Contract No.: EP-W-09-002
WA #: 048-RARA-02PE

Region 2 RAC2
Remedial Action Contract

Final Remedial Action Report

Old Roosevelt Field Contaminated Groundwater Area Superfund Site Remedial Action

Garden City, New York

September 25, 2015

CDM Smith

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PROJECT: RAC 2 Contract No.: EP-W-09-002
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SUBJECT: Final Remedial Action Report
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Dear Ms. Henry:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit the Final Remedial Action Report for the Old Roosevelt Field Contaminated Groundwater Area Site in the Village of Garden City, New York.

Per your request, we are providing copies of this submittal as follows:

- Sherrel Henry, USEPA – 1 hardcopy and 2 electronic copies
- Heather Bishop, NYSDEC - 1 hardcopy and 2 electronic copies

If you have any questions regarding this submittal, please contact me at (732) 590-4638.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Thomas Mathew

Thomas Mathew, P.E., BCEE
Site Manager

PSO: Bell

cc: H. Eng, EPA Region 2 (letter only)
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J. Litwin, CDM Smith (letter only)
RAC2 Document Control

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Acronyms

µg/L	microgram per liter
ACI	Arrowhead Contracting, Inc.
AISC	American Institute of Steel Construction
amsl	above mean sea level
ANSI	American National Standards Institute
APE	Area of Potential Effects
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials International
AWWA	American Water Works Association
bgs	below ground surface
CDFR	Chemical Data Final Report
CDM Smith	CDM Federal Programs Corporation
ChemTech	ChemTech Engineering
CLP	Contract Laboratory Program
CM Testing	CM Testing Laboratory, Inc.
COC	contaminant of concern
CQC	contractor quality control
CQCP	Contractor Quality Control Plan
CY	cubic yard
DCE	dichloroethene
DESA	Division of Environmental Science and Assessment
DGA	dense-graded aggregate
DO	dissolved oxygen
EPA	United States Environmental Protection Agency
EWS	Eastern Waste Services
FCN	Field Change Notification
FS	feasibility study
ft/d	foot per day
gpd/ft	gallon per day per foot
gpm	gallon per minute
GWTS	groundwater treatment system
HDB	Hemlock Directional Boring
HDD	horizontal directional drilling
H2K	H2K Technologies, Inc.
HDPE	high-density polyethylene
HMI	human-machine interface
HP	horsepower
HVAC	heating, ventilation, and air conditioning
IBC	International Building Code
ICC	International Code Council

ID	inside diameter
IDW	investigation-derived waste
INTEX	INTEX Environmental Group, Inc.
ITP	initial testing program
JKE	JK Electric
JZN	JZN Engineering PC
LEED	Leadership in Energy and Environmental Design
LIBS	Long Island Building Systems Inc.
LIPA	Long Island Power Authority
mA	milliamp
MCC	motor control center
MCL	Maximum Contaminant Level
mg/L	milligram per liter
MLS	Municipal Land Survey
ModSpace	Modular Space Corporation
MS	matrix spike
MSD	matrix spike duplicate
NFPA	National Fire Protection Association
NPL	National Priorities List
NTU	nephelometric turbidity unit
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&F	operational and functional
O&M	operation and maintenance
OD	outside diameter
OIT	operator interface terminal
ORP	oxidation-reduction potential
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PCE	tetrachloroethene
PDI	pre-design investigation
PEB	pre-engineered building
PHCC	Plumbing-Heating-Cooling Contractors National Association
PID	photoionization detector
PLC	programmable logic controller
Premier	Premier Utility Services
PSEG	Public Service Enterprise Group
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RA	remedial action

RAC	Remedial Action Contract
Racanelli	Racanelli Construction Company Inc.
RCA	recycled concrete aggregate
RD	remedial design
RI	remedial investigation
ROD	Record of Decision
ROW	right-of-way
R&L	R&L Well Drilling
Sampogna	Sampogna Contracting Corporation
SCADA	supervisory control and data acquisition
Seacoast	Seacoast Environmental Services, Inc.
SESC	soil erosion and sediment control
SESCP	Soil Erosion and Sediment Control Plan
SMP	site management plan
SOW	Statement of Work
SPDES-DGW	State Pollutant Discharge Elimination System – Discharge to Groundwater
SSHP	Site Safety and Health Plan
SVOC	semi-volatile organic compound
T&F	T&F Enterprises
TCE	trichloroethene
TCL	Target Compound List
TDH	total dynamic head
the Site	the Old Roosevelt Field Contaminated Groundwater Area Superfund Site
TOC	total organic carbon
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
UTD	Uni-Tech Drilling Co., Inc.
V	volt
VAC	volts of alternating current
VFD	variable-frequency drive
VOC	volatile organic compound
WC	water column

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Section 1

Introduction

The objective of this Remedial Action (RA) Report is to document the RA activities performed to achieve the requirements set forth in the United States Environmental Protection Agency's (EPA's) September 2007 Record of Decision (ROD) (EPA 2007) for the Old Roosevelt Field Contaminated Groundwater Area Superfund Site (the Site) located in Garden City, Nassau County, New York. The ROD calls for implementation of a groundwater extraction and treatment system to remediate the contaminant plume and prevent contaminant migration to Garden City supply wells GWP-10 and GWP-11. This report was prepared by CDM Federal Programs Corporation (CDM Smith) for EPA under Remedial Action Contract 2 (RAC2) No. EP-W-09-002, Work Assignment No. 048-RARA-02PE. This report was prepared in accordance with EPA's Close Out Procedures for National Priorities List Sites, Office of Solid Waste and Emergency Response (OSWER) Directive 9320.2-22, dated May 2011 (EPA 2011).

CDM Smith provided technical support to EPA during the RA. As part of this effort, CDM Smith contracted with Uni-Tech Drilling Co., Inc. (UTD) and Arrowhead Contracting, Inc. (ACI) to perform the remedial construction in accordance with the project design documents.

1.1 Purpose and Organization of Report

The purpose of this RA Report is to document the RA construction activities performed. This information is documented in the following sections:

- **Section 1: Introduction** – This section includes a description of the site environmental setting and historical operations.
- **Section 2: Background** – This section summarizes the ROD requirements, site contamination, and components of the remedial design (RD).
- **Section 3: Remedial Construction Activities** – This section summarizes the scope and sequence of activities undertaken to implement the RA.
- **Section 4: Chronology of Events** – This section provides a tabular summary of significant project events and dates.
- **Section 5: Performance Standards and Construction Quality Assurance/Quality Control –** This section discusses the construction and sampling quality assurance (QA)/quality control (QC) procedures implemented during the RA and inspections and audits conducted during the RA.
- **Section 6: Inspection and Certification** – This section summarizes the initial testing program (ITP) conducted at the Site, the pre-final and final inspections performed at the Site after completion of the RA, and health and safety procedures implemented during the RA.

- **Section 7: Operation and Maintenance** – This section summarizes the required post-construction operation and maintenance (O&M) activities, including routine O&M, monitoring, and reporting.
- **Section 8: Summary of Project Costs** – This section provides a summary of the actual RA project costs and discusses significant deviations between RD cost estimates and actual costs.
- **Section 9: Contact Information** – This section provides the contact information for site personnel, including regulatory agencies and the RA Contractors.
- **Section 10: References** – This section lists the references used in development of this RA Report.

1.2 Site Location and Description

The Site comprises an area of groundwater contamination spanning across several properties within the Village of Garden City, Nassau County, New York. The general site location is shown in **Figure 1-1**. The Site is located on the eastern side of Clinton Road, south of the intersection with Old Country Road, as shown in **Figure 1-2**. It includes a thin strip of open space along Clinton Road (known as Hazelhurst Park) and Roosevelt Field Mall (a large retail shopping mall with a number of restaurants and a movie theater). Several office buildings, including Garden City Plaza, share parking spaces with the shopping mall. Village of Garden City water supply wells GWP-10 and GWP-11 and two recharge basins are located in the immediate vicinity of the Site. The Pembrook recharge basin to the east of Garden City supply wells and is on land owned by Simon Property Group, the shopping mall's management company. Recharge Basin #124 is located to the south of Garden City supply wells and owned by Nassau County.

1.3 Site History

1.3.1 Early History

Prior to World War I, the United States (U.S.) military used the Site as a training center for Army and Navy officers and military pilots. The Site was historically known as Hempstead Plains Field until the Army changed the name to Roosevelt Field in 1918. After World War I, the U.S. Air Service maintained control of the Site but authorized aviation-related companies to operate from Roosevelt Field. On July 1, 1920, the U.S. Government sold the Site's buildings and relinquished control of the field for commercial aviation uses.

During World War II, Roosevelt Field was again used by the Army and the Navy. The Army used the field to train personnel on airplane and engine mechanics. As of March 1942, Roosevelt Field accommodated 6 steel/concrete hangars, 14 wooden hangars, and several other buildings used to receive, refuel, crate, and ship Army aircraft. In November 1942, the Navy Bureau of Aeronautics established a modification center at Roosevelt Field to install British equipment into U.S. aircrafts for the British Royal Navy. The U.S. Navy was responsible for aircraft repair and maintenance, equipment installation, preparation and flight delivery of lent-leased aircrafts, and metalwork required for the installation of British modifications. The facility also performed salvage work on crashed British Royal Navy planes. It is likely that chlorinated solvents were used at the Site during and after World War II.

Since the 1930s, chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE) have been widely used in aircraft manufacturing, maintenance, and repair operations.

The U.S. Navy vacated all but six hangars shortly after the war ended. Roosevelt Field resumed operations as a commercial airport from August 1946 until its closure in May 1951. In 1952, the Village of Garden City installed supply wells GWP-10 and GWP-11 in what had been the southwestern corner of the airfield. These supply wells were put into service in 1953. Over the subsequent years, several other supply wells and cooling water wells were installed and operated at the Site. The Roosevelt Field Mall was constructed at the Site and opened in 1957.

1.3.2 Recent History

In the late 1970s and early 1980s, investigations conducted by Nassau County discovered TCE and PCE contamination in supply wells GWP-10 and GWP-11, and concentration increased significantly until 1987, when an air-stripping treatment system was installed to treat the water from supply wells. High levels of contamination were also found in cooling water wells at the Site. The Site was listed on the National Priorities List (NPL) on May 11, 2000.

From June 2005 to December 2006, CDM Smith performed a comprehensive remedial investigation (RI) at the Site to determine the extent of groundwater contamination and to characterize site geology and hydrogeology (CDM Smith 2007a). A number of site-related contaminants were identified in the groundwater during the RI, including PCE, TCE, cis-1,2-dichloroethene (DCE), 1,1-DCE, and carbon tetrachloride.

Following the RI, a feasibility study (FS) was completed to evaluate the remedial alternatives to treat the contaminant plume (CDM Smith 2007b). On September 28, 2007, EPA issued the ROD, which called for a pre-design investigation (PDI) and extraction and treatment of contaminated groundwater (EPA 2007). The ROD specified the cleanup criteria for each of the five site-related contaminants of concern (COCs) (TCE, PCE, cis-1,2-DCE, 1,1-DCE, and carbon tetrachloride) to be the EPA and New York State Maximum Contaminant Level (MCL), or 5 micrograms per liter (µg/L). The ROD requirements are discussed in detail in **Section 2.1**.

