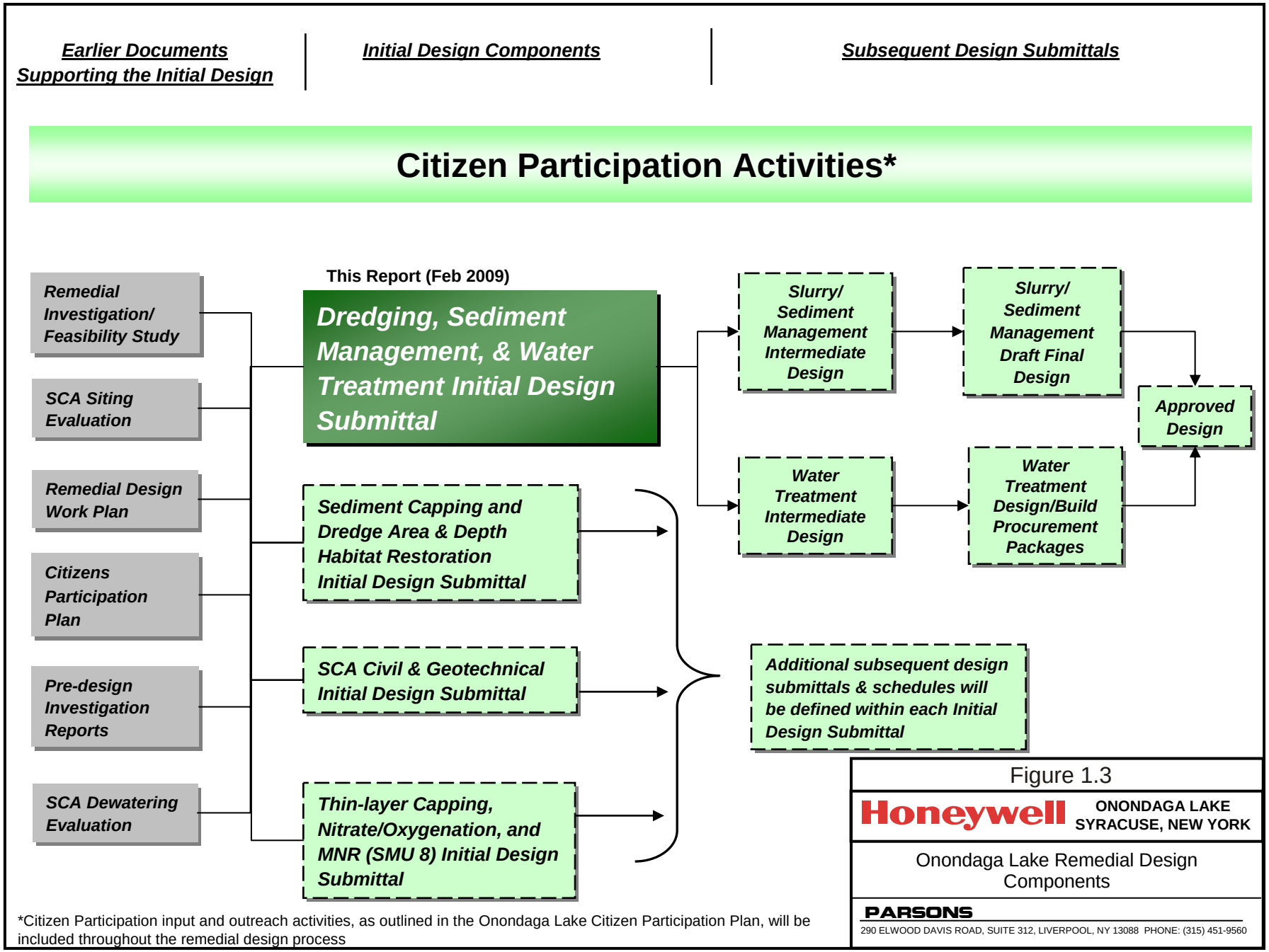

*Citizen Participation input and outreach activities, as outlined in the Onondaga Lake Citizen Participation Plan, will be included throughout the remedial design process

Figure 1.3

Honeywell ONONDAGA LAKE SYRACUSE, NEW YORK

Onondaga Lake Remedial Design Components

PARSONS

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SECTION 2

COMMUNITY PROTECTION AND GENERAL PROJECT REQUIREMENTS

In addition to the technical scope requirements laid out in the Consent Decree and attachments, as summarized in Section 1.3, there are other project requirements that the remedy will comply with. Paramount among these requirements is the overall protection of members of the community and consideration of community input in the entire remedial program, as detailed in Section 2.1. Additional requirements and considerations specifically pertaining to the operations aspect of the remedy are discussed in Section 2.2. In addition to these project requirements and considerations, Honeywell is committed to incorporating sustainability concepts into the design and execution of the remediation. Section 2.3 provides further detail pertaining to this commitment, and example concepts that will be considered.

2.1 COMMUNITY SAFETY & INVOLVEMENT

In recognition of the importance of the lake as a natural resource to the surrounding area, the level of community interest in the progress of the Onondaga Lake remediation, and some of the concerns raised by community members, Honeywell has initiated a Community Outreach Program which has been designed to bring transparency to the design process, incorporate community ideas and feedback into the design, and to maintain awareness of remedial progress and milestones. The purpose of this section is to: 1) discuss the importance of community feedback and some of the design aspects which have been modified based on feedback received; 2) describe the process by which interested community members and parties are updated on, and participate in the remedial process; and 3) to outline future plans and design components which will help ensure protection of the surrounding community while remedial activities are ongoing.

2.1.1 Community Participation

The NYSDEC and Honeywell are required and committed to informing and involving the public during the upcoming remedial design and construction phases of the Onondaga Lake project. The draft CPP, released in October 2008, provides a formal, yet flexible plan for communicating with the public during the remediation of Onondaga Lake. The final CPP will be distributed to the public once public comments have been reviewed and is anticipated to be released the first half of 2009.

While the remediation of Onondaga Lake, including the design and construction activities, will take several years to complete, public interest in the cleanup remains high. NYSDEC citizen participation plans provide baseline activities that require the issuance of a fact sheet and public availability sessions on all milestone projects. These and a variety of other techniques, described below, will be used to inform and engage the public throughout the remediation of the Onondaga Lake bottom.

2.1.1.1 Community Outreach and Citizen Participation Activities

The goals of the Onondaga Lake Citizen Participation Plan are to provide communications and dialogue with the public that are open, transparent, and proactive. It also provides multiple opportunities for dissemination of information to and from the public. Citizen participation activities include:

- **Fact Sheets –** Fact sheets will be distributed for milestones and other events to interested parties.
- **Websites –** There are two websites where members of the community can find information related to the lake bottom project.

  The Onondaga Lake page on the NYSDEC website (http://www.dec.ny.gov/chemical/8668.html) describes the lake site, its history and major cleanup milestones, and contains links to electronic copies of the Consent Decree and Record of Decision. The public can also download copies of fact sheets, maps, and data tables.

  Honeywell's website dedicated to the lake project (http://www.onondaga-lake-initiatives.com) also provides the public with information not necessarily found on the NYSDEC site. Members of the community can find a photo gallery of work being performed in and around the lake, project updates, chronologically organized press releases, and E-newsletters. Citizens will also be able to submit questions to Honeywell scientists and engineers via the site and add their names to a project contact list.
- **Electronic Newsletter –** Honeywell will provide E-newsletters on key remediation activities.
- **Annual Summary of Activities –** Each year an annual summary of the progress of the Onondaga Lake remediation will be prepared for the Onondaga Lake Partnership (OLP) Annual Progress Meeting. This report will be made available on the websites, at all document repositories, mailed to the project contact list and the media, emailed to Honeywell's E-newsletter list and be available at all public meetings.

As outlined in the CPP, the NYSDEC will establish Community Participation Working Groups (CPWGs). These groups will be open to the public and consist of public officials, community leaders, citizens, and conservation and environmental group leaders. They will be supported by technical experts from the NYSDEC and Honeywell.

The CPWG's will meet throughout the remediation efforts, providing a forum to inform, receive input, and discuss the remediation program. They will create opportunities for the public to contribute information, opinions, perspectives, and recommendations. Feedback from the CPWGs will be provided to the technical design teams for evaluation and consideration throughout the design process.

2.1.1.2 Participation To Date

Consideration of the protection of the public, and concerns and feedback received from representatives of the Town of Camillus received through the community participation process has already had a considerable influence on design-level decisions in several areas of the remedial design. Specific examples include:

- Geotextile tube dewatering – The presumptive dewatering method during the issuance of the ROD was a large open settling basin. Questions were raised from the Town of Camillus officials pertaining to the odor generation potential of this dewatering method. Following evaluation of alternative dewatering approaches, the use of geotextile tubes was specified, as detailed in Section 4, which will provide several benefits, including:
  - significant reduction of the potential for odor generation as compared to an open settling basin;
  - primary containment of the dredged sediments within the tubes;
  - reduction in required berm height and preloading requirements as compared to an open settling basin, thereby reducing scale of construction activities and associated truck and noise levels;
  - reduction in the required footprint as compared to an open settling basin which will reduce the visibility of the SCA and associated construction activities from nearby residential areas; and
  - elimination of open water basin, eliminating the potential safety (drowning) hazards of the project areas that could be accessed by the public and wildlife.
- Odor mitigation – To assess the potential for remedial elements to generate nuisance odors, several design-related investigations and assessments have been conducted to characterize the odor generation potential of the material and remedial elements. Furthermore, odor mitigation techniques for each of the remedial components anticipated to be employed on the project have been evaluated, and will be implemented on an as-needed basis, as best management practices. Parts and equipment needed for implementation of such activities will be procured and stored on site (for long lead items), or put on standby (for short lead items).
- Specification of hydraulic dredging and transportation – The use of hydraulic dredging and transportation, as opposed to mechanical dredging, was specified with several benefits pertaining to community protection. Given the large volume of sediment to be dredged, the truck traffic associated with transportation of mechanically dredged material could result in potential disruption and other impacts to local traffic patterns and road conditions; in addition, the hydraulic dredging and transport minimizes exposure of the dredged material to the air, thereby minimizing the odor generation potential.
- SCA buffer zone – To provide further protection of vicinity communities from nuisance impacts associated with the operation of the SCA (light, noise, odors), a buffer zone 500 ft wide between sediment dewatering activities and the Settling Basin

13 western boundary adjacent to specific community areas has been designed into the SCA.

