INTERIM REMEDIAL MEASURE CONSTRUCTION COMPLETION REPORT

WILLIS PORTION
WILLIS AVENUE/SEMET TAR BEDS SITES IRM
Syracuse, New York

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FEBRUARY 2012

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LIST OF ACRONYMS

ATL	Atlantic Testing Laboratories
BTEX	benzene, toluene, ethylbenzene, xylene
CLSM	controlled low strength material
CS	collection sump
DNAPL	dense non-aqueous phase liquid
FER	Final Engineering Report
FFS	focused feasibility study
FRP	fiberglass reinforced plastic
FS	feasibility study
ft.	feet
GWTP	groundwater treatment plant
HCL	muriatic acid
ICE	international construction equipment
IRM	interim remedial measure
MG	million gallons
MRCE	Mueser Rutledge Consulting Engineers
NAPL	non-aqueous phase liquid
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PDI	pre-design investigation
QA	quality assurance

LIST OF ACRONYMS (CONT.)

QC	quality control
RAWP	Remedial Action Work Plan
RFR	Rain for Rent
RI	remedial investigation
ROD	Record of Decision
RSTS	remedy selection treatability studies
SVOC	semi-volatile organic compound
TSS	total suspended solids

SECTION 1

INTRODUCTION

1.1 REPORT PURPOSE

This Interim Remedial Measure Engineering Report and Certification describes the construction of the Willis portion of the Interim Remedial Measure (IRM) for the Willis Avenue and Semet Tar Beds Sites (collectively called the Willis/Semet Site). This report documents the continued work being performed under Order on Consent Index No. D7 0004-01-09 dated April 16, 2002, for Sites Nos. 734026 and 734008.

The Willis portion covered in this report includes the construction of a barrier wall, installation of light weight fill, and construction of a groundwater collection trench. The Willis portion of the IRM is from the western extent of the causeway to the western extent of Wastebed B. The Semet portion was completed on November 30, 2006. The Semet portion of the IRM is from Tributary 5A to near the western extent of the causeway (approximately from Barrier Wall Station 0+00 to 11+96). The guidance document "Close Out Procedures for National Priorities List Sites" (USEPA, 2000) was used as guidance in preparing this IRM Report.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 1 provides the report organization, identification of project team members, and report basis.
- Section 2 provides an overview of the project background.
- Section 3 outlines the construction activities conducted by each of the various subcontractors and materials of construction.
- Section 4 provides a chronology of events.
- Section 5 outlines project communications.
- Section 6 provides a summary of project Construction Quality Assurance and Quality Control.
- Section 7 provides supplemental information on health and safety and site-specific observations and lessons learned.
- Section 8 is an introduction to the operation and maintenance requirements, which does not pertain to the scope of work described in this report.
- Section 9 describes the final inspections and provides the licensed engineer's certification pertaining to the quality of construction as it relates to the approved design.

1.3 PROJECT TEAM

This section provides a summary of the involved parties and their roles. Contact information for each party is provided in Table 1.1.

1.3.1 NYSDEC

The New York State Department of Environmental Conservation (NYSDEC) was the lead agency for the Willis Semet IRM. Rick Mustico was the Project Manager for NYSDEC and conducted periodic site inspections during construction of the IRM.

1.3.2 Honeywell

Honeywell International was ultimately responsible for completing the remedial action in accordance with the Order on Consent. Al Labuz was assigned as Honeywell's representative. Mr. Labuz attended weekly progress meetings and conducted site visits during construction.

1.3.3 Parsons

Parsons was the contractor selected by Honeywell to carry out the remedial activities. Parsons provided full-time construction oversight of project activities via daily inspections, documenting work activities, reviewing sub-contractor submittals, providing engineering support for design and field changes, administering quality assurance testing through laboratories, coordinating reviews of submittals and work plans with the agencies and remedial action sub-contractors, and coordinating project meetings.

Project personnel for Parsons included:

- John Lanier (Project Manager)
- Al Steinhoff (Construction Manager)
- David Steele, P.E. (Certifying Engineer)
- Mike Broschart (Engineering Support/Design Team Interface)
- Matt Warren (Quality Assurance)
- Dale Dolph (Health and Safety Officer)

1.3.4 Mueser Rutledge Consulting Engineers

Mueser Rutledge Consulting Engineers (MRCE) was subcontracted to Parsons and completed the following activities:

- Documentation of steel sheet pile installation
- Installation of sheet pile monitoring instrumentation
- Monitoring of sheet pile monitoring instrumentation

1.3.5 Peak Environmental

Peak Environmental was subcontracted to Parsons and completed the following activities:

- Erosion controls
- Steel sheet pile installation
- Light-weight fill installation
- Steel sheet pile cathodic protection system installation
- Groundwater collection trench and Collection Sump #2 installation
- Groundwater Collection Sumps #1 and 3 modification
- Wick drains installation
- Construction water management

Project personnel for Peak Environmental included:

- Mark O'Rourke (Project Manager)
- Tim O'Rourke (Project Safety Manager)
- Steve Thompson (Onsite HAS Officer)
- Mark Clapp (Sheeting Foreman)

1.3.6 Atlantic Testing Laboratories

Atlantic Testing Laboratories was subcontracted to Parsons for the vibration monitoring on the county sewer mains running through the site.

Project personnel include:

- James Scancarello (Project Manager)
- Glenn Hasburgh (Technician)

1.4 REPORT BASIS

This report is based on the following:

- Documentation and quality control (QC) testing results provided by the Remedial Action Contractors during construction
- Observations and Daily Field Reports made by Parsons during construction
- Quality Assurance (QA) testing performed by Parsons or its subcontractors

TABLE 1.1
CONTACT INFORMATION

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Mueser Rutledge Consulting Engineers

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Peak Environmental

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Owego, New York 13827

Atlantic Testing Laboratories

James Scancarello
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Cicero, New York 13039

SECTION 2

BACKGROUND

2.1 IRM OBJECTIVES

As described in the Order on Consent, the objectives of the IRM at the Willis/Semet Site are to:

- Eliminate, to the extent practicable, within the scope of this IRM, the discharge of contaminated groundwater and non-aqueous phase liquids (NAPL) material to Onondaga Lake from the Willis/Semet Site.
- Eliminate, to the extent practicable, within the scope of this IRM, direct point source discharges of metals (including mercury); semi-volatile organic compounds (SVOCs) (including chlorinated benzene compounds, naphthalene and other polycyclic aromatic hydrocarbon (PAH) compounds); benzene, toluene, ethylbenzene, and xylene (BTEX); and chlorobenzene to Onondaga Lake via storm water conveyances.
- Eliminate, to the extent practicable, within the scope of this IRM, potential impacts to fish and wildlife resources associated with ongoing discharges of contaminants of concern from the site.

