INTERIM REMEDIAL MEASURE CONSTRUCTION COMPLETION REPORT

EAST WALL PORTION OF THE WASTEBED B/ HARBOR BROOK IRM

County of Onondaga, New York

Prepared for:

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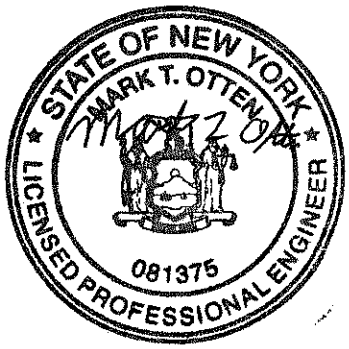
MAY 2014

CERTIFICATIONS

I, Mark T. Otten, certify that I am currently a New York State registered professional engineer. I had primary direct responsibility for implementation of the subject construction program, and I certify that the Remedial Design was implemented and that all construction activities were completed in substantial conformance with the Department-approved Remedial Design.[1]



NYS Professional Engineer #81375	5/2/14	Mark T Otten
	Date	Signature

1 This certification statement is required under Section 1.5 of the NYSDEC Program Policy DER-10: Technical Guidance for Site Investigation and Remediation, issued May 3, 2010 and shall be interpreted using the definitions of scope and responsibility provided in Section 1.5 of DER-10, particularly subsections 1.5(b)3. This certification was reviewed and signed in accordance with the provisions of New York Board of Regents Rule 29.3.

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LIST OF ACRONYMS

AOS	areas of study
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CM	construction manager
CME	CME Associates
CQA	construction quality assurance
CQAP	Construction Quality Assurance Plan
CY	cubic yards
DNAPL	dense non-aqueous phase liquid
DUSR	Data Usability Summary Reports
EE/CA	Engineering Evaluation/Cost Analysis
ECs/ICs	engineering and institutional controls
FCF	field change form
FRP	fiberglass reinforced pipe
ft.	feet
G.E.	geotechnical engineer
IRM	interim remedial measure
JPW	JPW Riggers & Erectors, Inc.
LF	linear feet
LLDPE	low linear density polyethylene
$\mu g/m^3$	micrograms per cubic meter
NAPL	non-aqueous phase liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OMM Plan	Operation, Maintenance and Monitoring Plan
OSHA	Occupational Safety and Health Administration
P.E.	professional engineer
PID	photoionization detector
PM	project manager
ppm	parts per million
PSP	Project Safety Plan

QA/QC	quality assurance/quality control
RAD	Response Action Document
SES	Sevenson Environmental Services, Inc.
SHSO	Site Health and Safety Officer
SWPPP	Stormwater Pollution Prevention Plan
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds
WBB/HB	Wastebed B/Harbor Brook

SECTION 1

INTRODUCTION

1.1 BACKGROUND AND SITE DESCRIPTION

Honeywell International Inc. (Honeywell) entered into an Order on Consent (Index #D7-0008-01-09) with the New York State Department of Environmental Conservation (NYSDEC), to perform an Interim Remedial Measure (IRM) on a 90-acre property located in the City of Syracuse and the Town of Geddes, New York, known as the Wastebed B/Harbor Brook (WBB/HB) Site. The WBB/HB site includes Harbor Brook, the Lakeshore Area, the Penn-Can Property, the Railroad Area and two additional areas of study (AOS) as shown on Figure 1.1. The Order on Consent, effective November 25, 2003, required an IRM to address migration of site contaminants into Harbor Brook and Onondaga Lake.

The location of the barrier wall required by the Order on Consent was to be determined as part of the WBB/HB IRM design. The location of the East Wall in proximity to Lower Harbor Brook was evaluated in the Engineering Evaluation/Cost Analysis (EE/CA) IRM (O'Brien and Gere, April 2010). The EE/CA recommended a barrier wall with temporary relocation of Lower Harbor Brook. NYSDEC and the Unites States Environmental Protection Agency (USEPA) subsequently issued a Response Action Document (RAD) (NYSDEC & USEPA, May 2011) authorizing the option recommended in the EE/CA.

The East Wall portion of the WBB/HB site is located in the County of Onondaga, New York and is identified as a portion of the following parcels on the Onondaga County Tax Maps:

- Tax Map No. 114-2-34, Liber 2562, Page 243 (City of Syracuse)
- Tax Map No. 114-2-42, Liber 324, Page 441 (Solvay Process Company)
- Tax Map No. 114-2-43, Liber 2024, Page 275 (Allied Chemical Corporation)

The East Wall site is situated at the east end of the Lakeshore Area and in AOS #1. It is bounded by Onondaga Lake to the north, I-690 and railroad tracks to the south, railroad tracks to the east, and the Lakeshore Area to the west (see Figure 1.1). The site boundaries are detailed in the land title survey provided in Appendix A. This Construction Completion Report (CCR) addresses the East Wall which is a continuation of the work performed under the WBB/HB IRM (i.e., Willis/Semet and West Wall projects).

An electronic copy of this CCR with all supporting documentation is included as Appendix B.

FIGURE 1.1

WILLIS WALL
48" SEWER
72" SEWER
FORMER PIER
FORMER OVERHEAD CONVEYOR
UPPER EAST FLUME
LOWER EAST FLUME
DSA 1
DSA 2
WEST WALL
ONONDAGA LAKE
WASTEBED B
WASTEBED C
LOWER HARBOR BROOK
EAST WALL
APPPROXIMATE LOCATION OF FORMER PIPELINE
LAKESHORE AREA
ROUTE 690 DRAINAGE DITCH
PENN-CAN PROPERTY
AOS #1
RAILROAD AREA
AOS #2
WASTEBEDS D,E

LEGEND

- HARBOR BROOK SITE
- DREDGE SPOIL AREA
- ADDITIONAL AREA OF STUDY
- WASTEBEDS

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

SITE PLAN

N
W E
S

0 225 450 900
Feet

Note: Original base map information obtained from O'Brien & Gere Remedial Investigation Report (November 2007), Figure 2.

PARSONS
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(Q:\GIS\Harbor_Brook_RI\Figure_2\SITE_PLAN.mxd)1/10/2008 -- 1:13:03 PM

SECTION 2

INTERIM REMEDIAL MEASURE

2.1 INTERIM REMEDIAL MEASURE (IRM) SUMMARY

This IRM CCR describes the East Wall portion of the WBB/HB IRM construction and presents Engineering Certification of the construction performed to satisfy the Order on Consent as identified in Section 1.0.

The East Wall project included construction of a subsurface steel sheet pile barrier wall and a groundwater collection trench from the eastern terminus of the West Wall, crossing Harbor Brook and extending northeast along the lakeshore for a distance of approximately 1,150 feet (ft.).

2.2 IRM OBJECTIVES

The primary objective of the East Wall project is to contain contaminants in the shallow and intermediate groundwater regimes within the site. The sheet pile barrier wall serves to contain impacted soils and prevent migration of potentially contaminated groundwater and non-aqueous phase liquid (NAPL) to Onondaga Lake. The groundwater collection trench was constructed inboard of the sheet pile barrier wall. The trench captures impacted groundwater along the length of the wall from the shallow and intermediate hydrogeologic units. Groundwater is pumped to the Willis Avenue Groundwater Treatment Plant. The East Wall construction also included re-routing a section of lower Harbor Brook in order to complete installation of the barrier wall.

