

Semet Residue Ponds Operable Unit 2

Subsite of the Onondaga Lake Superfund Site

Geddes, Onondaga County, New York



Department of
Environmental
Conservation

December 2018



PURPOSE OF THIS DOCUMENT

This Proposed Plan describes the remedial alternatives to address Semet Residue Ponds Subsite (Subsite) Operable Unit 2 (OU-2), identifies the preferred remedy for the Solvay waste/soil/fill material, and provides the rationale for this preference. The remedy for OU-1 that addressed Semet residue in five man-made ponds and containment of shallow and intermediate groundwater was selected in a 2002 Record of Decision (ROD), with modifications made in a 2017 Explanation of Significant Differences (ESD).

This Proposed Plan was developed by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (EPA) in consultation with the New York State Department of Health (NYSDOH). NYSDEC and EPA are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as well as the New York State Environmental Conservation Law (ECL) and Title 6 New York Code of Rules and Regulations (NYCRR) Part 375. The nature and extent of the contamination is described in the *Semet Residue Ponds Site OU-2 Data Summary Document (DSD)* and the remedial alternatives summarized in this Proposed Plan are described in *Semet Residue Ponds Site OU-2 Feasibility Study Report (FS)*, which is contained in the Administrative Record file for this Subsite. NYSDEC and EPA encourage the public to review these documents to gain a more comprehensive understanding of the Subsite and the Superfund activities that have been conducted at the Subsite.

This Proposed Plan is being provided as a supplement to the documents listed above to inform the public of NYSDEC's and EPA's preferred remedy and to solicit public comments pertaining to the remedial alternatives evaluated, including the preferred remedy.

NYSDEC and EPA's preferred alternative includes *in situ* treatment of targeted material (e.g., remaining Semet material that cannot be reused under the OU-1 remedy) and the installation of an enhanced engineered cover system where shallow soil exhibits concentrations above 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) for commercial use. In addition, this remedy includes the continuation of operation and maintenance (O&M) for Interim Remedial Measures (IRMs) that have been implemented at the Subsite, site grading, institutional controls, development of a Site Management Plan (SMP), periodic reviews, and long-term maintenance. The proposed enhanced engineered cover system would require routine maintenance and inspections to maintain cover system integrity.

Given the comingling of the shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake with that of the adjacent Willis Avenue subsite, the shallow and intermediate groundwater in this area will be addressed as part of the Willis Avenue subsite.

The remedy described in this Proposed Plan is the preferred remedy for the OU-2 portion of the Subsite. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the remedy will be made after NYSDEC and EPA have taken into consideration all public comments. NYSDEC and EPA are soliciting public comment on the alternatives considered in the Proposed Plan and in the detailed analysis section of the *Semet Residue Ponds Site OU-2 Feasibility Study Report* because NYSDEC and EPA may select a remedy other than the preferred remedy.

MARK YOUR CALENDAR

December 17, 2018 – January 16, 2019: Public comment period on the Proposed Plan.

Public Meeting

Wednesday January 9, 2019
(inclement weather date of January 10) at 6:00 PM

Open House from 5:00 – 6:00 PM

Martha Eddy Room in the Art and Home Center at the New York State Fairgrounds

Community Role in the Selection Process

NYSDEC and EPA rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a public comment period which begins on December 17, 2018 and concludes on January 16, 2019.

As noted above, a public meeting and an open house will be held during the comment period to elaborate on the reasons for recommending the preferred remedy and to receive public comments. The public meeting will include a formal presentation by NYSDEC of the preferred remedy and other cleanup options which have been considered for the Subsite.

The open house session will be less formal, and provide the public a chance to receive printed information and discuss the cleanup options with NYSDEC and EPA representatives on a one-on-one basis.

Comments received at the public meeting and in writing during the comment period, will be documented in the Responsiveness Summary Section of the ROD, the document that formalizes the selection of the remedy.

Written comments on this Proposed Plan should be addressed to:

Tracy A. Smith
NYS Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7013
E-mail: tracy.smith@dec.ny.gov

SUBSITE BACKGROUND

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, 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). This NPL listing means that the lake system is among the nation's highest priorities for remedial evaluation and response under the federal Superfund law for sites where there has been a release of hazardous substances, pollutants, or contaminants.

Because many Superfund sites are complex and have multiple contamination problems and/or areas, they are often divided into Operable Units (OUs) for managing the site-wide response actions. The NCP (Section 300.5) defines an OU 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 may be divided into OUs, depending on the complexity of the problems associated with the site. OUs address geographical portions of a site, specific site problems, or initial phases of an action, or consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site."

This Subsite, which is part of the Onondaga Lake NPL site and is listed as a Class "2" site in the New York State Registry of Inactive Hazardous Waste Disposal Sites (a Class 2 site represents a significant threat to public health or the environment; action is required), consists of two OUs. OU-1 includes the Semet residue¹ and containment of shallow and intermediate groundwater at the Subsite, and OU-2 consists of material including the Semet residue and Solvay waste/soil/fill² that was not addressed by other actions. The other actions include the implementation of the OU-1 remedy that consists of Semet residue removal and beneficial reuse and the installation of groundwater collection and treatment systems, as documented in the ROD issued by NYSDEC and EPA for OU-1 in 2002 and an ESD in 2017, which documented changes to the remedy selected in the 2002 ROD. Groundwater collection and treatment systems mitigate contaminated groundwater discharge to Onondaga Lake and Tributary 5A, with the collected groundwater being treated at the Willis-Semet Groundwater Treatment Plant, as documented in the ROD issued by NYSDEC and EPA for OU-1 in 2002. The shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake is comingled with the shallow

INFORMATION REPOSITORIES

The administrative record file, which contains copies of the Proposed Plan and supporting documentation are available at the following locations:

*Onondaga County Public Library
Syracuse Branch at the Galleries
447 South Salina Street
Syracuse, NY 13204
315-435-1800*

*Solvay Public Library
615 Woods Road
Solvay, NY 13209
315-468-2441*

*Atlantic States Legal Foundation
658 West Onondaga Street
Syracuse, NY 13204
315-475-1170*

*New York State Department of Environmental Conservation
615 Erie Boulevard, West
Syracuse, NY 13204
315-426-7400*

*New York State Department of Environmental Conservation
Attn.: Tracy A. Smith
625 Broadway
Albany, NY 12233-7013
518-402-9676*

¹ Semet residue is a tarry, organic-based residue generated by the acid washing of coke light oil during the production of benzene, toluene, naphthalene, xylene, and "motor benzol" at the benzol, toluol, xylol (BTX) Plant formerly operated by Honeywell predecessor Allied Chemical Corporation (later AlliedSignal).

² The Subsite was used historically as a settling basin (Solvay Wastebed A) for Solvay waste, a waste product from the Solvay Process. Solvay waste consists largely of calcium carbonate, calcium silicate, and magnesium hydroxide and which in an unweathered state has an elevated pH. In addition to the Solvay waste, the area received coarse ash and cinder from stoker-fired boilers, and soil/miscellaneous fill material appears to have been used to cover portions of the wastebed. The term "Solvay waste/soil/fill material" throughout this document refers to Solvay waste, fill materials (e.g., coarse ash and cinder from stoker-fired boilers, and soil/miscellaneous fill material) that have been placed at the Subsite, and soil that is located above the Solvay waste.

and intermediate groundwater of the adjacent Willis Avenue subsite. Therefore, shallow and intermediate groundwater outboard of the hydraulic containment system will be addressed as part of the Willis Avenue subsite. The remedial options for deep groundwater at this and adjacent subsites (*i.e.*, Wastebeds 1-8, Wastebed B, and Willis Avenue) are being evaluated by the potentially responsible party, Honeywell International Inc., and will be addressed separately as part of a regional OU.

SUBSITE DESCRIPTION AND HISTORY

Location: The Subsite is located south of Onondaga Lake in Geddes, New York within an industrial setting (see Figure 1).

Subsite Features: The approximately 52-acre Subsite includes berms and fenced-in areas. The Subsite is bordered on the north and west by the Crucible Specialty Metals Corporation (Crucible) and by the Crucible Lake Pump site and the Syracuse Metropolitan West Side Pump Station to the north. It is bordered on the northeast by Onondaga Lake, on the west by Conrail Railroad tracks and an industrial complex and on the southeast by the Willis Avenue Subsite (New York State Inactive Hazardous Waste Site #734026). There are no buildings present on the Subsite.

The main site area includes the portion of the Subsite to the west of I-690 and State Fair Boulevard, while the Semet Lakeshore Area includes the portion of the Subsite to the east of I-690 and State Fair Boulevard. The Semet Lakeshore Area is situated to the northeast between the southern shore of Onondaga Lake and the west bound lane of I-690. The extent of the Semet Lakeshore Area on the northwest is defined by a gated entrance, and the southeastern extent is defined by the Willis Lakeshore Area. The Semet Lakeshore Area is bounded by an 8 foot (ft.) high chain link fence with a locked gate and Onondaga Lake. A portion of the Willis-Semet Hydraulic Containment System IRM³ was implemented in the Semet Lakeshore Area. The IRM consisted of the installation of the Semet barrier wall and associated groundwater collection system, construction of a low permeability cap over the groundwater collection system and restoration of the Semet Lakeshore Area. Plantings included trees, shrubs and native grasses. In addition, an access road was constructed through the area.

An approximately 13-acre area designated as the Brushy Cleared Area (BCA) is located on the northeast portion of the main site area. There are five man-made excavations located west of the BCA within Solvay waste, referred to as ponds, containing Semet residue that is being removed for beneficial reuse to the maximum extent practicable in accordance with the OU-1 ROD and ESD. A site plan can be found on Figure 2.

Subsite Geology and Hydrogeology: The local geology consists of seven distinct layers including soil and fill material (including Solvay Waste) overlying the marl/peat, clay and silt, fine-grained sand and silt, sand with gravel, till, and bedrock.

The Subsite has three distinct groundwater zones including:

- The shallow hydrogeologic unit consists of anthropogenic fill/waste material.
- The intermediate hydrogeologic unit consists of the marl and peat material, underlain by a confining layer which includes the clay and silt unit.
- The deep hydrogeologic unit is composed of the fine-grained sand and silt and the medium- to coarse-grained sand.

The depth to groundwater ranges from 5 to 15 ft. below ground surface (bgs). The elevation of the shallow zone ranges from a minimum elevation of approximately 350 ft. above mean sea level (amsl) along the lake shore to 405 ft. amsl at the center of the main site area. The maximum thickness of this unit is approximately 45 ft. with an average thickness around 25 ft. The marl unit ranges from 345 ft. amsl to 365 ft. amsl. The maximum thickness of the marl is approximately 15 ft. near State Fair Boulevard and the average thickness is around 10 ft. The marl pinches out on the southern side of the main site area and is not present below Tributary 5A. The deep zone ranges from 280 ft. amsl to 370 ft. amsl with the deep elevations being closer to Onondaga lake. This zone has a maximum thickness of approximately 50 ft. and an average thickness of approximately 25 ft. This layer pinches out moving away from the lake and appears to pinch out moving to the south towards Tributary 5A.

Shallow groundwater at the Subsite, which is influenced by Onondaga Lake and Tributary 5A, generally flows in a radial pattern. Intermediate groundwater is not influenced by Tributary 5A and generally flows toward Onondaga Lake. This groundwater flow is captured by the groundwater collection systems that have been installed.

³ The term "IRM" describes an activity that is necessary to address either emergency or non-emergency site conditions, which in the short-term, need 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 CFR Part 300.415(b)(2).

History of the Subsite: Before 1917, the area was a settling basin (wastebed) for Solvay waste and known as Solvay Wastebed A. From 1917 to 1970, Semet residue, generated by Honeywell's predecessor Allied Chemical Corporation (later AlliedSignal) and its former BTX plant, was deposited in five bermed excavations in Wastebed A. The Semet residue ponds are in the western half of Wastebed A (Figure 2). The ponds were constructed by dragline and bulldozer excavation of the Solvay waste. Non-engineered dikes encompassing the ponds were constructed from fill materials, including concrete rubble, old electrolytic cell parts, ashes, and bricks. A clay and gravel mixture was also observed in the berms during investigative work performed in 2002. There are also Semet material areas (SMAs) within the western half of Wastebed A that were material handling areas during former operations.

Remedial Actions and Interim Remedial Measures: Various IRMs and remedial actions have been implemented at the Subsite (see Figure 3). Contaminated sediment and soils from the Tributary 5A remedial action and Willis-Semet Berm Improvements IRM were excavated and staged on the main site area. Following consolidation, this soil pile was graded and seeded (see Staged Soil Piles section, below). These and other remedial actions and IRMs are discussed below:

- **Semet Residue Removal and Reuse:** As part of the OU-1 remedy, over 32,300 tons of Semet material was dewatered, as needed, and sent off-site to a Resource Conservation and Recovery Act (RCRA) permitted thermal processing facility for beneficial reuse. A temporary fiber-based or cement-based spray cover was used for odor and emission control.
- **Tributary 5A:** As part of the OU-1 remedy, to prevent migration of groundwater to Onondaga Lake and a drainage ditch that discharges to Onondaga Lake called Tributary 5A, as well as associated Subsite impacts to sediment and surface water, a shallow groundwater collection system was installed beneath Tributary 5A from 2010 to 2012. As part of this remedial action, sediment in Tributary 5A was removed and an isolation layer was installed. Groundwater collected by this system is treated at the Willis Groundwater Treatment Plant (GWTP). Operation, maintenance, and monitoring of the groundwater remedy is ongoing.
- **Willis-Semet Lakeshore Hydraulic Containment System IRM:** To prevent the migration of contaminated shallow and intermediate groundwater to Onondaga Lake, the Willis-Semet Hydraulic Containment System IRM was installed in 2006 and 2007. The Semet portion of this IRM consists of approximately 1,440 linear ft. of barrier wall and groundwater collection system along the Onondaga Lake shoreline and was part of the OU-1 remedy. Groundwater collected from this system is treated at the Willis GWTP. The Willis GWTP, installed in 2006 and upgraded three times since then, treats groundwater collected across Honeywell's subsites around Onondaga Lake. A low permeability cap was constructed over the groundwater collection trench to minimize infiltration of rainwater and surface water runoff into the trench. The cap material was placed in a 1 ft. lift followed by compaction. Restoration included the placement of topsoil over the low permeability cap and seeding. This work was completed in 2007. Additionally, restoration along the Semet Lakeshore Area consisted of the placement of topsoil over the existing riprap embankment and the establishment of a native plant community using upland and shoreline plantings and seeding. Plantings included trees, shrubs, and native grasses. Restoration along the Semet Lakeshore Area was performed in 2010. The Willis-Semet Hydraulic Containment System was identified as a component of the OU-1 remedy in the 2002 ROD.
- **I-690 Storm Drainage System IRM:** In addition to the above-mentioned OU-1 groundwater remedies, an additional groundwater IRM was implemented at the Subsite. Groundwater discharging from the Subsite observed to be infiltrating into storm water sewers along State Fair Boulevard was mitigated in 2012 by the I-690 Storm Drainage System IRM (and the groundwater collection trench along State Fair Boulevard). Groundwater collected by this system is treated at the Willis GWTP.
- **Willis-Semet Berm Improvements IRM:** In 2012, berm material from select impacted areas was excavated and replaced with clean fill/topsoil prior to application of 6-inches of topsoil. In total, between 12- and 24-inches of clean fill and topsoil that met Unrestricted SCOs was placed. Native species (e.g., grass, trees and shrubs) were introduced after the topsoil was applied.

