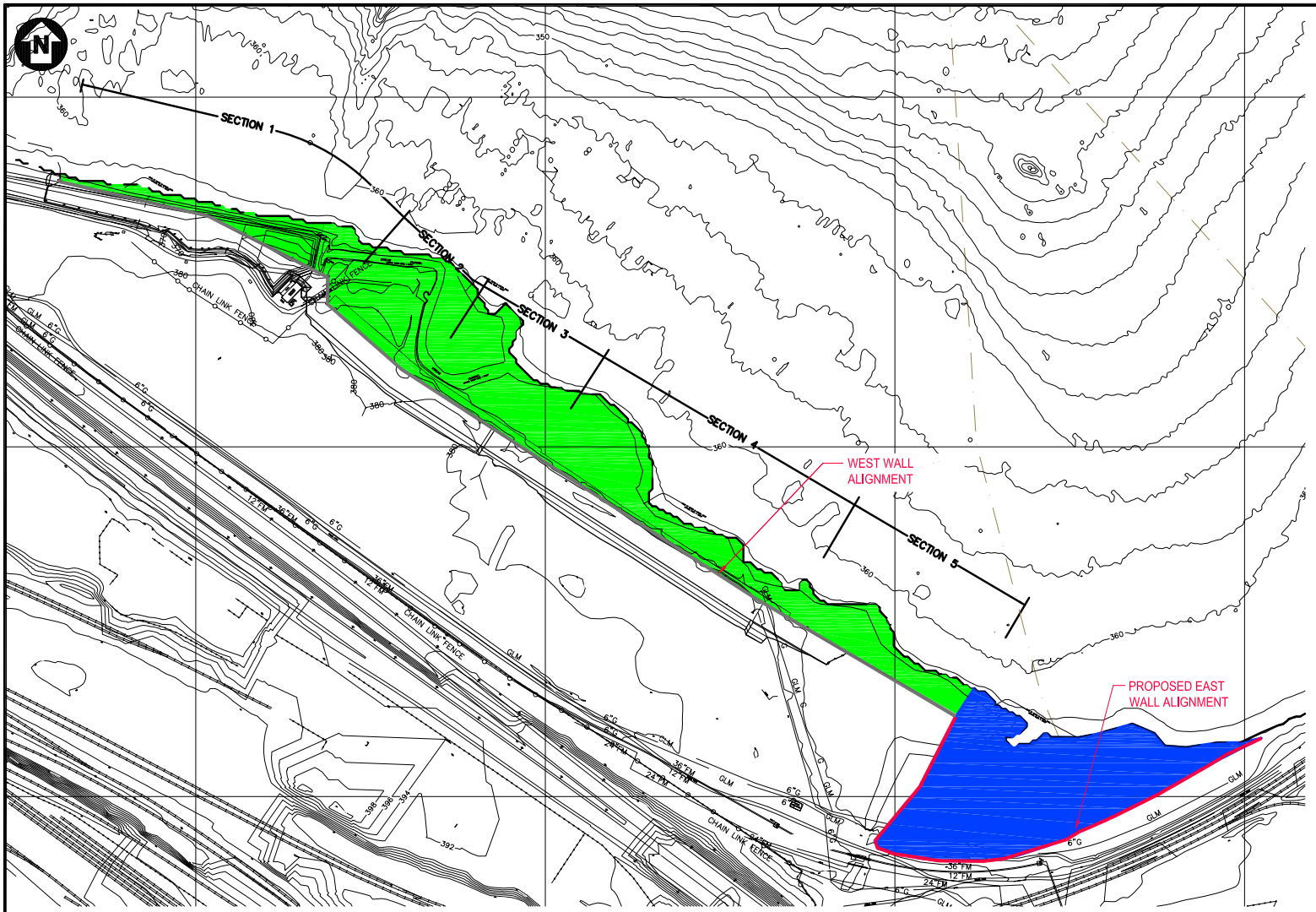

LEGEND:

- 360 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- EXISTING SHORELINE
- PROPOSED WEST WALL ALIGNMENT
- 370 — PROPOSED CONTOURS (5 FT)
- PROPOSED EAST WALL ALIGNMENT