Furthermore, the work must be conducted in concert with the work to remediate and restore Onondaga Lake as well as IRMs on the other lakeshore sites.

2.2 SITE DESCRIPTION AND BACKGROUND

The Willis/Semet site is located in the Town of Geddes, Onondaga County, New York as shown in Figure 2.1. The two sites are contiguously located in an industrial area along the southern shore of Onondaga Lake, as shown on Figure 2.2. The sites are bordered on the west by the Crucible Specialty Metals Corporation, on the south by the Crucible Specialty Metals Corporation, Conrail Railroad tracks, and an industrial complex, on the north by Onondaga Lake, and on the east by Willis Avenue.

2.2.1 Willis Avenue Chlorobenzene Site

The Willis Avenue site encompasses approximately 12 acres. The principal activity of this facility was the production of chlorinated benzene products from benzene. The facility began operation in 1918, and was subsequently damaged by fire in 1930. It was repaired and continued operation until 1977. From 1971 to 1975, the Willis Avenue Plant produced an annual average of 6,809 tons of monochlorobenzene (chlorobenzene), 3,351 tons of orthodichlorobenzene (1,2 dichlorobenzene), 4,260 tons of paradichlorobenzene (1,4 dichlorobenzene) and 450 tons of metadichlorobenzene (1,3-dichlorobenzene). Muriatic acid (HCL) was also produced at this facility as a by-product.

Additional operations that took place at the Willis Avenue Plant from 1918 to 1977 included the production of caustic potash (potassium hydroxide), caustic soda, and chlorine gas. Caustic potash and chlorine were saleable products while the chlorine gas was also utilized as a raw material in the chlorobenzene production process. Caustic soda was produced for internal use at the Syracuse Works. Caustic potash and chlorine were produced by the electrolysis of potassium chloride brine solution. Initially, this was done in diaphragm cells (installed in 1918). Mercury cells were installed in 1947 and combined with the diaphragm cells to manufacture these products. The process operations that took place at this facility have been described in the *History of the Willis Avenue Plant, Petroleum Storage Facility, and Associated "Hot-Spots" Report* (OBG, October 1990).

The Willis Avenue plant area has been classified as an inactive hazardous waste site as defined in ECL 27-1301(2), and has been listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 734026. The plant area has been given a classification of "2", indicating that action is required.

Currently, the *Willis Avenue Chlorobenzene Site Remedial Investigation (RI) Report* is being reviewed by the NYSDEC. The RI Report will be finalized upon receipt of NYSDEC's comments. The Feasibility Study (FS) for Willis Avenue will be initiated subsequent to NYSDEC's approval of the RI Report.

2.2.2 Semet Tar Beds Site

The Semet Tar Beds site consists of five irregularly shaped ponds used from 1917 to 1970 as depositories for Semet material, an organic based material generated from an acid washing process used in coke light oil distillation. Figure 2.2 shows the site plan. Prior to 1917, the area was a settling basin for Solvay process waste, which consists primarily of calcium carbonate ($CaCO_3$, unreacted limestone), and the area was known as Solvay Wastebed A. The Semet ponds are located in the western half of Solvay Wastebed A. The Semet ponds were constructed by excavating into Solvay Wastebed A and surrounding the excavation area with non-engineered dikes. The dikes were reportedly built from a variety of materials including concrete rubble, cinders, and bricks. Leaks in one of the dikes occurred. Consequently, two small containment areas to the south and west were built to contain the leakage.

The Semet ponds cover approximately 11 acres, have an estimated average depth of 20 feet (ft.), and are estimated to contain approximately 80 million gallons (MG) of Semet material including a separate aqueous phase. The semi-solid surface of the Semet ponds is approximately 4 inches thick and appears as a weathered black to brown granular material (OBG, 1989). Below the granular material is a highly viscous, black material, which resembles tar.

The Semet ponds, as well as Solvay Wastebed A and Willis Ave. site, are enclosed by a 6-ft. high fence installed in 1979 to inhibit access by wildlife and people. The only access to the site is through a locked manual gate accessible from Willis Avenue. Onondaga Lake is located between 400 and 1,200 ft. north of the Semet ponds. I-690 and Solvay Wastebed A are located between the site and the lake.

Tributary 5A is located in the immediate vicinity of the site. Tributary 5A flows along the southern portion of the site near the Conrail Railroad tracks and then onto Crucible Specialty Materials Corporation property, parallel to the southwest border of the ponds. The tributary crosses beneath the railroad tracks through a 6-ft diameter culvert and then runs parallel to the northwest border of the site, and discharges into Onondaga Lake. Tributary 5A is best classified as an industrial effluent stream and receives process wastewater from the Crucible Specialty Materials Corporation and the adjacent Trigen Cogeneration facility under SPDES permits. Shallow groundwater from the former Allied plant site, the Willis Avenue plant site, the former Church and Dwight manufacturing facility, and the Semet Tar Beds site discharges to Tributary 5A. Tributary 5A has a length of approximately 0.8 miles, and ranges in width from 5 to 15 ft. The center of the channel is approximately 1 ft. deep and is overgrown with the common reed (Phragmites australis). The locations of Onondaga Lake and Tributary 5A are illustrated in Figure 2.2.

The Semet Residue Ponds site has been separated into two Operable Units (OU). Operable Unit 1 (OU #1) consists of the Semet material in the five ponds, and groundwater underlying the Semet Residue Ponds site. Operable Unit #2 (OU #2) consists of residual material beneath and in the proximity of the ponds, and the Brushy Cleared Area north and east of the ponds.

Remedial alternatives for OU-1 were selected in a 2002 Record of Decision (ROD). Construction of the Groundwater Remedial Alternative began in the summer of 2010 and will continue through the summer of 2011. This effort consists of installation of a groundwater collection trench adjacent to Tributary 5A, installation of two groundwater pumping stations and associated force mains, rehabilitation of two culverts, excavation of sediments from Tributary 5A, installation of a geomembrane within the Tributary 5A channel, installation of new channel substrate, and restoration of the Tributary 5A channel and surrounding riparian areas.