The specific IRM objectives, as presented in the Order on Consent, are as follows:

- Eliminate, to the extent practicable, within the scope of this IRM, the discharge of contaminated groundwater and NAPL (and collect NAPLs, as feasible) into Harbor Brook and Onondaga Lake.
- Eliminate, to the extent practicable, within the scope of this IRM, the potential human health and ecological impacts associated with site constituents of concern.
- Eliminate, to the extent practicable, within the scope of this IRM, potential impacts to fish and wildlife resources associated with on-going discharges of contaminants of concern from the site.

The East Wall project is part of a larger hydraulic control system consisting of the Willis Avenue/Semet Tar Beds Sites (Willis/Semet) IRM and the Wastebed B/Harbor Brook IRM (West Wall, East Wall and Upper Harbor Brook) to address area groundwater. This system, which includes a sheet pile barrier wall along the Onondaga lake shoreline and a groundwater collection system, was constructed in three phases beginning in 2006 and finishing in 2012. The system was designed and constructed to eliminate, to the extent practicable, the discharge of contaminated groundwater and NAPL to Onondaga Lake from the Southeast Shoreline area of

Onondaga Lake. These IRMs were constructed consistent with the NYSDEC-approved designs. The system prevents the discharge of contaminated groundwater and NAPL to the lake from this area and has addressed the potential for groundwater upwelling to impact the Onondaga Lake sediment cap consistent with the cap design assumptions for this area.

In addition to the above IRMs, a dense non-aqueous phase liquid (DNAPL) collection system was installed along the lakeshore in 1993. The system was expanded to include additional collection wells in 1995 and 2002. In 2012, the system was again expanded and the entire system upgraded and optimized.

2.3 DESCRIPTION OF SELECTED REMEDY

The East Wall construction was completed in accordance with the remedy selected by the NYSDEC in the Order on Consent dated November 25, 2003 and Response Action Document dated May 2011 and included the following components:

- Temporary re-routing of a section of lower Harbor Brook including backfilling of the former Harbor Brook channel
- Replacement of the downstream culvert located in Harbor Brook
- Installation of a sheet pile barrier wall from the eastern terminus of the West Wall crossing Harbor Brook and extending northeast along the lakeshore for a distance of approximately 1,150 ft.
- Installation of a groundwater collection system along the barrier wall to achieve hydraulic control
- Grading and backfilling of portions of WBB
- Site restoration

2.4 REMEDIAL CONTRACTS

Honeywell was ultimately responsible for completing the IRM in accordance with the Order on Consent. The following subsections describe the roles and responsibilities of the other entities.

2.4.1 Regulatory Agency

The NYSDEC was the lead agency for the East Wall IRM. Mr. Tracy Smith was the Project Manager for NYSDEC. During construction, Mr. Smith attended weekly progress meetings and conducted site visits. The construction team coordinated design and field modifications with the NYSDEC. Agency approval correspondences are provided in Appendix C.

2.4.2 Remedial Action Contractor

The Parsons Corporation (Parsons) of Syracuse, NY was the contractor selected by Honeywell to carry out the remedial activities for the IRM. Parsons provided full-time construction management and oversight of the project activities. Some of these responsibilities included: management of remedial action sub-contractors, documentation of daily work activities, review of subcontractor submittals, providing engineering support for design and field

changes, administration of quality assurance oversight and testing through laboratories, coordinating reviews of submittals and work plans, coordination with the NYSDEC and other regulatory agencies, and conducting project meetings.

SECTION 3

REMEDIAL ACTIVITIES

3.1 REMEDIAL ACTIONS PERFORMED

Remedial activities completed at the site were conducted in accordance with the NYSDEC-approved Remedial Design Report, *East Wall Portion of the Wastebed B/ Harbor Brook IRM Final Design Report, June 2011*. All approved field design modifications to the Final Design Report are presented in Section 3.9 of this report. The following subsections describe the construction work performed to complete the IRM.

3.2 GOVERNING DOCUMENTS

Construction was completed under the approved design, which includes the following governing documents:

- *East Wall Portion of the Wastebed B/Harbor Brook IRM Final Design Report,* (Parsons, 2011)
- *Final Stormwater Pollution Prevention Plan (SWPPP), East Wall Portion of the Wastebed B/Harbor Brook IRM*, (Parsons, 2011)
- *Wastebed B/Harbor Brook Site IRM, East Wall and Groundwater Collection System Interim Remedial Measure Work Plan*, (Parsons, 2011)
- *Response Action Document, Wastebed B/Harbor Brook Site* (NYSDEC, May 2011)
- *Engineering Evaluation/Cost Analysis, Interim Remedial Measure, Wastebed B/Harbor Brook Site*, (O'Brien & Gere, April 2010)

Agency-approved correspondence of these documents are provided in Appendix C.

3.2.1 Final Design Report

The East Wall Portion of the *Wastebed B/Harbor Brook IRM Final Design Report* was submitted to the NYSDEC on November 19, 2009 and subsequently approved. The Final Design Report presented the following information:

- Pre-design investigation
- Basis of design
- Subsurface data
- Project schedule
- Summary of permits
- Response to NYSDEC comments
- Construction Quality Assurance and Procedure Plan
- Design calculations

- Design specifications
- Design drawings
- Design issues and construction activities

3.2.2 Site Specific Project Safety Plan

A Project Safety Plan (PSP) was prepared by Parsons to establish mandatory safety practices and procedures for the project. In addition, all subcontractors prepared and submitted their own PSPs to further define their specific tasks.

All remedial work performed under this Remedial Action was in full compliance with governmental requirements, including site and worker safety requirements mandated by the Federal Occupational Safety and Health Administration (OSHA).

The PSP was complied with for all remedial and invasive work performed at the site.

3.2.3 Construction Quality Assurance Plan

A Construction Quality Assurance Plan (CQAP) was prepared and submitted as Appendix L of the *East Wall Portion of the Wastebed B/Harbor Brook IRM Final Design Report* (Parsons, 2011). The CQAP managed performance of the remedial action tasks through designed and documented quality assurance/quality control (QA/QC) methodologies applied in the field and in the lab. The CQAP provided a detailed description of the observation and testing activities that were used to monitor construction quality and confirm that remedy construction was in conformance with the remediation objectives and specifications. Approved deviations from the CQAP are presented in Section 3.9 of this report.

In addition, the Remedial Contractor prepared and submitted a Quality Control Plan which identified their personnel, procedures, instructions, records and forms to be used in the quality control process.

3.2.4 Soil/Materials Management Plan

Management of soil and other materials was governed by the requirements described in the Final Design and Work Plan documents listed in Section 3.2 (a separate Soil/Materials Management Plan was not prepared). Excavated material was observed for signs of visible contamination and was segregated as necessary and stockpiled on-site.

3.2.5 Stormwater Pollution Prevention Plan

The erosion and sediment controls for all remedial construction were performed in accordance with the requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control and the site-specific Stormwater Pollution Prevention Plan (SWPPP). NYSDEC approval of the SWPPP, dated June 15, 2011, is included in Appendix C.

3.2.6 Community Air Monitoring Plan

Community Air Monitoring Plan (CAMP) monitoring is defined as perimeter or fence line monitoring. Fence line monitoring is defined as along the perimeter of Honeywell property or 200 ft. downwind of a work area; whichever distance is less.

Due to the nature of known or potential contaminants at this site, continuous monitoring for volatile organic compounds (VOCs) and particulates was required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities included, but were not limited to, soil/waste excavation and handling, demolition of the Harbor Brook culvert, trenching and the installation of sheet piles.