PROPOSED EXCAVATION DEPTH
SEE NOTE 3

- 2–3 METERS
- 1–2 METERS

NOTES:

1. THE WB–B/HB TOPOGRAPHIC MAP DATED APRIL 18, 2008 WAS PREPARED BY CNY LAND SURVEYING. THE LAKE BATHYMETRIC CONTOUR MAP IS DATED 2006.
2. EXCAVATION DEPTHS PROVIDED SHOW ANTICIPATED MINIMUM REMOVAL FOR SUBSEQUENT PLACEMENT OF THE CAP AND HABITAT LAYER.
3. FIGURE SHOWS AVERAGE REMOVAL DEPTHS. THE ACTUAL REMOVAL DEPTHS AND ELEVATIONS WILL VARY THROUGHOUT THE AREA TO ACCOMMODATE THE EXISTING GRADE, TOP OF WALL ELEVATION, AND PROPOSED HABITAT FEATURES.
4. EAST FLUME HAS BEEN BACKFILLED TO ELEVATION 365 (NAVD 88)

300 150 0 300 600

SCALE: 1"=300'

FIGURE 7

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ONONDAGA LAKE WBB/HB IRM OUTBOARD AREA

REMOVAL DEPTHS & AREAS
RESPONSE ACTION 2

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OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL –SYR\445308 WASTEBED B–HB OUTBOARD\10 TECHNICAL CATEGORIES\10.1 CAD\FIGURES\EE–CA\445308–EECA–003 (2).DWG
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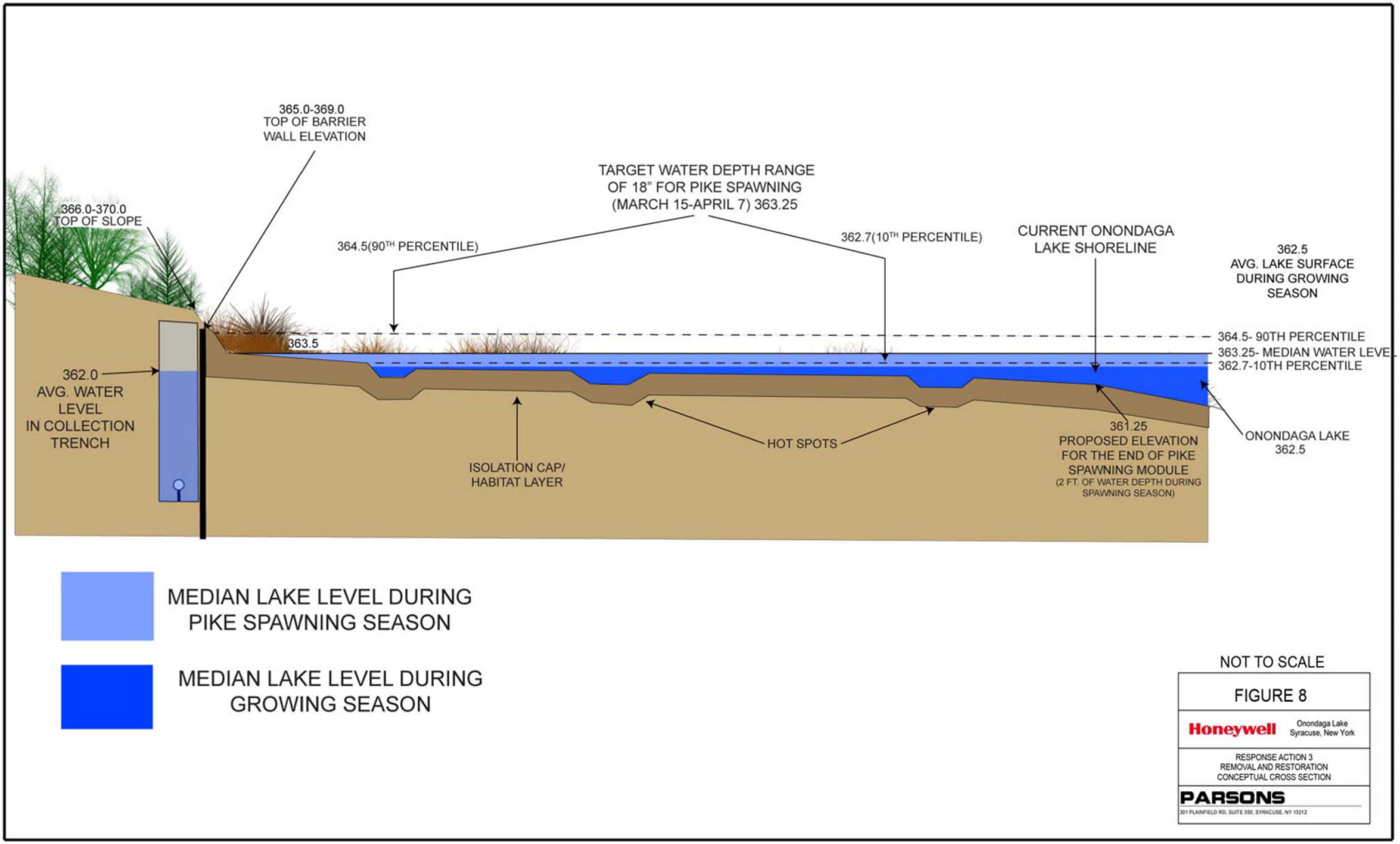