- Pipeline route selection – A hydraulic pipeline will be utilized for conveyance of the dredged sediment to the SCA for dewatering. To minimize disturbance to the public from the operation and maintenance of this pipeline, a route configuration was chosen which deliberately avoids, to the extent practicable, residential and outdoor recreational areas, as well as sensitive environments.
- Selection of construction support areas – To minimize the impact of construction and truck traffic on the local roadway and traffic problems, project support and material storage areas evaluated were limited to those that would have direct access to the lake, and would be easily accessible from major roads and highways.
- Expedited design and construction schedule – To facilitate the restoration of Onondaga Lake as quickly and efficiently as possible, an expedited design and construction schedule, beyond what was assumed during the development and evaluation of remedial alternative in FS, was specified during the ROD. The expedited schedule will ultimately allow for the faster completion of the dredging, capping, and restoration aspects of the lake remediation.
- Use of silt curtains – To minimize the impacts to Onondaga Lake water quality during the in-lake activities (e.g., sediment dredging, debris management, etc.), silt curtains will be fully deployed around intrusive activities conducted within the lake.
- Secondary containment of slurry pipeline – To ensure protection of the local community and the environment from the dredged sediments, secondary containment will be provided along the entire length of the slurry pipeline, which will be designed to contain the slurry in the event of a pipeline leak or breakage.
- SCA location – The selection of Settling Basin 13 was conducted with careful consideration of minimization of impacts to the local community. Based on the area and storage capacity required for the management of the dredged sediment and the geographical layout of the Settling Basins, the selection of Settling Basin 13 provides a reduction in the amount of fill material required for importing and provides the maximum buffer distance from nearby residential areas and public facilities.

Continued involvement of the community is a critical component to the successful Onondaga Lake restoration project.

2.1.2 Community Protection Plans

As part of the remedial design process, Honeywell is working with community leaders to develop various performance criteria and work plans specifically designed to ensure that the protection of the surrounding community and environment is maintained throughout the execution of the remedy. The performance criteria and work plans will be developed and presented in the Final Design and will include, but not necessarily be limited to:

- Site Security & Community Protection Plan – The Site Security & Community Protection Plan will outline health and safety considerations including provisions for

physical security for the site and physical security for off-site support areas to minimize risks to persons, property, and the environment. Physical security planning will include remedial activities on the lake, at the lakeshore (e.g., support facilities), in the areas between the lakeshore and the SCA (e.g., slurry pipelines), at the SCA, and at the WTP site. A vulnerability assessment will be included to identify potential security challenges, prioritize those challenges, and describe appropriate control measures. Security measures to be implemented will be specified, and may include fences, gates, signs, remote cameras, security patrols, and lighting. Additionally, posting requirements for appropriate warning signs, barricades, and caution tape to protect members of the public from accidentally accessing the site will be outlined.

- Volatile and Odor Emissions Monitoring and Mitigation Plan – This Plan will outline details for monitoring ambient air conditions in close proximity to remedial activities. Monitoring is done to ensure compliance with the air quality criteria, and to ensure that no risks associated with air emissions are posed to community members who reside, work, or recreate in these areas. Furthermore, monitoring will be done to ensure that no off-site nuisance odor impacts are created as a results of the remedial activities. In addition to monitoring, this Plan will outline mitigative steps that will be taken as needed, throughout the course of the project to control volatile and odor emissions. As detailed in Section 4, volatile and odor emission generation potential of the various remedial components will be assessed, and mitigative measures will be evaluated for effectiveness. During implementation of the remedy, the measures determined to be most effective would be implemented as needed to ensure compliance with the established air quality criteria, or if specific components of the remedy lead to off-site nuisance odors.
- Traffic Management Plan – Although the use of hydraulic dredging and transportation will help to minimize the amount of construction and trucking traffic required for the project, some traffic associated with the delivery of material, equipment, and supplies will be necessary. To ensure construction vehicles are routed to appropriate roads, a Traffic Management Plan will be created to specify traffic patterns for each of the construction areas anticipated.
- Spill Contingency Plan – Several components of the remedy will involve the pumping and/or storage of liquid materials. Any liquid storage facilities will be designed for proper containment of the liquids, however a Spill Contingency Plan will be developed to outline protocols and procedures to be taken in the event of a spill.
- Noise Abatement Plan – To ensure noise levels from remedial construction activities are controlled to the extent practicable, a Noise Abatement Plan will be established to outline equipment requirements and hours and areas of required noise reduction.
- Navigational Protection Plan – To protect recreational boaters in Onondaga Lake from work zones, navigational hazards, and construction equipment, a Navigational Protection Plan will be created to outline communication procedures for conveying important project information pertinent to boaters, posting and delineating of sensitive/restricted project areas, and procedures associated with the siting and illuminating of on-water equipment.

2.2 GENERAL PROJECT DESIGN AND PERFORMANCE CRITERIA

Details on requirements pertaining to specific aspects of the remedy are provided in Section 4. Project requirements applicable to multiple aspects of the operational design are listed below.

- Remedial activities will be completed in accordance with Federal and State ARARs.
- Remedial activities will be completed in accordance with local ordinances and regulations (Towns of Geddes and Camillus, Villages of Solvay and Liverpool, and City of Syracuse).
- Remedial activities will be completed in a manner protective of the health and safety of site workers, the community, and others at and in the vicinity of remedial activities.
- Honeywell shall obtain all permits, easements, rights-of-way, rights-of-entry, approvals, and other authorizations necessary to perform Honeywell's obligations under the Consent Decree.
- Good faith efforts shall be made to design the Remedial Program within five years from entry of the Consent Decree. The dredging obligations required by the Consent Decree shall be completed within four years subsequent to the construction of the SCA and WTP.

Additional discussion pertaining to regulatory requirements, property access requirements and health and safety requirements is provided below.

2.2.1 Federal and State ARARs

Compliance with federal and state ARARs will ensure that the existing resources are protected during operations and provide for overall protection of human health and the environment. A comprehensive list of chemical-specific, action-specific and location-specific ARARs are included in the ROD. Regulatory requirements, including ARARs, applicable to implementation of the remedy are summarized in Table 2-1. This list includes ARARs related to operations that are listed in the ROD. Compliance with federal and state ARARs frequently involve formal permit application and approval processes. Details pertaining to these processes applicable to Onondaga Lake are outlined in the Consent Decree (NYSDEC, 2006).

2.2.2 Local Ordinances and Regulations

Table 2-1 also includes local ordinances and regulations. The ordinances and regulation that apply include requirements pertaining to noise, traffic, vibration, dust or odors, building permits, site development permits, and site plan approval and flood plain development permits for temporary shore support facilities, in-lake utility work, sediment management, and water treatment.

2.2.3 Health and Safety Requirements

The health and safety of site personnel, visitors and members of the public are considered paramount. Written safety plans will be developed for each phase of the remediation project. Project Safety Plans will be developed and updated as needed to address changing activities and

site conditions. The health and safety record of all bidding contractors will be evaluated as part of the bidding process. At a minimum, selected Remedial Contractors will be required to prepare Project Safety Plans which will address potential safety issues associated with the specific tasks the contractor will be performing. Specific requirements, including audit procedures, employee drug and alcohol screening programs, and near-miss reporting protocols will also be specified within the Final Design.

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

Several components of the remedy may require the use of non-Honeywell owned property. These activities could include: construction laydown and material storage areas, dredged sediment or cap material placement processing areas, and the slurry conveyance pipeline and appurtenances. To ensure access to the properties owned/managed by these entities, access agreements and necessary permits will be obtained in advance of the execution of the remedial activities. All Remedial Contractors whose scope requires use of these properties will be required to abide by the terms and conditions of the negotiated access agreements and permits.

2.3 SUSTAINABILITY

Although not an overall regulatory project requirement, Honeywell is committed to minimizing the carbon footprint of construction activities anticipated as part of the execution of the remedy. During the design phase, evaluations will be conducted to identify and evaluate opportunities to incorporate sustainability concepts into all aspects of the Onondaga Lake remediation. To the extent practicable, use of renewable energy sources, utilization of locally produced/sourced materials and supplies, reduction/elimination of waste and inefficient use of resources and energy, and other practices will be specified in the Remedial Design, and implemented during remedial construction. Further details pertaining to the incorporation of sustainable practices will be included in the Final Design.