CDM Smith conducted a PDI for the Site between May 2008 and October 2008 to assess the impact on the groundwater table of increased seasonal pumping at the Garden City supply wells, to further delineate the contamination plume, and to assess the capacity of Recharge Basin #124 to accept discharge from the proposed treatment plant. The results of the PDI were presented in the Draft Pre-Remedial Design Investigation Technical Memorandum (CDM Smith 2009a).

Between June 2009 and August 2009, CDM Smith completed a supplemental “Stage 2” PDI to investigate the groundwater contamination south of the Garden supply well discovered during PDI. The results of the supplemental PDI were presented in the Draft Supplemental Pre-Remedial Design Investigation Technical Memorandum (CDM Smith 2009b).

In September 2009, CDM Smith completed the RD for the Site (CDM Smith 2009c). The RD included a groundwater extraction and ex situ treatment system to treat the contaminated groundwater and prevent contaminant migration to the Garden City supply wells. In accordance with the ROD and approved RD, the RA was completed in two phases (Phase 1 and Phase 2). Phase 1 included installation of three extraction wells (EW-1S, EW-1I, EW-1D) and three paired monitoring wells (MW-1I1S, MW-2I/2S, and MW-3I/3S) and aquifer testing. Phase 2 included construction of yard piping, the treatment building, and the groundwater treatment system (GWTS). The Phase 1 and Phase 2 RAs were completed in September 2010 and December 2011, respectively, and are detailed in **Section 3.1** and **Section 3.2**, respectively.

In 2011, groundwater sampling was completed from existing and newly installed monitoring wells. Groundwater data from the newly installed monitoring wells indicated contamination in the eastern portion of the Site at the Old Roosevelt Field Mall property. The results of the 2011 groundwater sampling event were presented in the Baseline Remedial Action/Round 5 Well Sampling Technical Memorandum (CDM Smith 2012a).

The eastern portion the Site was not addressed in the 2007 ROD. As a result, EPA divided the Site into two Operable Units (OUs) to address the long-term cleanup of groundwater contamination at the Site. OU1 addressed the northern and southern contaminated groundwater plume, and OU2 addressed the eastern contaminated groundwater plume.

The groundwater contamination discovered south of the Garden City supply wells necessitated additional RD and RA to treat and contain further migration of the southern plume. In June 2012, CDM Smith completed the simulation of extraction wells for the southern plume (CDM Smith 2012b), which included installation of three extraction wells at the Garden City property along Stewart Avenue. In June 2013, CDM Smith completed the southern plume RD (CDM Smith 2013a), which included upgrade of the existing treatment system to treat contaminated groundwater at 500 gallons per minute (gpm) and installation of yard piping. The southern plume RA was completed in two phases (Phase 3 and Phase 4). Phase 3 included installation of three extraction wells (SEW-1S, SEW-1I, SEW-1D), and Phase 2 included construction of yard piping and upgrade of the existing GWTS. The Phase 3 and Phase 4 RAs were completed in April 2013 and July 2015, respectively, and are detailed in **Section 3.3** and **Section 3.4**, respectively.

With the exception of October 22, 2014 through May 30, 2015, the GWTS has been operational since January 2012. Between January 2012 and July 2015, the groundwater was extracted from the three extraction wells (EW-1S, EW-1I, and EW-1D) at an average flow rate of 225 gpm, treated at the newly constructed GWTS, and discharged to Recharge Basin #124. Routine O&M and groundwater sampling and monitoring were performed during this period and are detailed in **Section 7**. Between October 22, 2014 and May 30, 2015, the GWTS was shut down to complete the Phase 4 RA.

Presently, the treatment plant is operating and treating the contaminated groundwater flow from the northern and southern plumes. Ongoing activities include O&M and monitoring of the treatment system. Routine monitoring of site groundwater is being performed as part of a long-term monitoring program to verify remedy effectiveness and to monitor remedial progress. Routine O&M and groundwater monitoring activities are described in **Section 7**. Groundwater institutional controls are being maintained to restrict groundwater use at the site, and are detailed in **Section 2.1**.

Concurrently with the ongoing activities for OU1, EPA is also addressing the eastern portion of the Site (OU2) that was not addressed in the 2007 ROD. OU2 is currently in the RI/FS stage.

1.4 EPA and CDM Smith Project Management

CDM Smith was responsible for the RD and oversight of the remedial construction activities. CDM Smith provided full-time, onsite technical representatives throughout the duration of the project. The representatives ensured that the project was executed in accordance with approved design documents and site-specific plans. Onsite representatives maintained a direct line of communication with the project management team of CDM Smith, UTD, ACI, and the EPA Region 2 Remedial Project Manager. Weekly project progress meetings were held at the Site throughout the duration of the Phase 2 and Phase 4 RAs.

Key project personnel included:

- Sherrel Henry, EPA Region 2 – Remedial Project Manager
- Thomas Mathew, CDM Smith – Project Manager
- Ali Rahmani, CDM Smith – Project Engineer
- Frank Robinson, CDM Smith – Project Geologist (Phase 1 RA)
- Jeffrey Mullen, CDM Smith – Construction Supervisor (Phase 2 RA)
- Mike Ehnot, CDM Smith – Project Geologist (Phase 3 RA)
- Katelyn Reepmeyer, CDM Smith – Construction Supervisor (Phase 4 RA)
- Karl Hitzelberger, UTD – Master Driller (Phase 1 and Phase 3 RA)
- Doug Ronk, ACI – Project Manager
- Joe Cotter, ACI – Site Superintendent
- Matt Swope, ACI – Construction Foreman
- Tom Gleave, ACI –QC/Safety and Health Manager (Phase 2 RA)
- Clayton Nystrom, ACI – QC/Safety and Health Manager (Phase 4 RA)

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Section 2

Background

2.1 ROD Requirements

The remedy was instituted to control contaminant migration and remediate the contaminated groundwater plume originating from the Site. The selected remedy, as defined in the ROD (EPA 2007), is comprised of the following components:

- **Pre-Design Investigation of the Contaminant Plume** – A pre-design investigation will be conducted to collect information for the remedial design. The pre-design investigation will include installation of at least three multiport monitoring wells; a pumping test; and infiltration tests at the Nassau County recharge basin #124.

- **Groundwater Modeling** – The preliminary three-dimensional groundwater model will be updated for the remedial design. Up-to-date contaminant distribution data will be collected from the pre-design investigation, and used to update the contaminant plume maps. The lithology and Site-specific hydraulic conductivity obtained during literature review and the pumping test will be incorporated into the model.

- **Stage II Cultural Resource Survey** – If ground intrusion such as well drilling or pipe routing are planned in any areas specified as sensitive for archeological resources during the State 1A cultural resource survey, as State II survey will be conducted.

- **Groundwater Extraction Well** – To reduce the contaminant concentrations reaching the two supply wells GWP-10 and GWP-11, a groundwater extraction well(s) will be installed south of SVP/GWM-4. A new remedial extraction well SVP-4E will capture the contaminant plume upgradient of SVP/GWM-4, while ensuring that the pumping capacity of supply wells GWP-10 and GWP-11 is not affected. The final locations and number of extraction wells required will be determined after the pre-design investigation is completed and the groundwater model updated.

- **Ex Situ Groundwater Treatment** – A low profile air stripper will remove volatile organic compound (VOC) contaminants. During the remedial design, additional treatment technologies (including liquid phase carbon adsorption) may be considered if additional information suggests the need for treatment following air stripping. The treated water will meet groundwater and surface water discharge standards.

- **Discharge of Treated Groundwater** – The treated groundwater will be discharged to the local Nassau County recharge basin #124. During the remedial design, results of infiltration tests will be used to calculate the capacity of the recharge basin. Run-off from a representative rain event will also be calculated to verify the available capacity for treated groundwater recharge.

- **Evaluation and Upgrade of the Air Strippers at Supply Wells GWP-10 and GWP-11** – An evaluation of the conditions of the air strippers will be conducted. Any necessary upgrade or replacement or the air strippers will be evaluated. The upgrade or replacement costs of the air strippers will be estimated based on the condition of the existing treatment system.

- **Vapor Intrusion Sampling** – There is concern, based on previous sampling results, that Site-related vapor may migrate into the commercial buildings to the west of the mall. Vapor intrusion sampling will be conducted at six buildings during the winter heating season. Vapor mitigations system will be installed, if further sampling indicates the need for such system.

- **Institutional Controls** – Institutional controls will be relied upon to restrict future use of groundwater at the Site. Specifically, the New York State Department of Health (NYSDOH) State Sanitary Code regulates the installation of private potable water supply wells in Nassau County. In addition, EPA will rely on the current zoning in the area including and surrounding the mall to restrict future land use to commercial or industrial uses. If a change in land use is proposed, additional investigation of soils in the area will be necessary to support the land use change. Based on regulatory requirements under the State's Superfund program, the New York State Department of Environmental Conservation (NYSDEC) may seek to obtain easements or covenants on various properties within the Site.

- **Site Management Plan (SMP)** – An SMP will be developed and will provide for the proper management of all Site remedy components post-construction, such as institutional controls, and shall include: (a) monitoring of Site groundwater to ensure that the following remedy implementation, the groundwater quality improves; (b) conducting an evaluation of the potential for vapor intrusion, and mitigation, if necessary, in the event of future construction at or in the vicinity of the Site; (c) provision for any operation and maintenance required of the components of the remedy; and (d) periodic certifications by the owner/operator or other person implementing the remedy that any institutional and engineering controls are in place.

- **Long-Term Monitoring** – The contaminant plume will be monitored through annual sampling and analysis of groundwater. The results of the long-term monitoring program will be use to evaluate changes in the contaminant plume over time and to ensure achievement of MCLs.

- **Contingency Plan** – In the event that public supply wells GWP-10 and GWP-11 are taken out of service permanently or are operated at a significant reduction of their current pumping rates, a contingency plan would be implemented to capture and treat the contaminant plume in that area. The contingency plan would include the installation of a new well or wells in the vicinity of supply wells GWP-10 and GWP-11 and an ex-situ treatment.

- **Five-Year Review** – Because MCLs will take longer than five years to achieve, it is EPA's policy to conduct a review of Site conditions no less often that once every five years.

As documented in this report, all ROD requirements have been addressed as part of the RA activities except as noted below.

- **Pre-Design Investigation of the Contaminant Plume** – As discussed in **Section 1.3.2**, a PDI was conducted to collect information for the RD. The PDI included installation of three multiport monitoring wells, a pumping test, and infiltration tests at Recharge Basin #124.

- **Groundwater Modeling** – The preliminary three-dimensional groundwater model developed during FS was updated using the PDI contaminant distribution data. The contaminant plume maps were revised with up-to-date contaminant distribution data. The updated lithology and site-specific hydraulic conductivity information obtained from the literature review and aquifer test were incorporated into the model. The groundwater extraction well locations and treated groundwater discharge options were selected using the improved groundwater model with up-to-date contaminant data.