Current Zoning and Land Use: The Subsite is currently zoned for industrial use and is bounded by commercial and industrial properties. The current and reasonably anticipated future land uses for the Subsite are industrial and commercial (including passive recreational⁴). The anticipated future use of the Semet Lakeshore Property (north of I-690) will include construction of paved roads and trails for passive recreational use as part of the Onondaga County West Shore Trail

⁴ Based on 6NYCRR Part 375 and NYSDEC's *Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation* (DER-10) passive recreation includes recreational uses with limited potential for soil contact (e.g., artificial surface fields; outdoor tennis or basketball courts; other paved recreational facilities used for roller hockey, roller skating, shuffleboard, etc.; outdoor pools; indoor sports or recreational facilities; golf courses; and paved bike or walking paths).

Extension and future access/use of the Southwest Lakeshore Area. It is reasonably anticipated that the portions of the property south of I-690 will continue to be used for either industrial or commercial purposes (e.g., parking for the State Fair).

RESULTS OF THE REMEDIAL INVESTIGATION

As presented in the *Semet Residue Ponds Site OU-2 Data Summary Document (DSD)*, the analytical results for Solvay waste/soil/fill material at the Subsite were compared to the respective industrial and commercial land use SCOs in consideration of anticipated future land use (see attached Tables 1 and 2). In addition, for purposes of developing an alternative to evaluate pre-disposal conditions, the analytical results were compared to unrestricted land use SCOs. Based on these considerations, the nature and extent of the contamination, discussed below, is presented in the context of these land uses.

In addition to environmental sample collection and analysis at the Subsite, the extent of contamination in the area west of the BCA was evaluated using a technology known as Tar-Specific Green Optical Screening Tool (TarGOST®). The TarGOST® responses and associated analytical soils data are summarized in the *2010 Operable Unit 1 Pre-Design Investigation*, and are included in the *DSD*.

Solvay Waste/Soil/Fill Material West of the BCA

The Semet residue ponds are located on the portion of the Subsite west of the BCA, and, as discussed above, the Semet residue is being removed for beneficial reuse to the maximum extent practicable. Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides and inorganics were detected in subsurface Solvay waste/soil/fill material in this area of the Subsite, and the analytical results were compared to the SCOs for Commercial, Industrial, and Unrestricted Uses. TarGOST® responses correlating to detected VOC concentrations were also observed in this area.

The analytical results comparison and TarGOST® responses are summarized as follows:

- **VOCs:** Benzene, toluene, ethylbenzene and xylene (BTEX) are the principal VOCs in the Solvay waste/soil/fill material with benzene generally having the highest VOC concentrations. VOC exceedances of Unrestricted Use SCOs were observed as deep as 40 ft. bgs, and VOC exceedances of Industrial Use SCOs and Commercial Use SCOs were noted as deep as 20 ft. bgs. Typically, benzene concentrations across the area west of the BCA exceeded Industrial Use and Commercial Use SCOs. Toluene and xylene frequently exceeded Commercial and Unrestricted Use SCOs with isolated Industrial Use SCO exceedances. Ethylbenzene concentrations were infrequently observed above Unrestricted Use SCOs.
- **SVOCs:** SVOCs are present at concentrations that are generally comparable to the VOC concentrations. SVOC exceedances of Unrestricted Use SCOs were observed as deep as 40 ft. bgs. SVOC exceedances of Industrial Use SCOs and Commercial Use SCOs were noted as deep as 20 ft. bgs. Detected SVOCs include: 1,1'-biphenyl, dibenzofuran, 2-methylnaphthalene, naphthalene, phenol, and various other polycyclic aromatic hydrocarbons (PAHs). Naphthalene is the predominant SVOC. Of the SVOCs observed, naphthalene, benzo(a)pyrene, and dibenzofuran (at one sample location) had concentrations exceeding the Commercial Use SCOs. Naphthalene and benzo(a)pyrene concentrations also exceeded Industrial Use SCOs.
- **Inorganic constituents:** Mercury was detected above Unrestricted Use SCOs across the Subsite. Concentrations of mercury exceeding Commercial Use and Industrial Use SCOs were also observed at a lower frequency across the site. Barium was observed at concentrations above Commercial Use SCOs at a single location.
- **Pesticides and PCBs:** The pesticide beta-BHC was detected at a concentration above its Industrial Use SCO in one sample. No PCBs were detected in Subsite Solvay waste/soil/fill material samples.
- **TarGOST® responses:** TarGOST® responses varied across the area west of the BCA. High responses, generally correlating with detected VOC concentrations, were observed as deep as 25 ft. over much of this area. Observations deeper than 35 ft. were limited to fewer locations.

Solvay Waste/Soil/Fill Material in the BCA

VOCs, SVOCs, pesticides and inorganics were detected in subsurface Solvay waste/soil/fill material in the BCA as described below. The analytical results were compared to the SCOs for Commercial, Industrial, and Unrestricted Uses.

The BCA generally has several inches to 2 ft. of soil/fill material overlying Solvay waste, located on the portion of the Subsite where the Semet residue ponds are not present. The BCA has a vegetative cover of buckthorn, cottonwood, and aspens.

Semet residue has not been observed in the BCA.

- **VOCs and SVOCs:** VOC and SVOC concentrations were below the SCOs.
- **Inorganic constituents:** Mercury concentrations exceeded Industrial Use and Unrestricted Use SCOs in soil at the BCA. The mercury exceedances were noted as deep as 3.5 ft.
- **Pesticides and PCBs:** Pesticides and PCBs were analyzed at one location. The concentration of beta-BHC was observed above the Industrial Use and Unrestricted Use SCOs at this location and PCBs were not detected.

Staged Soil Piles

Approximately 20,000 cubic yards of contaminated soil excavated during the Tributary 5A remedial action and Willis-Semet Berm Improvements IRM were consolidated into a pile located on the Subsite. Characterization sampling and analysis were performed to document that the materials did not exceed hazardous waste characteristics (e.g., Toxicity Characteristic Leaching Procedure testing). Data for these samples are included in the *Semet Residue Ponds Site OU-2 Data Summary Document (DSD)*.

- **VOCs:** VOC concentrations were below the SCOs.
- **SVOCs:** The PAHs benzo(a)anthracene and benzo(a)pyrene exceeded Industrial Use SCOs. The PAHs benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceeded Commercial Use SCOs. 1,2-dichlorobenzene and various other PAHs exceeded the Unrestricted Use SCOs.
- **Inorganic constituents:** Mercury concentrations exceeded Industrial Use, Commercial Use and Unrestricted Use SCOs.
- **Pesticides and PCBs:** Pesticides and PCBs were not analyzed.

Semet Related Materials

Stained Solvay wastes and Semet residue that cannot be reused (e.g., due to unacceptable sulfur or moisture content, insufficient heat content and/or unacceptable soil/debris content) as part of the OU-1 remedy have been observed in soil borings and test pits advanced during the investigations and other remedial work performed at the Subsite. These materials are present in the western portion of the main Subsite area where the Semet residue was present. Some of these materials may exhibit characteristics of principal threat waste. These areas are discussed in depth in the DSD and FS Reports. A detailed explanation of principal threat waste can be found in the textbox, "What is a Principal Threat?"

"What is a Principal Threat?"

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, surface water, or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material.

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Conclusions

Based on the DSD and other investigations, the following conclusions have been drawn:

- Contaminants of Concern (COCs) include BTEX, PAHs, phenolic compounds, and mercury.
- Stained Solvay waste and Semet residue-related materials are present in the western portion of main site area.

Waste Management Area

The NCP preamble language sets forth the EPA's policy that, for groundwater, "remediation levels generally should be attained throughout the contaminant plume, or at and beyond the edge of the waste management area (WMA) when waste

is left in place.” The NCP preamble also indicates that, in certain situations, it may be appropriate to address the contamination as one WMA for purposes of the groundwater point of compliance (POC). Therefore, groundwater POCs for meeting applicable or relevant and appropriate requirements (ARARs) are established at the WMA edge.

Due to the presence of historical fill materials (e.g., Solvay waste) deposited at the Subsite, it is not anticipated that groundwater standards would be achievable at the Subsite within a reasonable timeframe. Therefore, the area will be treated as part of a WMA (see Figure 4) with the groundwater POC being the WMA boundary (i.e., outside of the barrier wall). The material within the WMA includes Solvay waste comingled with hazardous substances that are contaminants of concern for the site. The management of the waste within the WMA includes meeting RCRA municipal landfill capping requirements. In many areas, existing covers and/or Solvay waste/soil/fill material is expected to meet the 1×10^{-5} centimeter per second (cm/sec) permeability rate required under the Subtitle D standards. Buildings/asphalt parking lots are expected to achieve and exceed the infiltration requirements. In areas where existing covers or Solvay waste/soil/fill material do not meet the standard, cover material will include materials needed to achieve the required infiltration rate requirements. The WMA boundary is conceptual and may be refined during remedial design.

Based on the results of a 2017 field investigation to assess degradation in groundwater, monitored natural attenuation (MNA) may be a viable option to address contaminated shallow/intermediate groundwater at and beyond the POC. The basis for MNA is supported by an evaluation of the shallow and intermediate groundwater using data collected in 2017, as part of an investigation of deep groundwater. Based on multiple lines of evidence, degradation of organic constituents is occurring in shallow and intermediate groundwater. Further evaluation of MNA would be conducted as part of the preliminary remedial design and/or O&M. Given the comingling of the shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake with that of the adjacent Willis Avenue subsite, shallow and intermediate groundwater at and beyond the POC (i.e., outside of the barrier wall) will be addressed as part of the Willis Avenue subsite.

SCOPE AND ROLE OF ACTION

In addition to this Subsite, eleven other subsites, Onondaga Lake Bottom; LCP Bridge Street; Geddes Brook/Ninemile Creek; Wastebed B/Harbor Brook; Willis Avenue; Wastebeds 1-8; General Motors (GM)-Inland Fisher Guide (IFG); Salina Landfill; Ley Creek PCB Dredgings; Lower Ley Creek; and Niagara-Mohawk Hiawatha Boulevard, are being addressed as part of the Onondaga Lake NPL site.

Dredging and capping activities for the Onondaga Lake Bottom subsite commenced in 2012. Dredging and capping activities in the lake were completed in 2014 and 2016, respectively. Habitat restoration activities associated with the remedy were completed in 2017. The dredged material is being managed at a sediment consolidation area (SCA) constructed on a former Solvay wastebed, Wastebed 13. Construction activities at the SCA, which included the placement of an engineered cap, were completed in 2017. The subsite is undergoing long-term maintenance and monitoring.

Remedies have been fully implemented at the LCP Bridge Street, Geddes Brook/Ninemile Creek, Salina Landfill and Ley Creek PCB Dredgings subsites. These subsites are undergoing long-term maintenance and monitoring. Remedial activities for portions of, or environmental media at, the Wastebed B/Harbor Brook, Wastebeds 1-8, GM-IFG and Niagara-Mohawk Subsides have been completed or are in progress. Other portions of, or media at, these subsites are in the remedial design or RI/FS phase. The Lower Ley Creek Subsite is in the remedial design phase. An RI/FS for the Willis Avenue subsite is near completion. A remedy for the Wastebed B/Harbor Brook Subsite was selected on September 28, 2018.

The scope of the action for this Subsite is to address the Solvay waste/soil/fill material and remaining Semet residue not addressed in OU1. NYSDEC and EPA expect this remedy to be a final, comprehensive remedy for these materials. Given the comingling of the shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake with that of the adjacent Willis Avenue subsite, the shallow/intermediate groundwater outboard of the hydraulic containment system will be addressed as part of the Willis Avenue subsite. Deep groundwater will be evaluated and addressed separately as part of a regional OU.

Summary of Quantitative Site Risk Assessments

As part of the RI process, quantitative risk assessments were conducted for the Subsite to estimate the potential risks to human health and the environment (see the “What is Risk and How is it Calculated?” and “What is Ecological Risk and How is it Calculated?” textboxes below). Baseline risk assessments, consisting of a human health risk assessment (HHRA), which evaluates potential risks to people, and an ecological risk assessment, which evaluates potential risks to ecological receptors, analyze the potential for adverse effects caused by hazardous substance releases from a site assuming no further actions to control or mitigate exposure to these hazardous substances are taken.

Human Health Risk Assessment

The Subsite is zoned commercial/industrial, and exposure scenarios were developed based on this current and likely future land use. The baseline HHRA considered exposure to many different media through a number of current and future exposure scenarios for different potential receptors including adolescent and adult trespassers, utility worker, State Fair Boulevard transients, surveillance worker, industrial worker, construction worker, sewer worker, and child and adult residents.

Exposure scenarios were developed for these populations, and considered exposure through incidental ingestion and inhalation of and dermal contact with surface/subsurface Solvay waste/soil/fill material, and sediment, and ingestion of groundwater as a hypothetical drinking water source in the future. Human health risks associated with ingestion of groundwater are based on groundwater data from the Willis Avenue subsite. Human health risks associated with exposure to Semet Residue Ponds Subsite groundwater can be considered similar to that for the Willis Avenue subsite since the groundwater plumes comingle at the two subsites. A summary of the cancer risks and noncancer hazards above threshold levels for each population in each of the areas of the Subsite, along with the chemicals that contribute the most to the risk or hazard, or COCs, can be found in Tables 3a and 3b.

The HHRA considered various current and future exposure scenarios for different potential receptors including future industrial workers that work both indoors and outdoors during their work day, and future construction workers. Exposure for future indoor/outdoor industrial workers was evaluated through incidental ingestion of, and dermal contact with, surface

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the Contaminants of Potential Concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a “reasonable maximum exposure” (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals can cause both cancer risks and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one-in-ten-thousand excess cancer risk”; or one additional cancer may be seen in a population of 10,000 people because of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6} , corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk. For non-cancer health effects, a “hazard index” (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as COCs in the ROD.

Solvay waste/soil/fill material (0-2 ft. bgs) and inhalation of ambient vapors and fugitive dust. Potential exposures were assumed to occur for the construction workers through incidental ingestion of surface/subsurface Solvay waste/soil/fill material (0-10 ft. bgs) through incidental ingestion, dermal contact, and inhalation of ambient vapors and fugitive dust.

The hazards and risks posed to indoor/outdoor industrial workers and construction workers from exposure to COPCs via incidental ingestion, dermal contact, and ambient air inhalation are as follows:

Indoor/Outdoor Industrial Worker – The calculated total excess lifetime cancer risk for all COPCs and exposure routes for the indoor/outdoor industrial worker is 2×10^{-3} , which is above the acceptable regulatory range of 1×10^{-4} to 1×10^{-6} . Unacceptable carcinogenic risks are primarily driven by inhalation of benzene and naphthalene in surface Solvay waste/soil/fill materials. The calculated hazard index (HI) for all COPCs and exposure routes is 30, which exceeds the regulatory threshold of 1. The unacceptable hazard is driven by exposure via inhalation of naphthalene and benzene originating from surface Solvay waste/soil/fill materials.