No exceedences of the VOC or particulate action levels occurred during construction Results of the CAMP monitoring are presented in Section 3.3.8 and Appendix E.

The following sections summarize the CAMP monitoring approach, instruments, action levels, and response measures, etc.

3.2.6.1 VOC Monitoring

VOCs were monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis. Upwind concentrations were measured at the start of each work day and periodically thereafter to establish background conditions. VOC monitoring was performed using two Gas MiniRAE 2000 photoionization detectors (PIDs), one upwind and one downwind. The calibration of the PIDs was checked at least daily for the contaminant(s) of concern or for an appropriate surrogate and when required, a full calibration was performed in accordance with the manufacturer's specifications.

The PIDs calculated 15-minute running average concentrations which were recorded and compared to the VOC action levels specified below:

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceed 5 parts per million (ppm) above background for the 15-minute average, temporarily halt work activities and continue monitoring. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, resume work activities with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, halt work activities, identify the source of the vapors, take corrective actions to abate emissions, and continue monitoring. After these steps, resume work activities provided that the total organic vapor level 200 ft. downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure (whichever is less; but in no case less than 20 ft.) is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, shutdown work activities.

3.2.6.2 Particulate Monitoring

Particulate concentrations were monitored continuously at the upwind and downwind perimeters of the exclusion zone at two temporary particulate monitoring stations, one upwind and one downwind. The particulate monitoring was performed using DataRAM 4 model DR-4000 real-time monitoring equipment capable of measuring particulate matter less than

10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. In addition, fugitive dust migration was visually assessed during all work activities. The particulate levels were compared to the levels specified below:

- If the downwind PM-10 particulate level was 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust was observed leaving the work area, employ dust suppression techniques. Continue work with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust was migrating from the work area.
- If after implementation of dust suppression techniques the downwind PM-10 particulate levels remain greater than 150 $\mu g/m^3$ above the upwind level, stop work and re-evaluate the dust suppression techniques initiated. Resume work provided that dust suppression measures and other controls have reduced the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and prevented visible dust migration.

Since many particulate monitoring instruments operate on nepholometric principles, they can record false positive results during certain atmospheric conditions. For this reason, particulate monitoring was suspended during periods of:

- Steady rain
- Heavy fog, where dust suppression methods preclude visible dust emissions and prior results indicate that dust suppression measures for controlling particulate migration are adequate
- Site activities that did not generate particulate containing hazardous constituents

3.2.6.3 Odors

The site-specific PSP directed that all projects must consider the potential for off-site odors that could result in complaints by the public when disturbing contaminated materials. The project team did not receive odor complaints associated with the East Wall construction.

3.2.7 Site Operations Plan

The Remedial Contractor prepared an IRM Work Plan detailing how the work was to be performed in compliance with the Order on Consent. The Remediation Engineer reviewed all plans and submittals for this remedial project (i.e., those listed above plus contractor and subcontractor submittals) and confirmed that they were in compliance with the Remedial Design. All remedial documents were submitted to NYSDEC and New York State Department of Health (NYSDOH) in a timely manner and prior to the start of work.

3.3 REMEDIAL PROGRAM ELEMENTS

3.3.1 Roles and Responsibilities

The roles and responsibilities of the team members include the following:

NYSDEC: The NYSDEC was the lead agency for the construction. The NYSDEC's designated Project Manager (PM) participated in progress meetings, conducted site inspections, and provided regulatory approval for components of the remedy. The NYSDEC's PM conducted and participated in public meetings, as necessary, and was the point of contact for public questions and concerns.

Parsons: The Parsons PM served as Honeywell's representative. The PM was responsible for ensuring that construction was completed in accordance with the Contract Documents and approved Final Design. The PM interfaced directly with Honeywell, NYSDEC and the Parsons' project staff as necessary.

The Parsons Construction Manager (CM) was responsible for completion of the construction work. The CM communicated directly with the PM for project needs and monitor on-site construction activities.

The Parsons full-time on-site Site Health and Safety Officer (SHSO) was responsible for implementation of the PSP and to ensure work was performed in compliance with the PSP and applicable regulations. The SHSO also implemented air monitoring program and report data, performed routine safety inspections, and reported and investigated near misses or incidents.

Parsons and Geosyntec design engineers provided engineering support as needed and reviewed construction submittals that required engineering interpretation.

The Parsons Construction Quality Assurance (CQA) staff was on-site during the construction and made daily field observations to monitor that the construction, installation, materials, workmanship and QC performed by the subcontractors were conducted in accordance with the approved design drawings and specifications. The CQA Manager was also responsible for conducting CQA testing (or working with independent testing subcontractor).

The Parsons CM and CQA Manager were on-site during the construction and made daily field observations and reports.

3.3.2 Remedial Contractor

Parsons was the Remedial Contractor selected by Honeywell to carry out the remedial construction. Project personnel for Parsons included:

- Alan Steinhoff (Senior PM)
- Mike Broschart (Engineering Support/Design Team Interface)
- Thomas Abrams (PM)
- William Long (CM)
- William Salomone, P.E. (Design Engineer)

- Dan Douglass (Quality Assurance)
- Dale Dolph (SHSO)
- Mark Otten, P.E., Certifying Engineer

The following subsections identify Parsons' subcontractors who performed the remedial design construction.

3.3.3 Consultants

Geosyntec Consultants of Atlanta, GA completed the following activities under subcontract to Parsons:

- Technical oversight and consulting for installation of the barrier wall
- Documentation of steel sheet pile installation
- Installation of sheet pile geotechnical instrumentation
- Initial monitoring of sheet pile geotechnical instrumentation
- Technical oversight and consultant for the certification of the barrier wall
- Vibration monitoring of the Onondaga County sanitary sewer force main during culvert demolition and sheet pile driving

Project personnel for Geosyntec included:

- Jay Beech, Ph.D., P.E.
- Ming Zhu, Ph.D., P.E.
- Chris Conkle, P.E., G.E.
- Alan Witthoeft, P.E.

Mueser Rutledge Consulting Engineers of New York, NY performed an inspection, condition survey and engineering evaluation of the Onondaga County sanitary sewer force main support structure prior to replacement of the Harbor Brook culvert under subcontract to Parsons.

Project personnel for Mueser Rutledge included:

- Peter Deming, P.E.
- Jesse L. Richins, P.E.

3.3.4 Subcontractors

JPW Riggers and Erectors Inc. (JPW) of Syracuse, NY performed welding of the steel sheet piles (fabricated by Skyline Steel) into pairs and epoxy coated the steel sheet pile pairs as a subcontractor to Parsons. Project personnel for JPW included:

- John Wozniczka (PM)

CME Associates (CME) of Cicero, NY performed inspection of welds and epoxy coating of the steel sheet pile pairs at the JPW fabrication shop as a subcontractor to Parsons. Project personnel for CME included:

- Vince Carnifax (QC Inspector)

The IRM construction was completed by Sevenson Environmental Services, Inc, (SES) of Niagara Falls, NY as a subcontractor to Parsons. SES performed site preparation; clearing and grubbing; excavation; work platform construction, dust control, waste stockpiling; Harbor Brook channel relocation; culvert demolition and replacement; installation of the sheet pile wall, groundwater collection system and instrumentation and monitoring systems; and finish grading.