- **Stage II Cultural Resource Survey** – Phase IB and Phase IA/IB cultural resource surveys were performed by Richard Grubb & Associates, Inc. prior to the start of the Phase 2 and Phase 4 RAs, respectively. These surveys were performed to evaluate the potential archaeological resources area identified by John Milner Associates, Inc. as part of the RI/FS in 2005. No significant archaeological resources were located within the Area of Potential Effects (APE). The portion of the former Long Island Parkway contained within the APE was deemed ineligible for the New York and National Registers of Historic Places, and no further cultural resources survey was recommended. The Phase IA/IB Cultural Resources Survey Reports and a letter from the New York State Office of Parks, Recreation and Historic Preservation, stating that the Site will have no effects upon cultural resources and is ineligible for inclusion in the National Register of Historic Places, are included in **Appendix A.**

- **Groundwater Extraction Well** – Groundwater extraction wells EW-1S, EW-1I, and EW-1D were installed south of SVP-4 to reduce the contaminant concentrations reaching supply wells GWP-10 and GWP-11, without affecting the pumping capacity of the supply wells. Groundwater extraction well installation details are included in **Section 3.1.5**.

- **Ex Situ Groundwater Treatment** – To meet groundwater and surface water discharge standards, a low-profile air stripper was installed to remove the volatile organic compounds (VOCs) from the extracted groundwater. Ex situ GWTS construction is detailed in **Sections 3.2.4 and 3.4.5**.

- **Discharge of Treated Groundwater** – As discussed in **Section 1.3.2**, a geotechnical investigation was completed at Recharge Basin #124 during the PDI to assess its capacity to accept discharge from the proposed treatment plant. Runoff from a representative rain event was also calculated to verify the available capacity for treated groundwater discharge. The results of this investigation are summarized in **Section 2.5**.

- **Evaluation and Upgrade of the Air Strippers at Supply Wells GWP-10 and GWP-11** – The Garden City air strippers, used to treat water from GWP-10 and GWP-11, were evaluated during the RD. Upgrade and replacement costs were estimated based on the condition of the existing treatment system.

- **Vapor Intrusion Sampling** – The vapor intrusion sampling was conducted at commercial and residential buildings by EPA during the winter and heating seasons. Four rounds of sampling were performed at commercial buildings in April, June and December 2007, and December 2008, and two rounds of sampling were performed at residential buildings in June and December 2007. The vapor intrusion sampling study is presented in the *Roosevelt Field Groundwater Contamination Superfund Site, Garden City, NY, Trip Report (Lockheed Martin 2008).* Analytical results indicated that vapor mitigation systems were not necessary.

- **Institutional Controls** – Institutional controls in the form of local laws that restrict future use of groundwater will be utilized for the Site. Specifically, the Nassau County Sanitary Code regulates installation of private potable water supply wells in Nassau County. The Site Management Plan will be revised to include the institutional control at the site.

- **Site Management Plan (SMP)** – The SMPs were developed (CDM Smith 2010a and 2013b) to provide for the proper management of all site remedy components during and post-construction. The post construction activities included groundwater monitoring to verify that groundwater quality improves following remedy implementation and provision for O&M as required for any components of the remedy. A revised SMP will be prepared for the site to include a comprehensive evaluation of any institutional controls that are required to be implemented at the site.

- **Long-Term Monitoring** – The contaminant plume will continue to be monitored through annual groundwater sampling and analysis. Results will be used to evaluate changes in the contaminant plume over time and verify achievement of MCLs.

- **Contingency Plan** – A contingency plan will be implemented to capture and treat the contaminant plume in the area of GWP-10 and GWP-11 in the event that the wells are taken out of service permanently or are operated at a significant reduction of their current pumping rates.

- **Five-Year Review –** EPA will conduct a review of site conditions at least once every five years. The first five-year review will be performed within five years of remedial action completion.

2.2 Site Geology

The Site is located within the Atlantic Coastal Plain of New York. The topography of the central portion of Nassau County is characterized by a gently southward sloping glacial outwash plain. The Site is flat to gently undulating, and slopes from approximately 100 feet above mean sea level (amsl) at the northern edge (along Old Country Road) down to approximately 70 feet amsl along Clinton Road, about 4,000 feet south-southwest of Roosevelt Field.

In the vicinity of the Site, the sedimentary units thicken from approximately 800 feet thick at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands. The Upper Glacial deposits and the Magothy Formation are the geologic units of interest for the Site. The Magothy Formation consists of fine to medium quartz sand and interbedded clayey sand with silt, clay, and gravel interbeds or lenses. Interbedded clay is more common toward the top of the formation. The Upper Glacial deposits are composed mainly of stratified beds of fine- to coarse-grained sand and gravel with thin interbeds of silt and clay.

2.3 Site Hydrogeology

The Upper Glacial deposits and Magothy Formation are unconfined and form a single aquifer unit, although properties vary between the two formations. In the vicinity of the Site, the depth to water ranges from 16 to 36 feet below ground surface (bgs). The saturated thickness of the Upper Glacial deposits ranges from 20 to 40 feet, while the thickness of the Magothy Formation is approximately 500 feet. These formations are the most productive and heavily utilized groundwater resource on Long Island. The average transmissivity is 240,000 gallons per day per foot (gpd/ft) in the Magothy Formation and 200,000 gpd/ft in the Upper Glacial deposits. The average hydraulic conductivity is 228 feet per day (ft/d) in the Upper Glacial deposits and 56 ft/d in the Magothy Formation.

During the RI, the depth to the water table at the Site was measured and ranged from 27 to 37.6 feet bgs. The apparent horizontal groundwater flow is to the south. Based on the RI Round 1 data for the shallow aquifer, the groundwater flow gradient is 0.00156 feet per foot. Given this flow gradient, an effective porosity of 15 percent, and an approximate hydraulic conductivity for the Magothy Formation of 56 ft/d, the flow rate was estimated to be 0.6 ft/d.

Water level data collected from the multiport wells installed during the RI indicated that the vertical groundwater flow in these wells was downward. The four multiport wells in the mall area exhibited similar vertical gradients; the difference in water levels between the shallow and deep ports within each well ranged from 1.8 to 2.9 feet. Farther to the south, the vertical gradients increase.

No naturally occurring surface water bodies are present in the vicinity of the Site. Most of the Site area is paved or occupied by buildings. Runoff is routed into stormwater collection systems and is generally discharged directly to dry wells or recharge/retention basins. There are three man-made water table recharge basins located at or near the Site, including the privately owned Pembrook recharge basin and Nassau County recharge basin. The Pembrook recharge basin receives surface water runoff from the Garden City Plaza area during storm events. The Nassau County recharge basin receive stormwater runoff from the municipal stormwater collection system.

2.4 Summary of Groundwater Contamination

Six rounds of groundwater sampling were conducted between 2006 and 2014 to characterize chlorinated VOC contamination in site groundwater and monitor the effectiveness of the remedy. The primary COCs include PCE, TCE, cis-1,2-DCE, 1,1-DCE, and carbon tetrachloride. A limited number of organic compounds related to gasoline have been detected in site groundwater; however, they are not attributed to historical site operations.

Historical groundwater sampling results documented downgradient (southern) migration of contamination originating from the former Roosevelt Field facilities, toward Village of Garden City supply wells GWP-10 and GWP-11. These supply wells have contained high levels of site-related contaminants since they were first sampled in the 1970s, although these levels have shown a decreasing trend since the mid-1990s. The results from the most recent RA groundwater sampling event performed in November 2014 (Round 6) indicate that TCE and PCE concentrations in both supply wells decreased by over or close to 50 percent between 2011 and 2014, although they continue to exceed the MCL of 5 µg/L. Between 2011 and 2014, PCE concentrations in GWP-10 decreased from 54 µg/L to 25 µg/L and TCE levels decreased from 25 µg/L to 11 µg/L. In GWP-11, PCE levels decreased from 130 µg/L to 68 µg/L and TCE levels decreased from 96 µg/L to 44 µg/L. cis-1,2-DCE levels also decreased during this 3-year period, from 9.8 µg/L to 5.1 µg/L. The decrease in levels of COCs over the 3-year period indicates that the EW-1 extraction wells, which have been operational since January 2011 and are located upgradient of the supply wells, are effectively reducing concentrations in the COC plumes. The locations of all site monitoring and extraction wells are depicted in **Figure 2-1**.

Comparisons of the PCE and TCE plumes in 2011 and 2014 are illustrated in cross sections presented in **Figure 2-2** and **Figure 2-3**, respectively. As shown in the two cross section figures, the general shape of the PCE plume exceeding the MCL of 5 µg/L was similar in 2011 and 2014. However, the core of the PCE plume (concentrations exceeding 100 µg/L) decreased significantly in size between 2011 and 2014. In 2011 (**Figure 2-2**), it spanned over 2,000 feet horizontally from SVP-4 in the north to SVP-12 in the south, and ranged in thickness from 30 to 130 feet between elevations of approximately -145 feet amsl and -320 feet amsl, with concentrations up to 230 µg/L at SVP-10. By 2014 (**Figure 2-3**), the PCE plume core had decreased to approximately 50 feet by 50 feet, with a maximum concentration of 160 µg/L at SVP-10.

The shape of the TCE plume exceeding the MCL of 5 µg/L was also similar in 2011 and 2014, with the exception that the downgradient edge of the TCE plume has migrated farther south to SVP-8 (**Figure 2-3**). As shown in the two cross sections, the core of the TCE plume (concentrations exceeding 100 µg/L) was similar in both 2011 and 2014. The TCE plume core occurs in the same areas in the two figures: two small pockets located at SVP-9 (at elevations of approximately -60 and -160 feet amsl); one thin, elongated area that extends from approximately -150 feet amsl at EW-1S to approximately -400 feet amsl at SVP-11, diving below GWP-10 and GWP-11; and one small area that extends from approximately -230 feet amsl at SVP-11 to -330 feet amsl at SVP-13. TCE levels in some areas of the plume core increased slightly between 2011 and 2014. For example, the concentration at SVP-9 (port 6) increased from 210 µg/L to 250 µg/L, the concentration at MW-1S increased from 340 µg/L to 450 µg/L, and the concentration at SVP-13 increased from 63 µg/L to 180 µg/L. The increase in TCE levels in conjunction with the decrease in PCE levels may indicate degradation from PCE to TCE.

2.5 Remedial Design

2.5.1 Pre-Design Investigation

From May 2008 to October 2008, CDM Smith performed a PDI to obtain data for the performance-based RD. Detailed information and data collected as part of the PDI are discussed in the Pre-Remedial Design Investigation Technical Memorandum (CDM Smith 2009a). The information collected from the following activities was used for design of the groundwater extraction and treatment system:

- Collection of continuous water level measurements at GWX-10019 and GWX-10020 to monitor seasonal water table fluctuations due to increased pumping.

- Installation of three multiport monitoring wells, SVP-9, SVP-10, and SVP-11, and site-wide groundwater sampling to further delineate the extent of the TCE and PCE plumes.
- Geotechnical infiltration testing at Recharge Basin #124 to assess its capacity to accept the 200 to 250 gpm discharge from the proposed GWTS.