Construction Worker – The calculated total excess lifetime cancer risk for all COPCs and exposure routes for the construction worker is within the acceptable regulatory range of 1×10^{-4} to 1×10^{-6} . The calculated HI for all COPCs and exposure routes is above the regulatory threshold of 1. Unacceptable hazard is driven by incidental ingestion of benzene in surface/subsurface Solvay waste/soil/fill materials and by inhalation of benzene, naphthalene, and 1,2,4-trimethylbenzene in surface/subsurface Solvay waste/soil/fill material.

Based on the HIs computed for the indoor/outdoor industrial worker and construction worker and the lifetime excess cancer risk computed for the indoor/outdoor worker, control of exposures to surface/subsurface Solvay waste/soil/fill material is warranted to provide adequate protection for future human users of the Subsite.

Groundwater at the Subsite is not used as a drinking or industrial water supply and is highly unlikely to be used as a drinking or industrial supply in the future, since the area is supplied by municipal water from the Onondaga County Water Authority. Furthermore, the groundwater at the Subsite is not suitable as a drinking water supply irrespective of any contributions related to waste at the Subsite because the yield of the overburden groundwater unit is inadequate for water supply wells, and the high natural salinity of the bedrock aquifer (approximately 3,000 mg/L chlorides) precludes its use as drinking water. In addition, since there are no buildings on the property, the indoor air pathway was not evaluated in risk assessments for the Subsite.

The HHRA included a recommendation that, based on the vapor intrusion screening presented in the HHRA and the vapor pressure of many of the compounds detected, a vapor intrusion evaluation should be conducted if buildings that will be occupied are constructed at the Subsite. Based on the vapor intrusion evaluation, measures may be included in the design and construction of buildings at the Subsite to mitigate the potential for exposure to constituents that may be present in soil vapor. Such measures may include an active sub-slab depressurization system, use of a vapor barrier or the installation of a venting system.

A full discussion of the HHRA evaluation and conclusions is presented in the HHRA Report.

Ecological Risk Assessment

Surface Solvay waste/soil/fill material data were screened against values protective of terrestrial plants, invertebrates, birds, and mammals. Inorganics, one pesticide, SVOCs, and VOCs were retained due to exceedances of screening values, their potential to bioaccumulate, or the absence of screening values.

Ecological hazard quotients (HQs) were calculated for six wildlife species (American robin, northern short-tailed shrew, mourning dove, eastern cottontail rabbit, red-tailed hawk, red fox) representing distinct trophic level receptors that may be exposed to Contaminants of Ecological Concern (COECs) in Subsite surface Solvay waste/soil/fill material. Based on food chain modeling using average and upper-bound surface soil concentrations of COECs coupled with exposure assumptions under both conservative and refined scenarios, potentially unacceptable risks to ecological receptors were identified at the Subsite. Under both the refined and the conservative modeling scenarios, risks were lower for the red-tailed hawk and red fox (wide-ranging wildlife receptors) relative to the American robin and short-tailed shrew. Because of its small size, high ingestion rate, and small home range, the highest HQs were calculated for the short-tailed shrew. Elevated risks under both conservative and refined exposure scenarios were attributable mainly to metals and SVOCs, which were detected more frequently and had a greater frequency of HQs exceeding the threshold of 1, relative to pesticides and VOCs. There is some uncertainty associated with the risks attributable to select COECs (*i.e.*, some VOCs) in Subsite surface Solvay waste/soil/fill material given the absence of comparative toxicity values for these chemicals.

Based on the exceedances of surface Solvay waste/soil/fill material COEC concentrations to ecologically-based screening

benchmarks and calculated food chain HQs exceeding 1 for the terrestrial avian and mammal wildlife receptors, control of exposures to surface Solvay waste/soil/fill material is warranted to provide adequate protection for current and future wildlife use of the Subsite. It should be noted that while an ecological risk assessment was performed for the Subsite, the reasonably anticipated future use for the Subsite will be industrial or commercial use, which is not suitable habitat for ecological receptors.

A full discussion of the ecological risk evaluation and conclusions is presented in the Ecological Risk Assessment Report.

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?

A Superfund baseline ecological risk assessment is an analysis of the potential adverse health effects to biota caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land and resource uses. The process used for assessing site-related ecological risks includes:

Problem Formulation: In this step, the contaminants of potential ecological concern at the site are identified. Assessment endpoints are defined to determine what ecological entities are important to protect. Then, the specific attributes of the entities that are potentially at risk and important to protect are determined. This provides a basis for measurement in the risk assessment. Once assessment endpoints are chosen, a conceptual model is developed to provide a visual representation of hypothesized relationships between ecological entities (receptors) and the stressors to which they may be exposed.

Exposure Assessment: In this step, a quantitative evaluation is made of what plants and animals are exposed to and to what degree they are exposed. This estimation of exposure point concentrations includes various parameters to determine the levels of exposure to a chemical contaminant by a selected plant or animal (receptor), such as area use (how much of the site an animal typically uses during normal activities); food ingestion rate (how much food is consumed by an animal over a period of time); bioaccumulation rates (the process by which chemicals are taken up by a plant or animal either directly from exposure to contaminated soil, sediment or water, or by eating contaminated food); bioavailability (how easily a plant or animal can take up a contaminant from the environment); and life stage (e.g., juvenile, adult).

Ecological Effects Assessment: In this step, literature reviews, field studies or toxicity tests are conducted to describe the relationship between chemical contaminant concentrations and their effects on ecological receptors, on a media-, receptor- and chemical-specific basis. To provide upper and lower bound estimates of risk, toxicological benchmarks are identified to describe the level of contamination below which adverse effects are unlikely to occur and the level of contamination at which adverse effects are more likely to occur.

Risk Characterization: In this step, the results of the previous steps are used to estimate the risk posed to ecological receptors. Individual risk estimates for a given receptor for each chemical are calculated as a hazard quotient (HQ), which is the ratio of contaminant concentration to a given toxicological benchmark. In general, an HQ above 1 indicates the potential for unacceptable risk. The risk is described, including the overall degree of confidence in the risk estimates, summarizing uncertainties, citing evidence supporting the risk estimates and interpreting the adversity of ecological effects.

Summary of Human Health and Ecological Risks

The results of the HHRA indicate that the contaminated Solvay waste/soil/fill material presents current and/or potential future unacceptable exposure risk and the ecological risk assessment indicates that the contaminated soils pose an unacceptable exposure risk. While some of the risks associated with contaminated Solvay waste/soil/fill material have been mitigated in part by the OU-1 remedial actions and IRMs that have been implemented, the calculated risks are unacceptable. Although the indoor air pathway was not evaluated, measures may be included in the design and construction of buildings at the Subsite to mitigate the potential for exposure to constituents that may be present in soil vapor. Such measures may include an active sub-slab depressurization system, use of a vapor barrier or the installation of a venting system.

Based upon the results of the RI and the risk assessments, EPA and NYSDEC have determined that actual or threatened releases of hazardous substances from the Subsite, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as potential ARARs, to-be-considered guidance, and site-specific risk-based levels established using the risk assessments. The following RAOs have been established for the Subsite:

- Prevent, or reduce to the extent practicable, ingestion/direct contact with contaminated Solvay waste/soil/fill material to be protective under the current and reasonably anticipated future land uses.
- Prevent, or reduce to the extent practicable, inhalation of or exposure to contaminants volatilizing from contaminated Solvay waste/soil/fill material and groundwater, and unacceptable inhalation threat associated with soil vapor.
- Restore groundwater outside of the WMA to levels that meet state and federal standards within a reasonable time frame.
- Prevent, or reduce to the extent practicable, the release of Subsite-related contaminants to groundwater, surface water and sediment that may cause unacceptable adverse effects on shallow and intermediate groundwater, surface water or sediment quality in Tributary 5A and Onondaga Lake.

NYSDEC's SCOs have been identified as remediation goals for soil to attain these RAOs. SCOs are risk-based criteria that have been developed by the State following methods consistent with EPA's methods/protocols/guidance and they are set at levels consistent with EPA's acceptable levels of risk that are protective of human health, ecological exposure, or the groundwater depending upon the existing and anticipated future use of the Subsite. While the land use of the Subsite has historically been industrial, current and anticipated future uses of some areas could include commercial use or recreational use.

Given the comingling of the shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake with that of the adjacent Willis Avenue subsite, shallow and intermediate groundwater at and beyond the POC will be addressed as part of the Willis Avenue subsite. As described for the Willis Avenue subsite, groundwater remedial goals are the New York State Ambient Water Quality Standards. Remedial actions and IRMs to address surface water and sediment have eliminated exposure to these media and maintenance of the remedial actions and IRMs are expected to achieve the RAO.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4).

Based on anticipated future development of the Subsite, expectations of the reasonably anticipated land use, as described above, were considered in the FS to facilitate the development and evaluation of remedial alternatives. The reasonably anticipated land use includes passive recreational use for the Semet Lakeshore Area, and industrial/commercial use for the main site area south of I-690.

All the alternatives other than Alternative 1 - No Further Action include the continuation of the O&M for the IRMs that have been implemented at the Subsite. Maintenance for the IRMs would include monitoring to document that success criteria are met and to identify the need for corrective action(s), as warranted. Corrective actions for covers may consist of cover repair in areas of disturbance or re-application of vegetation in areas of non-survivorship.⁵

The remedial alternatives are as follows:

Alternative 1 - No Further Action

A "no action" alternative is required to be considered by the NCP and NYSDEC's *Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation* (DER-10) Section 4.4(b)3 and serves as a benchmark for the evaluation of action alternatives. This alternative provides for an assessment of the environmental conditions if no further remedial actions are implemented.

⁵ The annual O&M cost estimates associated with monitoring and maintenance of the other IRM elements cited here are included in the cost estimates for each of the action alternatives.

Because this alternative would result in contaminants remaining above levels that allow for unlimited use and unrestricted exposure, CERCLA requires that the Subsite be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain the contaminated media.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	\$0
Annual O&M Cost:	\$0
Present-Worth Cost:	\$0

Alternative 2 – Cover System

Alternative 2 includes the placement of a cover system based on potential chemical-specific ARARs and reasonably-anticipated future land uses at the Subsite for commercial use. This alternative also includes the continuation of O&M for the IRMs that have been implemented at the Subsite, site grading, institutional controls, development of an SMP, and periodic reviews.

As necessary, grading would be conducted to support commercial and/or industrial development and would consist of backfilling of the emptied Semet residue ponds. The staged soil pile located on the BCA would be reused as backfill during grading. Following grading, a minimum 1-ft. thick soil/granular cover (or maintained paved surfaces and buildings) would be placed to minimize erosion and mitigate potentially unacceptable exposure of human receptors to constituents exceeding Commercial Use SCOs in surface Solvay waste/soil/fill material. The need for a demarcation layer between the soil cover and the underlying substrate would be evaluated during the design. Sampling would be performed to identify the appropriate cover thickness and limits. Design of the cover would take into consideration development plans that are available for the Subsite at that time. Further evaluation of Semet residue seep areas and Semet Lakeshore Area existing cover thickness would be performed during the design. Any fill material brought to the Subsite would need to meet the requirements for the identified Subsite use as set forth in 6 NYCRR Part 375-6.7(d). Native species would be used for the vegetative component of the covers, as appropriate. Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes for the vegetated cover either at implementation of the remedy or at a future time.

A portion of the main site area is anticipated to be used for overflow parking for the New York State Fairgrounds, and an extension of the "Onondaga Loop the Lake" trail will cross a portion of the Semet Lakeshore Area. Because Subsite development plans for the remaining portions of the Subsite have not been determined, the boundaries of the covers are conceptual and presented for cost-estimation purposes. The extent, thickness, and permeability of the covers would be revisited during the design and/or during site management if site uses change, as necessary. The conceptual extent of the cover system is depicted on Figure 5.

As summarized in Section 2.2 of the FS Report, the vertical hydraulic conductivity of the Solvay waste/soil/fill material present at the Subsite is generally less than 1×10^{-5} cm/sec (and the geometric mean of the vertical hydraulic conductivity is less than 1×10^{-5} cm/sec). The proposed cover materials in combination with the underlying Solvay waste/soil/fill material and continued O&M of the groundwater collection and treatment systems for site groundwater would meet the requirements for containment under RCRA Subtitle D, which would be an ARAR for this action.

Prior to pond backfilling activities, an assessment for the need to address the remaining Semet residue⁶ that could contribute to potential seepage during or following construction activities would be performed. The effectiveness and implementability of passive recovery wells to minimize or monitor the potential for future Semet residue seeps from ponds, would be evaluated as part of a pre-design investigation. Should passive recovery of Semet residue be deemed necessary, effective and implementable, it would be included in the remedial design. Recovered Semet residue would be transported for disposal off-site.

Institutional controls in the form of environmental easements and/or restrictive covenants would be used to limit land use to commercial (including passive recreational) or industrial, as appropriate, prevent the use of groundwater without approved treatment and require that any intrusive activities in areas where contamination remains would be conducted in accordance with a NYSDEC-approved SMP, which would include the following:

⁶ There is Semet residue remaining that is unsuitable for off-site thermal processing for beneficial reuse.

- Institutional and Engineering Control Plan that identifies use restrictions and engineering controls (if applicable) for the Subsite and documents the steps and media-specific requirements necessary to ensure the following institutional and engineering controls remain in place and effective:
 - environmental easements and/or restrictive covenants described above
 - Subsite cover systems described above
 - excavation plan which details the provisions for management of future excavations in areas of remaining contamination
 - descriptions of the provisions of the institutional controls including any land use or groundwater use restrictions
 - provision that future on-site buildings should be evaluated for the potential for vapor intrusion and may include vapor intrusion sampling and/or installation of mitigation measures, if necessary
 - provisions for the management and inspection of the identified engineering controls
 - maintaining Subsite access controls and NYSDEC notification
 - steps necessary for periodic reviews and certification of the institutional and/or engineering controls.
- Monitoring Plan to assess the performance and effectiveness of the remedy. The final monitoring program would be established during the design.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time for this alternative is one year. The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	\$10,900,000
Annual O&M Cost:	\$42,500
Present-Worth Cost:	\$11,500,000

Alternative 3 – Enhanced Engineered Cover System

Alternative 3 includes each of the elements of Alternative 2. In addition, the alternative includes the placement of an enhanced engineered cover system in the former Semet residue pond areas west of the BCA in lieu of the cover system described under Alternative 2.

The enhanced cover system over the area west of the BCA would be a minimum of 18-inch thick soil/granular cover (or maintained paved surfaces) incorporating a geomembrane cap for the purposes of mitigating potentially unacceptable exposure risks and surface erosion in support of the reasonably-anticipated future use of the Subsite and its surroundings. This geomembrane cap would also address the potential mobility of the remaining Semet residue. The minimum 18-inches of soil/granular cover would be needed for protection of the geomembrane cap (e.g., from puncture, etc.). The cover system would also include an engineered component to enhance structural stability, ranging from geofabric to geogrid depending on the needs of the final cover system uses.