Project personnel for SES included:

- Joseph Burke (PM)
- Brian Shanahan (Construction Superintendent)
- Michael Marrone (QC Manager)
- Scott Allaire (Project Safety Representative)

Woodford Brothers, Inc. of Apulia Station, NY installed helical piles to provide temporary shoring for the Onondaga County sewer force main foundation at Harbor Brook as a subcontractor to SES.

O'Connell Electric of East Syracuse, NY installed electrical power and controls for the groundwater collection and monitoring systems as a subcontractor to SES. Project personnel for O'Connell Electric included:

- Ken Palmisano (PM)

Thew Associates of Marcy, NY performed survey services as a subcontractor to SES. Project personnel for Thew included:

- Ryan Sadlon (PM)
- Richard Sterling (Surveyor)

Parratt–Wolff of East Syracuse, NY installed the piezometers as a subcontractor to SES. Parratt-Wolff also air-lanced pilot holes for wick drains to avoid utilities in the area of sheet pile refusal and installed inclinometers as a subcontractor to Parsons. Personnel for Parratt-Wolff included:

- Shawn Pepling (PM)

HB Wick Drains, a Division of Hayward Baker, Inc., of Centennial, CO installed the wick drains as a subcontractor to SES.

Atlas Fence of East Syracuse, NY installed the chain link fence, gates, railings and guard rail at the Harbor Brook culvert as a subcontractor to Parsons.

3.3.5 Site Preparation

A May 19, 2011 planning meeting and several weekly meetings were attended by Parsons and SES prior to beginning on-site work and served as the pre-construction meeting(s) for SES. A meeting was held with NYSDEC and subcontractors on July 5, 2011 prior to beginning on-site

work and served as the overall pre-construction meeting. Documentation of agency approvals required by the Order on Consent is included in Appendix C.

Site preparation including mobilization of heavy equipment, utility mark out, installation and maintenance of erosion and sediment controls, clearing and grubbing, and work platform construction was completed from July 19, 2011 to August 19, 2011.

3.3.6 General Site Controls

The following activities related to site controls were performed:

- Site security – Parsons and its subcontractors coordinated locking of site trailers and perimeter gates daily during non-working hours.
- Job site record keeping – Parsons maintained records of personnel present at the site on the trailer sign-in sheet.
- Erosion and sedimentation controls – Parsons performed inspections of the erosion and sediment control features per the approved SWPPP and ensured repairs were made when needed.
- Equipment decontamination and residual waste management – Subcontractors coordinated with Parsons to complete decontamination of equipment prior to leaving the site as well as the removal of waste material for off-site disposal.
- Soil screening results – Subcontractors performed analytical conformance testing of imported soil materials prior to delivery to the site.
- Stockpile methods – Subcontractors performed stockpile management in accordance with the design and approved changes.

3.3.7 Nuisance Controls

Dust control for the construction haul roads was performed as needed during dry periods. Dust control consisted of the application of water using a water truck. Subcontractors limited construction traffic to temporary access roads stabilized with gravel over the existing surface to reduce the potential erosion of soil outside of road areas.

Equipment decontamination was performed by subcontractors on the decontamination pad adjacent to the groundwater collection trench. Equipment decontamination consisted of the removal of soils from excavation equipment prior to demobilization from the site. Decontamination water was allowed to percolate into the ground where it would subsequently be collected by the groundwater collection system.

No nuisance dust or odor complaints associated with the construction were received.

3.3.8 CAMP Results

A description of the VOC and particulate action levels and response actions for the CAMP are provided in Section 3.2.6. No exceedences of the VOC or particulate action levels occurred during construction.

Copies of all air monitoring (CAMP) field data are provided in electronic format in Appendix E.

3.3.9 Reporting

Parsons and its subcontractors prepared daily reports during construction. Parsons daily reports include a description of the operations conducted for the day, equipment, and personnel on-site, problems encountered, weather conditions, and the results of monitoring equipment. Parsons maintained a separate photo log of the daily construction activities. Subcontractors placed their daily reports on the Parsons SharePoint website for review on a daily basis. Daily reports are included in electronic format in Appendix F. The photo log required by the Consent Order is included in electronic format in Appendix D.

3.4 HARBOR BROOK REROUTING

Prior to installation of the west end of the barrier wall, temporary rerouting of a portion of lower Harbor Brook was required. Construction included creation of a new section of Harbor Brook to the east, backfilling of an existing section of Harbor Brook, and demolition and replacement of the existing downstream culvert. The removed section of Harbor Brook was located approximately 300 ft. upstream from the lake and was approximately 700 ft. long including the culvert.

The design goals for the rerouted section of Harbor Brook were to: (1) create a stabilized channel having equal hydraulic capacity to the existing channel, and to (2) limit exposure of contaminated material to Harbor Brook during the temporary conditions. The rerouted section of the lower Harbor Brook channel is considered temporary as the final restoration of lower Harbor Brook will be completed as part of the lake cap and dredge project, and in accordance with the lake-wide plan for habitat restoration.

During culvert replacement, Harbor Brook was temporarily diverted around the work area using bypass pumping from upstream of the work area into the new channel. Clay berms were installed upstream and downstream in Harbor Brook to keep water out of the work area.

In order to maintain access to WBB from the east, a temporary bypass road was constructed southwest of Harbor Brook prior to culvert replacement and installation of the bypass pumping system. Removal of the temporary access road was completed as part of the Upper Harbor Brook IRM.

3.4.1 Harbor Brook Channel Excavation and Backfilling

Excavation of the new Harbor Brook channel occurred from September 28, 2011 to November 2, 2011 and progressed from north to south. Material excavated from below a depth of approximately 2 ft. was visibly contaminated and could not easily be segregated from the overlying uncontaminated material due to saturated conditions. Therefore, all of the excavated material was placed in WBB stockpile areas Annex A and D. The excavated channel was kept isolated from Onondaga Lake during excavation by maintaining a soil berm at the north end. An abandoned Sunoco oil pipeline that crossed the new Harbor Brook channel was removed during excavation and disposed at Roth Steel; no contaminated materials were present in the pipeline.

Following excavation of the new channel, stained sediments were noted to be present at the channel bottom. As requested by NYSDEC, a design change was made to cover the stained sediments with a 12-inch layer of a clayey shale material to further isolate the stained sediments within the new channel. Additional sediments were excavated from the channel to maintain the required cross-sectional area and the clayey shale installed and compacted with the excavator bucket. A 6-inch layer of granular fill was installed on top of the clayey shale. This modification is presented as Field Change Form (FCF)-4 in Appendix I

After lining of the new channel was completed, flow from Harbor Brook was diverted to the new channel via the bypass pumping on November 3, 2011. The original Harbor Brook section was backfilled with engineered fill and concrete debris from demolition of the culvert.

As described in Section 3.5.2, the barrier wall alignment in the vicinity of Harbor Brook was moved to the north due to underground obstructions which prevented installation of the sheet piles to the design depths. The modified wall alignment resulted in an approximately 35-foot. long section of open channel from the new culvert outlet to the barrier wall. The open channel crosses the barrier wall in lieu of the culvert as originally designed. A channel lining design for this open channel was prepared and approved by the NYSDEC. The revised design included a 40-millimeter low linear density polyethylene (LLDPE) geomembrane (Dura-Skrim K40BT2), 16-ounce non-woven geotextile fabric both below and above the geomembrane and riprap channel fill on top. To provide a relatively impervious seal at the barrier wall and culvert, the geomembrane was attached to the culvert outlet concrete and barrier wall with gasketed batten strips. Additionally, a soil-bentonite mixture was placed below the geomembrane at the barrier wall connection and clay was placed above the geomembrane at the barrier wall and behind the culvert wing walls. This modification is presented as FCF-6 in Appendix I. The channel lining was installed from February 4-7, 2012 following completion of the new Harbor Brook culvert as described in Section 3.4.2.