The findings of the PDI are summarized as follows:

- Water levels in GWX-10019 and GWX-10020 decreased approximately 7 feet and 1.5 feet, respectively, from May 2008 to mid-June 2008, demonstrating the impact of increased pumping at the two Garden City supply wells.
- The northern boundary of the contaminant plume with TCE or PCE concentrations greater than 100 µg/L extended to the north of SVP-9; the southern boundary extended to the south of SVP-11. TCE was detected in SVP-11, indicating that site contaminants had migrated south of the Garden City supply wells. The core of the TCE plume, with concentrations greater than 100 µg/L, had migrated as deep as 482 feet bgs. The bottom of the plume was still undefined.
- Geotechnical testing results concluded that Recharge Basin #124 had capacity to accept approximately 1,850 gpm, with no apparent head buildup. This capacity was determined to be sufficient to accommodate the additional flow of 200 to 250 gpm from the proposed GWTS. The results and analysis were included in a technical memorandum dated November 10, 2008 (CDM Smith 2008), which is included in **Appendix B**.

2.5.2 Supplemental Pre-Design Investigation

From July 2009 to August 2009, CDM Smith performed a supplemental "Stage 2" PDI to investigate the extent of groundwater contamination south of the Village of Garden City supply wells discovered during the initial PDI. Results of the supplemental PDI were presented in the Supplemental Pre-Remedial Design Investigation Technical Memorandum, submitted in November 2009 (CDM Smith 2009b). The major components of the supplemental PDI included the installation of two additional multiport monitoring wells, SVP-12 and SVP-13, south of the Village of Garden City supply wells and a fourth round of groundwater sampling. Locations of the new wells are shown in **Figure 2-1**.

2.5.3 CDM Smith Design

In September 2009, CDM Smith completed the RD, which included a combination of prescriptive and performance-based components to provide detailed requirements for certain aspects of the design as well as clear, specific, and measurable RA objectives developed to meet the ROD requirements (CDM Smith 2009c). The performance-based design components were intended to provide the RA Contractor with the flexibility to select different treatment processes and equipment to accomplish the ROD objectives. The 2009 RD addressed extraction and treatment of the contaminated groundwater plume upgradient of the Village of Garden City supply wells, which was later completed under the Phase 1 and Phase 2 RAs. The major components of the 2009 RD included:

- **General Site Layout** – An overall site layout plan was prepared, which included the treatment building footprint, entrance/egress areas and roads, locations of influent and effluent lines, a gravel laydown/temporary storage area, and limits of clearing, grubbing, and site disturbance.

- **Extraction Well Installation** – The design included detailed requirements for the installation of three new extraction wells (EW-1S, EW-1I, and EW-1D) in the northeastern portion of the plume for extraction of contaminated groundwater. Extraction well performance requirements and pumping rates were included in the design.
- **Monitoring Well Installation** – The design included detailed requirements for the installation of six single-screen monitoring wells (MW-1S, MW-1I, MW-2S, MW-2I, MW-3S, and MW-3I) to expand the existing well network for monitoring the performance of the pump and treat system.
- **Groundwater Treatment System and Building** – The GWTS design included specifications for minimum treatment train requirements and optional treatment components. GWTS effluent criteria were included in the design along with minimum unit process design and sizing requirements; minimum process instrumentation and control requirements; minimum construction and/or operation standards for equipment and materials; minimum treatment building/enclosure construction requirements; construction QC testing requirements; initial startup testing requirements to demonstrate treatment system performance based on field data and measurements; a minimum system up-time requirement; and minimum long-term O&M sampling, monitoring, and reporting requirements.
- **Influent and Effluent Pipeline** – The design included a detailed layout of the influent and effluent pipeline locations and depths.
- **Backfilling and Compaction** – The design included backfilling and compaction requirements for the treatment plant subgrade and all trenching performed for installation of the extraction well pipeline and electrical and control conduits.
- **Site Restoration** – The design included a new access road to the groundwater treatment building and restoration of pavement removed in the Roosevelt Field mall parking lot during pipeline installation. Construction details of new asphalt paving were specified. The unpaved disturbed area was required to be reseeded with a grass mixture compatible with the local climate and in accordance with NYSDEC requirements.

In June 2012, CDM Smith completed the design of the three southern extraction wells (CDM Smith 2012b), SEW-1S, SEW-1I, and SEW-1D, located at the Garden City property along Stewart Avenue. The southern extraction wells were installed as a part of the Phase 3 RA.

In June 2013, CDM Smith completed the southern plume RD (CDM Smith 2013a), which included upgrades of the existing treatment system to treat contaminated groundwater at 500 gpm from all six extraction wells and installation of yard piping connecting the southern extraction wells to the existing treatment building. The southern plume construction was completed as a part of the Phase 4 RA. The majority of the design was prescriptive, with the exception of influent piping to be installed underneath Stewart Avenue using the horizontal directional drilling (HDD) method. The major components of the 2013 design included:

- **General Site Layout** – An updated overall site layout plan was prepared, which included the location of the new influent line connecting the southern plume extraction wells to the treatment plant, a new effluent line, and limits of clearing, grubbing, and site disturbance.

- **Extraction Well Vault and Pump Installation** – The design included detailed requirements for extraction well casing retrofit, concrete vaults, piping, valves, and utility work, and furnishing of pumps and all necessary appurtenances for the three new southern extraction wells (SEW-1S, SEW-1I, and SEW-1D). Extraction well performance requirements and pumping rates were included in the design.

- **Groundwater Treatment System Upgrades** – The design included upgrades of the existing groundwater treatment plant with prescriptive equipment selections and pipes in accordance with the anticipated increase in flow to the treatment system. The design included specifications for minimum unit process design and sizing requirements; minimum process instrumentation and control requirements; minimum construction and/or operation standards for equipment and materials; construction QC testing requirements; and initial startup testing requirements to demonstrate treatment system performance based on field data and measurements. Electrical, hydraulic, and utility upgrades were specified in the design, including one-line and control system riser diagrams and process and instrumentation diagrams. Upgrades included:

  - Addition of one bag filter
  - Addition of three air stripper trays
  - Replacement of pumps and the air stripper blower
  - Replacement of piping and associated equipment on these lines with larger piping in accordance with flow increase
  - Installation of a new 6-inch effluent pipe to the stormwater manhole on Clinton Road, which discharges to Recharge Basin #124

- **Influent and Effluent Pipeline** – The design included a detailed layout of the influent and effluent pipeline locations and depths. In addition, the design specified the HDD method to be used for influent piping and conduit to be installed underneath Stewart Avenue.

- **Backfilling and Compaction** – The design included backfilling and compaction requirements for all trenching performed for installation of the extraction well pipeline and subsurface utilities.

- **Site Restoration** – The design included restoration of the gravel access road to the southern extraction wells and restoration of pavement removed during pipeline installation. Construction details of new asphalt paving and stone installation were specified. Unpaved disturbed areas were required to be reseeded with a grass mixture compatible with the local climate and in accordance with NYSDEC requirements. Any disturbed areas in the vicinity of trenchless pipeline installation were required to be restored to match existing conditions.

2.5.4 ACI Design

CDM Smith subcontracted ACI to prepare the detailed design for the groundwater extraction and ex situ treatment system and associated facilities. In March 2011, ACI completed the 100 percent RD based on the 2009 performance-based RD, which was accepted as final by CDM Smith (ACI 2011). This RD corresponded to work later completed in Phase 2 of RA construction. Major components of the RD included:

- **Groundwater Treatment Building** – A Leadership in Energy and Environmental Design (LEED)-certified, 40-foot by 50-foot pre-engineered building (PEB) was designed around construction configurations and practices associated with commercially manufactured metal buildings. A review of the International Building Code (IBC) – New York Edition (International Code Council [ICC] 2006a) was conducted to ensure that the final PEB design met all applicable codes, requirements, and standards. The treatment building included an area for process equipment with secondary containment areas as required for tank storage, a chemical storage room, an electrical and programmable logic controller (PLC) room, an office area, and a bathroom.

- **Treatment Process Design** – Process design included a final evaluation of groundwater flow to the treatment plant; final design criteria; contaminant mass loading calculations; effluent requirements; a system description for the process; hydraulic profile calculations; process piping designed for both interim and future flow conditions; equipment sizing calculations and selection; identification of key process-unit sizing criteria; and final primary process-unit sizing information. ACI designed a flexible system with the capacity to treat up to 250 gpm. The major process design components included:

  - A 5,500-gallon influent equalization tank
  - A chemical feed system to adjust effluent pH prior to discharge
  - A bag filter system
  - A low-profile air stripper
  - An iron removal system and an associated sludge handling system as an optional part of the construction, pending extraction well sampling results

- **Earthwork** – The earthwork design included excavation for the proposed treatment facility pads; preparation of the subgrade for footers and foundations; excavation and grading for roadways and parking areas; and installation of piping, valve boxes, bollards, and a septic tank.

- **Trenching and Installation of Extraction Well Pipeline and Utilities** – The design included trenching from the extraction wells to the treatment system building, installation of extraction well piping and underground electrical/control conduits, and installation of access handholes and vaults.

- **Stormwater Recharge Basin Rehabilitation** – The design included refurbishing Recharge Basin #124 as necessary to accommodate the effluent flow from the treatment plant, with the potential for sand replacement if required.

CDM Smith subcontracted ACI to complete the HDD investigation and design and to prepare shop drawings for the southern plume construction in accordance with the 2013 CDM Smith RD. Major components of the RD completed by ACI included:

- **Earthwork** – The earthwork design included excavation and grading for roadways and pathways and installation of piping and valve boxes.

- **Trenching, Horizontal Directional Boring, and Installation of Extraction Well Pipeline and Utilities** – The design included a combination of trenching and horizontal directional boring from the new southern plume extraction wells to the treatment system building, installation of extraction well piping and underground electrical/control conduits, and installation of cleanouts, access handholes, and vaults.

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Section 3

Remedial Construction Activities

This section summarizes the scope and sequence of RA construction activities completed at the Site. As discussed in **Section 1.3.2**, RA activities were divided into four phases of work:

- **Phase 1** – The first phase included drilling activities and installation of extraction wells EW-1S, EW-1I, and EW-1D to achieve hydraulic control of the contaminant plume encroaching upon Garden City supply wells GWP-10 and GWP-11.

- **Phase 2** – The second phase included construction of a facility for treatment of groundwater extracted from EW-1S, EW-1I, and EW-1D and construction of a pipeline connecting the extraction wells to the groundwater treatment facility.

- **Phase 3** – The third phase included drilling activities and installation of extraction wells SEW-1S, SEW-1I, and SEW-1D for remediation of the southern contaminated groundwater plume downgradient of Garden City supply wells GWP-10 and GWP-11.

- **Phase 4** – The fourth phase included construction of a pipeline connecting the southern extraction wells (SEW-1S, SEW-1I, and SEW-1D) to the existing treatment system and upgrade of the existing treatment system to accommodate the additional flow from the southern extraction wells.