TABLE 2.1
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
Nationwide Permit 38 (Sect. 404 Clean Water Act) Joint Application For Permit	**U.S. Army Corps of Engineers and NYSDEC with input from U.S. Fish and Wildlife Service (USFWS) and USEPA, as appropriate, through federal Executive Order 11990.**	• Preconstruction notification (PCN) • Remediation Project Scope of Work narrative. Indicates it is an NPL/ CERCLA site. • Location Map (USGS Quad) • Site/Remediation/Grading Plan • Details (e.g., Erosion & Sediment Controls, cross-sections, treatment options) • Photographs of the Project Area • Statement of the status of Endangered/ Threatened Species Resources Archaeological Resources • Vegetative Community Species List • Wetlands Delineation Report • Wetlands Restoration Program/Plan • Cultural Resources Statement	• Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA as approved or required by USEPA (such as Onondaga Lake), are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act. (Sections 10 and 404). • Per discussions with local USACE staff, notification of USACE is not required on CERCLA Sites as USACE assumes USEPA will ensure compliance with appropriate regulations. • NYSDEC to determine compliance with substantive requirements of CWA as well as 6 NYCRR Parts 663 – 665.
401 Water Quality Certification	**USEPA NYSDEC**	• Notice of Intent • Complete copy of package to be submitted to the New York District Army Corps of Engineers and to the NYSDEC • General Water Quality Certification, pursuant to Section 401 of the Clean Water Act, has been denied for Nationwide Permit 38. Individual Water Quality Certification must be obtained from the NYSDEC prior to undertaking activities described by this permit. This permit will then be subject to all terms and conditions placed upon the individual Water Quality Certification issued by the NYSDEC..	• Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA as approved or required by USEPA, are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act. (Sections 10 and 404) • NYSDEC to determine compliance with substantive requirements.
6 NYCRR Part 175 Special Licenses and Permits - Definitions and Uniform Procedures	**NYSDEC**	• Properly completed department application form. • Submitted to the appropriate department office as identified on the application or application instructions. • If the applicant is a corporation, firm, partnership, association, institution, or public or private agency, the application must be signed on behalf of such entity by the president or an appropriate principal officer.	• New York State Fish and Wildlife License may be required to collect and possess fish and wildlife for investigative purposes.

TABLE 2.1 (Cont)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
6 NYCRR Part 360 – Solid Waste Management Facilities	**NYSDEC**	• Engineering drawings that set forth the proposed landfill's location, property boundaries, adjacent land uses and detailed construction plans. • Operation drawings that prescribe how the landfill will fulfill the regulatory requirements. • Landscape plan. • Engineering report that comprehensively describes the existing site conditions and a full engineering analysis of the landfill and its containment components, including closure and post-closure plans and criteria. • Construction quality assurance/construction quality control plan. • Operation and maintenance manual. • Contingency plan. • Hydrogeologic report (Completed for SCA). • Landfill siting report (Completed for SCA). • Leachate management plan • Mined land use plan. If the applicant plans to use on-site excavation of cover material for the proposed landfill. • The most recent closure cost estimate for the landfill and a copy of the documentation required to demonstrate financial assurance. • Where applicable, the most recent post-closure care cost estimate for the landfill and a copy of the documentation required to demonstrate financial assurance. • Where applicable, the most recent corrective action cost estimate for the landfill and a copy of the documentation required to demonstrate the financial assurance. • Where applicable, an engineering report demonstrating how the landfill will meet the landfill gas collection system requirements.	• Regulation contains requirements for siting, design and operation of solid waste landfills. The SOW attached to the Consent Order for the Onondaga Lake Bottom Subsite requires Honeywell to design, operate, and maintain the SCA in accordance with the substantive requirements of NYSDEC Regulations Part 360, Section 2.14(a) for industrial monofills. • Part 360–2.14 regulations are performance based and complementary to the USACE pathway analysis requirements for dredged sediment disposal facilities.

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
6 NYCRR Part 420 – Part 425 Mining Regulations	**NYSDEC**	• Completed application forms. • A mined land-use plan which shall set forth in detail an outline of the mining property and the affected land, the mining plan (description of the mining operation, including maps, plans, written materials and other documents as required by NYSDEC, such as Erosion Control, etc.) and the reclamation plan (description of operations to be performed to reclaim the land to be mined over the life of the mine including maps, plans, the schedule for reclamation, written material and other documents as required by NYSDEC). • A reclamation bond or appropriate substitute which is conditioned upon conformance with the mined land-use plan. • A renewal application shall contain the following: (i) completed application forms; (ii) an updated mining plan map consistent with the provisions of title 27 and including an identification of the area to be mined during the proposed permit term; (iii) a description of any changes to the mined land-use plan; and (iv) an identification of reclamation accomplished during the existing permit term.	• Mining means the extraction of overburden and minerals from the earth; the preparation and processing of minerals, including any activities or processes or parts thereof for the extraction or removal of minerals from their original location and the preparation, washing, cleaning, crushing, stockpiling or other processing of minerals at the mine location so as to make them suitable for commercial, industrial, or construction use; exclusive of manufacturing processes, at the mine location; the removal of such materials through sale or exchange, or for commercial, industrial or municipal use; and the disposition of overburden, tailings and waste at the mine location. Mining does not include the excavation, removal and disposition of minerals from construction projects, exclusive of the creation of water bodies, or excavations in aid of agricultural activities. • Mineral means any naturally formed, usually inorganic, solid material located on or below the surface of the earth • Performance of the Lake bottom dredging and backfilling operations is outside the definition of mining, so a mining permit is not required. However restoration materials, such as imported SCA dike and cap materials are considered minerals, so any operation supplying these materials to the project would be subject to the requirements of this part.

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
6 NYCRR Part 500 Floodplain Management Regulations Development Permits **Executive Order 11988** **Camillus Municipal Code, Chapter 31: Flood Damage Prevention** **Geddes Flood Protection Ordinance**	**NYSDEC** **USEPA** **Town of Camillus** **Town of Geddes**	• Application to the Region 7 Permit Administrator on application forms provided by the department. • Description of the location, type and extent of the proposed project • Other information or plans required or specified in 6 NYCRR Part 500, section 500.8 and 6 NYCRR Part 621.	• May be applicable for shoreline support facilities and for construction of the pipeline from the Lakeshore to Settling Basin 13, if routed within a floodplain. • Executive Order 11988 may apply. • Camillus Municipal Code Chapter 31 covers Flood Damage Prevention within the Town of Camillus, and Town of Geddes also has a Flood Protection Ordinance. Per discussions with NYSDEC, both Town ordinances would take the place of 6 NYCRR Part 500. As a result, any work in areas of special flood hazard would require a permit from the town where the area is located. • In the Towns of Camillus and Geddes, the Code Enforcement Officer reviews any permit applications.
6NYCRR Part 608 Use and Protection of Waters.	**NYSDEC**	• Application to Region 7 Permit Administrator • Plan of Proposed Project • Location Map (USGS Quad) • Other as determined by NYSDEC	• 6 NYCRR Part 608 and Section 404 of the Federal Clean Water Act together regulate alterations to protected waters such as dredging and filling. Approval would be governed by whether: (a) the proposal is reasonable and necessary; (b) the proposal would not endanger the health, safety or welfare of the people of the State of New York; and (c) the proposal would not cause unreasonable, uncontrolled or unnecessary damage to the natural resources of the state.

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments

6NYCRR Parts 200, 201, 211, 212, 255, 256, 257, and 291 Prevention and Control of Air Contamination and Air Pollution	**NYSDEC**	• Preconstruction deliverables to NYSDEC Division of Air may include:
		  • Emission estimates
		  • Control technology description
		  • Air dispersion modeling protocol and analysis.
			• Although no permit was required for the Vapor Phase Treatment System (VPTS) at the Willis Ave. GWTP because the project was conducted under an Order on Consent, pre-approval by the NYSDEC was required prior to construction. VPTS at the GWTP is subject to 6 NYCRR Part 212 and DAR-1. Honeywell was also required to perform compliance testing to obtain the equivalent of "Certificate to Operate".
			• Will also apply to SCA leachate treatment plant if discharge to the atmosphere is included. Will need to coordinate with NYSDEC when leachate treatment design is ready.
			• The Site Remediation MACT (Subpart GGGGG) does not apply since the project will not emit pollutants above the "major source" thresholds.

Letter of Findings and Request for Concurrence. **National Historic Preservation Act 36 CFR Part 800**	**NYS Office of Parks, Recreation, & Historic Preservation (OPRHP) – State Historic Preservation Office (SHPO)**	• Letter of Findings requesting SHPO to concur that no additional archeological work is necessary in the project area if Phase 1A or Phase 1B determines no need for additional work. • If Phase 1B indicates existence of resources potentially eligible for listing in the National Register of Historic Places are discovered, a Phase 2 investigation will be required. • If Phase 2 confirms eligibility and impact to the eligible resource cannot be avoided, a Phase 3 Data Recovery may be required.	• A Phase 1A Cultural Resource Assessment was conducted for the lake and the SCA. A Phase 1B Cultural Resources assessment will be performed for the Lake bottom. No further action was recommended for the SCA. Additional Phase 1B work may be required along the route of dredge material pipeline.
Request for Authorization Letter **Federal Endangered Species Act and 50 CFR Parts 17 and 23** **Fish and Wildlife Coordination Act (16 USC Section 662)**	**US Fish & Wildlife Service (USWFS)**	• Letter of Intent requesting USWFS to identify any potential endangered or threatened species or critical habitats in the project area. • Scope of Work - Brief narrative of remedy • Location Map (USGS Quad with site location)	• A letter from USFWS (6/25/02) in the Baseline Ecological Risk Assessment indicates one threatened species within two miles of Onondaga Lake. Will send copy of letter to USF&WS when we request an updated evaluation.