Although a remedy for the Semet Residue was selected in the 2002 ROD, remedial alternatives for the Semet Residue were re-evaluated in a 2006 Focused Feasibility Study (FFS) Report due to changes in market conditions. An OU-1 pre-design investigation conducted in 2010 confirmed a significantly lower volume of Semet Residue than that assumed in the 2006 FFS Report. Remedy selection treatability studies (RSTSs) are currently being conducted to refine off-site and on-site remedial alternative evaluations for a revised FFS based on the lower volume. A Semet Residue Characterization for Thermal Treatment RSTS was conducted in December 2010 to provide samples to off-site treatment facilities for evaluation, characterize residue for further evaluation of on-site thermal treatment, and identify target compounds for air monitoring. Cold weather and hot weather RSTSs are planned for 2011 to evaluate material handling, air emissions, and pretreatment approaches during cold and hot weather conditions.

The nature and extent of OU-2 and remedial alternatives for OU-2 have not yet been identified.

2.3 PREVIOUS REMOVAL ACTIONS

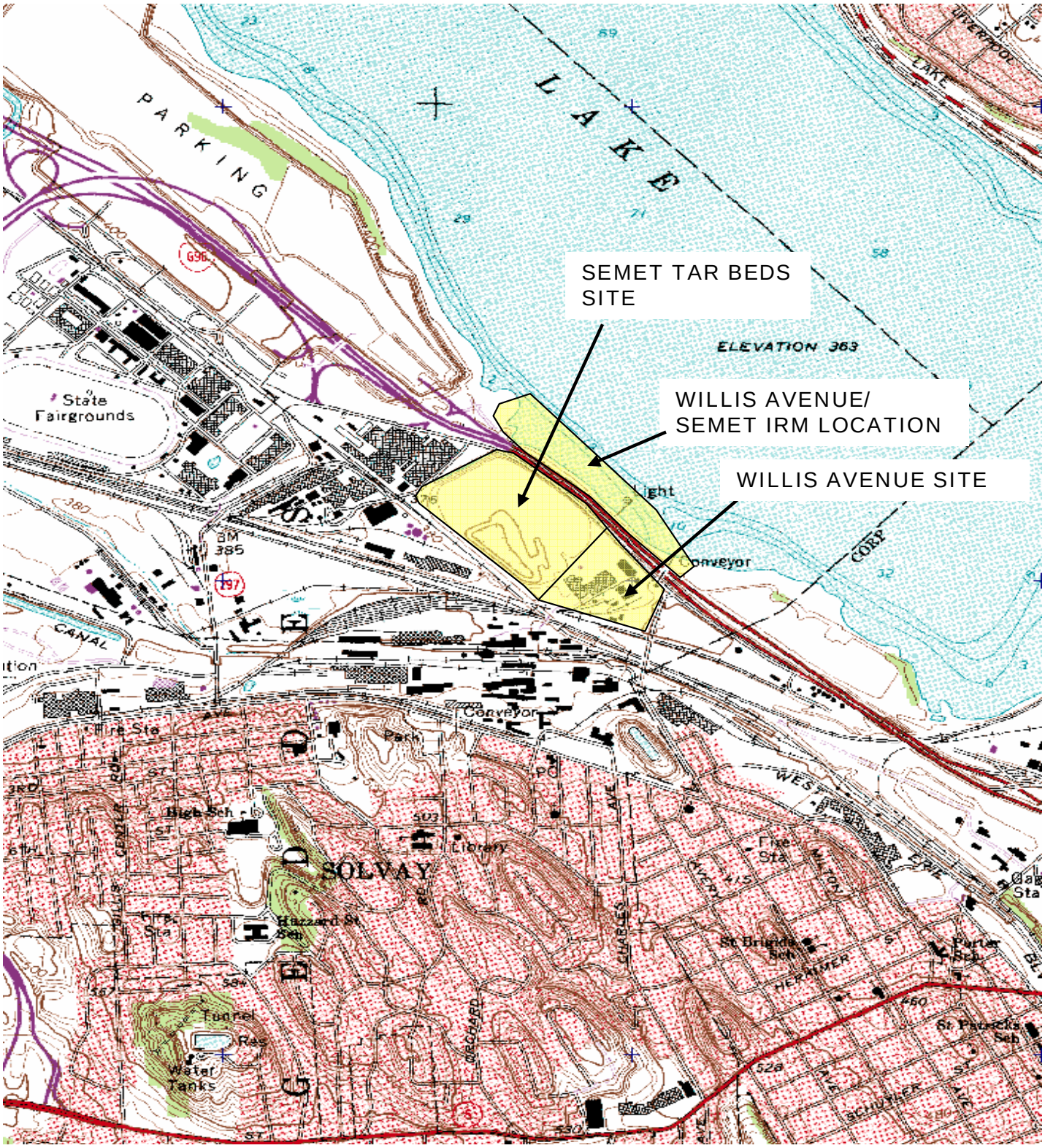
A number of IRMs have been performed at the Willis Avenue or Semet sites. These IRMs include the following:

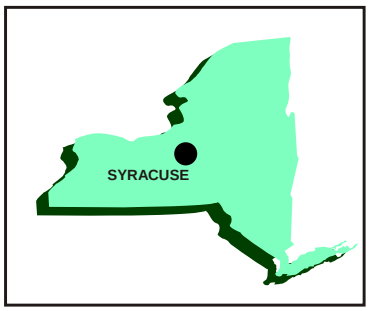
- Dense Non-Aqueous Phase Liquid (DNAPL) Recovery System IRM - This IRM included the installation and operation of a DNAPL Recovery System downgradient of the Willis Avenue site, and along the shoreline of Onondaga Lake. The DNAPL Recovery System was installed in 1992, and upgraded in 1995 and 2002.
- Semet Tar Ponds IRM – This IRM was initiated in December 1994 and required the covering of Semet Tar Pond Numbers 3 and 4 to mitigate the emission of organic vapors from the ponds. The IRM was modified in 1996 to cover the remaining ponds (Numbers 1, 2, and 5). All five ponds are recovered on an annual basis with Posi-Shell (a spray-applied, cement-mortar coating), normally in August.
- Seeps IRM - The seeps IRM was performed between September 2001 and June 2002 at the Semet Residue Ponds Site. The IRM approach included field investigation tasks (i.e., site reconnaissance, soil sampling, subsurface borings, and test pits) to evaluate the presence and extent of Semet material and seeps associated with Ponds 1 through 5. A temporary cover was placed over the observed seeps to minimize direct contact exposure to human and ecological exposure. Additionally, plastic and earthen material is placed over this area annually to minimize odors.
- I-690 Storm Drain System Rehabilitation – The storm drain system was evaluated and rehabilitated between 1996 and 1999 to isolate contaminants from infiltrating into the storm sewer.