In areas where a geomembrane cap would not be installed a minimum one-foot cover would be placed. In these areas the need for a demarcation layer between the soil cover and the underlying substrate would be evaluated during the design and sampling would be performed to identify the appropriate cover thickness and limits. The extent, thickness, and permeability of the covers would be revisited during the design phase and/or during site management if Subsite uses change, as necessary. The conceptual extent of the cover system is depicted on Figure 6.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is two years. The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	\$22,600,000
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Annual O&M Costs:	\$42,500
Present-Worth Cost:	\$23,200,000

Alternative 4 – *In-Situ* Treatment of Targeted Material and Enhanced Engineered Cover System

Alternative 4 includes each element of Alternative 3 (with the exception of potential passive recovery of Semet residue) and the addition of *in-situ* treatment of targeted materials. Following the completion of the implementation of the OU-1 Semet residue remedy, (*i.e.*, removal of Semet residue to the maximum extent practicable for beneficial reuse in accordance with the 2002 ROD and 2017 ESD), there will be Semet residue remaining that is unsuitable for off-site thermal processing for beneficial reuse. Semet residue unsuitable for off-site thermal processing under the OU-1 remedy either exhibits unacceptable sulfur or moisture content, insufficient heat content and/or exhibits unacceptable soil/debris content, as documented in demonstration reports. The remaining Semet residue that cannot be beneficially reused and may contain a free aqueous phase would be considered targeted material and would be treated *in-situ* by solidification/stabilization. Specifically, the treatment would consist of the addition of amendments (*e.g.*, Portland cement, cement kiln dust, lime kiln dust, blast furnace slag) to alter the physical characteristics to a granular material. The estimated volume of targeted material is approximately 7,000 cubic yards. The approximate area of *in-situ* targeted treatment is illustrated on Figure 7.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time of this alternative is two years. The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	\$24,000,000
Annual O&M Costs:	\$42,500
Present-Worth Cost:	\$24,600,000

Alternative 5 – Removal

Alternative 5 includes mechanical excavation of Solvay waste/soil/fill material exhibiting concentrations above Unrestricted Use SCOs⁷. Excavated Solvay waste/soil/fill material would be transported off-site for management and/or disposal.

This alternative is intended to evaluate restoration to pre-disposal conditions through full removal and replacement of Solvay waste/soil/fill material at the Subsite exhibiting concentrations above Unrestricted Use SCOs. Based on existing data, removal to depths of 5 ft. in the BCA and up to 25 ft. west of the BCA are assumed. Removal depths of up to 20 ft. in the Semet Lakeshore Area and I-690/State Fair Boulevard were assumed. Removal depths would be confirmed based upon either pre-construction or post excavation sampling. For cost estimation purposes, it was assumed that Solvay waste/soil/fill material would be removed from the existing grade to the top of marl (a native material); approximately a 5 ft. thickness would be removed from the BCA area, and generally between 10 and 25 ft. thickness would be removed from the area west of the BCA, and between 10 and 20 ft. for the Semet Lakeshore and beneath I-690/State Fair Boulevard. Based on these approximate depths, the total volume of Solvay waste/soil/fill material to be excavated in Alternative 5 is estimated at approximately 1.42 million cubic yards *in situ* (*i.e.*, volume in place), with an additional 20,000 cubic yards to be removed from the material piled on the BCA. Sloping techniques, benching, and/or engineering structures (*e.g.*, sheet piling) would be necessary during excavation to maintain stability of excavation walls. Excavation activities are also anticipated to impact adjacent Tributary 5A remedial action. Excavated material would be managed off-site in accordance with applicable waste management regulations.

Clean backfill would be transported via trucks from off-site borrow sources to the Subsite for restoration. Given the elevated grade of the BCA and area west of the BCA, backfill would be placed to match surrounding grade features, such as State Fair Boulevard, the railway elevation, and to restore the Tributary 5A bank. For cost estimation purposes, it is assumed that backfill thicknesses would range between 2 and 20 ft., resulting in approximately 1.29 million cubic yards to restore excavated areas to elevations approximately ranging from 368 to 376 ft. amsl. Excavated areas would be restored and vegetated consistent with plans developed based on future site use.

⁷ A partial removal alternative was not evaluated since, in addition to similar short-term impacts as Alternative 5, groundwater collection and treatment and, potentially, cover systems would still be necessary, negating much of the benefit from the partial removal of contamination.

The conceptual extent of excavation for this alternative is depicted on Figure 8.

The estimated construction time of this alternative is six to nine years. The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	\$977,000,000
Annual O&M Costs:	\$28,000
Present-Worth Cost:	\$977,000,000

COMPARATIVE ANALYSIS OF ALTERNATIVES

The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria (see textbox below) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

A comparative analysis of these alternatives based upon the evaluation criteria noted below follows.

NINE EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative would meet all the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to the site, or provide grounds for invoking a waiver.
Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies an alternative may employ.
Short-term effectiveness considers the period needed to implement an alternative and the risks the alternative may pose to workers, residents, and the environment during implementation.
Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
Cost includes estimated capital and annual O&M costs, as well as present-worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State acceptance indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the State supports, opposes, and/or has identified any reservations with the selected response measure.
Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Comments received on the Proposed Plan are an important indicator of community acceptance.

Overall Protection of Human Health and the Environment

Alternative 1 would not provide protection of human health and the environment. Alternatives 2 through 5 would be protective of human health and the environment through cover systems, removal, *in-situ* treatment, and/or site management.

Alternative 1 would not meet the RAOs. Alternatives 2 through 5 would address RAOs and would be consistent with current, intended, and reasonably anticipated future use of the Subsite upon implementation of the remedies. Alternatives 3 and 4, through the enhanced cover, provide greater protectiveness than Alternative 2. Alternatives 2, 3, and 4 provide adequate and reliable protection of human health and the environment without the risks to workers/community/environment and environmental footprint associated with Alternative 5. These added impacts are further described below under the effectiveness and implementability criteria.

Compliance with ARARS

Chemical-, location-, and action-specific ARARs were identified in the FS. Consistent with the NCP preamble that indicates that for groundwater "remediation levels generally should be attained throughout the contaminant plume, or at and beyond the edge of the waste management area when waste is left in place," attainment of chemical-specific groundwater ARARs is at the edge of a WMA. Thus, the POC (e.g., outside the barrier wall) for this Subsite is at the WMA edge and would be

addressed in conjunction with the Willis Avenue subsite remedy. The Subsite is part of a WMA because the waste is a solid waste containing site-related contaminants and would meet the requirements for containment under RCRA Subtitle D, which would be an action-specific ARAR under Alternatives 2 through 4. As summarized in Section 2.2 of the FS Report, the vertical hydraulic conductivity of the Solvay waste/soil/fill material present at the Subsite is generally less than 1×10^{-5} cm/sec (and the geometric mean of the vertical hydraulic conductivity is less than 1×10^{-5} cm/sec). The proposed cover materials in combination with the underlying Solvay waste/soil/fill material and continued O&M of the groundwater collection and treatment systems for the Subsite groundwater would meet the requirements for containment under RCRA Subtitle D.

Alternative 1 does not actively address chemical-specific ARARs relative to potential erosion of, or exposure to, Solvay waste/soil/fill material. For Alternatives 2 through 4, chemical-specific ARARs are addressed by limiting potential for exposures to Solvay waste/soil/fill material exceeding chemical-specific ARARs using cover systems, an SMP, and institutional controls. Alternative 5 addresses chemical-specific ARARs through removal of Solvay waste/soil/fill material.

No action- or location-specific ARARs were identified for Alternative 1. Construction methods and safety procedures would be implemented to adhere to the location- and action-specific ARARs identified for Alternatives 2 through 5. Specifically, institutional controls would be implemented in Alternatives 2 through 5 in conformance with NYSDEC's guidance DER-33⁸ and EPA guidance.⁹ The cover systems would be implemented in conformance with NYSDEC's guidance DER-10.¹⁰ Procedures would be implemented to adhere to the location-specific ARARs related to federal and state requirements for cultural, archeological, and historical resources. With respect to action-specific ARARs, the proposed cover systems and excavation activities would be conducted consistent with applicable standards; earth moving/excavation activities would be conducted consistent with air quality standards; transportation and disposal activities would be conducted in accordance with applicable state and federal requirements (including land disposal restrictions), by licensed and permitted haulers.

Long-Term Effectiveness and Permanence

Alternative 1 would involve no active remedial measures and, therefore, would not be effective in eliminating potential exposure to contaminants. Thus, with respect to the magnitude of residual risk, potentially unacceptable human health risks associated with Solvay waste/soil/fill material exceeding SCOs would remain under Alternative 1. For Alternatives 2 and 3, the passive recovery of Semet residue, if any, would provide added control of potential risks associated with potential for Semet residue seeps. The low permeability cover systems under Alternatives 3 and 4 would more effectively address the potential migration of contaminants than the soil cover under Alternative 2. Potentially unacceptable human health risk attributed to Solvay waste/soil/fill material exceeding ARARs would be addressed in Alternatives 2 through 4 through cover systems, institutional controls, an SMP, and periodic reviews. The removal of Solvay waste/soil/fill material in Alternative 5 does not result in added long-term effectiveness relative to addressing potential human health risks.

Reduction in Toxicity, Mobility, or Volume Through Treatment

There would be no reduction in toxicity, mobility, or volume in Solvay waste/soil/fill material through treatment provided in Alternative 1. Alternatives 2 and 3 would result in a reduction in mobility (*i.e.*, erosion) of Subsite-related contaminants in Solvay waste/soil/fill material through the placement of cover systems. Alternative 4 would provide for reduction in toxicity and mobility through an enhanced engineered cover system and *in situ* treatment of targeted materials. Alternative 5 would provide for reduction in mobility through removal. While Alternatives 2 through 3 and 5 would provide reduction in mobility of contaminants through containment or removal, the reduction would not be through treatment.

Short-Term Effectiveness

Alternative 1 does not include physical measures in areas of contamination and, therefore, would not present potential adverse impacts to remediation workers or the community due to implementation. Because of the increased quantity of materials that would be managed associated with Alternatives 2 through 5, there would be increased potential impacts to workers and the community. The risks to remediation workers and nearby residents under these alternatives would be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Impacts to the community resulting from the construction under Alternatives 2, 3 and 4 would primarily be due to increased truck traffic and increased noise for the duration of the construction. Alternative 5 would result in significant truck traffic and related noise. Alternative 5 would require the off-site transport of approximately 70 truckloads per day (for six to nine years), of contaminated material which would potentially adversely affect local traffic and may pose the potential for traffic

⁸ See https://www.dec.ny.gov/docs/remediation_hudson_pdf/der33.pdf

⁹ See <https://www.epa.gov/superfund/superfund-institutional-controls-guidance-and-policy>

¹⁰ See <https://www.dec.ny.gov/regulations/67386.html>

accidents, which in turn could result in releases of hazardous substances. In addition to the potentially significant adverse effects on local air quality and community traffic patterns, traffic of this magnitude would be anticipated to result in significant adverse effects on the conditions of roadways.

Because no actions would be performed under Alternative 1, there would be no implementation time. It is anticipated that Alternative 2 would require one construction season to implement. It is estimated that Alternatives 3 and 4 would require two construction seasons. Alternative 5 is anticipated to take six to nine construction seasons to implement.

Implementability

Alternative 1 would be the easiest alternative to implement, as there are no activities to undertake. Alternatives 2 through 4 can be readily constructed and operated; the materials necessary for the construction of these alternatives are reasonably available. The necessary equipment and specialists would be available for these alternatives. Monitoring the effectiveness of Alternatives 2 through 4 would be accomplished through cover system inspections and maintenance to verify continued cover integrity, visual signs of erosion, and condition of the cover. Alternatives 2 through 5 would require coordination with other agencies, including NYSDEC, the New York State Department of Transportation, NYSDOH, and EPA.

The excavation and off-site management of an estimated 1,420,000 cubic yards of Solvay waste/soil/fill material associated with Alternative 5 would be substantially more difficult to implement than the cover placement contemplated in Alternatives 2 and 3, or cover and *in-situ* targeted treatment in Alternative 4. Specifically, there would be significant implementability limitations associated with excavation, transportation, and obtaining appropriate disposal capacity for this large volume of material.

In addition, Alternative 5 would include challenging construction water management and slope stability concerns. Construction water management would be significant during excavation because large volumes would require management due to the presence of excavations proximate to Tributary 5A. Construction water treatment capacity would not be available at the Willis GWTP; therefore, another treatment system would need to be constructed. Due to the presence of active railroads, excavation proximate to them would be limited. Excavations along the Lakeshore proximate to the groundwater collection system would further limit implementability of Alternative 5, relative to potential for damage or need to replace the barrier wall and collection system. Based on a daily production rate of 1,000 cubic yards per day for 10 months of the year, it is estimated that up to approximately 240,000 cubic yards of material would be shipped off-site each year in 16,800 truckloads (70 truckloads per day) with an approximately equivalent number of trips being required for restoration. During a 10-hour work day, this would equate to approximately 1 truck entering or leaving the Subsite every 4 minutes for a period of six to nine years. In addition to the potentially significant adverse effects on local air quality and community traffic patterns, traffic of this magnitude would result in significant adverse effects on the conditions of roadways.

Cost

The estimated present-worth costs were calculated using a discount rate of seven percent and a thirty-year time interval for post-construction monitoring and maintenance period. (Although O&M would continue as needed beyond the thirty-year period, thirty years is the typical period used when estimating costs for a comparative analysis.)

The estimated capital, annual O&M, and present-worth costs using a 7% discount factor for each of the alternatives are presented in the table below.

Alternatives	Capital	Annual O&M	Total Present Worth
1 – No Further Action	\$0	\$0	\$0
2 – Cover System	\$10.9 million	\$42,500	\$11.5 million
3 – Enhanced Engineered Cover System	\$22.6 million	\$42,500	\$23.2 million
4 – In Situ Treatment of Targeted Material and Enhanced Engineered Cover System	\$24 million	\$42,500	\$24.6 million
5 – Removal	\$977 million	\$28,000	\$977 million

Support Agency Acceptance

NYSDOH has reviewed this Proposed Plan and concurs with the preferred remedy.

Community Acceptance

Community acceptance of the preferred remedy will be addressed in the ROD following review of the public comments received on the Proposed Plan.

PREFERRED REMEDY

Based upon an evaluation of the various alternatives, NYSDEC and EPA recommend Alternative 4 – *In-Situ* Treatment of Targeted Material and Enhanced Engineered Cover System as the preferred remedy. The preferred remedy would include implementation of *in-situ* treatment of targeted material and an enhanced engineered cover system based on potential chemical-specific ARARs and reasonably anticipated future land uses at the Subsite for industrial or commercial use. In addition, this remedy includes the continuation of O&M for the IRMs that have been implemented at the Subsite, site grading, institutional controls, development of an SMP, and periodic reviews.