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
Request for Authorization Letter **NYS Endangered Species Act and 6 NYCRR Part 182**	**NYS Natural Heritage Program (NYSNHP), NYSDEC Wildlife Resources Center**	• Letter of Intent requesting NYSNHP to identify any potential endangered or threatened species or critical habitats in the project area • Scope of Work - Brief narrative of remedy • Location Map (topographic map with site location)	• A letter from NY Natural Heritage Program (10/24/02) in the Baseline Ecological Risk Assessment indicates three threatened species within two miles of Onondaga Lake. Will send copy of letter to NYSNHP when we request an updated evaluation.
Stormwater Management & Erosion Control Plan - General Permit (Stormwater Pollution Prevention - SWPPP) **SPDES general Permits** **GP-0-08-001 (Construction)** **GP-0-08-002 (MS4)**	**USEPA,** **NYSDEC Division of Water** **Town of Camillus (Municipal Code, Chapter 43 – Stormwater Sewer System.** **Town of Geddes and City of Syracuse MS4 Regulations.**	• Notice of Intent to Discharge • Stormwater management scope of work narrative. Indicate its an NPL/CERCLA site • Stormwater Pollution Prevention Plan	• Disturbance of more than 1 acre requires preparation of an erosion control plan meeting the substantive requirements of the regulations. • Camillus, Geddes, and Syracuse are all have regulated Municipal Separate Storm Sewer Systems (MS4) and must develop, implement, and enforce a stormwater management program (SWMP).
SPDES Permit (6NYCRR Parts 750-757) **Clean Water Act, Sections 318, 402, and 405(a) and 40 CFR Parts 122 and 123.**	**NYSDEC Division of Water ,** **USEPA**	• Notice of Intent to Discharge <u>for discharge directly to NYS Surface Waters.</u> • Wastewater management scope of work narrative. Indicate it's an NPL/CERCLA site. • Technical information including : 1) Site status & site number 2) DHWR Engineer contact 3) Treatment system description 4) Discharge rate and duration 5) Description of receiving stream 6) Wastewater monitoring data (e.g., if system is new, then provide soil/sediment, groundwater, and surface water sampling data as representative of projected influent constituents) • Request effluent discharge criteria (suggest that Best Available Technology/Best Available Practice (BAT/BAP) criteria be used, along with the applicable analytical methods) • Sampling & Analysis Plan - Implemented for the duration of the treatment system operation	• Would receive a "Permit Equivalent" letter from the Division of Environmental Remediation in lieu of an actual SPDES permit from the Division of Water for discharge directly to surface waters. • Should effluent from the Treatment plant be discharged to the Syracuse Metro Wastewater Treatment plant, the SPDES permit would be replaced with an Industrial Wastewater Discharge Permit issued by the Onondaga County Department of Water Environment Protection. A permit application would need to be completed in accordance with Article IV, Section 4.02 of the Onondaga County Rules and Regulations Relating to the Use of the Public Sewer System.

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
CSX Access Agreement		• Description of Work • Site Narrative • Plan of Proposed Project • Location Map (USGS Quad) • CSX Application Form • Insurance Certificate	• Determine if access agreement would be required if area under railroad bridge over Ninemile Creek is utilized for dredge slurry piping (i.e. property under bridge owned by CSX).
Local Building Permit and Zoning Regulations (Bldg. Permit Application/Form)	**Town of Geddes (Town of Geddes Chapter 240 – Zoning.** **Town of Camillus (Municipal Code, Chapter 26 - Uniform Code Enforcement, Chapter 30 – Zoning Regulations of the Town of Camillus, Chapter 43 – Stormwater Sewer System, Chapter 48 - Waste Disposal, and Chapter 68 – Noise Law.** **City of Syracuse (City of Syracuse - Articles 5.1 through Articles 5.5 of the Building Code of the City of Syracuse)**	• Potential for Building Permit, Site Development Permit, Landfill Permit and Site Plan Approval, especially for the SCA, water treatment plant, shoreline processing facilities, and Pipeline. • Town of Camillus zoning regulations require planning board approval for a solid waste facility in areas zoned for industrial use (such as Settling Basin 13). • Location Map of the site (USGS Quad & Local) • Drawings of the structure (plan & profile) • Plan and profile for sediment transfer pipeline from the Lake shore to the SCA. • Truck access to SCA at Settling Basin 13 – Frequency and Route (Town of Camillus). • Placement of shoreline support facilities at Settling Basins 1-8 (Town of Geddes) and perhaps also at Settling Basin B (Town of Geddes and City of Syracuse) • Building and stormwater designs for shoreline support facilities. • Certificate of Occupancy for areas where workers will stay.	• Any work in the Town of Camillus may be subject to additional level of regulation and review if constructed in a "Stream Corridor Overlay District", dependent on the horizontal distance from the high water mark • Substantive requirements of applicable municipal building codes will need to be met.
Onondaga County Agreements	**Onondaga County**	• Access and building construction at northern portion of Settling Basins 1-8 as needed for dredging and capping support facilities.	• Truck access to Settling Basins 1-8 will also need to be coordinated with New York State Department of Agriculture & Markets (NYS Fair).

TABLE 2.1 (Cont.)
REGULATORY REQUIREMENTS

Requirement	Responsible Agency	Potential Supporting Documentation	Comments
Highway work permit and occupancy permit. (Honeywell submit application and proof of adequate insurance)	**NYSDOT, Onondaga County, and possibly local municipalities.**	• Perm 32 – Highway Work Permit Application for Utility Work. • Perm 33 – Highway Work Permit Application for Non-Utility Work. • Perm 44e – Surety Bond (Performance). • Perm 17 – Certificate of Insurance for Special Hauling, Divisible Load Overweight, and Highway Work Permit Insurance Requirements. • 17 NYCRR Part 131 – Accommodation of Utilities within State Highway Right-of-Way.	• Applicable if access to/from the SCA and/or Shoreline Processing area from I-690/SR-695 needs to be improved. • Applicable if pipeline routing requires crossing I-690. • 17 NYCRR Part 131 may also apply to pipeline route and/or access improvements. • May also need "Temporary Access/Curb Cut" permits to construct a new site entrance.
Private Landowner Agreements	**TBD**	• Access from Lakeshore to Settling Basin 13 (if a private landowner exists along selected ROW) • Quarry locations for SCA and lake cap materials (Candidate locations not yet identified. May also be subject to 6 NYCRR Part 420 - Part 425)	• Will need to review tax maps when routing of the pipeline from the lakeshore to the SCA is determined. Parsons has tax data in GIS and can generate required information. Also, data from Pictometry® Visual Intelligence may be useful.
Canal System Work Permit Canal Law, Article 2 § 10.	**NYS Canal Corporation**	• Canal Permit Application • Certificate of Insurance • Maps, Plans and Specifications of the proposed work • Copies of USACE and/or NYSDEC Approval • Application Fee	• May require permits and/or access agreements for: (a) Use of Barge Canal for material and equipment transfers; (b) Short-term navigation constraints during dredging and capping; and (c) Long-term cap protection institutional controls. • Per discussions with Canal Corp. personnel, Work Permit would allow the Canal Corp. to issue notices to navigation of work in progress in the lake and coordination with Canal Corp. maintenance activities. It would also help facilitate use of the Canal System for transport of equipment and supplies. • Estimated time requirements for obtaining permit for lake work would be approximately one month. Area of maximum interference would be with work in SMU 6 at the outlet of the Syracuse Terminal Channel. • Creation of an obstruction in Onondaga Lake such as a submerged outfall pipe or water intake

SECTION 3

IN-LAKE SITE CHARACTERIZATION

This section provides an evaluation of in-lake site conditions relevant to development and implementation of the operations design. The evaluation is based on data collected as part of the RI prior to the ROD, data from Honeywell design-related investigations, and data gathered by others. Referenced documents are available at the public document repositories listed in Section 5.3 of the RDWP (Parsons, 2008). Site conditions relative to operational support areas, such as the pipeline route and SCA, are described in Section 4.7.

Field efforts that were part of the RI for Onondaga Lake were conducted from 1992 to 2002. Five initial major RI investigation efforts were conducted by Honeywell in 1992: a geophysical survey, substance distribution sampling and analysis, mercury and calcite mass balances, an ecological effects investigation, and bioaccumulation analyses. Additional RI work was conducted by Honeywell in 1996 to assess mercury methylation and remineralization. Supplemental lake water sampling and analyses were performed by Honeywell in 1999. Additional investigation work by Honeywell in 2000 involved extensive lake sediment sampling and sampling of adjacent wetlands. In addition to work by Honeywell, limited sampling of lake water and wetland sediment was performed by NYSDEC in 2001 and 2002 as part of the RI effort. In total, more than 6,000 samples of water, sediments, and organisms were collected during the RI, and more than 130,000 data points were generated from RI samples (TAMS Consultants, 2002). Output from these efforts will be considered and supplemented with recently collected data during the remedial design effort.

Because of the large volume and complexity of the data required, design-related investigation activities for the lake bottom are being conducted in a phased approach. This phased approach allows the data from one phase to be interpreted and used to develop the appropriate scope for the next phase of investigation. This process ensures the overall quality and usefulness of the data and ensures that all data gaps are identified and fulfilled. Phase I, Phase II, and Phase III design-related investigation field efforts were conducted during 2005, 2006, and 2007, respectively, and were performed in accordance with NYSDEC-approved work plans. Data from design-related investigation Phases I, II and III were incorporated into the site characterization discussed in this section as well as the conceptual design for the remedy presented in Section 4. The Phase IV design-related investigation was conducted in 2008 and data from this investigation will be incorporated into the Final Design.

Design-related investigation activities during Phases I, II, and III included more than 400 sediment cores, 60 borings, 7,300 environmental samples, and 120,000 chemical and geotechnical analyses. Figure 3.1 depicts sediment sampling locations from these investigations. In general, the activities completed under the Phases I, II and/or III design-related investigation efforts included:

- geophysical surveys;

- sediment sampling for chemical and geotechnical analyses;
- *in situ* geotechnical testing of sediments;
- surface water sampling and analysis;
- porewater sampling and analysis;
- seepage meter and Geoprobe™ measurements, sediment cores, and drilling to evaluate groundwater discharge and ILWD stability;
- various types of sediment cores and drilling to delineate DNAPL extent;
- various types of bench-scale testing; and
- installation and monitoring of two meteorological stations.

A more detailed description of the activities conducted to date is provided in Section 2 of the RDWP (Parsons, 2008). Detailed results from these investigations have been submitted to DEC and have been or will be provided to the public document repositories after they are finalized by Honeywell and approved by NYSDEC.

3.1 REFINEMENT OF REMEDIATION AREAS AND DREDGE AREAS

During the FS process, Onondaga Lake was broken into eight different SMUs, which were determined based on water depth, sources of water entering the lake, and ecological and chemical risk drivers, developed for remedial alternative evaluation purposes. During the PDI described above, collection and analysis of the data collected indicated that the SMU boundaries did not accurately define the limits of the individual sub-areas of the lake.