NOT TO SCALE

FIGURE 8

Honeywell Onondaga Lake Syracuse, New York

RESPONSE ACTION 3
REMOVAL AND RESTORATION
CONCEPTUAL CROSS SECTION

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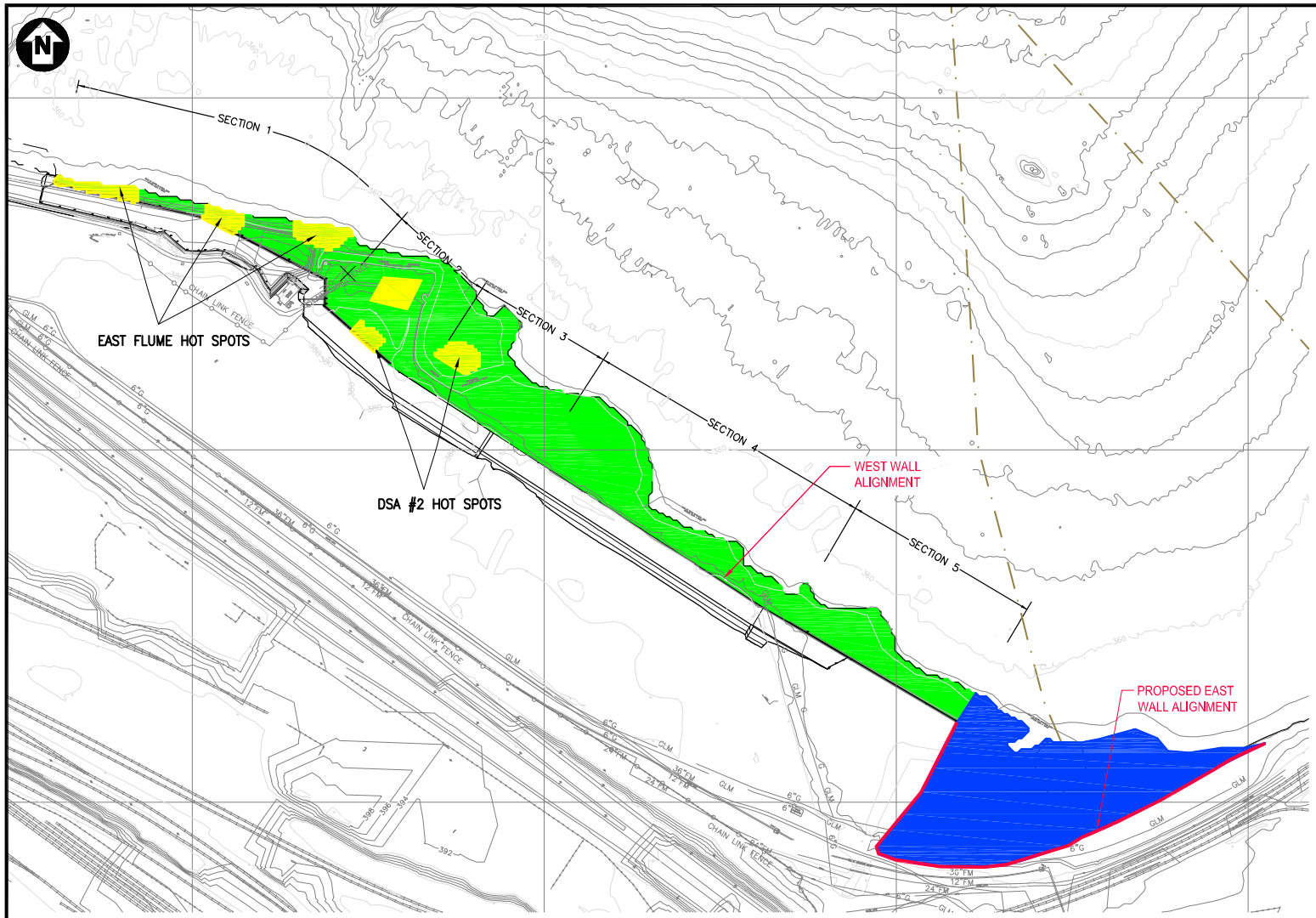