2.4 IRM OVERVIEW

In summary, the IRM addressed in this report is as follows:

1. Installation of a sheet pile barrier wall along the Willis portion of the lakeshore to prevent migration of potentially contaminated groundwater and NAPL to Onondaga Lake.
2. Installation of a shallow groundwater collection system to work in conjunction with the barrier wall and mitigate, as much as practicable, the discharge of contaminated groundwater and NAPL to Onondaga Lake from the shallow and intermediate hydrogeologic units. Installation of a system for pumping collected groundwater to the groundwater treatment plant (GWTP) for treatment. Installation of fill between the sheet pile barrier wall and the shoreline.





Syracuse West, N.Y.
Quadrangle

N

LATITUDE: N43° 4' 6"
LONGITUDE: W76° 12.1' 15.5"

FIGURE 2.1

HONEYWELL
WILLIS AVENUE/SEMET TAR BEDS SITE
SYRACUSE, NEW YORK

SITE LOCATION MAP

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, NY 13088 PHONE: (315) 451-9560

ONONDAGA LAKE

84" INTAKE

72" INTAKE

EAST FLUME

I-690 WEST BOUND

I-690 EAST BOUND

SEMET TAR BEDS AREA

WILLIS AVE PLANT AREA

WILLIS AVE

CRUCIBLE SPECIALTY METALS CORP.

TRIBUTARY 5A

1

2

3

4

5

TRIBUTARY 5A

CONTAINMENT AREAS

LEGEND:

SEMET POND LOCATION

APPROXIMATE SITE BOUNDARY

1 POND NUMBER

300 150 0 300 600

SCALE: 1"=300'

FIGURE 2.2

WILLIS AVENUE/SEMET TAR BEDS SITE
SYRACUSE, NEW YORK

EXISTING SITE PLAN

Honeywell

EMS ENGINEERING DEPARTMENT
101 COLUMBIA RD. BOX 2105
MORRISTOWN, NJ 07962

PARSONS

290 ELWOOD DAVIS ROAD • SUITE 312 • LIVERPOOL, N.Y. 13088 • 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\742211 - WILLIS-SEMET\CAD\2211G01.DWG
PLOT DATE: 10/16/2007 8:05 AM PLOTTED BY: RUSSO, JILL

SECTION 3

CONSTRUCTION ACTIVITIES

3.1 SITE PREPARATION AND PRE-CONSTRUCTION ACTIVITIES

Site preparation consisted of abandoning existing wells within the work area, installing temporary facilities, installing temporary erosion control, installing a temporary access road, and excavating test pits.

3.1.1 Temporary Facilities

Six temporary field trailers with utility services were set up in the designated support area west of the Willis area. The trailers were used to support the construction of the Willis/Semet IRM as wells as the Onondaga Lake and Wastebed B/Harbor Brook Pre-Design Investigation (PDI) activities. A laydown area was constructed adjacent to the trailers to provide storage for construction materials needed for the IRM.

This component of the project included the following items:

- Light tree clearing
- Installation of a 1-ft. thick crusher run gravel sub-base over stabilization fabric
- Installation of security fencing
- Installation of electrical supply lines and transformers
- Relocation of the previous PDI complex and NYSDEC trailer

3.1.2 Causeway Upgrade

To provide access during construction, the structure of the causeway was repaired. Work including re-welding existing steel pieces and installing new steel pieces.

3.2 BARRIER WALL INSTALLATION

Sheet pile installation began on August 12, 2008 and was completed on November 22, 2008. Sheet pile was driven to a minimum 3 ft. into the silty clay layer. Record drawings presenting the wall alignment have been included in Appendix A of this report. In addition, a cross section chart showing the wall elevation with respect to the road elevation and depth into the confining silt and clay layer is presented in Appendix A of this report.

3.2.1 Barrier Wall Materials

Materials used in the barrier wall construction included steel sheeting, sealant, and cathodic protection.

3.2.1.1 Steel Sheeting

Steel sheeting consisted of AZ 19-700 piles from Skyline Steel LLC (a wholly owned subsidiary of Arcelor Mittal). Piles were welded into pairs at the factory. The sheet piles conformed to material property data consistent with ASTM A 572 GRADE 50 carbon steels. Welds are made by qualified welders in accordance with American Welding Society code D1.1. Prior to mobilization to the site, a portion of the top of each pile was coated with Carboline Bitumastic® 300 M Coal Tar Epoxy to provide high chemical, corrosion, and abrasion resistance. The coal tar epoxy specification is provided in Appendix B. The depth of the coal tar epoxy application is shown in the steel sheeting manufacturer's QC documentation drawings in Appendix B.

Steel sheeting specifications are provided in Appendix B.

3.2.1.2 Sealant

The sheet pile sealant consisted of Swellseal® WA sheetpile channel or "knuckle" sealant from DeNeef Construction Chemicals Inc. Sealant was applied at the factory, covered, and shipped to the site installed on the steel sheeting.

Sealant specifications are provided in Appendix B.

3.2.1.3 Cathodic Protection

Cathodic protection consisted of PZ-150 zinc anodes manufactured by Farwest Corrosion Control. Cathodic protection specifications are provided in Appendix B.

3.2.2 Barrier Wall Installation

Barrier wall installation consisted of:

- Sheeting installation and turbidity monitoring
- Removal and plugging of existing piping
- Cathodic protection system installation
- Barrier Wall Instrumentation

3.2.2.1 Sheeting Installation

Major equipment utilized during the sheeting installation included:

- International Construction Equipment (ICE) Vibratory Hammer with Power Supply Cell
- Link Belt HYLAB -18 200-ton crane for sheet driving
- Flexi-float work barges
- Link Belt 100-ton crane for unloading steel trucks and loading barge
- Quick Disconnect Positive Connectors
- Articulating Boom Manlift

Sheeting installation began at the eastern end of the Semet barrier wall Station 11+96 and proceeded to the east. Sheet pile was installed with a crane which was situated on either the placed inland fill, or on a work barge, depending on the access in the area. A silt curtain was staged around the work barge from the end of the sheet pile wall to the shoreline to contain turbidity.

To install sheeting, each double pile was picked with Quick Disconnect Connectors by the handling hole cut into the top of each sheet. The pile was then hoisted up and threaded into the interlocking channel of the previously installed pile.

Sheeting alignment was guided by survey equipment to ensure in-line placement. Plumbness was controlled by the use of a standard 4 ft. level monitored by the sheeting foreman as the piles were driven. Plumbness corrections were controlled by slightly swinging the vibratory hammer (still connected to piles) in either direction to adjust angle of impact on the sheeting and thus drive them back into plumb.