3.1 Phase 1 Activities

Phase 1 RA activities consisted of installing one test boring (TB-01), three extraction wells (EW-1S, EW-1I, and EW-1D), and six monitoring wells (MW-1S, MW-1I, MW-2S, MW-2I, MW-3S, and MW-3I) and aquifer testing. Extraction wells were installed in the northern area of the contaminant plume to intercept the VOC contamination. UTD of Franklinville, New Jersey performed drilling activities and Seacoast Environmental Services, Inc. (Seacoast) of Lincroft, New Jersey was responsible for the disposal of soil and water investigation-derived waste (IDW). UTD subcontractor INTEX Environmental Group, Inc. (INTEX) of Pipersville, Pennsylvania provided and operated a temporary GWTS to treat water generated during well development and aquifer testing. Phase 1 field activities began on May 3, 2010 and were completed on September 23, 2010. All field work and sampling was conducted in accordance with the subcontract drilling Statement of Work (SOW), Specification Section 02525, and the EPA-approved Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (CDM Smith 2010b), and Field Change Notification (FCN) #01 and FCN #02. FCN #01 (CDM Smith 2010c) and FCN #2 (CDM Smith 2010d), which are included in **Appendix T**, lists the changes to the approved UFP-QAPP (CDM Smith 2010b) for groundwater sampling during aquifer testing. Well permits were obtained from Nassau County by UTD for the installation of monitoring and extraction wells, and are included in **Appendix C**.

3.1.1 Temporary Facilities

To facilitate well installation activities, construction and staging areas were established at the Old Roosevelt Field Mall property east of the proposed extraction well locations. Modular Space Corporation (ModSpace) delivered a temporary construction trailer to the staging area for CDM Smith personnel. UTD constructed a decontamination pad to decontaminate the drill rig, drill rods, drill bits, casings, and other associated equipment in accordance with the approved UTD submittals. National Rent-A-Fence provided and installed security fencing around the temporary facilities and monitoring and extraction wells. All temporary facilities were demobilized from the Site upon completion of Phase 1 construction activities.

3.1.2 Surface Geophysical Survey and Subsurface Utility Survey

Prior to drilling activities, UTD conducted a surface geophysical survey and contacted Dig Safely New York for a subsurface utility survey. The utility survey was completed to ensure that the proposed locations for the test boring and extraction well boreholes did not coincide with the locations of any underground utility lines. CDM Smith used the survey results to finalize the test boring and extraction well locations.

3.1.3 Test Boring Installation

Test boring TB-01 was drilled to obtain lithological and analytical data for the subsurface soil correlating to the proposed screened intervals of the extraction wells. Information obtained from TB-01 was used to finalize the designs of the three extraction wells. TB-01 was completed to a final depth of 415 feet bgs using standard mud rotary drilling methods. An 8.75-inch drag bit was advanced, and a 2-inch inside diameter (ID), 2-foot-long steel split-spoon sampler was used to collect soil samples at prescribed intervals to the final borehole depth.

Split-spoon samples were obtained every 10 feet between 10 and 200 feet bgs, and every 5 feet between 200 and 415 feet bgs. Split-spoon samplers were decontaminated between sampling intervals using a non-phosphate detergent wash followed by a tap water rinse. Split-spoon sampling was performed in accordance with American Society for Testing and Materials International (ASTM) D1586-08a (ASTM 2008).

Upon retrieval, CDM Smith screened the soil for organic vapors using a photoionization detector (PID) and recorded a description of the soil using the Burmeister soil classification system. The majority of the soil collected consisted of sand-sized particles. No organic vapors were detected using the PID. Lithological data are included on the TB-01 test boring log in **Appendix D**.

Soil samples were collected and shipped to Long Island Analytical Laboratories, Inc. and Johnson Screens for total organic carbon (TOC) and grain size analysis, respectively. TOC data were used to refine the retardation factor used in the site-specific groundwater model. Grain size data were used to finalize the well screen size and sand filter pack. Depths at which samples were collected for TOC and grain size analysis are presented in **Table 3-1**.

A total of 27 soil samples were collected for TOC analysis and 20 soil samples were collected for grain size analysis. TOC analytical data are presented in **Table 3-2**. Grain size analytical data are presented in the Johnson Screens report included in **Appendix E**. Johnson Screens provided a recommended design for the well screen slot size and filter pack based on results of the grain size analysis and lithologic descriptions. CDM Smith reviewed the Johnson Screens report and concurred with the recommended design for the well screen slot size and filter pack.

Following split-spoon sample collection, TB-01 was backfilled with sand as a temporary closure. Sand was placed into the borehole annulus via tremie pipe from the final depth to the surface. The borehole was later converted into EW-1D using the procedures described in **Section 3.1.5**.

3.1.4 Monitoring Well Installation

Six monitoring wells (MW-1S, MW-1I, MW-2S, MW-2I, MW-3S, and MW-3I) were installed to monitor water levels during operation of the pump and treat system. Monitoring wells were installed between May 2010 and June 2010 using standard mud rotary drilling methods. Monitoring well locations are shown in **Figure 2-1**. Monitoring well construction logs and NYSDEC well completion reports are included in **Appendix D**.

3.1.4.1 Outer Steel Casing Installation

Outer steel casings were installed in each well to prevent borehole collapse in the shallow overburden soil. UTD used standard mud rotary drilling methods to advance a nominal 12-inch diameter drill bit to an approximate depth of 80 feet bgs. An 8-inch outside diameter (OD) carbon steel casing was then installed to a depth of 80 feet bgs. Grout was placed into the borehole annulus around the outer steel casing, via tremie pipe, from 80 feet bgs to the ground surface. Grout was allowed to set for a minimum of 12 hours before drilling activities resumed at the monitoring well.

3.1.4.2 Drilling and Well Installation

After the outer casings were installed, monitoring well boreholes were installed by advancing a nominal 8-inch diameter drag bit, via standard mud rotary drilling methods, from 80 feet bgs to the final borehole depths. A Type 304, Schedule 10S, 4-inch ID, 10-foot stainless steel well assembly was then lowered into the borehole and positioned at the appropriate depth. Each well assembly consisted of a 10-slot wire-wrapped well screen, sump, and riser sections. The sections of the well assembly were connected via flush-threaded joints. Centralizers were attached to the outside of the well assembly at approximately 50-foot intervals.

Following well assembly placement, a U.S. Silica Filpro #1 sand commercial filter pack was placed into the borehole annulus via tremie pipe. The filter packs extended from the final borehole depths to a minimum of 10 feet above the top of the well screen. A minimum 5-foot-thick sand seal, consisting of U.S. Silica Filpro #00 sand and bentonite slurry, was placed above the filter pack via tremie pipe. During placement, UTD sounded the depth to the top of filter pack and sand seal in the borehole annulus to ensure sufficient volume of backfill material was added. Neat cement grout was added to the borehole annulus, via tremie pipe, from above the sand seal to the ground surface. The tremie pipe was retracted gradually as backfill materials accumulated in the borehole.

3.1.4.3 Alignment Testing

UTD tested each monitoring well for alignment immediately prior to development to ensure proper construction. Well casing alignment was tested by lowering a 20-foot-long alignment disk, with a diameter just under the 4-inch ID of the well casing, to the top of the well screen and then retracting it. The alignment disk moved freely throughout each well casing. Alignment test results are summarized in the Phase 1 Bi-Weekly Reports No. 3 and No. 4 (**Appendix F**).

3.1.4.4 Well Development

Monitoring wells were developed in June 2010 using the air lift method described in **Section 3.1.5.4**. A minimum of three well volumes of water were purged from each well screen during development. Water quality parameters were monitored and recorded as described in **Section 3.1.5.4**. Once the parameters stabilized, well development was considered complete. The water quality parameter logs populated during monitoring well development are included in Phase 1 Bi-Weekly Reports No. 3 and No. 4 (**Appendix F**).

3.1.5 Extraction Well Installation

Between July 2010 and August 2010, CDM Smith installed three extraction wells (EW-1D, EW-1I, and EW-1S) to capture the contaminant plume in the deep, intermediate, and shallow zones of the aquifer, respectively, for subsequent treatment. EW-1D, EW-1I, and EW-1S were completed to final depths of 415, 345, and 275 feet bgs, respectively. The wells were installed in a cluster on the western border of the property at 300 Garden City Plaza. Standard mud rotary drilling was used to install the outer steel casings, and reverse circulation drilling was used to complete the boreholes. Extraction well locations are shown in **Figure 2-1**. Extraction well construction logs and NYSDEC well completion reports are included in **Appendix D**.

3.1.5.1 Outer Steel Casing Installation

Outer steel casings were installed in each well to prevent borehole collapse in the shallow overburden soil. UTD used standard mud rotary drilling methods to advance a nominal 20-inch diameter drill bit to an approximate depth of 80 feet bgs. A 16-inch OD carbon steel casing was then installed in the borehole to a depth of 80 feet bgs. Grout was placed into the borehole annulus around the outer steel casing via tremie pipe. Grout was allowed to set for a minimum of 12 hours before drilling activities resumed at the extraction well.

3.1.5.2 Drilling and Well Installation

After the outer casings were installed, extraction well boreholes were installed by advancing a nominal 16-inch diameter drag bit, via reverse circulation drilling methods, from 80 feet bgs to the final borehole depths. A Type 304, Schedule 10S, 8-inch ID stainless steel well assembly was then lowered into the borehole and positioned at the appropriate depth. Each well assembly consisted of a 20-slot wire-wrapped well screen, 5-foot sump, and riser sections. The sections of the well assembly were connected via flush-threaded joints. Centralizers were attached to the outside of the well assembly approximately every 50 feet. EW-1D, EW-1I, and EW-1S were screened from 350 to 410 feet bgs, 280 to 340 feet bgs, and 210 to 270 feet bgs, respectively.

Following well assembly placement, a U.S. Silica commercial filter pack was placed into the borehole annulus via tremie pipe. A U.S. Silica Filpro #0 sand pack was used for EW-1S and EW-1D, and a U.S. Silica Filpro #1 sand pack was used for EW-1I. The filter packs extended from the final borehole depths to a minimum of 10 feet above the top of the well screen. A minimum 5-foot-thick sand seal, consisting of U.S. Silica Filpro #00 sand and bentonite slurry, was placed above the filter pack via tremie pipe. During placement, UTD sounded the depth to the top of the filter pack and sand seal in the borehole annulus to ensure sufficient volume of backfill material was added. Neat cement/bentonite grout was added to the borehole annulus, via tremie pipe, from above the sand seal to the ground surface. The tremie pipe was retracted gradually as backfill materials accumulated in the borehole.

3.1.5.3 Plumbness and Alignment Testing

UTD tested each extraction well for plumbness and alignment immediately prior to development to ensure proper construction. Plumbness testing consisted of suspending a plumb bob centered in the well casing from a cable fixed 10 feet above the top of the well. The plumb bob was lowered into the well and the displacement was measured, at 10-foot intervals, from the ground surface to the top of the well screen. Displacement was measured between the cable and the well casing on the northern and eastern sides of the well using a folding ruler. CDM Smith calculated the casing drift using the displacement measurements. The American Water Works Association (AWWA) allows a drift of two-thirds the ID of the well per 100 feet of depth (AWWA 2006). A maximum deflection of 3/8 inch was noted; therefore, the drift for each well was within the acceptable AWWA limits.


Photographs 3-1 and 3-2: Plumbness and alignment testing device, total length view (left) and top view (right).

Well casing alignment was tested by lowering a 20-foot-long alignment disk, with a diameter just under the 8-inch ID of the well casing, to the top of the well screen and then retracting it. The alignment disk moved freely throughout each well casing. Plumbness and alignment test results are summarized in the Phase 1 Bi-Weekly Report No. 8 (**Appendix F**).