LEGEND:

- 360 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- EXISTING SHORELINE
- PROPOSED WEST WALL ALIGNMENT
- 370 — PROPOSED CONTOURS (5 FT)
- PROPOSED EAST WALL ALIGNMENT

PROPOSED EXCAVATION DEPTH
SEE NOTE 3

- 2–3 METERS
- 1–2 METERS
- ADDITIONAL 1 METER HOT SPOT REMOVAL

NOTES:

1. THE WB–B/HB TOPOGRAPHIC MAP DATED APRIL 18, 2008 WAS PREPARED BY CNY LAND SURVEYING. THE LAKE BATHYMETRIC CONTOUR MAP IS DATED 2006.
2. EXCAVATION DEPTHS SHOWN FACILITATE REMOVAL OF MATERIAL FOR SUBSEQUENT PLACEMENT OF THE OUTBOARD CAP AND HABITAT LAYER AND FOR REMOVAL OF HOT SPOTS AND POTENTIAL HOT SPOTS.
3. FIGURE SHOWS AVERAGE REMOVAL DEPTHS. THE ACTUAL REMOVAL DEPTHS AND ELEVATIONS WILL VARY THROUGHOUT THE AREA TO ACCOMMODATE THE EXISTING GRADE, TOP OF WALL ELEVATION, AND PROPOSED HABITAT FEATURES.
4. EAST FLUME HAS BEEN BACKFILLED TO ELEVATION 365 (NAVD 88)

300 150 0 300 600

SCALE: 1"=300'