3.2.2.2 Remove and Plug Existing Piping

Three existing pipes that extended outboard through the work area were demolished at the point of intersection with the wall alignment. The 72-inch cast iron and 84-inch corrugated steel intake pipes in Design Section 1 were plugged with grout outboard of the barrier wall and filled with controlled low strength material (CLSM) inboard of the barrier wall to prevent loss of ground conditions along the wall alignment. Prior to breaking these pipes, a plug was installed in each pipe approximately 10 ft. outside of the barrier wall. The plug consisted of grout placed by a diver. The pipes were demolished using a spud to break the portion which intersects the barrier wall alignment. The inboard portions of the pipes were filled with CLSM. The grout plugs were installed on December 11, 2008 and the CLSM was placed from December 11 to December 18, 2008. Manufacturer submittals for the grout and CLSM are presented in Appendix B. During the placement of the CLSM, some CLSM material was inadvertently placed into the vault on the south side of the causeway. The CLSM was removed in December 2008. The CLSM was stockpiled and then disposed of off-site. Samples were collected prior to off-site disposal. The samples were analyzed for TCLP Herbicides, TCLP Pesticides, TCLP metals, total mercury, TCLP Semi-Volatiles, TCL Semi-Volatiles, TCLP Volatiles, TCL Volatiles, Ignitability, pH, and percent moisture. The laboratory report and disposal manifest are included in Appendix F.

The third pipe, located in Design Section 4, was broken using a spud. Grouting was not necessary at this location.

3.2.2.3 Cathodic Protection System Installation

The cathodic protection system was installed from October 27, 2008 through November 5, 2008 by Peak Environmental. Anodes were spaced at 30-ft. intervals on each face (inboard and outboard) of the sheet piling. Adherence to design elevations was independently verified by Parsons.

The anode supporting brackets were welded to the steel sheeting. Any breaks in the sheeting's coal tar epoxy caused by the welding process was field coated with coal tar epoxy. The coal tar epoxy field coats were inspected by Parsons supervising personnel prior to backfilling.

3.2.3 Barrier Wall QA/QC Activities

Barrier Wall QA/QC activities included vibration monitoring of the sanitary sewer force mains, and inspections of the steel sheeting, shop welds, and sealant.

3.2.3.1 Vibration Monitoring

Ground vibrations were monitored during barrier wall and fill installation by Atlantic Testing Laboratories (ATL). Two Geosonics SSU 3000LCP seismograph instruments were placed between the two sanitary sewer forcemains on the lower deck of the causeway. Access to the monitoring locations was through panels of the causeway deck that had previously removed for other activities. The instruments were continuously monitored from August 12, 2008 to October 9, 2008.

Vibrations detected were compared to the criteria depicted on the "Suskind Diagram" in the United States Bureau of Mines Report 8507. The peak particle velocity limit was not reached or exceeded at any time during vibration monitoring operations. The vibration monitoring report is presented in Appendix C.

3.2.3.2 Sheeting QA/QC

Peak Environmental performed QC during pile installation. A pile driving record was maintained by Peak Environmental for each sheet driven that outlined:

- Date
- Sheet pair no.
- Sheet length
- Coating lLength
- Signature of Swell Seal Inspector
- Drive time
- Plumbness @ ½ and full depth

Pile driving records were completed daily and inspected by Parsons. In addition, periodic checks of welds, sealant installation, plumbness, and elevations were performed by Parsons. An independent visual check was performed on all welds of the sheeting pairs for defects. The pile driving record is provided in Appendix C.

3.2.3.3 Turbidity Monitoring

The water quality monitoring was conducted at three locations in Onondaga Lake approximately 50 ft. outboard of the silt curtain and at one background location approximately

500 ft. from the work area. Background locations were located approximately 500 ft. northwest and 500 ft. southeast of the site (Locations ML-1 & ML-2). One background sample location was selected each day based on wind direction, as observed at the Lakeside Meteorological (MET) tower located at the Willis Avenue site. Compliance monitoring locations (Locations ML-3, ML-4, & ML-5) were evenly spaced along the length of the silt curtain, which moved as the work progressed. The turbidity monitoring included collection of total suspended solids (TSS) samples and real-time monitoring using a handheld turbidity monitor (Lamotte 2020e digital turbidity meter). Samples were collected one time each day during construction of the barrier wall and placement of light weight fill from the midpoint of the water column (50 percent of water depth) at each respective location. After the barrier wall was completed, 2- 1 ft. x 1 ft. holes were cut into the sheets to allow the water behind the barrier to be displaced during fill operations. The holes were surrounded by an outboard silt curtain and the turbidity sampling routine was cut to one background and one 50-ft. outboard of the holes following the previous methodology. TSS samples were submitted to the selected laboratory for analysis with an expedited turn-around-time. Real time monitoring and laboratory results for TSS are provided in Appendix C.

3.3 INLAND FILL INSTALLATION

Fill was installed between the barrier wall and the previous shoreline. Geotextile was placed over the lake sediments prior to fill installation. Fill was then installed to elevation 365.5 ft. The geotextile and fill were installed from August 27, 2008 to December 18, 2008.

3.3.1 Bottom Geotextile

Geotextile was installed inside of the barrier wall alignment prior to fill placement. The joints of the fabric were installed perpendicular to the shoreline and sewn. Manufacturer's data for the geotexile is provided in Appendix B. Overlap joints between panels were 5 ft. or greater and will be pinned in place and anchored to maintain tension during fill placement.

3.3.2 Inland Fill

Light weight fill was installed up to elevation 365.5. #57 stone was installed in some areas at a distance of greater than 60 ft. from the barrier wall and at an elevation of no higher than 1 ft. above lake level. 40,000 tons of light weight fill and approximately 5,000 tons of #57 stone were installed.

Light weight fill was obtained from two sources Norlite ¾ aggregate and Solite ¾ aggregate. Manufacturer's data for the light weight fill is provided in Appendix B. The imported light weight fill was tested at a frequency of 1 test per 2,000 tons for gradation, specific gravity, and unit weight. Results are provided in Appendix B.

#57 Stone was obtained from Hanson Aggregates of Jamesville, New York. Supplier's data for #57 Stone is presented in Appendix B.

Lightweight fill was placed west to east to elevation 365.5 ft. once the geo-textile fabric was in place. The sub-grade on the leading edge of the fill was monitored for displacement or mud. The top two lifts of the light weight fill were rolled with a smooth drum compactor.