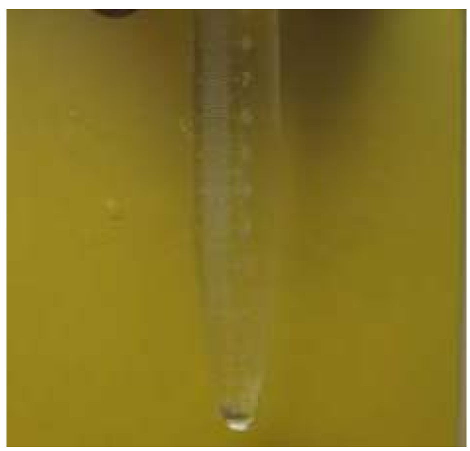
3.1.5.4 Well Development

Extraction wells were developed on August 24, 2010 using a combination of bailing, air lift/swabbing, and constant rate pumping. This process removed drilling fluids and fine-grained material from the wells, stabilized the filter packs, and repaired damage to the formation caused by drilling. Purge water was contained at the surface and ultimately pumped into a 21,000-gallon tank located approximately 200 feet from the extraction wells. CDM Smith measured and recorded the depth to water in each extraction well prior to development using a water level meter. Well development data are included in Phase 1 Bi-Weekly Report No. 8 (**Appendix F**).

Bailing was conducted at each extraction well to begin development. A bailer was lowered 10 feet below the static water table and retracted to the surface to create an inflow to the well. Purge water was contained at the surface. Bailing was performed over a minimum of six 15-minute bailing periods until recharge yield stabilized.

Air lift/swabbing methods followed bailing. The assembly for air lift/swabbing consisted of an air line inside a string of drill rods. A 20-foot-long swab was attached to the bottom of the rods. The swab assembly was lowered near the top of the well screen. Well development began by moving formation water into the well and removing fine-grained material using air lift methods alone. When it was confirmed that the well was producing water, the well screen was swabbed in combination with air lift. In this step, the swab was raised and lowered repeatedly inside the well using a 20-foot stroke at a rate of six strokes per minute. The swab was then lowered to the next interval of the well screen and the process was repeated until the entire screen was developed. The screened intervals were swabbed at a pumping rate of approximately 150 gpm (approximately 120 percent of the design flow rate at EW-1D, and approximately 250 percent of the design flow rate at EW-1I and EW-1S).

Following completion of air lift/swabbing, a submersible pump was lowered into each well and a flow meter/totalizer and Rossum Sand Tester were attached to the purge water discharge hose. The pumps were provided by UTD, along with a trailer-mounted diesel generator to supply power. The submersible pumps were activated, and UTD monitored the flow rate and sand content of the purge water. EW-1D was pumped at a rate of 157 gpm and EW-1I and EW-1S were pumped at 72 gpm to complete well development.

Photographs 3-3 and 3-4: EW-1I sand content sample (left) and 0.05 mg/L of sand deposited into vial (right).

During purging, CDM Smith periodically measured drawdown and water quality parameters, including pH, temperature, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity, and collected samples to determine sand content. Pumping continued until water quality parameters stabilized to within 10 percent over three consecutive readings; the turbidity was less than 10 nephelometric turbidity units (NTU); sand content was less than 5 milligrams per liter (mg/L); and there was no increase in yield for four 0.5-hour periods. Each extraction well stabilized within 2 hours of purging. Well development data are presented in the Phase 1 Bi-Weekly Report No.

8 (**Appendix F**). Following well development, one pint of water was collected in a clear glass jar from each well and photographed for documentation.

3.1.5.5 Groundwater Sampling

Following well development, a groundwater sample was collected from each extraction well. Groundwater samples were shipped to EPA's Division of Environmental Science and Assessment (DESA) and/or Contract Laboratory Program (CLP) laboratory for Target Compound List (TCL) VOCs, total iron and manganese, and dissolved iron and manganese analyses. Analytical results are included in **Table 3-3**.

3.1.5.6 Well Completion

A stainless steel lid was welded onto the top of each extraction well. Sand was then placed around the well and a 24-inch by 24-inch stainless steel plate was installed by securing it with rebar at each corner, driven 2 feet into the ground.

Photographs 3-5 and 3-6: Extraction well welded stainless steel cover (left) and steel plates (right).

3.1.6 Aquifer Testing and Groundwater Sampling

To support construction of the groundwater extraction and treatment system, aquifer testing, consisting of a step drawdown test and sustained yield test, was performed at each extraction well. The objectives of this investigation were to test the capacity of extraction wells EW-1S, EW-1I, and EW-1D to meet design flow requirements; obtain site-specific aquifer hydraulic data for use in the groundwater flow model of the Site; and obtain baseline specific capacity data for each extraction well. In addition to providing hydrologic data, results of the aquifer testing revealed that the extraction wells had the capacity to meet their design flow requirements and that pumping at municipal wells GWP-10 and GWP-11 would not compromise the capture of the contaminant plume by the extraction wells. The Sustained Yield Test Technical Memorandum, dated November 9, 2011 (CDM Smith 2011), summarizes the aquifer test design, equipment, methods, sampling, data analysis, and results. The memorandum is included as **Appendix G**.

Groundwater samples were collected from the extraction wells during aquifer testing to provide data for final treatment system design, and results are summarized in the Sustained Yield Test Technical Memorandum (CDM Smith 2011). Groundwater analytical results from the step test and sustained yield test are included in **Table 3-4** and **Table 3-5**, respectively. CDM Smith evaluated the extraction well data collected during the aquifer test and determined that an iron removal system was not needed as part of the final treatment system. This recommendation regarding treatment system design and a summary of the sample results were conveyed in a letter to EPA (CDM Smith 2010e).

3.1.7 Well Disinfection

The extraction wells were disinfected after well development, aquifer testing, and sampling using calcium hypochlorite granules mixed with city water. After a minimum period of 24 hours following injection of calcium hypochlorite solution, the extraction wells were purged using a submersible pump to remove the chlorine solutions from the wells. The purge water was tested for residual chlorine using a chlorine test kit. Water was purged until the extraction wells were free of chlorine. Purged water was neutralized in the influent frac tanks by adding Johnson Screens NW-500 chlorine neutralizer before pumping the water into the temporary GWTS. Well disinfection details and purge water test results are included in the Phase 1 Bi-weekly Report No. 10 (**Appendix F**).

Photograph 3-7: Well disinfection setup.

3.1.8 Temporary Water Treatment System

A temporary GWTS was used to treat the purge water produced during well installation, well development, and aquifer testing. The system was designed to accommodate an influent flow rate of 250 gpm and treat groundwater for VOCs, in compliance with the site-specific New York State Pollutant Discharge Elimination System – Discharge to Groundwater (SPDES-DGW) permit, prior to discharge to Recharge Basin #124 via storm sewer. CDM Smith obtained the New York SPDES-DGW permit from NYSDEC on June 2, 2010. A copy of the permit is included in **Appendix C**.

INTEX submitted temporary GWTS shop drawings for CDM Smith's review and approval. Subsequent to shop drawing approval, INTEX provided a pre-packaged treatment system within a standard-length commercial freight trailer, with dimensions of 8 feet wide by 48 feet long. The temporary treatment system consisted of the following primary process components:

- Two 15-horsepower (HP), 4-inch by 3-inch electrical centrifugal liquid transfer pumps
- Three high-pressure duplex filtration units
- Two 5,000-pound activated carbon absorption vessels
- One caustic soda chemical feed system
- One 1,000-gallon discharge equalization tank
- One 4-inch totalizing flow meter
- One process control panel

Purge water was contained in a 21,000-gallon tank supplied by the IDW subcontractor and ultimately transferred to the temporary GWTS. Level sensors were placed inside the tank and connected to the treatment system's control panel to allow for batch processing of water during drilling activities and automatic processing during well development and testing. INTEX provided all required piping and connections to convey the water from the source, through the treatment system, and to the storm drain on Clinton Road, west of the extraction wells. The storm drain runs into Recharge Basin #124, which is outside the area of influence of the extraction wells.

During the first week of operation, the treated water was held in the effluent tank for evaluation of the temporary GWTS removal efficiency. Water samples were collected from the influent and effluent holding tank, and data were submitted to CDM Smith for review. Effluent sample results were below the SPDES-DGW permit criteria. CDM Smith authorized INTEX to discharge the treated water to the storm drain.

INTEX performed O&M of the treatment system, including effluent monitoring and sampling. A total of 1,758,000 gallons of water was treated by the temporary GWTS between May 15 and September 10, 2010. During operation of the temporary GWTS, 11 effluent samples were collected at a frequency of one sample per 200,000 gallons and sent to QC Laboratories in Southampton, Pennsylvania for VOCs analysis. All sample results are summarized in the INTEX Water Treatment System Report included in **Appendix H**. In addition, the process-flow diagram for the temporary treatment system is included in **Appendix H**.

3.1.9 Investigation-Derived Waste Handling

During well drilling, installation, development, and disinfection activities, soil and water IDW was contained by UTD. Seacoast, the IDW contractor, provided 20-cubic yard (CY) roll-off containers and 21,000-gallon holding tanks to contain the soil and water IDW, respectively.

Drill cuttings from the boreholes were discharged directly into UTD's soil holding container. The drillers transferred the cuttings from this container into the 20-CY roll-off containers using a backhoe. Seacoast collected composite samples of the soil IDW for waste characterization analysis. Analytical results indicated that the drill cuttings were non-hazardous. Kiln dust was delivered to the Site and added to the roll-off containers as necessary to dewater the saturated soil prior to transport. A total of 196 tons of soil cuttings were disposed of offsite at Modern Landfill in York, Pennsylvania.

Purge water was treated and discharged to Recharge Basin #124 as discussed in **Section 3.1.8**. Seacoast cleaned out the Adler tanks at the conclusion of field activities. IDW that had settled at the bottom of the Adler tanks and could not easily be removed was treated as sludge IDW. A total of 15,200 gallons of sludge IDW was pumped into a vacuum truck and transported to Environmental Recovery Corporation of Lancaster, Pennsylvania for treatment and disposal.

Table 3-6 summarizes the quantities of material disposed of for each waste type, as well as disposal facility names, addresses, and offsite transportation company names. Waste manifests and certificates of disposal are included in **Appendix I**.

3.1.10 Equipment Decontamination

During field activities, UTD decontaminated equipment used for drilling, soil sampling, well development, and disinfection in accordance with the drilling SOW. Large equipment and materials were decontaminated using a steam cleaner at the designated decontamination pad within the staging area. Split-spoon samplers were cleaned after each use with a non-phosphate detergent wash, followed by a tap water rinse. Rinsate was contained and ultimately treated using the temporary treatment system.

3.2 Phase 2 Activities

ACI was selected as the RA Contractor to perform Phase 2 construction activities, including construction of a groundwater treatment facility and a pipeline connecting extraction wells EW-1S, EW-1I, and EW-1D to the new groundwater treatment facility. Onsite construction activities began on March 21, 2011 and were substantially complete at the conclusion of the first ITP on December 30, 2011.