To more accurately reflect the current understanding of in-lake conditions, the littoral area remediation has been redefined into Remediation Areas A through F, each of which include areas of both capping and dredging (Figures 3.2 and 3.3). The limits and boundaries of these Remediation Areas were established based on data collected through Phase III of the PDI. As further design-related investigations are completed, further characterization of the in-lake conditions is achieved, and the detailed capping and dredging plans are finalized, these areas will be refined further if necessary. Remediation Area refinements will also consider constructability limitations, and may be further divided into sub-areas based on dredging and capping design considerations. A summary description of these Remediation Areas is provided below.

<u>Remediation Area A</u>

This area is associated with sediment contamination resulting from discharges of mercury and other CPOIs from Ninemile Creek (Figure 3.2). In nearshore areas where groundwater upwelling is higher, dredging of nearshore impacted sediments to achieve numeric cleanup criteria is required. In these areas, capping will not be conducted. This area is referred to as Dredge Area A-1. This approach was referred to as targeted dredging in the ROD. Additional dredging is required in deeper areas that will be capped, referred to as Dredge Area A-2. A conceptual cross-section showing the different dredge areas is shown in Figure 3.4.

Remediation Area B

This area includes several separate sub-areas which are associated with offshore impacts from Settling Basins 1-8 (Figure 3.2). It includes addressing toxicity measured at sample location S-48, however, the remedial approach to address this data has not been developed yet. Materials in this area are generally consistent with the Solvay waste present onshore. Consistent with Remediation Area A, it includes dredging in areas that will not be capped in nearshore areas (Dredge Area B-1), and dredging in areas that will be capped (Dredge Area B-2), shown conceptually in Figure 3.4. The need for and/or extent of dredging in areas that will not be capped will be influenced by the shallow groundwater management approach currently under development for Settling Basins 1-8 as part of the remedy for this site.

Remediation Area C

This area includes sediments in two separate areas to the northwest of the ILWD in the area offshore and adjacent to the Willis-Semet IRM Barrier Wall (Figure 3.3). The western area includes dredging both in areas that will not be capped (Dredge Area C-1) and areas that will be capped (Dredge Area C-2), shown conceptually in Figure 3.4. In the eastern area adjacent to the ILWD, the Willis-Semet IRM Barrier Wall reduces groundwater upwelling such that capping is effective all the way to the shoreline; therefore, only dredging followed by capping is required in this Area.

Remediation Area D

This area is associated with the ILWD. The preliminary boundaries for this area, shown on Figure 3.3, are based on the overall extent of ILWD in the littoral area regardless of the thickness of the ILWD or overlying sediment layer. The extent to which the ILWD in the fringe areas, where the ILWD is thinner and is typically buried by more overlying sediment, impacts the capping and dredging design is under evaluation. Based on this evaluation, the boundaries of this Remediation Area may be refined in Final Design. Dredging in this area will be a minimum of 2 meters on average, and may be refined based on factors that include hot spot exceedances and stability. The removal areas and depths for this area are still being refined, and are depicted on Figure 3.3.

Remediation Area E

This area consists of sediment to the east of the ILWD that has been impacted primarily by contaminant sources in the vicinity of the ILWD (Figure 3.3). It includes dredging both in areas that will not be capped (Dredge Area E-1), and in areas that will be capped (Dredge Area E-2), shown conceptually in Figure 3.4. In the small shoreline area adjacent to the ILWD offshore of the anticipated east wall portion of the Settling Basin B / Harbor Brook IRM, groundwater upwelling is reduced such that capping is effective all the way to the shoreline; therefore, dredging followed by capping is required in this area.

Remediation Area F

This is the area associated with the infrequent and minor exceedances of cleanup criteria in SMU 5 not included in the Remediation Areas defined above. Design-related investigations indicate minimal remedial action will be required in this area; however, the exact remedial scope will be determined in the Sediment Capping and Dredge Area & Depth IDS. Therefore, no remedial areas are shown on Figures 3.2 or 3.3

3.2 LAKE SETTING AND HYDROGRAPHY

Onondaga Lake is situated in the midst of Syracuse and its suburbs, an urbanized area that makes up the largest metropolitan and industrial center in central New York State. With 146,435 people currently residing in Syracuse and 458,336 people residing in Onondaga County (2000 census), the lake and its environs have been influenced by development activities for over 200 years. Land around the southwest corner and southern portion of the lake is generally industrial. Land around the rest of the lake is recreational, providing hiking and biking trails, picnicking, sports, and other recreational activities. No residential or other private properties directly adjoin the lake.

The primary tributaries to Onondaga Lake are Ninemile Creek, which empties into the lake along its western shore just north of the New York State Fairgrounds, and Onondaga Creek, which enters the lake along its southern shore (Figure 1.1). Other tributaries include Ley Creek in the southeastern corner, Harbor Brook in the southwestern corner, Sawmill Creek in the northeastern corner, and Bloody Brook along the eastern shore. In addition to the tributaries, the Metro Plant located along the southern shore of Onondaga Lake near the mouth of Onondaga Creek releases an average of 80 million gallons per day (mgd) of treated wastewater daily to the lake.

A dam located approximately 15 miles downstream along the Oswego River in Phoenix, New York, maintains the water level in the lake. The lake level can change seasonally due to spring run-off and dry summers as well as daily due to weather events. Figure 3.5 presents lake elevation data for the past 30 years. While high lake levels can reach as high as 369 ft above MSL (highest recorded level was 369.77 ft above MSL), low lake levels are typically not lower than 1 ft below average (lowest recorded level was 361.59 ft above MSL). High water events are relatively frequent, with the lake elevation above 366 ft above MSL more than 180 days during the past 30 years (approximately 2% of days on record). However, these exceedances were limited to 11 years, with each year's exceedances lasting in excess of ten days. The lake is generally at its highest elevation in the early spring due to increased tributary flows and at its lowest elevation during the summer months.

Like many inland northern lakes, Onondaga Lake is stratified during summer, more weakly stratified in winter, and is vertically mixed in the spring and fall. Summer stratification is most pronounced from May through September due to temperature effects on water density.

Waters within Onondaga Lake are more saline than in most inland lakes. Solvay Settling Basins 1 through 15, as well as Solvay waste that was disposed of directly in the lake and at other locations along and near the lakeshore are known to contribute calcium, sodium, and

chloride to Ninemile Creek and/or the lake. In addition, naturally occurring salt brine, which was collected and evaporated in the vicinity of Onondaga Lake for many years, affects both groundwater and nearby surface water quality. Naturally occurring salt springs also discharge to Onondaga Creek, contributing to the salinity of the lake. Natural salt springs present near the lake result in saline wetlands.

3.3 SEDIMENT PHYSICAL CHARACTERISTICS

As part of the various design-related investigations, data was obtained to characterize the physical characteristics of the sediments on the bottom of Onondaga Lake. Parameters such as particle size distribution, *in situ* solids content, and sand content are important parameters for many of the engineering evaluations and calculations associated with the dredging and pumping of the sediments (e.g., size of dredge required, horsepower of conveyance line booster pumps, etc), as well as for assessment of potential preconditioning steps, such as sand removal and coagulant addition.

Much of the sediment in the littoral area of the lake consists generally of fine silts and clays, sand, and shell fragments. High concentrations of calcite exist within the littoral sediments of the lake as a result of the past and present input of naturally calcitic sediments from the tributaries and from the former Allied (now Honeywell) Main Plant that operated from 1884 to 1986. Additionally, erosion from the settling basins along the shoreline contributes calcium carbonate and calcite to the lake.

Oncolites, a form of calcite, are found in the littoral sediments of the lake. Oncolites are small, oval or irregularly rounded, calcareous concretions that resemble elongated pebbles. Made up of calcium carbonate and a small fraction of organic material, they are found throughout the littoral sediments of the lake, especially along the northeast, north, and northwest shorelines.

The ILWD represents a historic depositional area within the littoral zone in the southwest corner of Onondaga Lake. This area was formed primarily through the precipitation of calcite (calcium carbonate) from the overflow of dikes around Settling Basin B and discharges via the East Flume.

During the RI and design-related investigation field activities, several rounds of sediment sampling were conducted to characterize the physical properties of the sediment that is to be dredged and/or capped. Physical characteristics of sediment, updated through the Phase III PDI, are summarized in Table 3.1 and are presented in greater detail in Appendix A. The summary statistics presented on Table 3.1 are not area- nor volume-weighted. For the purposes of this IDS Report, data collected from the top 2 meters of sediment have been used to generate these statistics. This depth was chosen for preliminary design evaluations because it generally represents the limits of dredging based on achieving the remedial objectives. As dredging areas and depths are finalized, this data will be re-evaluated and revised to more accurately represent the sediment that is to be dredged. In all areas, sediment conditions can vary significantly. However, physical sediment conditions of the Remediation Areas can be generalized as follows:

Remediation Area A – Remediation Area A includes the outlet of Ninemile Creek into Onondaga Lake, which significantly impacts the characteristics of the sediment in the area. Being largely a depositional area for Ninemile Creek sediments, the average percent sand in this area is 32% with an average fines (i.e., silt and clay) content of approximately 65%. Gravel content is generally low, with an average content of approximately 2.8%. In addition, the material typically has low plasticity.

Remediation Area B – In general, sediment in Remediation Area B is comprised of eroded and/or crusty Solvay waste material in the immediate nearshore areas. Additionally, data pertaining to the physical characteristics of this sediment will be collected in future design-related investigations

Remediation Area C – Sediment in Remediation Area C contains relatively higher gravel content (i.e., approximately 11%), as compared to Remediation Areas A and D. The percent sand averages around 29%, of which approximately two-thirds is fine sand (0.075mm - 0.425mm). Percent fines in the area averaged 60% with two-thirds being silt-sized particles. In addition, the material in this area typically has low plasticity.