The engineered cover in the former Semet residue pond areas west of the BCA would be a minimum of 18-inch thick soil/granular cover (or maintained paved surfaces), incorporating a geomembrane cap for the purposes of mitigating potentially unacceptable exposure risks and surface erosion in support of the reasonably anticipated future use of the Subsite. This geomembrane cap would also address the potential for mobility of the remaining Semet residue. The minimum 18 inches of soil/granular cover would be needed for protection of the geomembrane cap (e.g., from puncture, etc.). The cover systems would also include an engineered component to enhance structural stability, ranging from geofabric to geogrid depending on the needs of the final cover system uses. The soil cover over the BCA, where the geomembrane cap would not be present, would be a minimum of 1-foot thick soil/granular cover (or maintained paved surfaces) for the purposes of mitigating potentially unacceptable exposure of human receptors to constituents exceeding Commercial Use SCOs in surface Solvay waste/soil/fill material and surface erosion in support of the reasonably anticipated future use of the Subsite and its surroundings. The need for a demarcation layer between the soil cover and the underlying substrate would be evaluated during the design. The engineered cover system would require routine maintenance and inspections to maintain cover integrity.

Subsite grading would be conducted to support commercial and/or industrial development and would consist of backfilling of the emptied Semet residue ponds. The staged soil pile located on the BCA would be reused as backfill during grading (e.g., to fill in the former Semet residue pond areas) prior to cover placement. Fill material brought to the Subsite would need to meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d)

Design of the cover would take into consideration development plans that are available for the Subsite at that time. Further evaluation of Semet residue seep areas, Semet Lakeshore Area existing cover thickness, and other areas (e.g., berms) would be performed during the design and, as necessary, sampling would be performed to determine the appropriate cover extents. Native species would be used for the vegetative component of covers. Structures, such as buildings, pavement, or sidewalks, as part of future development, could also serve as acceptable substitutes for the vegetated cover either at implementation of the remedy or at a future time. The cost estimates assume that the seed application would consist of a grassland seed mix native to New York State that has been selected for its ability to attain relatively high growth rates and ecological function.

The Subsite is part of a WMA because the waste is a solid waste containing site-related contaminants and would meet the requirements for containment under RCRA Subtitle D. The vertical hydraulic conductivity of the Solvay waste/soil/fill material present at the Subsite is generally less than 1×10^{-5} cm/sec. The existing or proposed cover materials in combination with the underlying Solvay waste/soil/fill material and continued O&M of the groundwater collection and treatment systems for Subsite groundwater would meet the requirements for containment under RCRA Subtitle D.

Given the comingling of the shallow and intermediate groundwater outboard of the hydraulic containment system at the shore of Onondaga Lake with that of the adjacent Willis Avenue subsite, shallow and intermediate groundwater at and beyond the POC will be addressed as part of the Willis Avenue subsite.

Following the removal of the Semet residue under the OU-1 remedy, there is Semet residue remaining at the Subsite that is unsuitable for off-site thermal processing for beneficial reuse. Semet residue under the OU-1 remedy that is unsuitable for off-site thermal processing either exhibits unacceptable sulfur or moisture content, insufficient heat content and/or

exhibits unacceptable soil/debris content, as documented in demonstration reports. The remaining Semet residue that cannot be beneficially reused and may contain a free aqueous phase would be treated *in-situ* by solidification/stabilization. Specifically, the treatment would consist of the addition of amendments (e.g., Portland cement, cement kiln dust, lime kiln dust, blast furnace slag) to alter the physical characteristics to a granular material.

A portion of the main site area is anticipated to be used for overflow parking for the New York State Fairgrounds, while an extension of the "Onondaga Loop the Lake" trail will cross a portion of the Semet Lakeshore Area. The extent, thickness, and permeability of the covers would be revisited during the design phase and/or during site management, if site uses change, as necessary. The cover systems would require routine maintenance and inspections to maintain their integrity. The conceptual extent of the cover system is depicted on Figure 7.

Institutional controls in the form of environmental easements and/or restrictive covenants would limit land use to commercial (including passive recreational) or industrial, as appropriate, restrict groundwater use without approved treatment and, require that any intrusive activities in areas where contamination remains would be conducted in accordance with a NYSDEC-approved SMP, which would include the following:

- Institutional and Engineering Control Plan that identifies use restrictions and engineering controls for the Subsite and details the steps and media-specific requirements necessary to ensure the following institutional and engineering controls remain in place and effective:
 - environmental easements and/or restrictive covenants described above
 - Subsite cover systems described above
 - excavation plan which details the provisions for management of future excavations in areas of remaining contamination
 - descriptions of the provisions of the institutional controls including any land use or groundwater use restrictions
 - provision that future on-site buildings should be evaluated for the potential for vapor intrusion and may include vapor intrusion sampling and/or installation of mitigation measures, if necessary
 - provisions for the management and inspection of the identified engineering controls
 - maintaining Subsite access controls and NYSDEC notification
 - steps necessary for periodic reviews and certification of the institutional and/or engineering controls.
- Monitoring Plan to assess the performance and effectiveness of the remedy. The final monitoring program would be established during design.

O&M would include monitoring to document that success criteria are met and to identify the need for corrective action(s), as warranted. Corrective actions for covers may consist of cover repair in areas of disturbance or reapplication of vegetation in areas of non-survivorship.¹¹ Continued maintenance of the Willis-Semet Berm Improvement IRM is anticipated at the Subsite.

Green remediation techniques, as detailed in NYSDEC's Green Remediation Program Policy-DER-31,¹² and EPA Region 2's Clean and Green Policy¹³ would be considered for the preferred remedy to reduce short-term environmental impacts. Green remediation best practices such as the following may be considered:

- Use of renewable energy and/or purchase of renewable energy credits to power energy needs during construction and/or O&M of the remedy
- Reduction in vehicle idling, including both on and off-road vehicles and construction equipment during construction and/or O&M of the remedy
- Design of cover systems, to the extent possible, to be usable for alternate uses, require minimal maintenance (e.g., less mowing) and/or be integrated with the planned use of the property
- Beneficial reuse of material that would otherwise be considered a waste
- Ultra-low sulfur diesel.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

¹¹ The annual O&M cost estimates associated with monitoring of the vegetative cover and for maintenance of the vegetative cover are included in the cost estimates.

¹² See http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.

¹³ See http://epa.gov/region2/superfund/green_remediation.

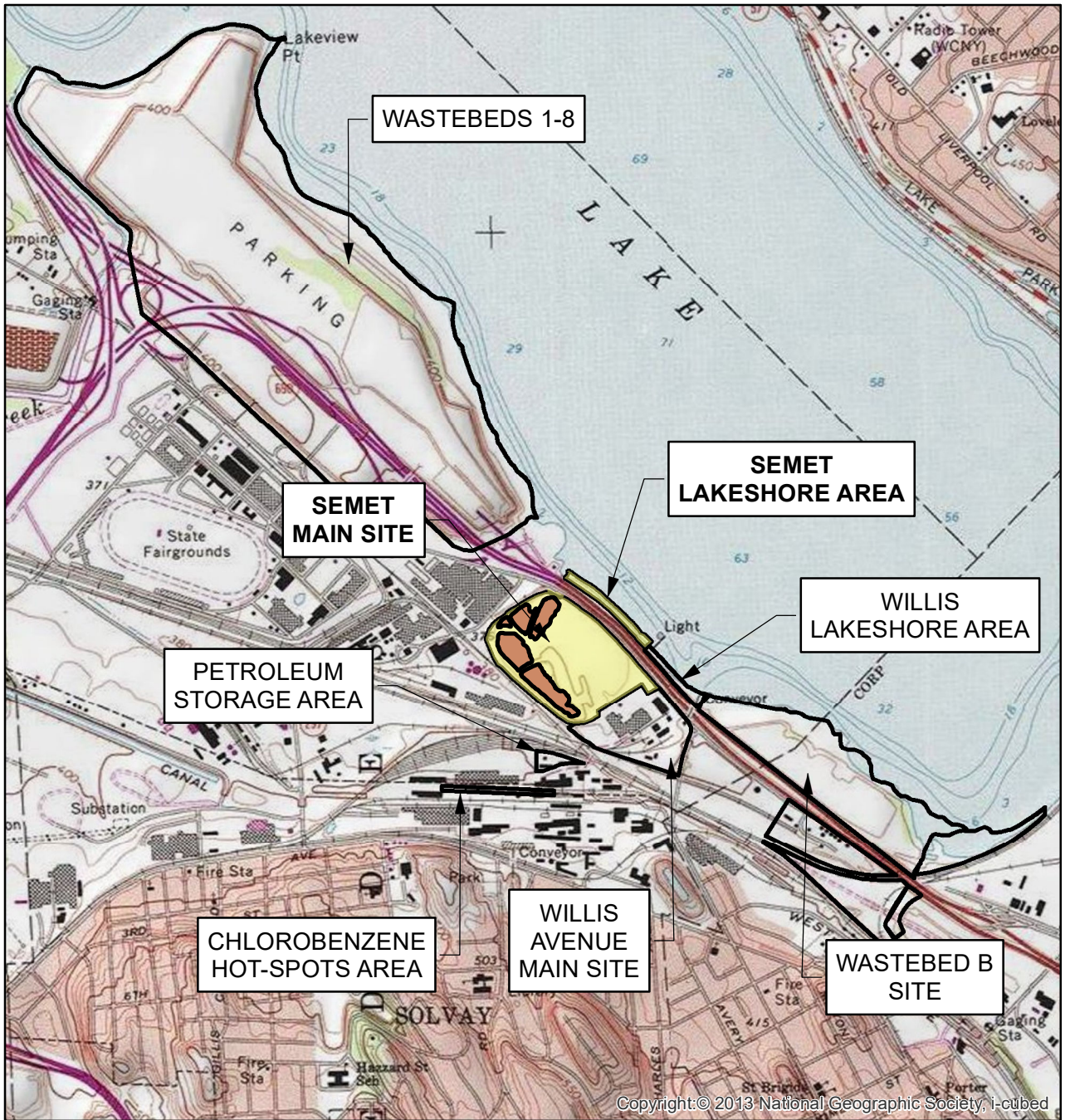
BASIS FOR THE REMEDY PREFERENCE

Alternative 1 would not satisfy the threshold criteria upon implementation. Alternatives 2 through 5 would be protective of human health and the environment and would address the RAOs; however, Alternative 5 would be extremely difficult and much more costly to implement than Alternatives 2, 3, and 4. In addition, Alternative 5 would present greater short-term impacts to the community and take longer to implement than Alternatives 2, 3, and 4. Relative to Alternative 2, Alternatives 3 and 4 would provide added effectiveness and permanence by incorporating enhanced covers that would provide added isolation from Solvay waste/soil/fill material at the Subsite. Alternative 4 would also include *in-situ* treatment of targeted material and, therefore, better address potential principal threat waste at the Subsite than Alternative 3. While Alternative 4 costs more than Alternative 3, it is only marginally more expensive. Given the added degree of protectiveness that Alternative 4 provides, it would be more cost-effective than Alternative 3.

Based on information currently available, NYSDEC and EPA believe that Alternative 4, the preferred alternative, meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. NYSDEC and EPA expect the preferred alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element (or justify not meeting the preference).

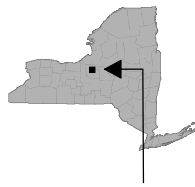
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HONEYWELL INTERNATIONAL INC.
 SEMET RESIDUE PONDS SITE
 OU-2 PROPOSED REMEDIAL ACTION PLAN
 GEDDES, NEW YORK



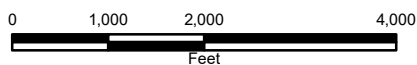
MAP LOCATION



LEGEND

- SEMET RESIDUE PONDS
- SEMET RESIDUE PONDS SITE

SITE LOCATION



1:24,000

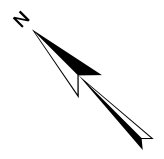
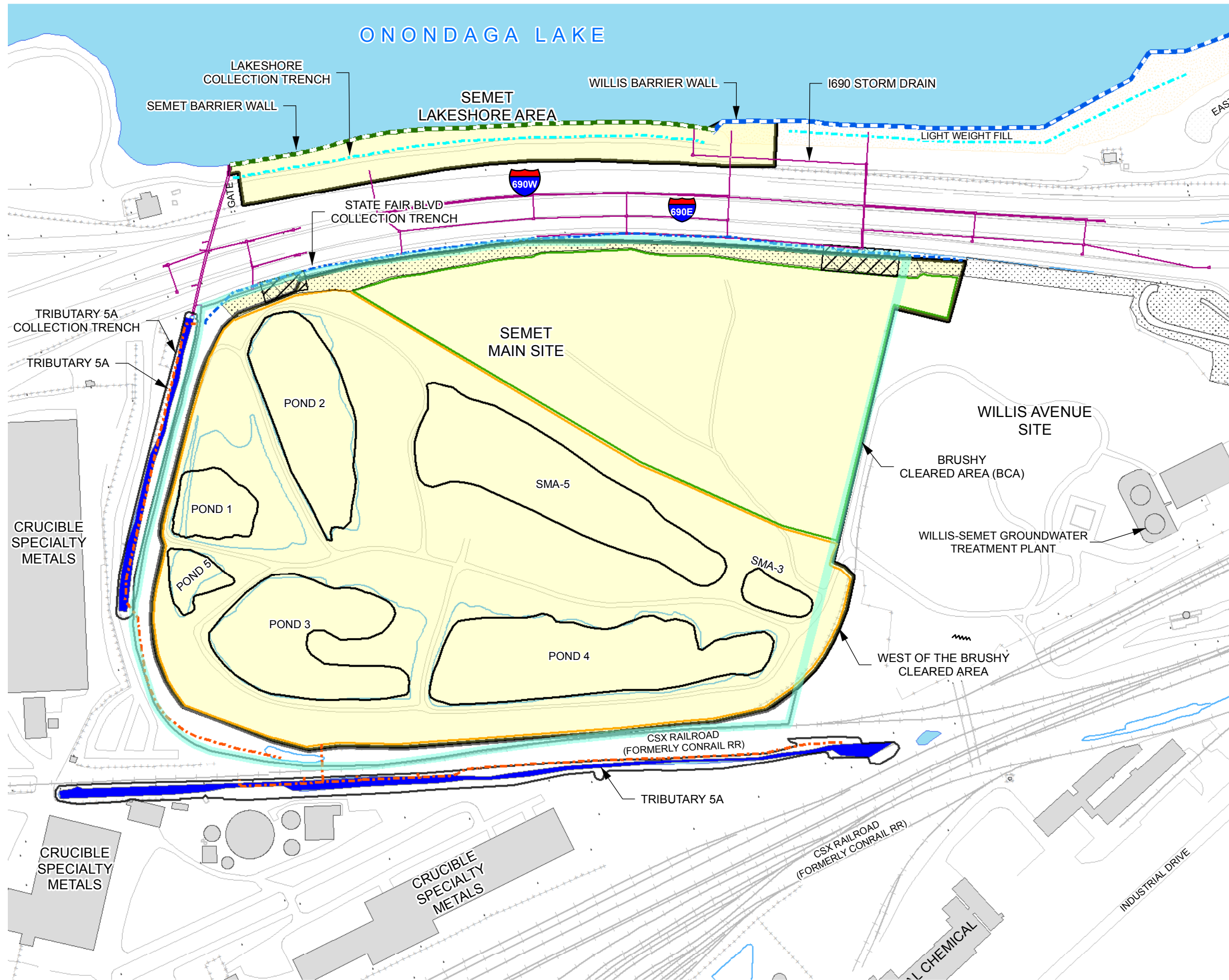


O'BRIEN & GERE ENGINEERS, INC.