3.2.1 Pre-Construction Activities

Pre-construction activities included required submittals and meetings, permitting, photographs, site clearing and grubbing, implementation of soil erosion and sediment control (SESC) measures, an initial site survey, site security, and installation of temporary facilities.

3.2.1.1 Pre-Construction Submittals

Following RA Contract award, ACI prepared the required work plans and submitted them to CDM Smith for approval in accordance with the contract Specification Section 01330. ACI's approved work plans are included in **Appendix J**.

3.2.1.2 Pre-Construction Meeting

A pre-construction meeting was held on July 23, 2010 to coordinate the efforts of all parties involved. The pre-construction meeting included the Pre-Construction Work Conference, Pre-Construction Safety Conference, Pre-Work Conference, and Mutual Understanding Meeting. Representatives from EPA, CDM Smith, and ACI participated in the pre-construction meeting. The pre-construction meeting minutes are included in **Appendix K**.

3.2.1.3 Permitting and Approvals

The following permits and approvals were required for the Phase 2 RA work. Copies of all permits are included in **Appendix C**.

- **Road Opening /Drainage Construction Permit** – A Road Opening/Drainage Construction permit was obtained by ACI from the Nassau County Department of Public Works. This permit covered connection of the effluent discharge pipe to the existing storm sewer structure.

- **New York State Pollutant Discharge Elimination System** – CDM Smith obtained a New York SPDES-DGW permit equivalent from NYSDEC for discharge of treated groundwater to Recharge Basin #124. This permit equivalent was obtained during Phase 1 of the RA for discharge of temporary treatment system effluent, as discussed in **Section 3.1.7**, and is also applicable for the long-term RA at the Site.

- **Soil Erosion and Sediment Control Certification** – No SESC certifications or permits were required; however, ACI installed SESC measures as described in **Section 3.2.2.3**.

- **Groundwater Treatment Building Construction Permit** – The groundwater treatment building design was not required to be submitted to the Village of Garden City Architect Review Board for the construction permit. However, the Village of Garden City requested that CDM Smith submit the building rendering for general approval. CDM Smith submitted the building rendering to the Village of Garden City for approval, and received verbal approval from Francis Koch, Superintendent of Water & Sewer.

As described in **Sections 2.5.3 and 2.5.4**, an air stripper was included in the design of the treatment facility. In accordance with 6 New York Codes, Rules and Regulations (NYCRR) Subpart 201-3.3 (NYSDEC 2004), air strippers at a Superfund site are considered trivial, and the owner and operator are exempt from obtaining a NYSDEC air pollution control state facility permit. However, the owner and/or operator of an exempt source is required to certify that it is operated properly and to maintain onsite records. Discharge of toxic air pollutants, such as PCE and TCE, must meet the regulatory requirements of the NYSDEC Air Toxics Program as specified in 6 NYCRR Part 212 (NYSDEC 2010a). Based on modeling performed during design of the treatment system and sampling of effluent during treatment system startup, it was determined that VOC concentrations in the air stripper effluent were far below applicable short-term and annual guidance concentrations. PID readings were taken at the air stripper effluent stack on a weekly basis to monitor VOC emissions and quarterly air sampling was performed to ensure continued compliance.

3.2.1.4 Pre-Construction Video and Photographs

Prior to the start of site activities, ACI recorded a video of the existing site conditions. The pre-construction video was filmed by ACI QC personnel on March 15, 2011. A copy of the pre-construction video is included on digital versatile disc in **Appendix L**. All photographs and photographic logs are included in the bi-weekly progress reports in **Appendix F**.

3.2.1.5 Civil Site Survey

ACI enlisted the services of Municipal Land Survey (MLS) of Middle Island, New York to perform survey activities as required by the Contract Documents and as necessary to perform construction activities at the Site. MLS mobilized to the Site on April 4, 2011 to perform an initial site survey, which included staking out limits of disturbance, surveying existing site conditions, and staking out locations of the main access road, treatment plant building footprint, stormwater retention basins, and pipeline route. MLS also periodically surveyed as-built conditions during work at the Site. As-built drawings are included in **Appendix M**.

3.2.2 Site Preparation

Site preparation activities began on March 28, 2011, immediately after mobilization and prior to commencement of construction. Site preparation activities included temporary facilities mobilization, site security, stormwater management and SESC implementation, site clearing and grubbing, and access road construction.

3.2.2.1 Temporary Facilities Mobilization

Prior to mobilization, no temporary facilities were present at the Site. ACI procured two work trailers from Williams Scotsman, Inc. for ACI and CDM Smith personnel and a sea-carton storage container for equipment and materials. Two portable restroom facilities were also procured and maintained. The base for the work trailers and a parking area for site personnel were constructed with a woven geotextile fabric covered with approximately 6 inches of American Association of State Highway and Transportation Officials 2A modified crushed stone. Laydown areas for temporary materials storage were constructed using a woven geotextile fabric covered by approximately 4 to 6 inches of crushed stone.

Verizon installed temporary telephone and internet service for both work trailers. Temporary electric service was provided to both trailers by Long Island Power Authority (LIPA).

3.2.2.2 Site Security

Temporary facilities, the new groundwater treatment building, and the main construction staging area were all located at an existing facility that is owned and operated by the Village of Garden City. The facility contains the two municipal supply wells, GWP-10 and GWP-11, and associated air strippers and water storage facilities. The Village of Garden City controls security at the facility, which is entirely fenced in, with one access gate along Clinton Road. The gate was generally left open during normal work hours, and was closed and locked at all times that the Site was unattended.

Because the new treatment building’s footprint extended beyond the existing Garden City property fenceline, the fence was extended north and east of the new treatment building’s footprint as part of the RA construction activities. Additionally, a temporary fence was installed around the extraction wells on the Treeline property during construction activities.

No significant security issues were reported over the course of the RA construction activities.

3.2.2.3 Stormwater Management and Soil Erosion and Sediment Control

ACI developed a Soil Erosion and Sediment Control Plan (SESCP) covering construction of the GWTS, access road, influent and effluent pipes, and utilities. The SESCP outlined procedures to be implemented during construction, soil excavation, backfilling, and grading operations. Per Nassau County Soil & Water Conservation District request, a copy of the SESCP was forwarded to the district for information only and is included in **Appendix J**.

ACI installed SESC measures where applicable on site in accordance with the Contract Documents, immediately upon mobilization and prior to ground disturbance. SESC measures included silt fence and covering stockpiled soils with plastic sheeting. The condition of SESC features was inspected on a daily basis by ACI QC personnel, and issues were immediately brought to the attention of the site superintendent, who directed repairs as necessary. A silt fence was maintained along the perimeter of the Site until completion of site restoration activities.

3.2.2.4 Site Clearing and Grubbing

ACI initiated site clearing and grubbing on March 21, 2011, the same day mobilization began. Clearing activities were limited to areas required to complete construction, including treatment building installation, temporary facilities setup, influent pipeline installation, and recharge basin renovation. ACI used a wood chipper to reduce small trees and plants. Larger items were cut into manageable pieces and loaded into roll-off containers for offsite disposal. Wood chippings were reused north of the Garden City Pumping Station along the effluent line. The wood chips were also utilized on site for temporary access road construction along the entire length of the discharge pipeline after backfilling.

3.2.3 Site Work

3.2.3.1 Progress Photographs and Post-Construction Photographs

Progress photographs were collected by ACI and CDM Smith personnel throughout the duration of construction. All photographs and photographic logs are included in the bi-weekly progress reports provided as **Appendix F**.

3.2.3.2 Recharge Basin

Effluent from the GWTS is discharged to an existing 48-inch storm sewer inlet located along Clinton Road and conveyed to the existing Recharge Basin #124. The recharge basin is located approximately 800 feet south of the treatment facility. The recharge basin's dimensions are approximately 400 feet long, 400 feet wide, and 10 feet deep. The inside slopes of the basin are approximately 3:1 (horizontal to vertical), with the exception of the vehicular access ramp, which was constructed with a 10:1 slope.

In accordance with the Contract Documents, ACI refurbished the recharge basin prior to discharging treated effluent to the storm sewer. The existing access road into the basin was overgrown and in need of maintenance. ACI removed trees and shrubs from the road and placed 3 to 4 inches of commercial-grade recycled concrete aggregate (RCA) over the existing road to provide a stable surface. ACI also cleared and grubbed trees in a 2,500-square-foot area near the storm sewer outfall. Finally, approximately 26 tons of 5-inch riprap was placed below the existing outfall in the recharge basin for added stabilization to accommodate the increased flow.

Photograph 3-8: Recharge Basin #124, facing north.

3.2.3.3 Underground Piping and Electrical

Underground utilities installed during the Phase 2 RA consisted of four main systems:

- Influent piping and electrical/control wiring connecting the extraction wells to the GWTS. This included three 3-inch high-density polyethylene (HDPE) influent groundwater conduits, three 2-inch polyvinyl chloride (PVC) electrical power conduits, and one 2-inch PVC control wiring conduit installed between the GWTS and the extraction wells.
- Effluent piping and control wiring connecting the GWTS to an existing stormwater manhole along the east side of Clinton Road. This included one 4-inch HDPE effluent pipe and one 2-inch PVC control wiring conduit between the GWTS and the manhole on Clinton Road. Stormwater flows from the manhole and eventually discharges to Recharge Basin #124.
- Municipal water service piping connecting the GWTS to an existing potable water main near Clinton Road. This consisted of one 1.25-inch polyethylene potable water line installed from the GWTS to the existing 12-inch potable water service main.
- Electrical service wiring connecting the GWTS to LIPA's electrical service grid. This consisted of direct-bury electrical wire installed from the LIPA service connection enclosure on the southwest corner of the lot to the GWTS.

Trenching was performed between the extraction wells and the GWTS for installation of influent piping and electrical/control conduits. Due to property access restrictions, the trench was routed north from the extraction wells along the edge of the Treeline property parking lot, west along the emergency access road, south on the Hazelhurst Park property along Clinton Road, east along the southern border of the Hazelhurst Park property, and south into the Garden City Pumping Station property housing the GWTS. This trench was also utilized for a section of the GWTS effluent piping and control wiring conduit leading to the stormwater sewer manhole and a section of the potable water line to the existing 12-inch service main near Clinton Road. Narrow trenches branching off the main trench were installed to complete the effluent pipeline and potable water service connection.

Trenching and pipe installation were performed by T&F Enterprises (T&F) using a CAT 420D backhoe. The Treeline property parking lot was saw-cut using a k-saw to break the asphalt. This area contained approximately 4 inches of asphalt. The asphalt was stockpiled separately from other spoils and deposited into a 20-CY roll-off container for recycling. Native soil was piled adjacent to the trench as the excavation progressed. Excavated soil was found to be suitable for pipe bedding material and subsequently reused for pipe bedding. The 3-inch HDPE influent and 4-inch HDPE effluent pipes were fused in 360-foot sections prior to the start of trenching using a butt fusion machine with a detachable heat plate. After trenching, pipes and electrical/control conduits were laid, and backfilling and compaction were completed in accordance with the Contract Specifications.

T&F completed pneumatic pressure testing on each pipe section prior to installation to ensure that no faulty welds were present. Hydrostatic testing of the completed pipeline was conducted following completion of the GWTS.