Remediation Area D – Remediation Area D is comprised of the ILWD. Solvay waste material is predominant throughout the area, although some areas have an overlying layer of natural sediments. The physical properties of the ILWD material can vary significantly, ranging from extremely soft consistency to extremely hard crusty material. Data summarized in Table 3.1 show the grain-size distribution of the Solvay waste particles. The waste material consists primarily of silt-sized particles, but also includes sand-sized and crusty coarse gravel-sized material. The grain-size data do not include the crusty ILWD material. The particle size of this material will depend on how it breaks down during dredging.

Remediation Area E – Remediation Area E includes the outlet of Onondaga Creek, and represents the leeward end of the lake. On average, this material consists of approximately 20% gravel, 40% sand (predominantly fine sand), 40% silts and clays (predominantly silt). In addition, the majority of the sediment in this area has no to low plasticity.

3.4 SEDIMENT CHEMICAL CHARACTERISTICS

In addition to the physical characteristics of the sediments, design-related investigations also focused on characterizing the chemical characteristics of the sediments to be dredged (i.e., the concentrations in sediment of the various CPOIs). Sediment chemical characteristics are used herein to identify preliminary remedial areas, to assess the potential for emission and odor generation, as well as to help characterize the SCA effluent routed to the Honeywell WTP, and will be used in the Sediment Capping and Dredge Area & Depth IDS to define cap areas and dredged areas and depths.

Chemical characteristics of sediments to be dredged can vary significantly, not only by Remediation Area, but also within any given Remediation Area. This heterogeneity is especially predominant in Remediation Area D, where order-of-magnitude differences in concentrations for various contaminants within an individual core or boring are not uncommon. Table 3.2 presents a general summary of chemical data collected as part of the RI and design-related investigations

in the top 2 meters. A generalized description of the chemical characteristics within each remediation area is as follows:

Remediation Area A – Remediation Area A contains sediment with the highest mercury concentration compared to the other remediation areas, as a result of the sediment deposited from Ninemile Creek. Average concentrations of other contaminants, including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), are relatively low in this Remediation Area.

Remediation Area B – Remediation Area B is the area offshore of Settling Basins 1-8, which is the primary source of contamination to this area. The settling basins and the sediment immediately adjacent to shore are primarily made up of Solvay waste and are characterized by its high carbonate content. As a result, the sediment in Remediation Area B has a high pH (11.0). Sediments in Remediation Area B contain moderate concentrations of BTEX compounds and naphthalene. Average contaminant concentrations are generally lower than Remediation Area D.

Remediation Area C – Sediment in Remediation Area C contains high concentrations of most contaminants within the top 1 meter, however, concentrations drop significantly in the 1-2 meter depth. Naphthalene, ethylbenzene, xylenes, and ammonia are present in relatively high average concentrations in this Remediation Area within the top 1 meter.

Remediation Area D – Except for mercury, sediment in Remediation Area D has the highest average concentration for all the chemicals of concerns among all the remediation areas. The sediment in this area is made up primarily of Solvay waste and has a high pH (11). Remediation Area D sediment contains high average concentrations of BTEX, chlorobenzene, dichlorobenzene, naphthalene, and ammonia.

Remediation Area E – Sediment in Remediation Area E contains moderate concentrations of most of the chemicals of concern, including chlorobenzene, dichlorobenzene, mercury, and naphthalene. Concentrations, on average, are less than those found in Remediation Area D, and concentrations within the area trend downward with distance from the border with the Remediation Area D.

3.5 SHORELINE CHARACTERISTICS

Completion of the Onondaga Lake remedy may necessitate utilization of specific shoreline areas for operational support, and removal of shoreline soils/sediments along specific stretches which may require land-based access, and may cause temporary shoreline disturbances in specific areas. To help assess appropriate means and methods for completion of the various remedial tasks, and to ensure that the remedy can be completed without causing impacts to particularly sensitive areas, characterization of the shoreline is necessary.

The riparian zone (shoreline) of Onondaga Lake consists of maintained, natural, and disturbed areas. The City of Syracuse is located at the southern end of Onondaga Lake, and numerous towns, villages, and major roadways surround the lake. The eastern shore of Onondaga Lake is urban, while the northern shore is dominated by parkland, wooded areas, and wetlands. The northern upland areas in Liverpool and Lakeland are mainly residential, with

interspersed urban structures and several undeveloped areas. Much of the western and southern lakeshore is covered by Settling Basins that received wastes generated from Honeywell's predecessor Allied Signal, Solvay operations. These Settling Basins contain a mix of wetland and terrestrial plant communities typical of disturbed areas.

Five NYSDEC-mapped wetlands occur along or near Onondaga Lake's shoreline. These wetlands are located as follows: near the mouth of Sawmill Creek (SYW-1), near the mouths of Harbor Brook (SYW-19), Ley Creek (SYW-12), Ninemile Creek (SYW-10), and along the northwest portion of the lake (SYW-6) (Figure 1.2).

Immediately ashore of Remediation Areas A and B lie Settling Basins 1-8. The shoreline is characterized by flat plateaus of Solvay waste material at or slightly above lake water level. These plateaus vary in degree of stability, however, access roads have been installed along much of this shoreline area in support of RI activities for the Settling Basin 1-8 site. The plateaus give way to slopes of exposed Solvay waste material. In general, the shoreline along Remediation Areas A and B contains sparse on-land and in-water vegetation.

Remediation Area C is comprised of two separate areas, each with unique shoreline features. The northern portion of Area C lies immediately offshore of a small parcel of land owned by Onondaga County, southwest of Settling Basins 1-8, and northeast of the Willis-Semet site. This parcel of land is used as a public access boat launch area. The rocky shoreline transitions into very shallow waters which are fairly densely populated with aquatic vegetation. Upland areas are generally maintained, and gravel access roads generally follow the shoreline. The southern area of Remediation Area C lies immediately adjacent to the Willis-Semet IRM Barrier Wall. The previous shoreline has been replaced with the sheet-pile barrier wall, which essentially forms a bulkhead along the shore. Water depths are fairly deep adjacent to this barrier wall.

The shoreline upland of Remediation Area D varies significantly from north to south. The northwest portion of the Remediation Area lies immediately adjacent to the Willis Semet IRM barrier wall. The previous shoreline has been replaced with the sheet-pile barrier wall, which essentially forms a bulkhead along the shore. On the western-most stretch of this wall the lake is relatively deep, and is relatively shallow moving eastward. The remaining portions of the shoreline along Remediation Area D consist primarily of heavily vegetated, low-lying areas. Most of the shoreline of this area will be modified as part of the Settling Basin B / Harbor Brook IRM. Details pertaining to the future shoreline conditions will be developed as part of a separate design effort.

Shoreline conditions of Remediation Area E are predominantly thickly vegetated low-lying areas and wetlands. Both Harbor Brook and Onondaga Creek discharge into this Remediation Area. The outlet of Harbor Brook is currently surrounded by Wetland SYW-19 and other low-lying areas which are intermittently submerged during high water events. The CSX railroad hugs the shoreline for most of this area, leaving only a thin strip of land between the rail tracks and the shoreline. The shoreline of the northeastern portion of the Remediation Area is comprised of Wetland Area SYW-12.

3.6 LAKE BATHYMETRY AND WATER ELEVATIONS

Accurate lake bathymetry and water elevation data are critical for sediment dredging and capping projects. The debris removal strategy, dredge methodology and selection, and viability assessment of silt curtains are all influenced by water depths and elevations. Beyond the scope of this IDS Report, capping and habitat considerations can also be significantly influenced and dictated by water depths, as will be discussed in the Sediment Capping and Dredge Area & Depth IDS.

Geophysical and bathymetric surveys of Onondaga Lake were performed by CR Environmental, Inc. as part of Honeywell's Phase I PDI (Parsons, 2005) as documented in *Onondaga Lake Phase I Pre-Design Investigation Geophysical Survey Report* (CR Environmental, 2007). Four different types of surveys were conducted as part of the Phase I PDI: (1) bathymetric survey to identify the lake bottom surface; (2) side-scan sonar to characterize debris, obstructions, and other surficial features of the lake bottom; (3) sub-bottom profiling to supplement the assessment subsurface stratigraphy; and (4) magnetometer data to identify fired debris and obstructions containing iron within or on top of the lake sediments.

A 1-ft contour interval bathymetric map of Onondaga Lake was generated from the 2005 data set (Figures 3.6a and b). The data reveal that the lake has two main basins. The larger southern basin (minimum elevation 298 ft NAVD88) is slightly deeper than the northern basin (minimum elevation 302 ft NAVD88). Volume and surface area calculations for the lake were conducted using Surfer V.8.1 by comparing the bathymetric grid surface to the shoreline elevation of 362.82 ft. The volume of the lake is approximately 112,740 acre-ft. The planar area of the lake is approximately 2,952 acres. The surface area of the lakebed is slightly greater than the surface area due to irregular morphology, and was calculated as approximately 2,956 acres.

Results of the bathymetric and geophysical surveys (which identified bathymetric contours and potential wreckage, debris, pipelines, outfalls, anomalies, and other structures) are discussed in Section 4.2

3.7 WATER QUALITY

Water quality within Onondaga Lake can vary significantly due to natural events such as rain storms and other weather events. While in-lake remedial activities are being conducted, water quality will be monitored to ensure that unacceptable impacts are not being created by the remedial activities. To develop the baseline range of water quality conditions within the lake for an accurate benchmark for comparison during remediation, data pertaining to various water quality parameters has been collected and evaluated.

The northern two-thirds of the lake are currently classified by the State of New York as Class B waters, while the southern third of the lake and the area at the mouth of Ninemile Creek are classified as Class C waters. Best usages for these waters are defined as:

- Class B – "primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival" (6 NYCRR Part 701.7).

- Class C – "fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation although other factors may limit the use for these purposes" (6 NYCRR Part 701.8).

Water quality in Onondaga Lake has been impaired by many years of industrial pollution and wastewater discharges. In general, the lake contains high levels of phosphorus, ammonia, and nitrate, which all contribute to the lake reaching anoxic conditions on a yearly basis. Recent and continuing upgrades to Syracuse's wastewater collection and treatment systems have led to improving water quality.