FIGURE 9

Honeywell

ONONDAGA LAKE WBB/HB IRM OUTBOARD AREA

REMEDIAL DEPTHS & AREAS
RESPONSE ACTION 3

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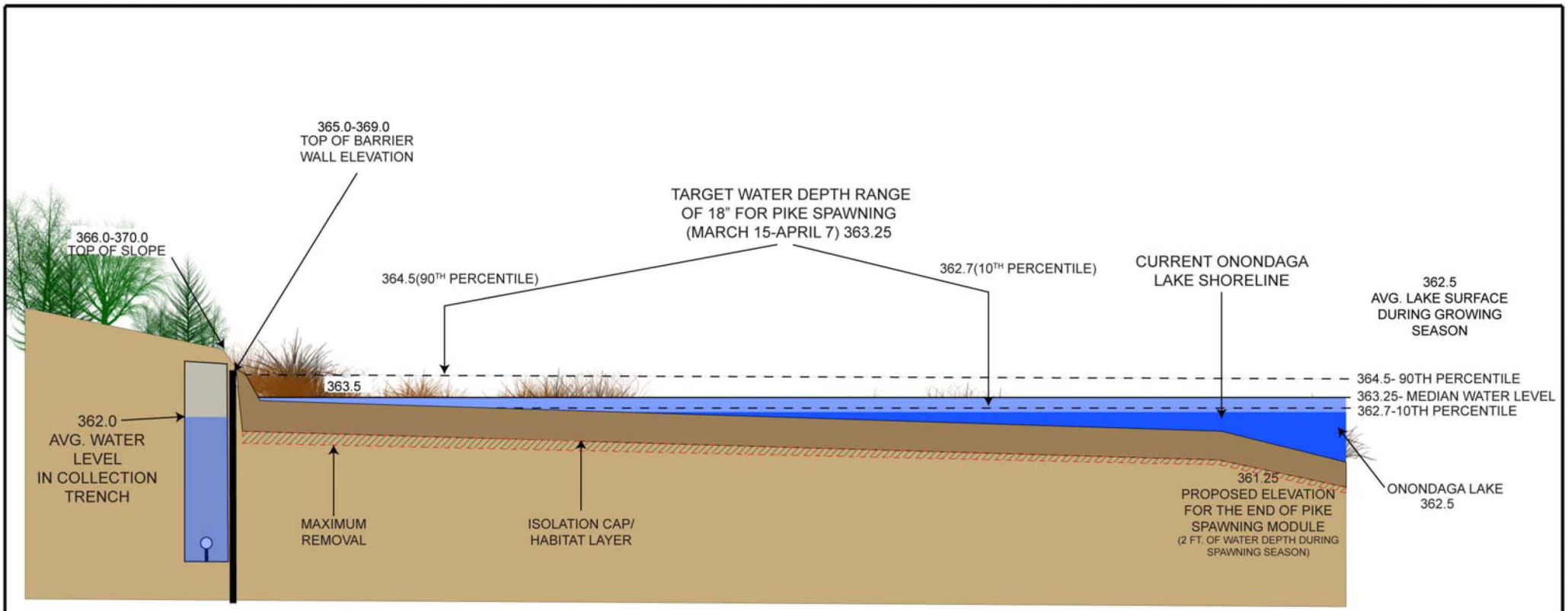
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\446377 (WBB OUTBOARD)\10 TECHNICAL\10.1 CAD\FIGURES\EE-CA\446377-SK001-8-28-11.DWG
PLOT DATE: 1/25/2008 12:29 PM PLOTTED BY: RUSSO, JILL