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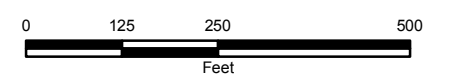


LEGEND

- IRMS & REMEDIAL ACTIONS**
- STATE FAIR COLLECTION TRENCH
 - LAKESHORE COLLECTION TRENCH
 - TRIBUTARY 5A COLLECTION TRENCH
 - I-690 STORM DRAIN
 - SEMET BARRIER WALL
 - WILLIS BARRIER WALL
 - TRIBUTARY 5A
 - ▭ TRIBUTARY 5A SEDIMENT REMOVAL
 - ▨ SOIL REMOVAL AREA
 - ▤ BALLFIELD / WILLIS / SEMET BERM AREA
- STUDY AREA**
- ▭ SEMET RESIDUE PONDS SITE
 - ▭ WASTEBED A AREA
 - ▭ BRUSHY CLEARED AREA (BCA)
 - ▭ WEST OF THE BCA
 - ▭ SEMET BERM AREA

HONEYWELL INTERNATIONAL INC.
 SEMET RESIDUE PONDS SITE
 OU-2 PROPOSED REMEDIAL ACTION PLAN
 GEDDES, NEW YORK

SITE PLAN



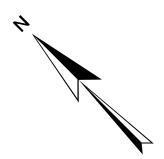
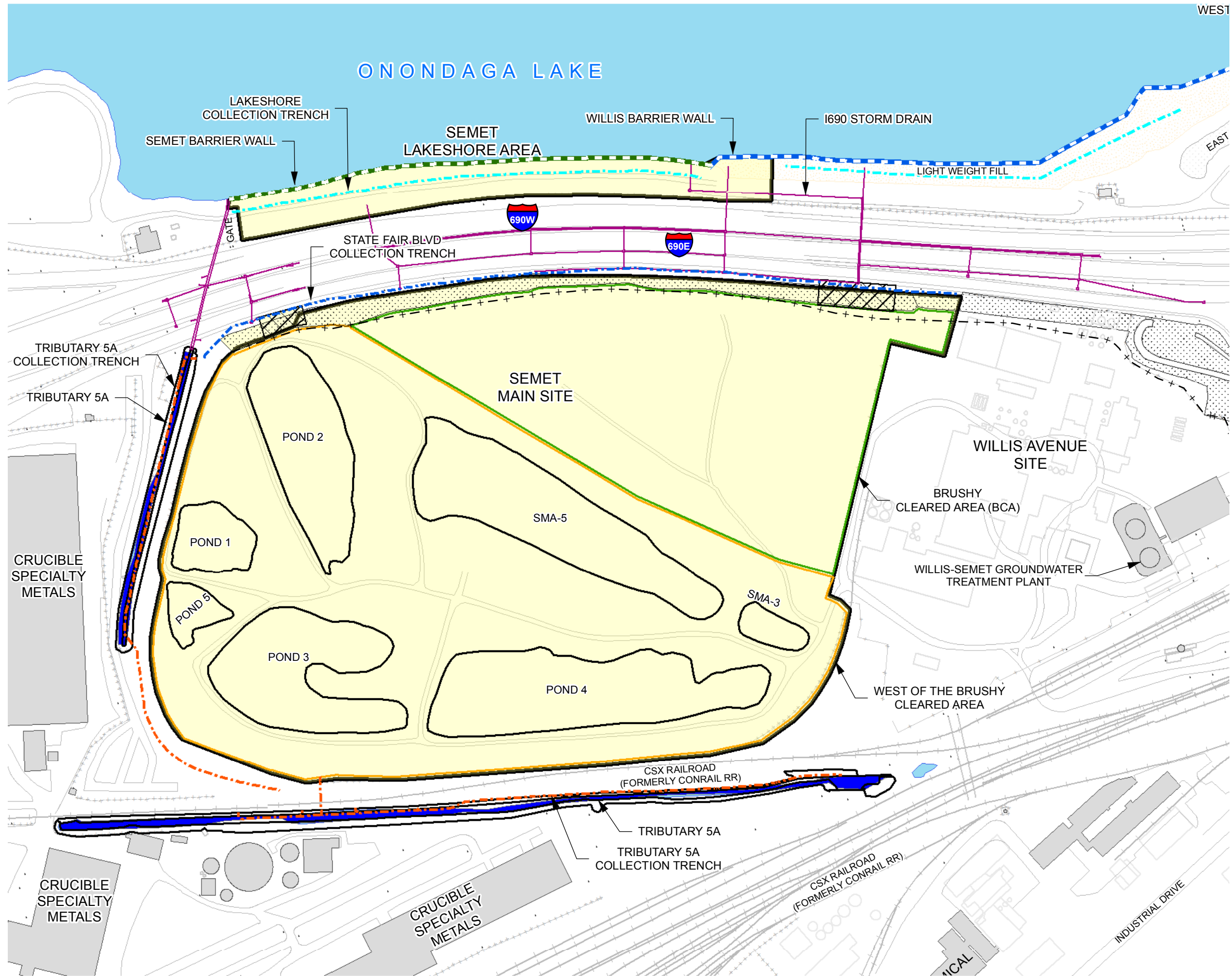
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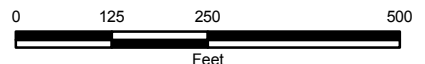


LEGEND

- SEMET RESIDUE PONDS SITE
- INTERIM REMEDIAL MEASURES**
- WILLIS - SEMET HYDRAULIC CONTAINMENT SYSTEM**
- LAKESHORE COLLECTION TRENCH
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- I-690 STORM DRAINAGE SYSTEM INVESTIGATION AND REHABILITATION IRM**
- I-690 STORM DRAIN
- STATE FAIR COLLECTION TRENCH
- WILLIS - SEMET BERM SITE IMPROVEMENTS PROJECT**
- BALLFIELD / WILLIS / SEMET BERM AREA
- SOIL REMOVAL AREA
- OU1 REMEDY**
- SEMET RESIDUE REMOVAL**
- FORMER POND AREAS - OU1
- SEMET PONDS SHALLOW GROUNDWATER REMEDIAL ACTION (TRIBUTARY 5A)**
- TRIBUTARY 5A SEDIMENT REMOVAL
- TRIBUTARY 5A COLLECTION TRENCH

**HONEYWELL INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
OU-2 PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK**

INTERIM REMEDIAL MEASURES AND REMEDIAL ACTIONS



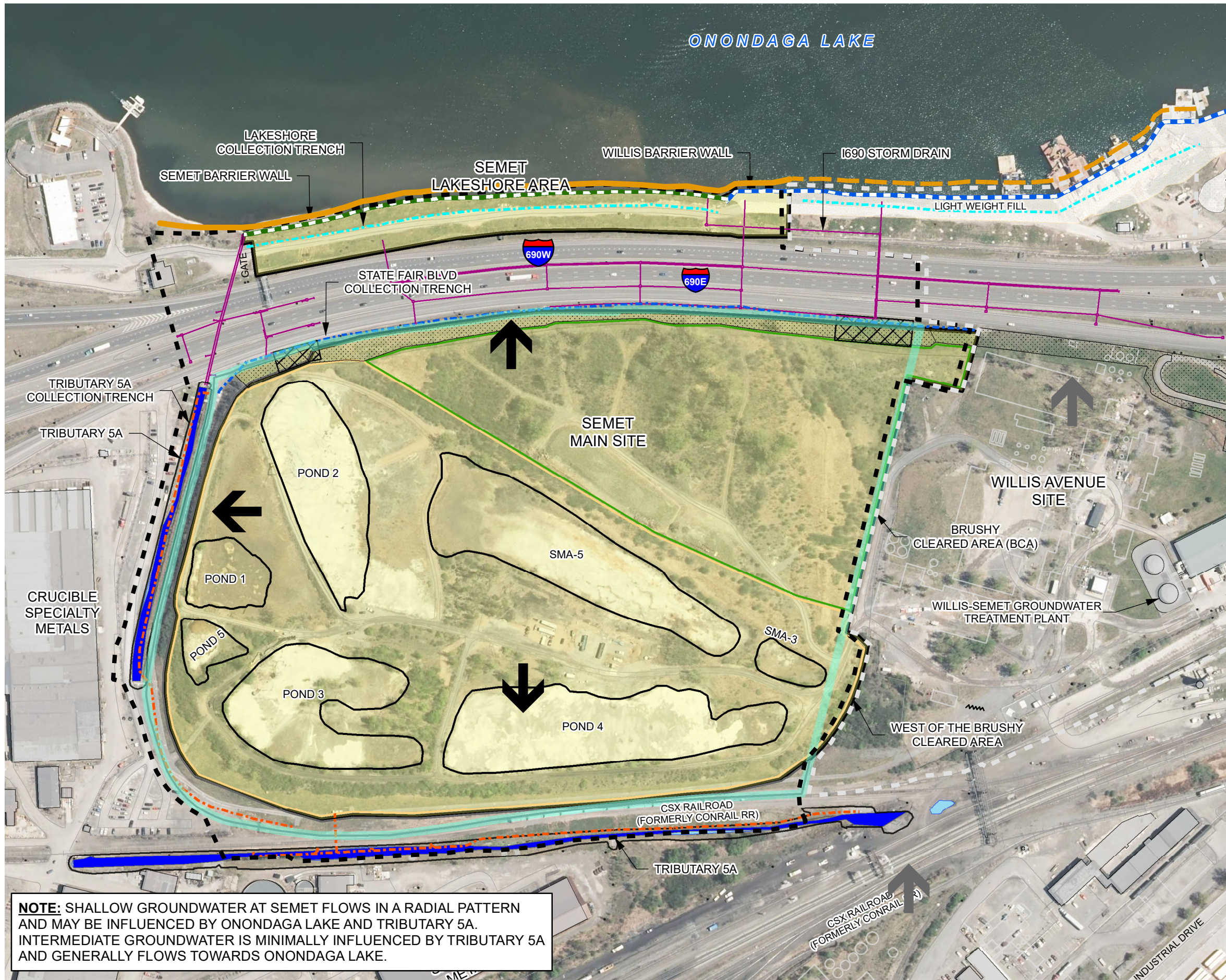
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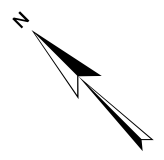
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NOTE: SHALLOW GROUNDWATER AT SEMET FLOWS IN A RADIAL PATTERN AND MAY BE INFLUENCED BY ONONDAGA LAKE AND TRIBUTARY 5A. INTERMEDIATE GROUNDWATER IS MINIMALLY INFLUENCED BY TRIBUTARY 5A AND GENERALLY FLOWS TOWARDS ONONDAGA LAKE.

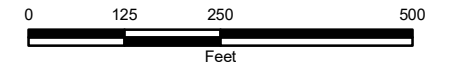


LEGEND

- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- ▭ SEMET WASTE MANAGEMENT AREA
- ▭ WILLIS WASTE MANAGEMENT AREA
- IRMS & REMEDIAL ACTIONS**
- STATE FAIR COLLECTION TRENCH
- LAKESHORE COLLECTION TRENCH
- TRIBUTARY 5A COLLECTION TRENCH
- I-690 STORM DRAIN
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- ▭ TRIBUTARY 5A
- ▭ TRIBUTARY 5A SEDIMENT REMOVAL
- ▭ SOIL REMOVAL AREA
- ▭ BALLFIELD / WILLIS / SEMET BERM AREA
- STUDY AREA**
- ▭ SEMET RESIDUE PONDS SITE
- ▭ BRUSHY CLEARED AREA (BCA)
- ▭ WEST OF THE BCA
- ▭ SEMET BERM AREA
- ➔ SEMET GENERAL SHALLOW AND INTERMEDIATE GROUNDWATER FLOW DIRECTION
- ➔ WILLIS GENERAL SHALLOW AND INTERMEDIATE GROUNDWATER FLOW DIRECTION

**HONEYWELL INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
OU-2 PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK**

WASTE MANAGEMENT AREA AND GROUNDWATER POINT OF COMPLIANCE



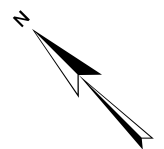
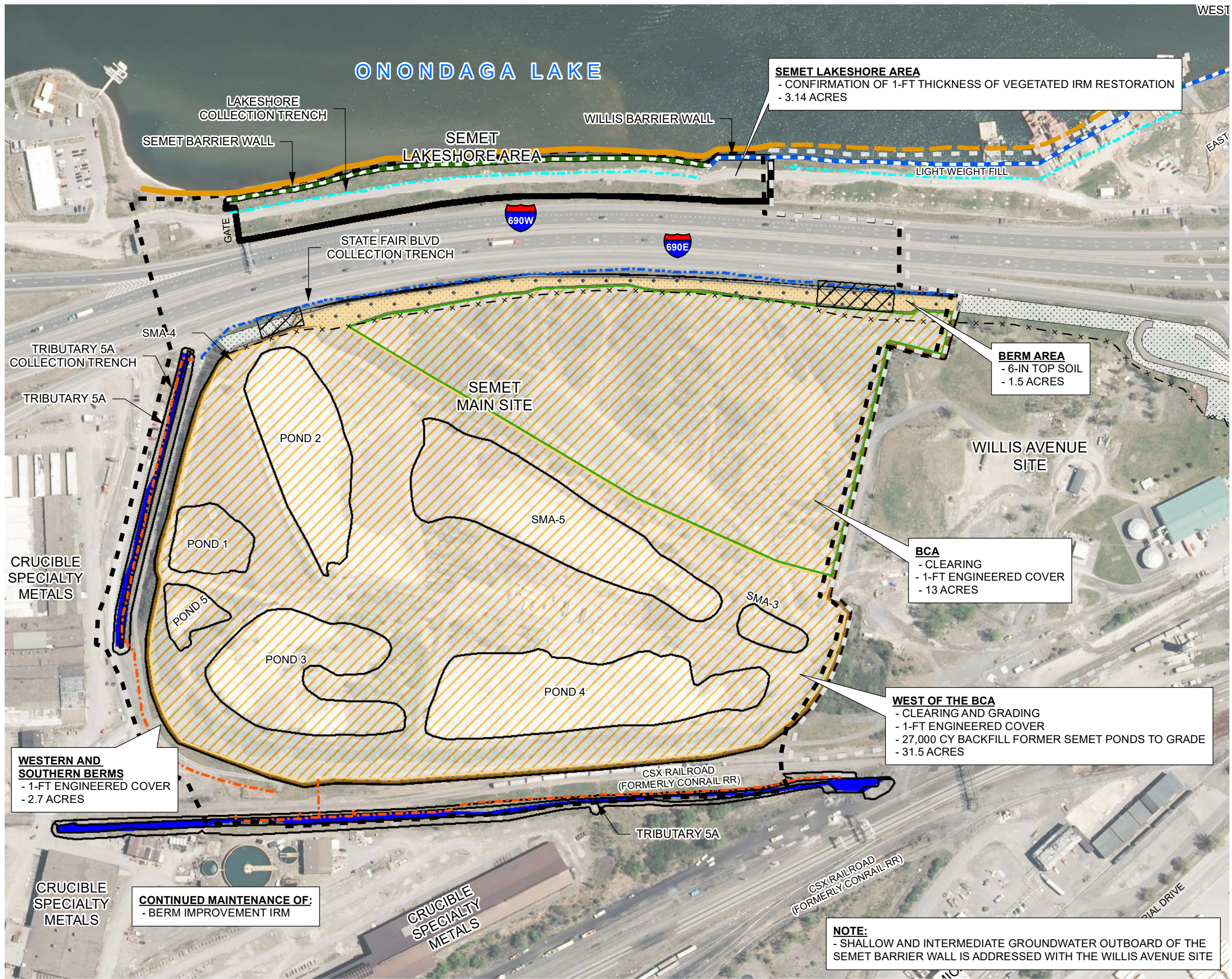
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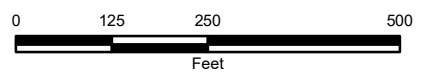


LEGEND

- SEMET PONDS SITE BOUNDARY
 - BRUSHY CLEARED AREA (BCA)
 - WEST OF THE BCA
 - TRIBUTARY 5A
 - 6-INCH TOP SOIL
 - 1-FOOT ENGINEERED COVER
 - STATE FAIR BOULEVARD COLLECTION TRENCH (IRM)
 - SEMET POINT OF COMPLIANCE
 - WILLIS POINT OF COMPLIANCE
 - SEMET WASTE MANAGEMENT
 - WILLIS WASTE MANAGEMENT
 - SOIL REMOVAL AREA (IRM)
 - BALLFIELD / WILLIS / SEMET BERM SITE IMPROVEMENTS AREA (IRM)
- OU1 REMEDY**
- LAKESHORE COLLECTION TRENCH
 - SEMET BARRIER WALL
 - WILLIS BARRIER WALL
 - TRIB 5A COLLECTION TRENCH
 - TRIB 5A SEDIMENT REMOVAL

**HONEYWELL INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
OU-2 PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK**

ALTERNATIVE 2



DECEMBER 2018
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O'BRIEN & GERE ENGINEERS, INC.