Limited water quality sampling was completed as part of the RI. At that time, surface water concentrations of specific metals, including mercury, methylmercury, barium, cadmium, copper, cyanide, lead, manganese, and zinc were found in exceedance of New York State surface water quality criteria (TAMS, 2002). Distribution of mercury in the water column follows seasonal patterns, with concentrations of both mercury and methylmercury building up in the hypolimnion during summer stratification.

Other parameters such as ammonia, phosphorus, sulfide, chloride, salinity, dissolved oxygen, and water transparency were also measured during the RI. Concentrations of ammonia, phosphorus, and sulfide followed a similar pattern to total mercury and methylmercury, increasing in the hypolimnion during seasonal stratification. New York State Narrative Water Quality Standards (6 NYCRR Part 703.2) for turbidity and suspended, colloidal and settleable solids were exceeded in RI sampling results (TAMS, 2002).

Turbidity in Onondaga Lake can vary significantly throughout the year, under various weather conditions, and between various areas in the lake. For example, the southeast portion of the lake in the area of Remediation Area E, represents the predominantly leeward end of the lake, and as a result becomes turbid on windy and stormy days. On calm days, water clarity can be good in shallow areas. Each year on a quarterly basis, the Onondaga County Department of Water Environment Protection collects and analyzes water quality samples from various areas of the lake. Parameters monitored in the littoral area of the lake include turbidity and temperature. Onondaga County provides annual updates of results for public consideration (OCDWEP, 2007).

3.8 AQUATIC WILDLIFE AND HABITAT

Although existing wildlife and habitat conditions are more applicable to assessments being conducted under the Sediment Capping and Dredge Area & Depth IDS, baseline wildlife and habitat community information is critical for ensuring that remedial activities account for any particularly sensitive biological populations or habitat areas.

Onondaga Lake currently supports a variety of plants and animals in various areas of the lake. Existing biological communities within and near Onondaga Lake include aquatic macrophytes, fishes, amphibians, reptiles, mammals, and endangered, threatened and rare plant and animal species as listed below.

- Aquatic macrophytes: Seventeen species of macrophytes including coontail, common waterweed, water star grass, water milfoil, pondweed, and sago pondweed were identified in 2005 (Madsen *et al.*, 1993,1996a,-b).
- Fishes: Species present include desirable sport fish such as largemouth bass, smallmouth bass, and walleye. Brown trout and sturgeon have also been documented. Panfish, such as yellow perch, pumpkinseed sunfish, and bluegill sunfish, are abundant in the nearshore areas (EcoLogic *et al*., 2006).
- Amphibians and Reptiles: Species include frogs, toads, salamanders, turtles, aquatic and terrestrial snakes.
- Mammals: Mammalian species that occur near Onondaga Lake include opossums, shrews, rodents, chipmunks, squirrels, woodchucks, muskrats, raccoons, skunks, and deer.
- Endangered, threatened and rare species: Rare plant species include Sartwell's sedge, hairy small-leaved tick-trefoil or little-leaf tick-trefoil, and red pigweed.

Two major habitat types comprise the littoral zone: submerged macrophytes and unconsolidated bottom. The submerged macrophyte habitat is characterized by the presence of plants that grow entirely under water or have leaves that extend to and float on the water surface. Unconsolidated bottom habitats are characterized by the lack of vegetation.

No restrictions or limitations on remediation activities due to the identified biological communities and habitats which may exist in or around the lake have been identified other than those associated with wetland protection as listed in Table 2.1.

3.9 WEATHER AND CLIMATE CONDITIONS

Weather and climate data and conditions are used in several evaluations and assessments within this IDS Report. For example, temperature and precipitation data influence assumptions on the number of average working days available during the year, and wind data is utilized in the viability assessment of silt curtains. Additionally, climate data are used in dispersion modeling analysis, which may be completed on point-of-dredge emissions.

Climate conditions in Syracuse pose limitations on the on-lake activities associated with the Onondaga Lake remediation. In general, Onondaga Lake freezes over on a yearly basis, freezing over as early as mid-December, and thawing as late as early April. Table 3.3 presents lake freezing data collected over the past 20 years as part of Onondaga County's ambient monitoring program (OCDWEP, 2007). To date, design-related investigation activities generally experienced difficulties conducting on-water activities beyond mid- to late-November, as freezing water frequently ices up equipment and creates unsafe working conditions. Average winter temperatures fall as low as 15° F for the months of January and February. On average, Syracuse receives 115 inches of snow per year. Average highs during summer are around the low 80s, however, highs in the mid-80s to mid-90s are common.

Meteorological data are collected at several locations in the area. As part of the design-related investigations, Honeywell installed two meteorological monitoring stations to collect

weather data. The first station, located on Settling Basin 13, began collecting data on December 1, 2005. The second station, located on the Willis Avenue site immediately adjacent to I-690 across from Remediation Area C, began collecting data on December 1, 2006. Additionally, weather data is collected from a monitoring station at the Syracuse Airport, located approximately 5.5 miles from Onondaga Lake. Tables presented in Appendix B summarize the data collected from the two site-specific towers, as well as the Syracuse Airport tower over the past 3 years. Summarized data includes wind direction and speed, temperature, dew point temperature, relative humidity, solar radiation, barometric pressure, and rain. Data in these tables has been summarized into monthly averages, and hourly minimum and maximum values. Figures presented in this appendix summarize the wind roses developed from wind data collected at these locations. As shown in these figures, winds measured at the Settling Basin 13 tower vary slightly from the lakeshore tower. However, all three sources demonstrate a predominant wind direction originating from southwest to northwest directions.

3.10 WAVE / LAKE CURRENT CONDITIONS

With any water-based dredging operation, a thorough understanding of wave heights and lake currents is required. Specific planning aspects such as dredging sequencing and silt curtain deployment configurations can both be heavily influenced by these conditions. Additionally, coordination of dredging and capping operations is also influenced by these conditions, and will be further evaluated as part of the Sediment Capping and Dredge Area & Depth IDS.

Wave heights of half a foot have been measured in Remediation Area D (Owens et al., submitted). Additionally, annual wind-generated wave heights of approximately 1-2 ft were predicted to occur in the southern basin based on historic average wind speeds. More detailed evaluation is currently being conducted to assess available wave and current data to determine if sufficient data exists to further characterize lake current and wave heights within the lake. The results of any detailed characterization will be included in future design documents. Wave heights will be calculated for various areas of the lake, based on average and maximum wind speeds. This evaluation is being conducted in support of the Sediment Capping and Dredge Area & Depth IDS to evaluate erosion protection requirements, and will be presented in that IDS Report.

The circulation of the water within the lake is generated by wind speed and direction, tributary inflows, the outflow at the northern end of the lake, shoreline configuration, and stratification (Parsons 2004). Currents at the water surface tend to move in the direction of the wind except close to shore, where currents move water parallel to the shoreline (Owens and Effler 1996). General current velocity is greatest when winds are situated along the major axis of the lake basin (northwest to southeast, in a counter-clockwise direction). Although the current flow is complex and variable, the prevailing current direction is generally counter clockwise in response to prevailing westerly wind direction.

3.11 GEOPHYSICAL SURVEYS

As part of the design-related investigation, geophysical survey work was conducted, consisting of a side-scan sonar and magnetometer survey. Side-scan sonar equipment is used to detect debris and obstructions that project above the sediment surface (or mudline), while

magnetometer tools can detect contacts containing iron or debris that has been fired (such as bricks) that are located either at or below the mudline. The survey methodologies, limitations, and data results are discussed in greater detail in the debris and utility management discussion in Section 4.2.

3.12 CULTURAL RESOURCES

Previous archaeological and geophysical work has been undertaken in and around Onondaga Lake. In 2004, the Public Archaeology Facility of SUNY Binghamton carried out a Phase IA Cultural Resource Assessment of the Onondaga Lake Site (PAF, 2004). This work recommended a Phase IB archaeological survey be executed in Onondaga Lake and along the shoreline due to the high potential that those areas may contain historic cultural resources. In 2005, CR Environmental of Falmouth, Massachusetts conducted a remote sensing survey of the lake bottom (CR Environmental, 2007). This effort recorded side-scan sonar, magnetometer, bathymetry, and sub-bottom sonar data primarily in support of the remedial design effort.

The Lake Champlain Maritime Museum (LCMM) under subcontract to Parsons has prepared a Phase 1B Underwater Archaeological Resources Work Plan for the Onondaga Lake Bottom (Parsons and LCMM, 2008). The analysis of the geophysical survey data, previous archaeological surveys, archival information and aerial imagery undertaken during work plan preparation, revealed 51 areas within Onondaga Lake that could potentially represent archaeological resources. Twenty-six of the targets are located in or within 100 ft of a currently anticipated remediation (e.g. dredge and/or isolation cap) area. These include:

- 4 wrecks;
- 7 possible wrecks;
- 5 areas of shoreline infrastructure; and
- 11 inconclusive objects.

Public Archeology Facility (PAF) under subcontract to Parsons has prepared a Phase 1B Archeological Work Plan (Parsons and PAF, 2008) that includes the shoreline archeology survey recommended in the Phase 1A Report, along with similar activities for several of the upland sites. Remediation along the edge of Onondaga Lake is limited to the southwestern and western shorelines. However, the majority of the shoreline within Remediation Areas B through E has undergone substantial modifications during the 19th and early 20th centuries, including large areas of made land (also known as reclaimed lots). The area along the western side of Lake View Point, adjacent to Remediation Area A, does not appear to have been impacted by 20th century modifications to the shoreline. In addition, borings taken off of the shore of Ninemile Creek suggest that there may be intact soil horizons buried beneath accumulated alluvial sediments.