Mud wave was observed during placing the #57 stone on December 18, 2008. A double layer of geo-grid was installed to encapsulate the wave before the area was filled. Geogrid was installed inside of the barrier wall alignment prior to fill placement on December 18, 2008 to mitigate potential mud wave in an area approximately 375 ft. long in Design Section 3. Manufacturer's data for the geogrid is provided in Appendix B.

Deep densification of the lightweight fill has not yet been performed. Installation of the work platform over the lightweight fill has not yet been performed.

3.5 CONSTRUCTION WATER MANAGEMENT

Construction water generated during the intake pipe filling activities was relocated through temporary piping extending west of the causeway to holding tanks supplied by Rain for Rent (RFR). The water from the tanks was filtered through bag filters and discharged into Transition Sump 02 for transference to the GWTP. The holding tanks were cleaned and demobilized at the end of construction.

3.6 BARRIER WALL INSTRUMENTATION

3.6.1 Monitoring Clusters

Instruments installed at the site include:

- Nine sheet pile inclinometers attached to the sheet pile barrier wall
- Eight tiltmeters attached to the sheet pile barrier wall
- Ten Settlement Plates, 10-inch inboard of the sheet pile barrier wall
- Eight instrumented boreholes, installed 5-inch inboard of the sheet pile barrier wall, with each borehole containing
    - Four vibrating wire piezometers
    - One inclinometer casing
    - Seven extensometer rings along with a collapsible casing
    - Grout protecting the contents of the instrumented boreholes

In addition, deformation monitoring points were established on the barrier wall at every ten pairs of sheets. These instruments provide data for sheet pile movement, lateral and vertical fill movement and hydraulic pressures due to groundwater.

The sheet pile wall inclinometers were installed by Peak concurrently with sheet pile installation. The borehole instruments were installed by Parratt Wolff Inc from December 1, 2008 to December 12, 2008. An Instrumentation Data Report is included in Appendix D.

3.7 WILLIS GROUNDWATER COLLECTION TRENCH INSTALLATION

The Willis groundwater collection trench was installed between September 23, 2009 and October 7, 2009 by Peak. Excavation started from the northwest end of the trench alignment and progressed toward the southeast end. Photographs of the collection trench excavation have been included in the project photograph log provided in Appendix E of this report.

3.7.1 Groundwater Collection Trench Materials

Groundwater collection trench materials included:

- Slotted collection pipe
- Trench backfill
- Wick drains
- Collection sumps
- Force main
- Pumps and controls

3.7.1.1 Slotted Collection Pipe

The slotted collection pipe consisted of 6-inch diameter fiberglass reinforced plastic (FRP) pipe with 0.015-inch slots, at 210 slots per foot, and open area of 7.09 square inches per foot. The slotted FRP pipe was supplied by Fiberglass Well Systems. Manufacturer's data for the pipe is provided in Appendix B.

3.7.1.2 Trench Backfill

The excavated lightweight fill material from the trench was used as the trench backfill.

3.7.1.3 Wick Drains

The wick drain material selected and installed was AmerDrain 607, manufactured by the American Wick Drain Corporation. Manufacture's data for the wick drains is presented in Appendix B.

3.7.1.4 Sumps

Materials for Collection Sump #1 (CS #1) and Collection Sump #2 (CS #2) consisted of pre-cast concrete structures supplied by Binghamton Precast & Supply Corp. Manufacture's data for the sumps is presented in Appendix B.

3.7.1.5 Force Main

Buried force main piping consisted of Green Thread provided by FGS Smith Fibercast. Manufacture's specifications are provided in Appendix B.

3.7.1.6 Pumps and Controls

The pump and control system consisted of field devices and collection sump control panel. A master telemetry panel that provides remote monitoring of the system has been installed at the Willis Groundwater Treatment Plant as part of the Semet portion of the IRM. The control system provides automatic and manual control of the collection sump pumps as well as alarm monitoring and data collection. The field devices related to this system consisted of:

- Submersible hydrostatic pressure transducers
- Redundant low level float switches
- Submersible pumps
- Variable frequency drives with output filters
- Five piezometers

Submersible pumps placed in CS #1 and CS #2 are 1.5 horsepower submersible pumps, model number 3885 WE1534HH manufactured by Goulds Pumps. The submersible pump placed in CS #3 is a Goulds 0.5 horsepower submersible pump, model number 3885 WE0534HH. Manufacture's specifications are provided in Appendix B. Additional material specifications and operating parameters are described in the System Control Description (Parsons, 2007).

3.7.2 Groundwater Collection Trench and Collection Sump #2 Installation

The Willis groundwater collection trench and CS# 2 was installed between September 22, 2009 and October 30, 2009 by Peak. As-built drawing of the collection trench, sumps, and piezometers is provided in Appendix A. 968 ft. of 6-in. diameter slotted FRP pipe was installed in the collection trench. The installation started from the north-west end of the trench alignment. First the lightweight fill material was removed to six inches above the original mudline to place trench box. Then divers entered the trench to level the bottom and place and connect the pipes. This process was repeated as the installation progressed to the south-east end of the trench alignment. The excavated lightweight fill material was replaced after the pipe has been placed. Portions of the excavation leading up to the collection sumps required excavation of materials other than lightweight fill. These excavated materials were stockpiled on site and later transferred to the soil stockpile previously constructed on the Willis Avenue site. Prior to the transfer to the Willis Avenue site, a sample was collected from the stockpiles. The sample was analyzed for PCBs, TCLP Metals, ICP Metals, TCLP Semi-Volatiles, TCL Semi-Volatiles, TCLP Volatiles, TCL Volatiles, Ignitability, pH, and percent moisture. Analytical results are included in Appendix F of this report. Due to conflicts with grading and site restoration, CS#2 was relocated about 100 ft. to the south of its proposed location. Connection between the trench and CS #2 was made at approximately 250 ft. from the south-east end of the trench, using the same pipe and methods used for the collection trench and 89 ft. of pipe was installed for the connection.

CS #2, including the manhole and vault, was installed between October 01, 2009 and October 30, 2009. A Volvo EC330 excavator was used to excavate the pit for the manhole and vault. Large stones and rip-rap were placed as foundation for CS #2 in the excavated pit. Sump pump and level transducers were installed in the manhole. Collection pipe, forcemain, and electrical conduit were connected to the manhole and vault. CS #2 started operating on October 30, 2009.