NOTE:
- SHALLOW AND INTERMEDIATE GROUNDWATER OUTBOARD OF THE SEMET BARRIER WALL IS ADDRESSED WITH THE WILLIS AVENUE SITE

WESTERN AND SOUTHERN BERMS
- 1-FT ENGINEERED COVER
- 2.7 ACRES

CONTINUED MAINTENANCE OF:
- BERM IMPROVEMENT IRM

SEMET LAKESHORE AREA
- CONFIRMATION OF 1-FT THICKNESS OF VEGETATED IRM RESTORATION
- 3.14 ACRES

BERM AREA
- 6-IN TOP SOIL
- 1.5 ACRES

BCA
- CLEARING
- 1-FT ENGINEERED COVER
- 13 ACRES

WEST OF THE BCA
- CLEARING AND GRADING
- 1-FT ENGINEERED COVER
- 27,000 CY BACKFILL FORMER SEMET PONDS TO GRADE
- 31.5 ACRES

CRUCIBLE SPECIALTY METALS

CRUCIBLE SPECIALTY METALS

CRUCIBLE SPECIALTY METALS

LAKESHORE COLLECTION TRENCH

SEMET BARRIER WALL

SEMET LAKESHORE AREA

WILLIS BARRIER WALL

STATE FAIR BLVD COLLECTION TRENCH

LIGHT WEIGHT FILL

TRIBUTARY 5A COLLECTION TRENCH

TRIBUTARY 5A

SEMET MAIN SITE

WILLIS AVENUE SITE

POND 1

POND 2

POND 5

POND 3

POND 4

SMA-4

SMA-5

SMA-3

TRIBUTARY 5A

CSX RAILROAD (FORMERLY CONRAIL RR)

CSX RAILROAD (FORMERLY CONRAIL RR)

WEST

EAST

ONONDAGA LAKE

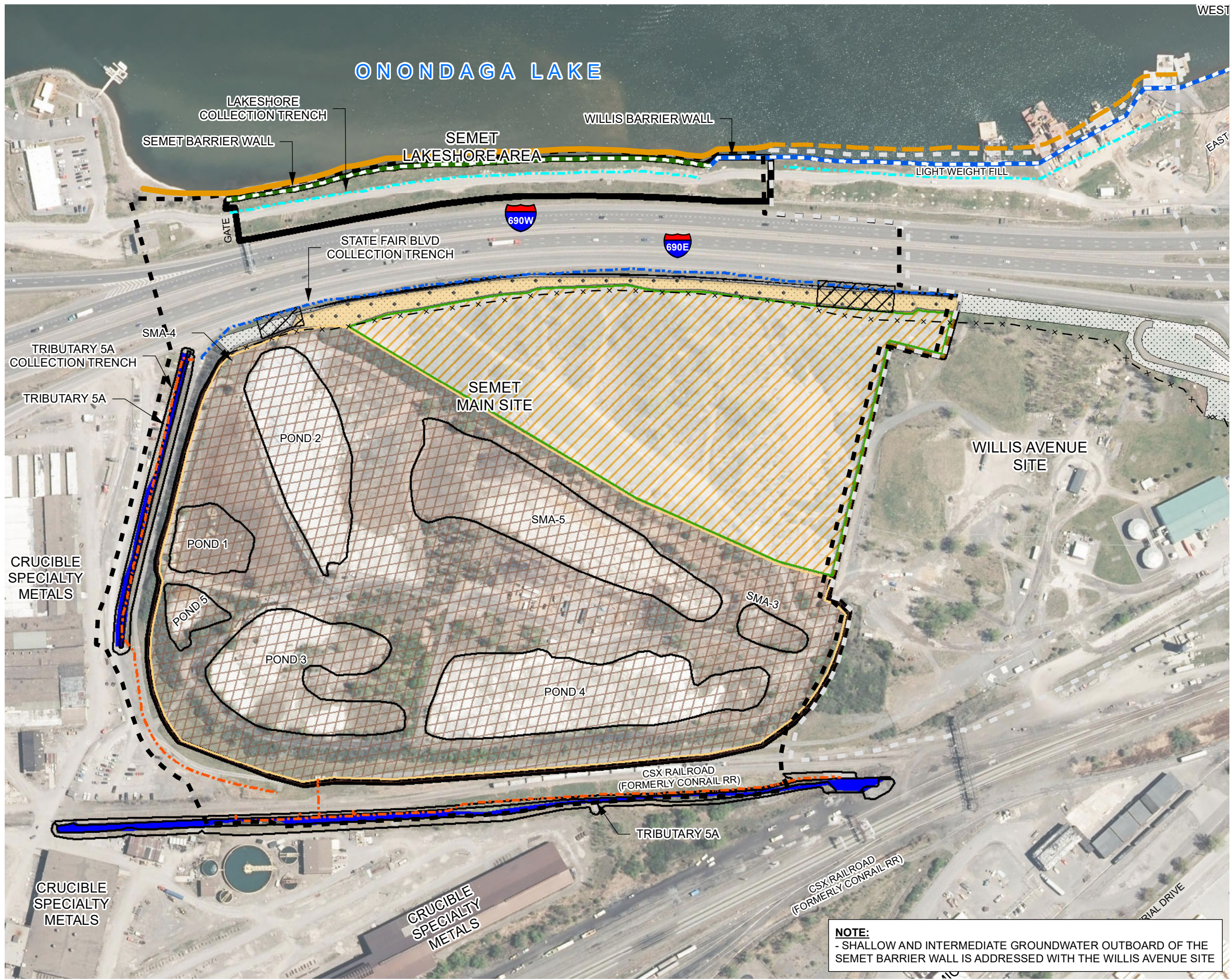


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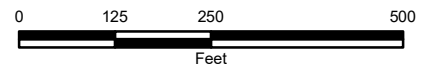
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LEGEND

- SEMET PONDS SITE
- BRUSHY CLEARED AREA (BCA)
- WEST OF THE BCA
- TRIBUTARY 5A
- 6-INCH TOP SOIL
- 1-FOOT ENGINEERED
- 1.5-FOOT LOW-PERMEABILITY COVER
- STATE FAIR BOULEVARD COLLECTION TRENCH (IRM)
- SEMET POINT OF
- WILLIS POINT OF
- SEMET WASTE MANAGEMENT
- WILLIS WASTE MANAGEMENT
- SOIL REMOVAL AREA (IRM)
- BALLFIELD / WILLIS / SEMET BERM SITE IMPROVEMENTS AREA (IRM)
- OU1 REMEDY**
- LAKESHORE COLLECTION
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- TRIB 5A COLLECTION
- TRIB 5A SEDIMENT

HONEYWELL INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
OU-2 PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK
ALTERNATIVE 3



DECEMBER 2018
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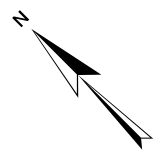
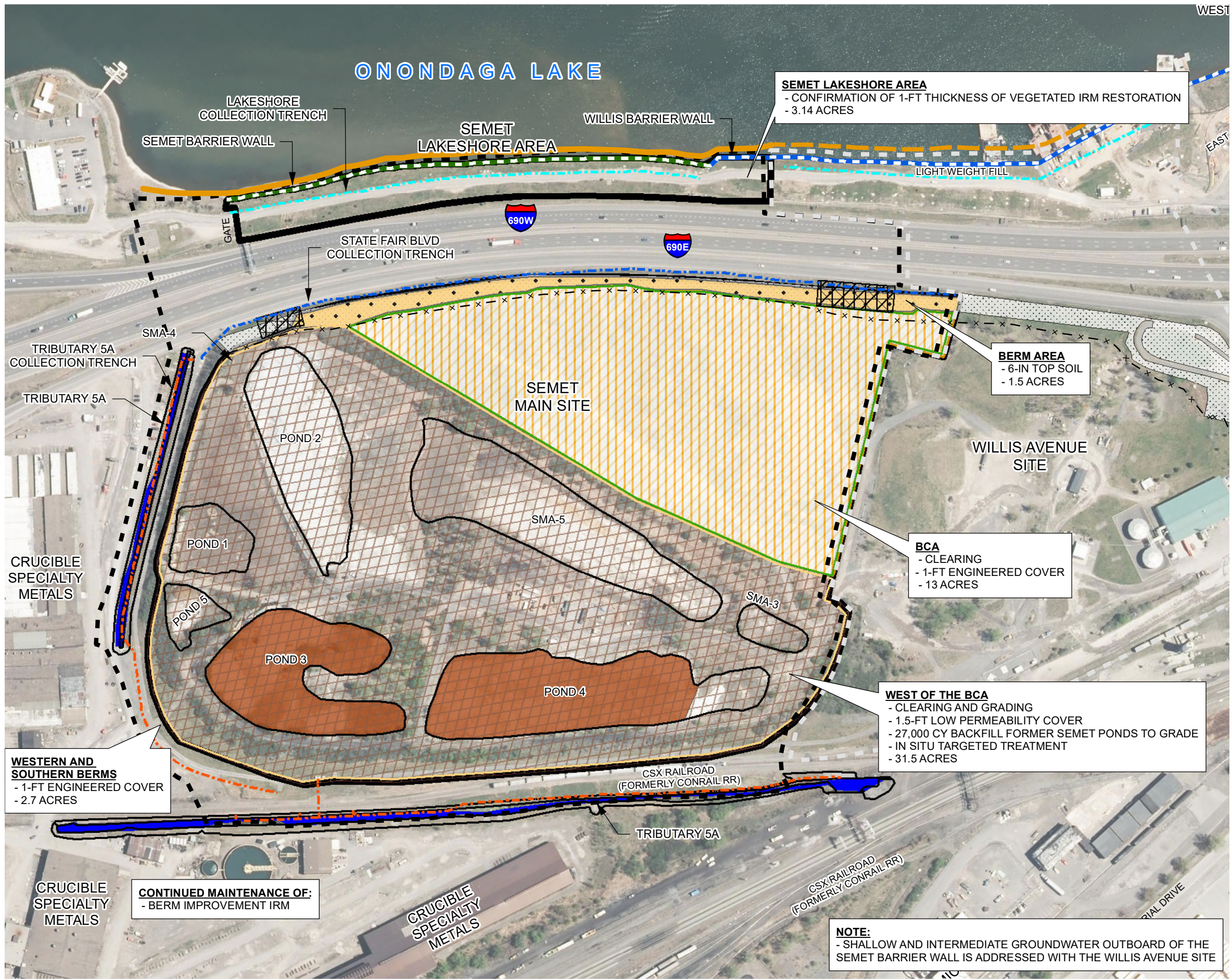


O'BRIEN & GERE ENGINEERS, INC.

NOTE:
- SHALLOW AND INTERMEDIATE GROUNDWATER OUTBOARD OF THE SEMET BARRIER WALL IS ADDRESSED WITH THE WILLIS AVENUE SITE

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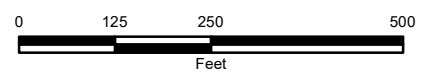


LEGEND

- SEMET PONDS SITE BOUNDARY
- BRUSHY CLEARED AREA (BCA)
- WEST OF THE BCA
- TRIBUTARY 5A
- 6-INCH TOP SOIL
- 1-FOOT ENGINEERED COVER
- 1.5-FOOT LOW-PERMEABILITY COVER
- IN-SITU TARGETED TREATMENT
- STATE FAIR BOULEVARD COLLECTION TRENCH (IRM)
- SEMET POINT OF COMPLIANCE
- WILLIS POINT OF COMPLIANCE
- SEMET WASTE MANAGEMENT
- WILLIS WASTE MANAGEMENT
- SOIL REMOVAL AREA (IRM)
- BALLFIELD / WILLIS / SEMET BERM SITE IMPROVEMENTS AREA (IRM)
- OU1 REMEDY**
- LAKESHORE COLLECTION TRENCH
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- TRIB 5A COLLECTION TRENCH
- TRIB 5A SEDIMENT REMOVAL

HONEYWELL INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
OU-2 PROPOSED REMEDIAL ACTION PLAN
GEDDES, NEW YORK

ALTERNATIVE 4



DECEMBER 2018
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O'BRIEN & GERE ENGINEERS, INC.