The Phase 1B Archeological Work Plan (Parsons and PAF, 2008) for this area includes supplemental background research as well as subsurface testing. Supplemental background research will investigate further the documented prehistoric sites around Ninemile Creek, as well as other sites around the lakeshore. Because three possible mounds were previously identified in the vicinity of Ninemile Creek and Onondaga Lake, additional research will be undertaken.

Subsurface testing along the immediate shoreline adjacent to remediation areas will gauge the potential for sites to be located submerged below the water within Remediation Area A. Additionally, testing along the lakeshore will help to assess if prehistoric activities in these areas may date to the time periods when the lake level was lower and the submerged shoreline may have been exposed.

Implications of potential cultural resources on lake remedial design activities will be addressed as part of the Final Design following completion of the Phase 1B Archeological Survey. As part of the Cultural Resource Assessments discussed above, Honeywell and the USEPA will continue to coordinate with the Onondaga Nation to ensure that the execution of the assessments, and any subsequent actions, are conducted in recognition of the historic and cultural significance of the lake and surrounding areas to the Nation.

TABLE 3.1
ONONDAGA LAKE SEDIMENT PHYSICAL CHARACTERISTICS

Remediation Area (Top 2m within Dredging Zone)	Parameters	Water Content %	Percent Gravel %	Percent Sand %	Percent Fines (Silt and Clay) %	Percent Silt %	Percent Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Specific Gravity	Organic Content %	Carbonate Alkalinity %
Remediation Area A	Average	79	2.8	32.0	65.2	54.0	11.2	46	34	12	2.71	3.3	
	Max	122	51.6	62.0	97.0	87.0	29.0	53	40	18	2.75	4.1	
	Min	36	0	3.0	19.8	18.0	1.8	Non-Plastic			2.65	2.9	
	Standard Dev (s)	19	11.0	16.8	19.4	17.9	6.2	5.0	3.4	3.2	0.06	0.7	
	Number of Samples	25	22	22	22	22	22	6	6	6	3	3	
	Average+1.96s	117	24.3	64.9	103.3	89.0	23.4	56	41	19	2.82	4.6	
	Average-1.96s	41	-18.8	-0.9	27.2	19.0	-0.9	36	27	6	2.61	2.0	
Remediation Area C	Average	80	11.1	28.8	60.2	40.1	20.1	42	31	11	2.73		
	Max	105	28.9	37.5	79.4	54.7	24.7	44	31	14	2.76		
	Min	64	0	17.3	38.2	19.8	12.8	39	30	8	2.70		
	Standard Dev (s)	14	12.0	6.3	15.3	13.7	4.6	3.5	0.7	4.2	0.03		
	Number of Samples	11	7	7	7	7	7	2	2	2	3		
	Average+1.96s	108	34.6	41.2	90.1	67.1	29.1	48	32	19	2.79		
	Average-1.96s	52	-12.5	16.3	30.2	13.2	11.1	35	29	3	2.67		
Remediation Area D	Average	149	1.3	13.7	84.9	64.2	20.5	61	40	20	2.54	7.4	58.8
	Max	242	36.0	78.0	99.7	98.2	44.0	161	88	112	2.75	15.7	83.0
	Min	19	0	0.3	17.2	12.6	1.5	Non-Plastic			2.02	2.9	30.0
	Standard Dev (s)	47	5.2	16.1	18.1	16.3	10.0	31.5	12.1	22.9	0.10	3.9	9.0
	Number of Samples	113	125	125	124	122	122	103	103	103	93	16	80
	Average+1.96s	242	11.5	45.3	120.3	96.1	40.0	122.4	64.0	65.3	2.74	14.9	76.4
	Average-1.96s	57	-8.9	-17.9	49.5	32.2	1.0	-1.2	16.7	-24.6	2.34	-0.2	41.2
Remediation Area E	Average	65	19.1	40.5	40.4	32.4	8.3	49.8	32.8	17.0	2.59	2.8	60.3
	Max	251	70.5	93.8	98.6	91.0	49.7	138.0	43.0	99.0	2.70	12.2	67.9
	Min	29	0	1.4	0.9	0.3	0	Non-Plastic			2.35	0.7	56.2
	Standard Dev (s)	31	24.3	28.7	26.9	21.1	8.3	27.2	5.1	24.0	0.08	2.8	4.9
	Number of Samples	83	95	95	95	94	94	15	15	15	24	14	9
	Average+1.96s	125	66.8	96.7	93.1	73.9	24.6	103.0	42.7	64.1	2.74	8.4	70.0
	Average-1.96s	6	-28.5	-15.8	-12.3	-9.0	-8.0	-3.4	22.9	-30.0	2.43	-2.8	50.7

TABLE 3.2
ONONDAGA LAKE SEDIMENT CHEMICAL CHARACTERISTICS SUMMARY
Data set includes RI, PDI Phase I, II and III data, and represents length-weighted averages within each 1-meter interval.

Depth Interval	Remediation Area	Parameter	Units	Number of Observations	Average	90th Percentile	Maximum
0 - 2m	A	Benzene	mg/kg	15	0.04	0.2	0.3
		Chlorobenzene	mg/kg	15	0.04	0.2	0.2
		Dichlorobenzene	mg/kg	17	0.1	0.3	0.3
		Ethylbenzene	mg/kg	15	0.03	0.2	0.2
		Mercury	mg/kg	19	13	59	79
		Naphthalene	mg/kg	17	0.04	0.2	0.2
		NH_3N	mg/kg	16	97	302	341
		pH	---	16	7.3	8.5	8.9
		Total SVOC	mg/kg	9	1.3	2.6	2.6
		Toluene	mg/kg	15	0.04	0.2	0.2
		Total VOC	mg/kg	15	0.6	2.8	3.4
		Total Xylenes	mg/kg	15	0.3	1.4	1.8
	B	Benzene	mg/kg	10	2.1	9.9	10.3
		Chlorobenzene	mg/kg	10	0.4	1.4	1.4
		Dichlorobenzene	mg/kg	10	0.4	1.2	1.2
		Ethylbenzene	mg/kg	10	0.3	0.9	0.9
		Mercury	mg/kg	10	0.2	0.6	0.7
		Naphthalene	mg/kg	10	2.8	14	14
		NH_3N	mg/kg	6	85	*N/A*	164
		pH	---	8	11	*N/A*	12
		Total SVOC	mg/kg	8	5	*N/A*	18
		Toluene	mg/kg	10	1.6	6.9	7.1
		Total VOC	mg/kg	10	11	45	48
		Total Xylenes	mg/kg	10	3.3	21	23
	C	Benzene	mg/kg	20	1.8	2.2	30
		Chlorobenzene	mg/kg	20	0.3	1.1	2.9
		Dichlorobenzene	mg/kg	20	17	1	345
		Ethylbenzene	mg/kg	20	3.6	1	71
		Mercury	mg/kg	20	0.5	2.0	3.1
		Naphthalene	mg/kg	20	658	38	13105
		NH_3N	mg/kg	10	89	414	441
		pH	---	10	8.1	12	13
		Total SVOC	mg/kg	20	256	589	4080
		Toluene	mg/kg	20	0.4	1.0	6.9
		Total VOC	mg/kg	20	703	39	14000
		Total Xylenes	mg/kg	20	16	1	325
	D (ILWD)	Benzene	mg/kg	216	6.6	13	169
		Chlorobenzene	mg/kg	216	46	93	3005
		Dichlorobenzene	mg/kg	216	96	167	8249
		Ethylbenzene	mg/kg	216	10.1	12	751
		Mercury	mg/kg	207	10	30	62
		Naphthalene	mg/kg	215	149	269	1048
		NH_3N	mg/kg	137	351	1036	1935
		pH	---	173	11	12	13
		Total SVOC	mg/kg	161	36	67	466
		Toluene	mg/kg	216	11	25	271
		Total VOC	mg/kg	216	384	758	13456
		Total Xylenes	mg/kg	216	48	116	406
	E	Benzene	mg/kg	60	0.2	0.3	2.7
		Chlorobenzene	mg/kg	60	1.8	3.9	34
		Dichlorobenzene	mg/kg	60	1.4	4	21
		Ethylbenzene	mg/kg	60	0.2	0.8	4.2
		Mercury	mg/kg	60	3.9	16	43
		Naphthalene	mg/kg	60	4.7	19	62
		NH_3N	mg/kg	35	150	241	838
		pH	---	45	7.4	7.7	8.0
		Total SVOC	mg/kg	50	63	169	377
		Toluene	mg/kg	60	0.2	0.5	8
		Total VOC	mg/kg	60	10	41	123
		Total Xylenes	mg/kg	60	1.1	1.8	35

TABLE 3.3
SUMMARY OF ANNUAL ICE COVERAGE ON ONONDAGA LAKE

Winter	Date Ice First Recorded	Date Ice Last Reported	Approximate Days of Ice Cover, North Basin	Approximate Days of Ice Cover, Lakewide
87-88	12/31/87	3/28/88	70	20
88-89	12/12/88	3/22/89	75	9
89-90	12/6/89	3/14/90	90	30
90-91	12/27/90	3/4/91	54	6
91-92	12/19/91	3/25/92	59	19
92-93	12/14/92	4/9/93	76	13
93-94	12/23/93	4/4/94	78	18
94-95	12/12/94	3/16/95	53	5
95-96	12/13/95	3/6/96	32	11
96-97	1/9/97	2/27/98	47	19
97-98	12/31/97	2/11/98	15	0
98-99	12/23/98	3/29/99	62	12
99-00	1/17/00	unknown	42	28
00-01	12/26/00	4/6/01	100	88
01-02	1/8/02	2/20/02	2	2
02-03	1/13/03	3/26/03	42	40
03-04	1/9/04	3/26/04	88	78
04-05	12/20/04	4/1/05	73	72
05-06	12/14/05	3/13/06	23	14
06-07	1/22/07	3/30/07	69	64

Source: Onondaga Lake Ambient Monitoring Program, 2006 Annual Report (http://www.ongov.net/WEP/we15.html) page 2-117