Equipment used for trench excavation, pipe installation, collection sump installation, and backfill consisted of:

- Volvo EC210 Excavator
- Volvo EC330B Excavator
- Dozer
- Front-end loader
- Dump trucks
- Water truck

3.7.3 Groudwater Collection Trench Piezometer Installation

Five groundwater collection trench piezometers were installed between October 15, 2009 and October 16, 2009 by Parratt Wolff. Boreholes were drilling by hollow stem augers. After the borehole had been flushed with water, FRP screen and risers were installed to construct the monitoring well. Monitoring well material included:

A Geokon 4500AL-170kPa vibrating wire piezometer was also installed in each well to provided continuous readings of the trench water level. The vibrating wire piezometers were connected to a central data logging units for data downloading. Manufacturer's data for the piezometers are provided in Appendix B.

3.7.4 Wick Drain Installation

The Willis groundwater collection trench wick drains were installed by DGI Menard between November 16, 2009 and November 17, 2009. The wick drains were installed at 3-ft. intervals, along a line between collection pipe and peizometer cable conduit. Equipment used in the installation was Alimak ADS stitcher mounted on a Volvo 360 excavator. The stitcher is an approximate 60-ft. high mast that houses the steel mandrel that drives the wick drain into the ground. The steel mandrel is diamond shaped with the long dimension being 5.5 inches and the short dimension being just under 3 inches. The steel mandrel was advanced to the required depth at each location and extracted leaving the wick material in its place with minimal disturbance to the surrounding soils. Totally 305 wick drains were installed at approximately 3-ft. intervals. All wick drains were driven to the depth of approximately 45 ft., at top of stratum M2 silt clay, except the former intake pipe location. At this location wick drain # 303 had refusal at 10 ft.

below ground surface, and wick drain #304 had refusal at 8 ft. below ground surface. Manufacturer's data for the wick drain is provided in Appendix B.

3.7.5 Collection Sumps #1 and 3 Renovation

CS#1 renovation was performed between October 14, 2009 and November 11, 2009. The renovation work included:

- Add a vault
- Cut and cap existing pipes
- Remove one pump from the sump
- Re-wire the remaining pump
- Re-connect the groundwater collection pipe, force main, and electrical conduit to the manhole and vault

CS#3 renovation was performed between October 9, 2009 and December 11, 2009. The renovation work included:

- Connect the sump with the force main
- Install valve
- Install control panel
- Install electric conduit

3.7.6 Groundwater Collection Trench QA/QC Activities

Parsons provided QA personnel to execute the activities described in this section. The team consisted of the project construction manager and the QA inspector. Quality Assurance activities executed by Parsons QA team included collection of grade shots to verify the collection pipe and sump elevations.

3.8 RESTORATION ACTIVITIES

Restoration along the shoreline was performed after the barrier wall and the groundwater collection trench were installed. Restoration was performed in two areas: along the Semet shoreline area of the site, and in Design Section 4 in the Willis portion of the site. The extent of the restoration work is shown in the project photographic log (Appendix E). The restoration activities were described in a June 2009 letter from Alfred Labuz of Honeywell to Richard Mustico of NYSDEC.

The restoration along the Semet shoreline area consisted of placement of topsoil over the existing riprap embankment and the establishment of a native plant community using upland and shoreline plantings and seeding. The upland conservation seed mix presented in the table below was used. Plantings included trees and shrubs. Restoration along the Semet shoreline area was performed in April and May of 2010.

The restoration in Design Section 4 consisted of placement of fill over the light-weight fill, placement of topsoil to a minimum depth of 6 inches, and the establishment of a native plant community using upland and shoreline plantings and seeding. The upland conservation seed mix presented in the table below was used. Plantings included trees and shrubs. Restoration in Design Section 4 was conducted in October through December in 2009.

Upland Conservation Seed Mix	
Species	**Percent by Weight**
‘Niagara’ Big Bluestem (Andropogon gerardii, ‘Niagara’)	25
Canada Wild Rye (Elymus canadensis)	25
Indiangrass, PA Ecotype (Sorghastrum nutans, PA Ecotype)	20
Partridge Pea (Chamaecrista fasciculata)	10
Showy Tick Trefoil (Desmodium canadense)	6
Ox Eye Sunflower (Heliopsis helianthoides)	5
‘Shelter’ Switchgrass (Panicum virgatum, ‘Shelter’	5
Black Eyed Susan (Rudbeckia hirta)	4

SECTION 4

CHRONOLOGY OF EVENTS

A chronology of major events related to the design and construction of Semet portion of the IRM, starting with the signing of the ROD, is presented below:

CHRONOLOGY OF EVENTS

DATE	ACTIVITY
April 16, 2002	Order on Consent for the Willis/Semet IRM signed
July 15, 2002	IRM Work Plan Submitted to NYSDEC
May 12, 2003	IRM Work Plan approved by NYSDEC
March 20, 2006	Final (95%) Design Report for the Willis Avenue/Semet Tar Beds Sites IRM submitted to the NYSDEC
April 8, 2006	NYSDEC comments on 95% Design Report for Semet Portion of IRM
October 4, 2006	Revised Work Plan and Final Request for Proposal Package for the Willis Avenue/Semet Tar Beds Sites IRM submitted to NYSDEC
October 12, 2006	NYSDEC approval of revised Work Plan and Final Request for Proposal Package for the Willis Avenue/Semet Tar Beds Sites IRM
October 16, 2006	Began construction activities of Semet portion of IRM
May 11, 2007	Semet portion of IRM completed
November 21, 2007	Draft Final Engineering Report (FER) for Semet submitted
June 5, 2008	Final FER for Semet submitted
June 12, 2008	Final FER for Semet approved

CHRONOLOGY OF EVENTS (CONTINUED)

DATE	ACTIVITY
February 15, 2008	Request for Proposal for the Willis Portion of the Willis Ave./Semet Tar Beds IRM Hydraulic Barrier Wall submitted to NYSDEC
July 2, 2008	Willis Portion of the Willis Avenue/Semet Tar Beds Sites IRM, Remedial Action Work Plan submitted to NYSDEC
July 21, 2008	Began construction activities with causeway upgrade
August 14, 2008	Completed causeway upgrade
August 12, 2008	Began Willis sheet pile installation
August 21, 2008	Began fill installation
December 18, 2008	Completed intake pipe filling
November 22, 2008	Completed sheet pile installation
December 18, 2008	Completed fill installation
February 2009	Request for Proposal Permanent Groundwater Collection and Monitoring System for the Willis Portion of the Willis Ave./Semet Tar Beds IRM submitted to NYSDEC
June 26, 2009	Restoration/Mitigation Design letter sent to NYSDEC
September 16, 2009	Willis Avenue/Semet Tar Beds Sites IRM, Permanent Groundwater Collection & Monitoring System, Remedial Action Work Plan submitted to NYSDEC
September 22, 2009	Began collection trench installation
October 7, 2009	Completed collection trench installation
October 1, 2009	Began Collection Sump #2 installation
October 30, 2009	Completed Collection Sump #2 installation