MEDIAN LAKE LEVEL DURING PIKE SPAWNING SEASON

MEDIAN LAKE LEVEL DURING GROWING SEASON

NOT TO SCALE

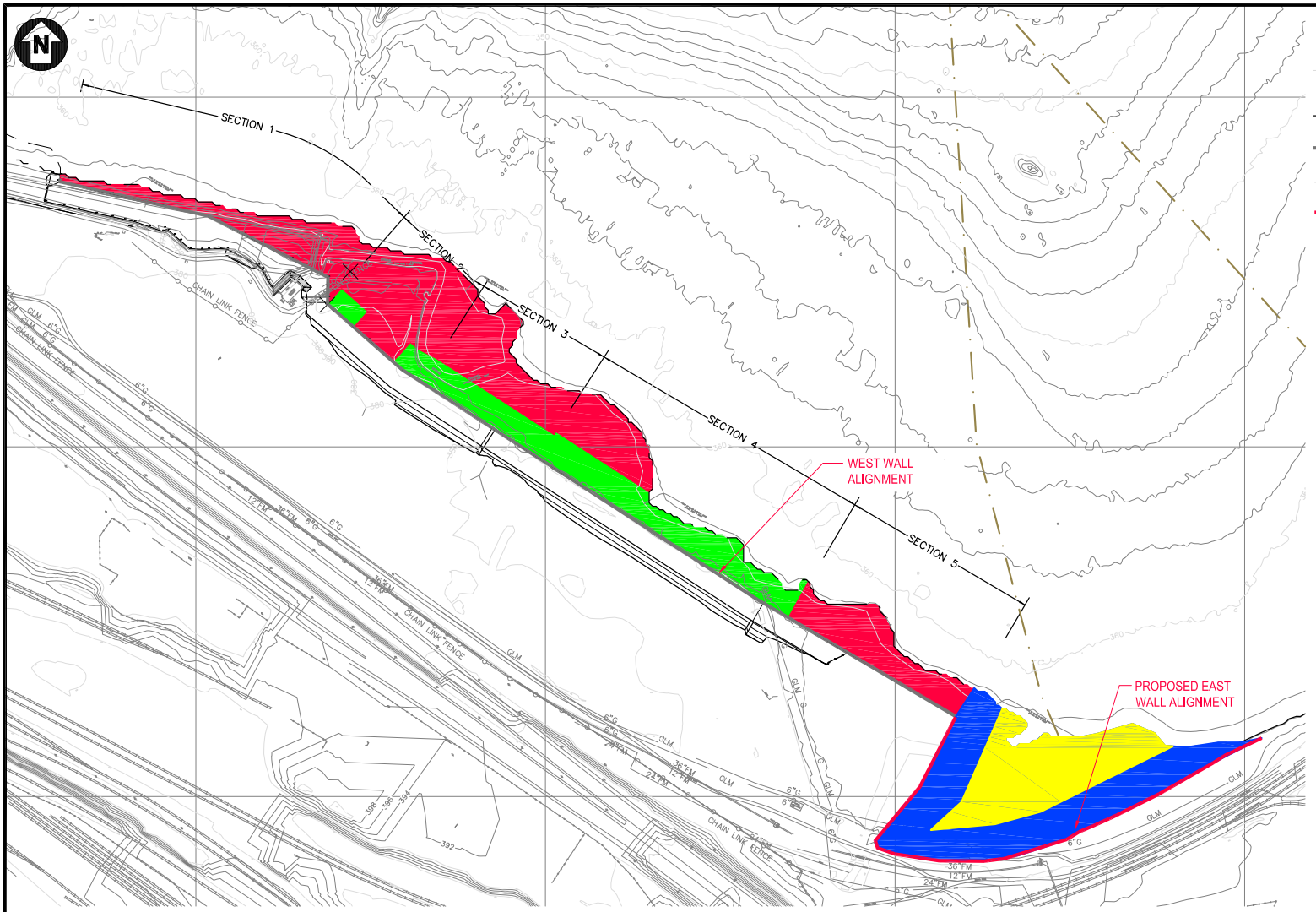
FIGURE 10

Honeywell Onondaga Lake Syracuse, New York

RESPONSE ACTION 4
REMOVAL AND RESTORATION
CONCEPTUAL CROSS SECTION

PARSONS

301 PLAINFIELD RD. SUITE 350; SYRACUSE, NY 13212



LEGEND:

- 360 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- EXISTING SHORELINE
- PROPOSED WEST WALL ALIGNMENT
- 370 — PROPOSED CONTOURS (5 FT)
- PROPOSED EAST WALL ALIGNMENT

PROPOSED EXCAVATION DEPTH
SEE NOTE 3

- 2–3 METERS
- 4 METERS
- 1–2 METERS
- 2–3 METERS (NOTE: REMOVAL CONSTRAINED BY STABILITY AND SEQUENTIAL EXCAVATION CONSIDERATIONS)

NOTES:

1. THE WB–B/HB TOPOGRAPHIC MAP DATED APRIL 18, 2008 WAS PREPARED BY CNY LAND SURVEYING. THE LAKE BATHYMETRIC CONTOUR MAP IS DATED 2006.
2. EXCAVATION DEPTHS PROVIDED SHOW MAXIMUM MATERIAL REMOVAL TO MAINTAIN SITE STABILITY.
3. FIGURE SHOWS AVERAGE REMOVAL DEPTHS. THE ACTUAL REMOVAL DEPTHS AND ELEVATIONS WILL VARY THROUGHOUT THE AREA TO ACCOMMODATE THE EXISTING GRADE, TOP OF WALL ELEVATION, AND PROPOSED HABITAT FEATURES.
4. EAST FLUME HAS BEEN BACKFILLED TO ELEVATION 365 (NAVD 88)

300 150 0 300 600

SCALE: 1"=300'

FIGURE 11

Honeywell

ONONDAGA LAKE WBB/HB IRM OUTBOARD AREA

REMOVAL DEPTHS & AREAS
RESPONSE ACTION 4

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OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL –SYR\446377 (WBB OUTBOARD)\10 TECHNICAL\10.1 CAD\FIGURES\EE–CA\446377–SK002.DWG
PLOT DATE: 1/25/2008 12:29 PM PLOTTED BY: RUSSO, JILL