NOTE:
- SHALLOW AND INTERMEDIATE GROUNDWATER OUTBOARD OF THE SEMET BARRIER WALL IS ADDRESSED WITH THE WILLIS AVENUE SITE

WESTERN AND SOUTHERN BERMS
- 1-FT ENGINEERED COVER
- 2.7 ACRES

CONTINUED MAINTENANCE OF:
- BERM IMPROVEMENT IRM

SEMET LAKESHORE AREA
- CONFIRMATION OF 1-FT THICKNESS OF VEGETATED IRM RESTORATION
- 3.14 ACRES

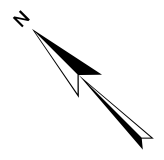
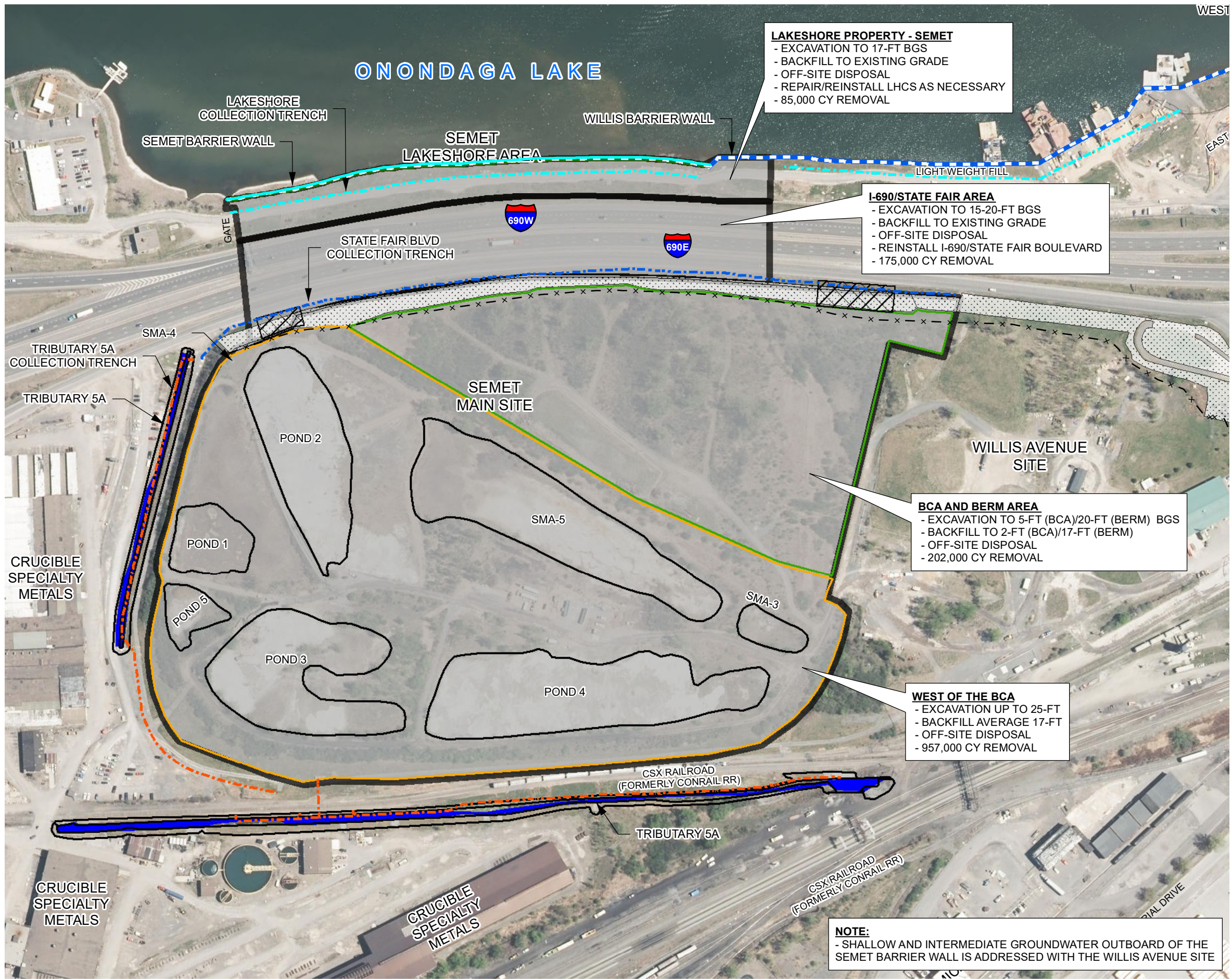
BERM AREA
- 6-IN TOP SOIL
- 1.5 ACRES

BCA
- CLEARING
- 1-FT ENGINEERED COVER
- 13 ACRES

WEST OF THE BCA
- CLEARING AND GRADING
- 1.5-FT LOW PERMEABILITY COVER
- 27,000 CY BACKFILL FORMER SEMET PONDS TO GRADE
- IN SITU TARGETED TREATMENT
- 31.5 ACRES

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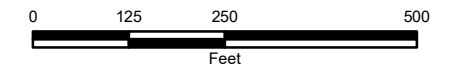


LEGEND

- SEMET PONDS SITE BOUNDARY / EXCAVATION AREA
 - BRUSHY CLEARED AREA (BCA)
 - WEST OF THE BCA
 - TRIBUTARY 5A
 - STATE FAIR BOULEVARD COLLECTION TRENCH (IRM)
 - SOIL REMOVAL AREA (IRM)
 - BALLFIELD / WILLIS / SEMET BERM SITE IMPROVEMENTS AREA (IRM)
- OU1 REMEDY**
- LAKESHORE COLLECTION
 - SEMET BARRIER WALL
 - WILLIS BARRIER WALL
 - TRIB 5A COLLECTION TRENCH
 - TRIB 5A SEDIMENT REMOVAL

**HONEYWELL INTERNATIONAL INC.
 SEMET RESIDUE PONDS SITE
 OU-2 PROPOSED REMEDIAL ACTION PLAN
 GEDDES, NEW YORK**

ALTERNATIVE 5



DECEMBER 2018
 1163.63447



O'BRIEN & GERE ENGINEERS, INC.

NOTE:
 - SHALLOW AND INTERMEDIATE GROUNDWATER OUTBOARD OF THE SEMET BARRIER WALL IS ADDRESSED WITH THE WILLIS AVENUE SITE

Table 1

Semet Residue Ponds Site-wide Surface Soils (0-2 ft bgs) Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances						
Parameter	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Volatile Organic Compounds (µg/kg)						
Benzene	0.49	7,810,000	44,000	11	89,000	10
Toluene	0.89	4,040,000	500,000	9	1,000,000	8
Xylenes (Total)	0.90	5,600,000	500,000	8	1,000,000	8
Semivolatile Organic Compounds (µg/kg)						
Benzo(a)pyrene	48.0	1,100	1,000	1	1,100	0
Dibenz(a,h)anthracene	73.0	564	560	1	1,100	0
Naphthalene	45.0	4,410,000	500,000	7	1,000,000	4
Pesticides (mg/kg)						
beta-BHC	360	360	3	1	14	1
Metals (mg/kg)						
Mercury	0.04	197	2.8	20	5.7	6
NOTES						
<p>This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.</p> <p>The Site-wide data includes the Berm Area, Brushy Cleared Area (BCA), Area west of the BCA, and Lakeshore Area. The Lakeshore Area data were taken from the stockpile samples (soils excavated during barrier wall and collection trench installation; Section 5.5 of <i>Semet Residue Ponds Site OU-2 Final Data Summary Document</i> [OBG, June 2018]).</p> <p>bgs = below ground surface</p>						

Table 2

Semet Residue Ponds Site-wide Subsurface Soils (>2 ft bgs) Summary of Detected Concentrations and Part 375 Restricted Use SCO Exceedances						
Parameter	Minimum Detected Conc.	Maximum Detected Conc.	NYSDEC Part 375 Restricted Use - Commercial SCOs	Number of Commercial SCO Exceedances	NYSDEC Part 375 Restricted Use - Industrial SCOs	Number of Industrial SCO Exceedances
Volatile Organic Compounds (µg/kg)						
1,2,4-Trimethylbenzene	750,000	750,000	190000	1	380000	1
1,3,5-Trimethylbenzene	510,000	510,000	190000	1	380000	1
1,4-Dichlorobenzene	0.64	260,000	130,000	1	250,000	1
Benzene	0.49	44,000,000	44,000	96	89,000	91
Chlorobenzene	0.51	820,000	500,000	1	1,000,000	0
Ethylbenzene	0.36	480,000	390,000	1	780,000	0
Naphthalene	2.00	2,600,000	500,000	1	1,000,000	1
Toluene	0.89	16,000,000	500,000	68	1,000,000	61
Xylene (Total)	2.00	10,000,000	500,000	68	1,000,000	61
Semivolatile Organic Compounds (µg/kg)						
Benzo(a)pyrene	33.0	1,300	1,000	2	1,100	1
Dibenzofuran	27.0	470,000	350,000	1	1,000,000	0
Napthalene	45.0	63,000,000	500,000	59	1,000,000	43
Metals (mg/kg)						
Arsenic	0.8	18	16	1	16	1
Barium	5.7	795	400	1	10000	0
Copper	1.7	1,180	270	1	10000	0
Mercury	0.005	197	2.8	10	5.7	9
NOTES						
This table presents (1) the detected concentration data only and (2) only parameters that exceeded the Part 375 Commercial or Industrial SCOs.						
The Site-wide data includes the Berm Area, Brushy Cleared Area (BCA), Area west of the BCA, and Lakeshore Area. The Lakeshore Area data were taken from the stockpile samples (soils excavated during barrier wall and collection trench installation; Section 5.5 of <i>Semet Residue Ponds Site OU-2 Final Data Summary Document</i> [OBG, June 2018]).						
bgs = below ground surface						

TABLE 3a
SUMMARY OF RISKS AND HAZARDS FOR CONSTRUCTION WORKER
SITEWIDE SOIL / FILL MATERIAL - SURFACE/SUBSURFACE SOIL
SEMET PONDS SITE - GEDDES, NEW YORK

CAS Number	Constituent	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient													
		Ingestion	Dermal	Inhalation	Exposure Routes Total	Ingestion	Dermal	Inhalation	Exposure Routes Total										
<i>METALS</i>																			
7440-38-2	Arsenic	4E-07	3E-08	2E-07	7E-07	6E-02	4E-03	2E-01	3E-01										
7440-47-3	Chromium, Hexavalent (derived)	6E-08		1E-06	1E-06	3E-03		9E-03	1E-02										
7440-48-4	Cobalt			6E-07	6E-07	1E-01		7E-01	9E-01										
7439-97-6	Mercury					1E+00		4E-02	1E+00										
7440-28-0	Thallium					7E-01			7E-01										
<i>PESTICIDES</i>																			
319-85-7	beta-BHC	2E-05	3E-06	8E-07	3E-05														
<i>SVOCs</i>																			
92-52-4	1,1'-Biphenyl	6E-09			6E-09	1E-04		1E-01	1E-01										
106-46-7	1,4-Dichlorobenzene	2E-09		3E-08	4E-08	4E-04		3E-04	7E-04										
6165-52-2	1-Phenyl-1-[2,4-dimethylphenyl]-ethane																		
3717-68-8	1-Phenyl-1-[4-methylphenyl]-ethane																		
91-57-6	2-Methylnaphthalene					2E-01	3E-02		2E-01										
208-96-8	Acenaphthylene					4E-06													
56-55-3	Benzo(a)anthracene	1E-08	2E-09	2E-10	1E-08														
50-32-8	Benzo(a)pyrene	6E-08	1E-08	1E-09	7E-08														
86-74-8	Carbazole																		
53-70-3	Dibenzo(a,h)anthracene	3E-08	6E-09	6E-10	4E-08														
132-64-9	Dibenzofuran					8E-02	3E-03		8E-02										
91-20-3	Naphthalene			9E-06	9E-06	5E-01	9E-02	7E+00	7E+00										
621-64-7	N-Nitrosodipropylamine	1E-07	2E-08	4E-09	2E-07														
110-86-1	Pyridine					4E-01			4E-01										
<i>VOCs</i>																			
95-63-6	1,2,4-Trimethylbenzene							3E+00	3E+00										
71-43-2	Benzene	1E-05		4E-05	5E-05	4E+00		1E+01	2E+01										
74-83-9	Bromomethane					1E-02		2E-01	2E-01										
108-90-7	Chlorobenzene					8E-03		4E-02	5E-02										
67-66-3	Chloroform	2E-09		4E-08	4E-08	3E-04		1E-03	1E-03										
100-41-4	Ethylbenzene	4E-08		1E-07	2E-07	2E-03		3E-03	6E-03										
108-87-2	Methylcyclohexane																		
99-87-6	p-Isopropyltoluene																		
108-88-3	Toluene					1E-01		4E-02	2E-01										
1330-20-7	Xylenes (total)					4E-02		1E+00	1E+00										
Total Risk					9E-05					Total Hazard					3E+01				

TABLE 3b
SUMMARY OF RISKS AND HAZARDS FOR INDOOR / OUTDOOR INDUSTRIAL WORKER
SITEWIDE SOIL / FILL MATERIAL - SURFACE SOIL
SEMET PONDS SITE - GEDDES, NEW YORK

CAS Number	Constituent	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
		Ingestion	Dermal	Inhalation	Exposure Routes Total	Ingestion	Dermal	Inhalation	Exposure Routes Total	
<i>METALS</i>										
7440-38-2	Arsenic	4E-06	4E-07	3E-09	4E-06	2E-02	2E-03	1E-04	3E-02	
7440-47-3	Chromium, Hexavalent (derived)	4E-07		2E-08	4E-07	7E-04		6E-06	7E-04	
7440-48-4	Cobalt			7E-09	7E-09	3E-02		4E-04	3E-02	
7439-97-6	Mercury					3E-01		9E-01	1E+00	
7440-28-0	Thallium					2E-01			2E-01	
<i>PESTICIDES</i>										
319-85-7	beta-BHC	1E-04	4E-05	1E-08	2E-04					
<i>SVOCS</i>										
92-52-4	1,1'-Biphenyl	6E-08			6E-08	4E-05		2E-01	2E-01	
106-46-7	1,4-Dichlorobenzene	2E-08		1E-06	1E-06	1E-04		4E-04	6E-04	
6165-52-2	1-Phenyl-1-[2,4-dimethylphenyl]-ethane									
3717-68-8	1-Phenyl-1-[4-methylphenyl]-ethane									
91-57-6	2-Methylnaphthalene					6E-02	2E-02		8E-02	
208-96-8	Acenaphthylene					1E-06				
56-55-3	Benzo(a)anthracene	9E-08	3E-08	1E-09	1E-07					
50-32-8	Benzo(a)pyrene	3E-07	1E-07	1E-11	5E-07					
86-74-8	Carbazole									
53-70-3	Dibenzo(a,h)anthracene	3E-07	1E-07	1E-11	5E-07					
132-64-9	Dibenzofuran					3E-02	2E-03		3E-02	
91-20-3	Naphthalene			4E-04	4E-04	2E-01	8E-02	1E+01	1E+01	
621-64-7	N-Nitrosodipropylamine	8E-07	2E-07	6E-11	1E-06					
110-86-1	Pyridine					1E-01			1E-01	
<i>VOCs</i>										
95-63-6	1,2,4-Trimethylbenzene							6E-02	6E-02	
71-43-2	Benzene	6E-05		8E-04	9E-04	5E-01		1E+01	1E+01	
74-83-9	Bromomethane					2E-03		2E-01	2E-01	
108-90-7	Chlorobenzene					1E-03		4E-02	4E-02	
100-41-4	Ethylbenzene	2E-07		3E-06	3E-06	4E-04		4E-03	4E-03	
108-87-2	Methylcyclohexane									
99-87-6	p-Isopropyltoluene									
108-88-3	Toluene					2E-02		4E-02	6E-02	
1330-20-7	Xylenes (total)					6E-03		1E+00	1E+00	
Total Risk					2E-03	Total Hazard				3.E+01