CHRONOLOGY OF EVENTS (CONTINUED)

DATE	ACTIVITY
October 14, 2009	Began Collection Sump #1 renovation
November 11, 2009	Completed Collection Sump #1 renovation
October 9, 2009	Began Collection Sump #3 renovation
October 20, 2009	Began restoration in Design Section 4
December 4, 2009	Completed restoration in Design Section 4
December 11, 2009	Completed Collection Sump #3 renovation
April 26, 2010	Began restoration at Semet shoreline
May 17, 2010	Completed restoration at Semet shoreline

SECTION 5

PROJECT COMMUNICATION

5.1 MEETINGS

To facilitate communications of scheduled activities, testing results, identification and resolution of problems, the following project meetings were held and attended by project personnel:

- Pre-Construction Kickoff Meeting held on August 5, 2008
- Weekly Project Status Meeting
- Daily Tailgate Safety Meetings

The agenda for the Pre-Construction Kickoff Meeting and the Weekly Project Status Meetings are included in Appendix G.

5.2 REPORTS

Reports and written communication generated during the construction activities include:

- Parsons: Daily Construction Activities Report
- MRCE: Daily Construction Activities Report
- MRCE: Instrumentation Data Report
- ATL: Vibration Monitoring Reports

SECTION 6

CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL

6.1 OVERVIEW

The construction was implemented pursuant to the Construction Quality Assurance Procedures Plan, which was appended to the Final (95%) Design Report (Parsons, 2006). Documentation collected during the construction is discussed in Section 6.2, below.

6.2 DOCUMENTATION

6.2.1 Remedial Action Work Plan

In accordance with the Order on Consent, a Remedial Action Work Plan (RAWP) was submitted to and approved by NYSDEC prior to commencement of the IRM work. Section 4 provides information regarding submittal, approval, and/or distribution dates.

6.2.2 Daily Field Reports

Parsons prepared Daily Field Reports for each day that work occurred. The daily reports documented the date, work activities, equipment, work force, deliveries, visitors, health and safety incidents/reportables, expected next day work activities, and photographs.

6.2.3 Photographic Log

Parsons took photographs to document progress of the work. Photographs were frequently submitted with the Daily Field Report. Selected photographs that summarize the construction activities described in this report are included in Appendix E. A photo ID, description and date accompany each photograph.

6.2.4 Meeting Agendas and Minutes

Weekly and monthly status meetings were held while work was being performed. Meetings were not held during winter shutdown periods. The meeting discussions included, but were not limited to, safety, work completed the previous week, work expected for the next week, documentation, and other issues. Parsons prepared and distributed meeting agendas and minutes to attendees, Honeywell, and NYSDEC to record issues and action items.

6.2.5 Submittals

Parsons reviewed and commented on contractor submittals provided pursuant to the technical specifications. Submittals discussed in Sections 3 of the report are included in Appendix B.

6.2.6 Testing

Material testing was conducted pursuant to the Construction Quality Assurance Project Plan, which was appended to the Final (95%) Design Report (Parsons, 2006). Test results discussed in Sections 3 of the report are included in Appendix C.

6.2.7 Changes

Five field adjustments were documented in Field Change Forms. The Field Change Forms are included in Appendix H. Field Change Forms were submitted to the NYSDEC prior to implementation.

SECTION 7

SUPPLEMENTAL INFORMATION

7.1 HEALTH AND SAFETY

The design included a project-specific Health and Safety Plan, which the remedial action contractors used as a basis to prepare Health and Safety Plans specific to their activities and procedures. The Health and Safety Plans prepared were dated as follows: (Peak Environmental, December 30, 2009).

Periodic safety meetings were conducted throughout the duration of the construction.

7.2 SITE SPECIFIC OBSERVATIONS AND LESSONS LEARNED

Site specific observations are noted pertaining to vibration monitoring and air monitoring.

7.2.1 Vibration Monitoring

As described in Section 3.4.3, the surface of the causeway between the two sanitary forcemains was monitored while sheeting was installed off the causeway for vibrations. Vibrations detected were compared to the criteria depicted on the "Suskind Diagram" in the United States Bureau of Mines Report 8507. The peak particle velocity limit was not reached or exceeded at any time during vibration monitoring operations.

7.2.2 Air Monitoring

Air monitoring was conducted during groundwater collection trench installation, during wick drain installation, and during piezometer installation. During these activities, worker breathing zone was periodically monitored for organic vapors. During groundwater collection trench installation, the worker zone was periodically monitored for mercury and the site perimeter was continuously monitored for dust and for organic vapors.

Readings were below the action levels identified in the Project Safety Plan.

SECTION 8

OPERATION AND MAINTENANCE

8.1 DETAILS

Not relevant to this portion of work.

SECTION 9

FINAL INSPECTION AND CERTIFICATIONS

9.1 FINAL INSPECTIONS

Peak Environmental, OBG, and Parsons conducted periodic inspections during the construction. Prior to demobilization of Peak and OBG, a punch list of required work items was created. A final inspection was conducted for each contractor to ensure that work on the punch lists was completed. The punchlist for the barrier wall construction is included in Appendix C.

9.2 RECORD DRAWINGS

Drawings documenting the completed IRM, signed and stamped by a professional engineer licensed in New York, are included in Appendix A.

9.3 CERTIFICATION

Pursuant to item III.A of the Order on Consent, the following certification is provided, signed by a qualified licensed professional engineer in New York:

I, David Steele, certify that I am currently a NYS registered professional engineer, I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Action Work Plans was implemented and that all construction activities were completed in substantial conformance (as documented in this report) with the NYSDEC-approved Remedial Action Work Plans[1,2]

By: David Steele 2/1/12

NYS PE # 082293

STATE OF NEW YORK
DAVID D STEELE
No. 082293
LICENSED PROFESSIONAL ENGINEER

[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 and/or 1.5(b)4. The services covered by this report were conducted in a manner consistent with that level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, is made. Unauthorized alternation or addition to this engineering document is a violation of Section 7209 Provision 2 of the New York State Education Law.

[2] List of Work Plans

July 2008, Willis Portion of the Willis Avenue/Semet Tar Beds Sites IRM, Remedial Action Work Plan

September 2009, Willis Avenue/Semet Tar Beds Sites IRM, Permanent Groundwater Collection & Monitoring System, Remedial Action Work Plan

June 2009, Letter from Alfred Labuz of Honeywell to Richard Mustico of NYSDEC regarding Restoration/Mitigation Design