3.4.2 Harbor Brook Culvert Replacement

An Onondaga County 36-inch sanitary sewer force main crosses over Harbor Brook directly above both the former and replaced culverts. The force main is supported by a steel truss bridge bearing on concrete footings. In order to protect the force main from damage, several steps were taken prior to and during culvert replacement:

- an inspection, condition survey and engineering evaluation of the Onondaga County sanitary sewer force main support structure
- installation of temporary shoring consisting of helical piles driven deeper than the existing bridge footings, concrete pile caps and steel I-beams to support each end of the truss bridge
- a 9-step excavation plan to minimize lateral pressures on and the potential for displacement of the bridge footings
- removal of trees embedded in portions of the truss bridge
- spot welding repairs to the truss bridge

- vibration monitoring on each concrete footing
- installation and monitoring of survey targets on the truss bridge
- installation and monitoring of crack gauges on the force main pipe insulation
- use of spotters during demolition to prevent equipment from contacting and damaging the truss bridge

The inspection, condition survey and engineering evaluation and helical pile installation logs are provided in Appendix G.

The existing reinforced concrete culvert was demolished in place from November 4, 2011 to December 20, 2011 using excavators with jackhammer attachments. Demolition began at the north end of the culvert using a large excavator and progressed to the south where a small excavator was used to reduce the intensity of vibrations acting on the force main structure. During culvert demolition, remnant wood piles, wood formwork and concrete from former structures were discovered and demolished in order to reach the required grade for the new culvert. Vibration levels were kept below the established action levels during demolition and no movement of the force main structure was detected by the survey targets and crack gauges.

Soil excavated during culvert demolition was often visually contaminated with NAPL and was placed in stockpile areas Annex A and D. Water seeping into the culvert excavation had an oil sheen and was pumped to the Willis Avenue wastewater treatment plant. Reinforcing steel was easily separated from the culvert concrete and was disposed off-site at Roth Steel. Concrete rubble was disposed both on-site and off-site. Approximately 300 cubic yards (CY) of concrete rubble less than 6 inches in size and with no visible contamination was placed on-site as backfill at the bottom of the former Harbor Brook channel as approved by NYSDEC (Appendix I). Concrete rubble larger than six inches or visibly stained was disposed offsite at the Camillus C&D Landfill.

The new culvert consists of 14 reinforced precast concrete sections with an interior dimension of 20 ft. (width) by 6 ft. -10 inches (height) and pre-cast aprons and wing walls at each end. The exterior surfaces of the culvert sections were coated with Carboline Bitumastic® 300 M coal tar epoxy to minimize potential contact with the groundwater. Cast-in-place concrete knee walls were installed at each end of the culvert. Details for the culvert are shown in shop drawings provided in Appendix J.

In order to limit the potential for differential settlement between culvert sections, a reinforced concrete slab-on-grade was installed under the culvert. This modification is presented as FCF-8 in Appendix I. Concrete test results of the slab-on-grade are provided in Appendix G. The culvert sections were then lifted into place with a crane; culvert sections under the force main were slid into place by applying biodegradable grease to the slab-on-grade and pushing each section horizontally with an excavator. The joints between culvert sections were sealed with DeNeef Swellseal® WA, manufactured by DeNeef Construction Chemicals Inc, the same sealant used to seal the sheet piles as described in Section 3.5.1. Installation of the slab-on-grade and

new culvert was completed from January 4, 2012 to February 7, 2012. The bypass pumping system was shut down and natural flow returned to Harbor Brook on February 7, 2012.

Flow through the new culvert was bypassed again during the Upper Harbor Brook remediation in 2013. The joints between the culvert sections were inspected and four leaks found. The leaks were resealed with DeNeef Swellseal.

3.5 BARRIER WALL INSTALLATION

Sheet pile driving for the barrier wall began on August 19, 2011 and was completed on December 7, 2011. Pile driving was suspended from October 18, 2011 until December 5, 2011 to allow for removal and replacement of the Harbor Brook culvert. Sheet piles were driven to the depths and extents in accordance with the design and approved changes.

3.5.1 Steel Sheet Piles

The barrier wall was constructed of model AZ 19-700 steel sheet piles manufactured by Skyline Steel LLC (a wholly owned subsidiary of Arcelor Mittal). JPW welded the sheet piles into pairs and prepared special fabrications. The upper 13 ft. of the welded sheet pile pairs were coated by JPW with PPG Amercoat® 78HB coal tar epoxy.

Sheet pile sealant consisted of Swellseal® WA, manufactured by DeNeef Construction Chemicals Inc. The sealant was applied in the field prior to driving the sheet piles.

Zinc anodes were installed every 15 linear feet (LF) horizontally on alternating sides of the barrier wall for cathodic protection of the steel wall in accordance with the design. Anodes were attached to the wall using steel angle brackets welded to the steel sheeting. Brackets were field coated with Carboline Bitumastic® 300 M coal tar epoxy. A log of the anode brackets is shown on the as-built survey drawings provided in Appendix A.

3.5.2 Sheet Pile Installation

Steel sheet piles for the barrier wall ranged from 45.5 to 77 ft. long. The sheet piles were driven using two different rigs: an ABI Mobile Ram with a vibratory hammer and a 150-ton crawler crane with a vibratory hammer. Sheet piles up to approximately 67 ft. long were driven exclusively with the ABI Mobile Ram and hammer. The ABI Mobile Ram could drive sheet piles up to approximately 67 ft. long; therefore, longer sheet piles were partially driven with the crane and hammer then driven to final toe elevation with the ABI Mobile Ram and hammer. During sheet pile installation near the County sanitary sewer force main, vibration monitoring was conducted on a concrete sewer vault and each bridge footing; no exceedences of the vibration limits occurred.

Sheet pile installation began at approximately Station 4+32 (sheet pile SP-95) and proceeded north to Station 1+76 (sheet pile SP-41) and east to Station 4+48 (sheet pile SP-100). Several sheet piles in the vicinity of and including sheet pile SP-96 were damaged by underground obstructions during installation. Sheet pile installation was subsequently moved to the east end of the wall alignment while an investigation of the underground obstructions was performed. Sheet

pile installation recommenced at Station 16+30 (sheet pile SP-357) and proceeded to the west to approximately Station 10+87 (sheet pile SP-240).

Investigation of the underground obstructions consisted of the removal of large boulders from the shallow soil and spudding with a steel H-beam along the along the wall alignment east of sheet pile SP-96 to determine the location of and remove obstructions. The investigation identified numerous buried obstructions ranging from 10 to 35 ft. in depth both along and north of the original wall alignment. Due to the depth of these obstructions, it was determined to be not feasible to drive the sheets to the design depths along the original wall alignment. A design modification was prepared which moved approximately 457 LF of the barrier wall an average of approximately 30 ft. north. The modification affected the barrier wall from Stations 3+63.0 to 8+20.2 and shortened the overall wall length by 77 LF from 1,630 LF to 1,553 LF.

Following the wall realignment, previously installed sheet piles SP-80 to SP-99, which were no longer needed as per the new alignment, were removed. Sheet pile installation then proceeded from Station 3+63R (sheet pile SP-93R) east to approximately Station 10+82 (sheet pile SP-239). Sheet pile installation for the final section began at Station 0+00 (sheet pile SP-1) and proceeded south until the wall was completed at approximately Station 1+81 (sheet pile SP-40). Several sheet piles were not able be driven to their design depths but were determined to be acceptable from a design prospective and approved as FCF-1, FCF-2 and FCF-3.

The sheeting alignment was controlled by using offset stakes and a steel tape and was documented by Parsons using GPS based survey equipment. Sealant was applied to one interlock of each sheet pile pair in the field prior to installation. Sheet pile pairs were then connected by threading the interlocking channel of the previously installed pile to form the barrier wall. Plumbness was controlled by the use of a standard 4-foot level monitored by the sheeting foreman as the piles were driven and by adjusting the vibratory hammer angle of impact on the sheet piles as they were driven.

The as-built location of the barrier wall is shown on the survey drawings provided in Appendix A. The final sheet pile driving log is provided in Appendix G. Record drawings of the barrier wall are included in Appendix H. Modifications to the barrier wall are presented in Appendix I. Submittals for the sheet pile barrier wall are provided in Appendix J.

3.5.3 Sheet Pile and Barrier Wall QA/QC Activities

Sheet pile wall QA/QC activities included review of the steel mill certificates, inspections of the steel sheeting, shop welds, sealant, and epoxy coating application during fabrication.

Sheet pile driving was observed and documented by Geosyntec. Pile driving records were prepared daily and reviewed by Geosyntec. In addition, periodic checks of welds, sealant installation, plumbness, and sheet pile elevations were performed by Geosyntec. Geosyntec personnel documented the following information for each sheet pile pair:

- Sheet pile ID number
- Sheet pile part number (JPW fabrication number)
- Inclinometer angle and special sheet locations

- Design and actual sheet pile lengths
- Design and final top elevations
- Design and final tip (bottom) elevations
- Length of coating
- Date of installation
- Start and end times for driving
- Deviations
- Notes such as pile type, driving conditions, etc.

The pile driving record and other QA/QC data are provided in Appendix G.

3.5.4 Sheet Pile Wall Instrumentation

The following monitoring instruments were installed by Parsons and Geosyntec to monitor the barrier wall in accordance with the design:

- Thirteen inclinometers (SI-W14 thru SI-W26) attached to the sheet piles along the wall
- Four inclinometers (SI-14 thru SI-17) on land inboard of the sheet pile barrier wall to monitor the wall
- Three vibrating wire piezometers (PZ-14 thru PZ-16) installed on land inboard of the sheet pile barrier wall to measure groundwater elevation. These instruments were nested with three of the four inboard inclinometers.

Baseline conditions were established for the barrier wall based on instrument readings prior to dredging. Monitoring of sheet pile movement, lateral and vertical fill movement, and groundwater elevations for geotechnical purposes are currently ongoing and will continue until the dredging and capping of the lake is complete. It is planned for these instruments to be removed or abandoned following completion of the local dredging work.

Seven inclinometers (SI-18 thru SI-24) and seven piezometers (PZ-17 thru PZ-23) were also installed by Parsons and Geosyntec on land between the sheet pile barrier wall and the CSX railroad tracks to monitor the tracks during dredging.

Four piezometers (HB-PZ-24 thru HB-PZ-27) were also installed in the groundwater collection trench to evaluate the performance of the collection system as discussed in Section 3.6.4.

Instrumentation is shown on record drawings C-017 thru C-019 included in Appendix H.

3.6 GROUNDWATER COLLECTION TRENCH INSTALLATION

The East Wall groundwater collection trench system is comprised of the groundwater collection pipe, groundwater force main, one collection sump (CS-7), backfill material, wick drains, piezometers, and supporting electrical, mechanical and other ancillary equipment. The

East Wall collection trench is located on the inboard side of the barrier wall and connects to the West Wall collection trench at sump CS-6.

The groundwater collection trench system was installed between November 30, 2011 and May 25, 2012. Trench excavation began at the east end and progressed toward the northwest Groundwater in the trench during construction was collected and disposed as described in Section 3.7.1.

The as-built location for the collection system is shown on the survey drawing provided in Appendix A. Photographs of the collection trench excavation have been included in the project photograph log provided in Appendix D. Record drawings of the groundwater collection trench are provided in Appendix H. Conformance and performance testing of the backfill material including geotechnical and analytical lab testing results are discussed in Section 3.8.5. Submittals are included Appendix J.

3.6.1 Piping

The collection trench installation included a 6-inch diameter slotted fiberglass reinforced pipe (FRP) collection pipe and a 4-inch solid-wall FRP force main. Cleanout risers were installed at 100-foot intervals along the collection pipe in accordance with the design.

3.6.2 Mechanical and Electrical Equipment

The East Wall collection system includes an electronically controlled pump, mechanical valves and sensors. The system is powered and controlled by panels in the Lakeshore Pumping Station. A monitoring system provides automatic and manual control of the collection sump pump as well as alarm monitoring and data collection. Combined flow from the West and East Wall collection systems is measured by a flow meter located in the Lakeshore Pumping Station. Permanent groundwater piezometers were installed to monitor the performance of the collection system. A summary of the devices related to the East Wall collection system consists of:

- Submersible pump
- Hydrostatic pressure transducers
- Float switches
- Variable frequency drive with output filters
- Four (4) groundwater piezometers

The groundwater pump installed in sump CS-7 is a model 3885 WE1534HH submersible pump manufactured by Goulds Pumps.

3.6.3 Groundwater Collection Trench Installation

Major components of the groundwater collection trench were installed between November 30, 2011 and March 26, 2012. Electrical work commenced on January 17, 2011 and continued until May 25, 2012. Collection trench installation began at east end of the trench alignment and continued to the northwest to collection sump CS-6. Spoils from trench excavation were placed in the stockpile area in accordance with the design. The 6-inch slotted

FRP was installed to the elevation as indicated on the design drawings. The 4-inch solid FRP force main was installed at a depth of 4 ft. below the finished grade. The collection trench was backfilled with pipe bedding (washed stone) and drainage medium (Type 1B coarse aggregate) in accordance with the design. Hydrostatic testing of the force main piping at a pressure of 100 pounds per square inch was conducted for two hours under the observation of Parsons. A copy of the test report is included in Appendix G.

One collection sump (CS-7) and two valve vaults (VV-6A and VV-7) were installed in the collection trench system. The collection sump and valve vaults are precast concrete structures coated with Carboline Bitumastic® 300 M coal tar epoxy to minimize potential contact with the groundwater. An air release valve and manhole was also installed just east of Harbor Brook.

3.6.4 Groundwater Collection Trench Piezometer Installation

Parratt Wolff Drilling, a subcontractor to SES, installed a total of four permanent groundwater piezometers (HB-PZ-24 thru HB-PZ-27) as part of the collection system. (Note that these piezometers were numbered to PZ-16 thru PZ-19 in the Operation, Maintenance and Monitoring Reports.) Boreholes were drilled using hollow stem augers, then the well constructed with an FRP screen and riser, sand filter pack, cement/bentonite grout seal and cover. The wells were then developed to less than 50 nephelometric turbidity units and constant temperature, pH, and conductivity levels prior to piezometer installation. The development logs are included in Appendix G. One Geokon 4500AL-170kPa vibrating wire piezometer was then installed in each well and connected to a central data logging units for data downloading. The groundwater piezometers are permanent instruments to evaluate the performance of the collection system.

3.6.5 Wick Drain Installation

The wick drain material selected and installed was AmerDrain 607, manufactured by the American Wick Drain Corporation. The wick drains were installed from April 5-11, 2011 by HB Wick Drains, a subcontractor to SES. The wick drains were installed on an alignment located between collection pipe and piezometer cable conduit on 3-foot intervals, except at where the collection trench crosses Harbor Brook and at sump CS-7 as noted on the survey drawing. The wick drains were driven approximately to the depth of the top of stratum M2 silt-clay. Parratt-Wolff air lanced pilot holes for wick drains in the area of sheet pile refusal east of Harbor Brook to avoid hitting previously installed utilities. The as-built wick drains are shown on the survey drawings provided in Appendix A. Wick drain submittals are included in Appendix J.

3.6.6 Groundwater Collection Trench QA/QC

SES provided QC for the installation of the collection trench system. The QC activities provided by SES are described in the QC Plan provided in Appendix J. Parsons provided QA for the installation of the collection trench. QA activities executed by the Parsons QA team included: photographs of daily work activities, observation of installed materials, observation of excavation work, observation of backfill materials, observation of well development, observation of FRP pressure testing and collecting system measurements including verification of the collection pipe and sump elevations.

3.6.7 Site Restoration

Site restoration was performed following completion of construction of the barrier wall and the groundwater collection trench in accordance with the design. Site restoration along the barrier wall and trench consisted of the replacement of the gravel work platform which was removed to install these features. Gravel was installed over the top of the new culvert for use as the site access road. A chain link fence with two gates, one at the culvert and one at the temporary bypass road, was installed to provide access control and security to the site. Railings on the culvert wing walls, a guardrail and traffic signs were installed near Harbor Brook for traffic safety.

3.7 DISPOSAL OF WASTES

3.7.1 Construction Water Management

Construction water is defined as water collected from excavations. Construction water generated during replacement of the Harbor Brook culvert and collection trench excavation and construction was pumped into temporary holding tanks on-site. Water collected in the tanks was allowed to settle prior to discharge into the existing collection system for ultimate treatment at the Willis Avenue groundwater treatment plant. Approximately 9.6 million gallons of construction water was collected and treated from November 14, 2011 thru March 29, 2012 (Appendix K). The temporary holding tanks were decontaminated and demobilized at the end of construction in accordance with the design.

3.7.2 Excavated Soil

Approximately 8,700 CY of material excavated to install the barrier wall, groundwater collection trench, new Harbor Brook channel and culvert were placed in Annexes A and D (Appendix H, Drawing C-030). In accordance with the design, excavated material was visually observed for signs of contamination (e.g., NAPL, grossly stained) and if visually contaminated, stockpiled separately onsite. Visually contaminated material was initially stockpiled in Annex A. However, Annex A did not have sufficient capacity for all of the visually contaminated material; therefore, Annex D was added by FCF-07. Since completion of the East Wall IRM, the material stockpiled in Annexes A and D has been moved to other portions of WBB.

Analytical testing of the material placed in Annexes A and D was performed after consultation with the NYSDEC. Sampling of Annex A and D soils was performed in December 2011. The sampling results showed the material to be non-hazardous. Based on the analytical results, NYSDEC approved the materials to remain on WBB following completion of the IRM. The final location of the material will be evaluated during the final remedy for the WBB/HB site as discussed in the Wastebed B/Harbor Brook Materials Management, Grading and Disposal Plan (O'Brien & Gere, 2013). A copy of the analytical testing results and NYSDEC approval to leave the material on WBB are provided in Appendix L. A drawing showing the location of Annexes A and D is provided in Appendices H and L.

3.7.3 Harbor Brook Relocation/Culvert Demolition Debris

Reinforcing steel was separated from the culvert concrete and the abandoned Sunoco Oil pipeline removed from Harbor Brook were disposed off-site at Roth Steel. Concrete rubble was disposed both on-site and off-site. Approximately 300 CY of concrete rubble less than six inches in size and with no visible contamination was placed on-site as backfill at the bottom of the former Harbor Brook channel. Concrete rubble larger than 6 inches or visibly stained was disposed off-site at the Camillus C&D Landfill in Camillus, NY.

3.8 DOCUMENTATION

3.8.1 Testing and Verification

Parsons subcontractors performed QC testing in accordance with the CQAP portion of the Final Design Report. Some of the QC tasks performed included the following:

- Review of mill certificates, shop drawings, welding inspection reports, coal tar epoxy coating inspection reports, and final driving logs for the steel sheet piles that make up the barrier wall. Testing and verification reports for the steel sheet piles are provided in Appendix G.
- Geotechnical and chemical testing was conducted for imported soil and gravel used for backfill material. General borrow source materials include engineered fill, work platform gravel fill material, Type 1B course aggregate, blended stone, low permeability soil, and topsoil. Initial samples were conducted for each borrow source for conformance to the specifications. Test results are summarized in Table 3.1 and included in Appendix J.
- Surveying was conducted to verify elevations and locations of: excavations, sheet piles, pipes, electrical and mechanical structures and final grades. The survey drawings are included in Appendix A.
- Testing and verification was conducted for the quality control of the collection system and instrumentation. Hydrostatic pressure testing was performed for the force main. All gages and control devices connected to lines being tested were disconnected for the duration of the test.

3.8.2 Meeting Reports

Project coordination meetings were conducted on a weekly basis every Tuesday during construction. Meeting attendees included representatives from Honeywell, the NYSDEC PM, Parsons CM, and Parsons CQA, Parsons SHSO, and Parsons subcontractors. Weekly meeting minutes are provided in Appendix F.

3.8.3 Reports

Reports for construction quality assurance performed included daily construction summary reports, weekly meeting minutes, phase meeting minutes, field inspection logs, FCFs, and final documentation. Identification and resolution of construction issues or deficiencies were handled via field correspondence and meetings.

Quality Control phase meetings were conducted for each definable feature of construction. Phase meetings included three phases (preparatory, initial and follow-up) and final inspections. Daily reports, weekly meeting minutes and phase meeting minutes are provided in Appendix F.

3.8.4 Soil/Materials Management

Excess material was generated during the relocation of Harbor Brook, replacement of the culvert and installation of the groundwater collection trench. Excess excavated material was stockpiled in on-site staging areas, tested for contaminants, determined to be non-hazardous and allowed to remain on WBB as described in Section 3.7.2. The final location of the material will be evaluated during the final remedy for the WBB/HB site as discussed in the Wastebed B/ Harbor Brook Materials Management, Grading and Disposal Plan (O'Brien & Gere, 2013). As-built survey drawings are provided in Appendix A.

3.8.5 Imported Soil and Gravel Material

The quantities of each imported material per source are shown in Table 3.1. A summary of the analytical tests collected for imported backfill material is provided in Table 3.2 and the analytical results are provided in Appendix L. Imported soil and gravel materials were primarily used to backfill the collection trench and for surface treatments such as low permeability soil and gravel.

3.8.6 Stormwater Pollution Prevention

The erosion and sediment controls for the IRM construction were installed and maintained in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control and the NYSDEC-approved site-specific SWPPP dated June 15, 2011.

Parsons performed inspections of erosion and sediment controls per the approved SWPPP during construction. SWPPP inspections logs are provided in Appendix M.

3.8.7 Remedial Performance/Documentation Sampling

Remedial performance, end-point sampling, or Data Usability Summary Reports (DUSRs) for site contamination were not part of the IRM.

3.8.8 Construction Documentation

Final reports for the East Wall construction provided by SES included the following documents:

- As-built sheet pile driving log
- Log of imported aggregate material
- Logs of installed anodes and wick drains
- Owner's manuals for the collection system operational equipment
- Electrical record drawings
- As-built topographic survey

3.9 DEVIATIONS FROM THE FINAL DESIGN

During construction, a total of nine deviations from the final design were required. Deviations presented in this section are modifications that required evaluation and approval by the design engineer and/or the NYSDEC prior to implementation. However, none of the field changes impacted the design intent or long-term effectiveness of the system. Typical minor construction modifications or "field fit" of the components that do not require design evaluation, approval by the design engineer, or the NYSDEC are not covered under this section but are recorded on the final project record drawings. For example, the actual collection system alignment may deviate slightly from the design drawings to accommodate field conditions; however, the general location and extents of the collection system is installed in accordance with the final design. Field changes are documented on a Parsons FCF and numerically identified with the prefix "FCF".

The following approved changes were implemented:

- FCF-1: Installation of Pile SP-262
- FCF-2: Installation of Pile SP-100R
- FCF-3: Sheet Pile Toe Deviations
- FCF-4: Temporary Harbor Brook Lining
- FCF-5: Realignment of the Barrier Wall
- FCF-6: Permanent Harbor Brook Section
- FCF-7: Modified Stockpile Locations
- FCF-8: Reinforced Culvert Slab
- FCF-9: Collection Trench Realignment

FCFs and supporting documentation are provided in Appendix I.

3.10 CONTAMINATION REMAINING AT THE SITE

As presented in Section 2.2, the primary objective of the East Wall IRM is to contain impacted soils and prevent migration of potentially contaminated groundwater and NAPL to Onondaga Lake. The groundwater collection trench captures impacted groundwater along the length of the wall from the shallow and intermediate hydrogeologic units. The IRM objective does not include excavation or removal of a contamination source or post-remedial sampling.

3.11 FINAL COVER SYSTEM

In order to prevent exposure to remaining contamination at the site, additional measures will be evaluated and constructed in the future under other IRMs or the final remedy for the site.

3.12 ENGINEERING AND INSTITUTIONAL CONTROLS

This IRM does not require Engineering and Institutional Controls (ECs/ICs).

Procedures for monitoring, operating and maintaining the groundwater collection system and site final closure systems are provided in the Operation, Maintenance and Monitoring Plan (OMM Plan) for the Onondaga Lake Lakeshore Barrier Wall Hydraulic Containment System for the site.

The final site remedy will include an environmental easement or deed restriction placed on the property as required.

Table 3.1 - Summary of Imported Material

Material	Application	Vendor	Imported Volume (cy) [1]
4" Minus Aggregate	Work Platform/Haul Roads/Culvert Slab-on-Grade Bedding	Hanson	5,698
1.5" Dense Graded Aggregate	Work Platform/Haul Roads/Harbor Brook Backfill	Hanson	2,897
Engineered Fill	Harbor Brook Backfill	Hanson	3,434
Clay / Low Permeability Material	Harbor Brook Channel Lining/Collection Trench Surface	Riccelli - Black Creek	1,008
NYSDOT #1B Aggregate	Collection Trench Backfill/ Drainage Media	Hanson	2,425
NYSDOT #1 and #2 Aggregate Blend	Collection Trench Bedding	Hanson	442
Type K Fill	Harbor Brook Channel Lining, Downstream From Culvert	Hanson	129

Notes.

1. Volumes of imported material are calculated based on average unit weight and load quantities.

Table 3.2 - Summary of Imported Material Testing

Material	Analytical Testing [1]	Geotechnical Testing	Imported Quantity (cy) [2]	Application	Submittal #	Sample Date
4" Minus Aggregate	Not Required [3a,b]	Initial	5,698	Work Platform/Haul Roads/Culvert Slab-on-Grade Bedding	02223-3 / Drawing S2-14	7/27/2011
1.5" Dense Graded Aggregate	Not Required [3d]	Initial	2,897	Work Platform/Haul Roads/Harbor Brook Backfill	02223-3	7/27/2011
Engineered Fill	Not Required [3d]	Initial	3,434	Harbor Brook Backfill	02223-4a	8/5/2011
	Initial [4a]	Initial		Harbor Brook Channel Lining	02223-2a	8/3/2011
Clay / Low Permeability Material	Initial	Initial	1,008	Harbor Brook Channel Backfill/ Collection Trench Surface	West Wall #56	5/12/2011
NYSDOT #1B Aggregate	Not Required [3f]	Initial	2,425	Collection Trench Backfill/ Drainage Media	C-028-1	7/27/2011
NYSDOT #1 and #2 Aggregate Blend	Not Required [3]	Initial	442	Collection Trench Bedding	C-028-1	7/27/2011
Type K Fill	Not Required [3]	Initial	129	Harbor Brook Channel Lining, Downstream From Culvert	C-024 - Type K Fill	12/16/2011

Note:

1. Analytical testing results provided in the appendices.
2. Volumes of imported material are calculated based on average unit weight and load quantities.
3. Chemical testing not required for the following aggregates - meets DER-10, Section 5.4(e)(5) requirement of less than 10% passing #80 sieve (as per 8/2/11 and 10/24/11 emails from NYSDEC):
   a. Drawing C-002 - 4" minus aggregate for the Work Platform
   b. Drawing C-019A, Note 2 - 4" minus bedding material under the culvert and channel (Permanent)
   c. Drawing C-023, Phase 2 - Aggregate for the pump pad staging area (Temporary)
   d. Drawing C-024, Drawing C-016 - 3" minus Engineered Fill to be used to backfill the old Harbor Brook Channel (Permanent)
   e. Drawing C-027 - 4" minus washed stone to be used under the collection sump and valve vault (Permanent)
   f. Drawing C-028, Section A - NYSDOT #1B aggregate for collection trench backfill (Permanent)
4. Chemical testing required for the following aggregates (as per 8/2/11 email from NYSDEC):
   a. Drawing C-024, Note 4 - 6" layer of granular fill to be used as lining of the new harbor brook temporary channel (Temporary)
   b. Drawing C-024, Note 5 - Rip Rap outlet protection to be used upstream and downstream of the culvert (Permanent)

APPENDIX A

AS-BUILT SURVEY DRAWINGS

APPENDIX B

DIGITAL COPY OF THE CCR

(SEE CD)

APPENDIX C

NYSDEC APPROVALS OF SUBSTATIVE TECHNICAL REQUIREMENTS

(SEE CD)

APPENDIX D

CONSTRUCTION PHOTOS

APPENDIX E

CAMP FIELD DATA

(SEE CD)

APPENDIX F

DAILY CONSTRUCTION REPORTS, WEEKLY MEETING MINUTES

(SEE CD)

APPENDIX G

QA/QC DATA

(SEE CD)

APPENDIX H

RECORD DRAWINGS

APPENDIX I

APPROVED MODIFICATIONS TO THE FINAL DESIGN

(SEE CD)

APPENDIX J

SUBMITTALS

(SEE CD)

APPENDIX K

OFF-SITE WASTE MANIFESTS

(SEE CD)

APPENDIX L

ANALYTICAL TEST DATA

(SEE CD)

APPENDIX M

SWPPP INSPECTION LOGS

(SEE CD)