An air release vault was installed to allow venting of air from the top of the influent piping during pump startup. Thrust blocks were installed at all influent and effluent pipe bends to provide a rigid attachment point and restrain thrust forces. Eight handholes were installed along the trenches for access to electrical/control conduits and to install the electrical/control wires.

A fiberglass electrical enclosure was installed near Clinton Road by LIPA for connection of electrical service to the Site. JK Electric (JKE) installed direct-bury cables between the fiberglass enclosure and a new main service transformer located by the northwestern corner of the GWTS. Subsequently, JKE installed electrical service from the electrical transformer to the GWTS.

No major issues were noted during installation of the underground piping and electrical/control conduits. Piping and electrical installations in the GWTS subgrade are discussed in **Section 3.2.3.4.8**. As-built trench details are included in **Appendix M**.

3.2.3.4 Treatment Building Construction

A building was designed to house the groundwater treatment process equipment at the Site. The building was designed using construction configurations and practices associated with commercially manufactured metal buildings and in accordance with shop drawings approved by CDM Smith. The building consists of steel beams, piers, and trusses with painted sheet-steel roofing and wall materials. The design considered snow, wind, and seismic loads.

Photograph 3-9: View of treatment building facing east.

The building has dimensions of approximately 40 feet by 50 feet, with approximately 2,000 square feet of floor space and a 20-foot eave height. The following are key features of the treatment building:

- The treatment building is a single-story structure with slab-on-grade construction.
- The treatment building includes secondary containment areas as part of a floor/hip-wall system that meets the requirements for all internal tank secondary containment.
- The process/equipment room is the main area and occupies about 90 percent of the building.
- The treatment building includes an approximately 200-square-foot office area with an attached bathroom along the southern wall of the building.

A review of all applicable codes, requirements, and standards was conducted to ensure the final PEB design was in compliance. These standards are as follows:

- Building Code – 2006 IBC, New York Edition (ICC 2006a)
- Mechanical Code – 2006 International Mechanical Code®, New York Edition (ICC 2006b)
- Plumbing Code – 2006 National Standard Plumbing Code (Plumbing-Heating-Cooling Contractors National Association [PHCC] 2006), as amended by the State of New York
- Electrical Code – 2005 National Electrical Code (National Fire Protection Association [NFPA] 2005), as amended by the State of New York
- Fire Code – 2006 Fire Code of New York State (ICC 2006c)
- Energy Code – 2006 International Energy Conservation Code®, New York Edition (ICC 2006d)
- Accessibility –American National Standards Institute (ANSI) A117.1 (ANSI 2003), as amended by the State of New York

ACI and their subcontractors performed all construction activities for the groundwater treatment facility as follows:

- T&F prepared the treatment building subgrade.
- T&F installed sub-slab sanitary piping, water supply piping, influent headers, and effluent carrier pipes.
- JKE installed underground electrical conduits.
- JKE performed electrical work and instrumentation installation.
- Sampogna Contracting Corporation (Sampogna) installed the 40-mil HDPE geomembrane liner/vapor barrier beneath the building slab.
- Sampogna installed formwork, reinforcement steel, and concrete, and performed finishing and curing for the treatment building foundation.
- ACI performed backfill installation and compaction.
- ACI performed miscellaneous concrete installation.
- Racanelli Construction Company Inc. (Racanelli) installed structural steel framing, wall and roof sheathing, and masonry.
- ACI installed vinyl siding, roof materials, personnel doors, windows, and skylights.
- ACI constructed interior walls and finishing.
- ACI installed the interior process piping and equipment.
- Testani Paving provided the asphalt paving.
- Stronghold Fence furnished and installed the chain link fence.
- ACI constructed the extraction well vaults.
- R&L Well Drilling (R&L) installed the submersible well pumps in the extraction wells.
- ChemTech Engineering (ChemTech) tested and programmed the control equipment.
- ACI completed the final site restoration.

For worker safety and spill containment, the groundwater treatment building contains an eyewash station, sprinkler system, ventilation system, heater, emergency shower, and secondary containment.

3.2.3.4.1 Subgrade Preparation

Prior to Phase 2 mobilization, ACI subcontracted JZN Engineering PC (JZN) to perform a geotechnical investigation in the footprint of the proposed groundwater treatment building. The investigation included four soil exploration borings drilled approximately 25 feet below the existing ground surface.

Laboratory index tests of soil mechanics were conducted, and engineering analyses were performed to develop recommendations for foundation design and installation, utility support, and earthwork. The subsurface investigation revealed a soil profile generally consisting of approximately 4 feet of topsoil deposits with roots and underlying coastal plain deposits. Based on the findings of the geotechnical study, it was recommended that the groundwater treatment building be supported on a conventional shallow foundation and slab-on-grade following over-excavation of the topsoil materials and replacement with structural fill. The geotechnical investigation report for the building foundation is included in **Appendix N**.

Once stormwater management and SESC features were in place, ACI field crews began excavation and backfill of the proposed footprint for the treatment plant building. Excavated soils that were not suitable for reuse as structural fill were stockpiled and used for grading purposes during site restoration. Stockpiles were covered with polyethylene sheeting when excavation was not actively ongoing. Imported backfill materials and RCA were sampled and analyzed for chemical contamination in accordance with ACI's approved QAPP for commercial/industrial use prior to their use on site. These data are presented in the Chemical Data Final Reports (CDFR) included in **Appendix O**.

Subgrade fill was placed in 6- to 8-inch lifts. Dense-graded aggregate (DGA) structural fill and RCA were used to backfill within the excavated foundation footprint to an elevation 6 inches below the proposed vapor barrier grade. The remaining excavation area (capillary barrier) was backfilled with 6 inches of select granular fill (crushed stone) and topped with a 15-mil HDPE vapor barrier. All structural fill materials were compacted to achieve the required subgrade elevation for the concrete slab. In-place density testing was performed by CM Testing Laboratory, Inc. (CM Testing) using a nuclear density gauge to ensure that materials were compacted to at least 95 percent of the laboratory maximum dry density and were within the acceptable range for optimum moisture content. Field moisture and density test reports are provided in **Appendix P**.

3.2.3.4.2 Building Foundation

The building foundation consists of reinforced concrete with spread footings. The building foundation extends 4 to 5 feet below the finished grade to prevent frost heave and foundation movement.

ACI subcontracted foundation construction services to Sampogna, who performed all formwork, reinforcement steel, and concrete placement, as well as finishing and curing for the treatment building. Wood forms were used for the spread footings, while a modular form system was utilized for the vertical frost walls. After the modular forms were removed, ACI backfilled around the foundation walls using a skid-steer loader, walk-behind vibratory roller, and plate compactor. Reinforcing steel was installed according to approved project plans and associated shop drawings. Concrete placement was performed under the supervision of ACI and CDM Smith inspectors. QC testing of each pour was performed by CM Testing. CM Testing monitored concrete deliveries for slump, air content, temperature, and time between batch preparation and placement. One set of test cylinders was collected per pour, and compressive strength testing was performed at 7 and 28 days following placement. All results were at or above the minimum 4,000 pounds per square inch (psi) on the 28-day break. Concrete field inspection and laboratory testing reports are included in **Appendix Q**.

Photograph 3-10: View of treatment building footings facing northeast.

3.2.3.4.3 Treatment Building Under-Slab Utilities and Vapor Barrier

Prior to pouring the GWTS floor, a vapor barrier system was installed below grade to retard moisture migration upward through the floor slab and to allow for proper concrete curing. Sanitary piping, potable water service piping, underground electrical conduits, an electrical grounding system, treatment system influent headers, and effluent carrier pipes were also installed prior to construction of building slabs.

3.2.3.4.4 Concrete Slabs

ACI's subcontractor, Sampogna, performed placement and finishing of the GWTS building slabs. Reinforcing steel was provided as specified in the Contract Documents.

The floor slab in the office area is constructed of 5-inch-thick concrete, as shown on as-built drawing Sheet S-03, provided in **Appendix M**. Eight-inch-thick concrete slab was utilized for areas bearing heavy equipment and for the access ramp. An 8-inch-high curb was installed around the perimeter of the process equipment and chemical storage area to contain spills.

Three floor drains and one sump were installed within the concrete slab. Floor surfaces in the process equipment area slope toward the nearest floor drain or sump. The building sump has a capacity of 475 gallons and contains a sump pump. Pump operation is controlled automatically by level switches. Water collected in the sump is pumped into the influent tank for processing through the treatment system.

Concrete placement was performed under the supervision of ACI and CDM Smith inspectors. QC testing of each concrete delivery was performed by CM Testing, who monitored concrete loads for slump, air content, temperature, and time between batch preparation and placement. For each delivery, concrete cylinders were collected and tested for 7- and 28-day compressive strength. No issues were noted during the onsite rebar and concrete inspections, and all 28-day compressive strength results were above the 4,000-psi design. Forms were removed from newly placed concrete no less than three days after pour. Concrete inspection and testing reports are included in **Appendix Q**.

3.2.3.4.5 Structural Steel, Roof Decking, and Exterior Wall Construction

ACI subcontracted erection of the treatment building structural steel frame to Racanelli and Metal-Bilt Construction. Installation of exterior wall framing, insulation, and wall and roof sheathing was subcontracted to Racanelli and Long Island Building Systems Inc. (LIBS).

Photograph 3-11: View of the building frame during construction, facing north.

The primary structural design codes and standards used in the building design were as follows:

- 2006 IBC, New York Edition (ICC 2006a)
- American Society of Civil Engineers (ASCE) Standard 7-05, Minimum Design Loads for Buildings and Other Structures (ASCE 2005)
- American Concrete Institute Standard 318-05, Building Code Requirements for Structural Concrete (American Concrete Institute 2005a)
- American Concrete Institute Standard 530-05, Building Code Requirements and Specification for Masonry Structures (American Concrete Institute 2005b)
- American Institute of Steel Construction (AISC) Steel Construction Manual, 13th Edition (AISC 2006)

As-built drawings for structural steel construction are included in **Appendix M**.

3.2.3.4.6 Wall Paneling, Roofing, Doors, Windows, Louvers, and Exterior Finishes

ACI subcontracted Racanelli and LIBS to install the steel stud/oriented strand board wall panel system (including insulation, flashing, and trim). ACI installed asphalt shingles and four skylights on the roof. ACI subcontracted King Gutters of Long Island to install the rain gutters and downspouts. ACI subcontracted Brentwood Door Company, Inc. of Long Island to provide and install the main service door to the process area. Exterior windows, doors, trim, vinyl siding, and flashing were installed by ACI. As-built drawings for all wall paneling, roofing, doors, windows, and louvers are included in **Appendix M**.

3.2.3.4.7 Interior Architectural Finishes

ACI constructed the control room, bathroom, and electrical, mechanical, and chemical storage rooms. Work within these rooms included framing, insulation, sheetrock installation, acoustical ceiling installation, finish carpentry, flooring, and accessories such as one louver in the chemical storage room wall. The main structure walls were insulated with fiberglass batts. Following insulation, a 26-gauge metal interior liner panel was installed. The interior offices and rooms were constructed of wood framing with sheetrock finish. The office and bathroom were installed with acoustical drop ceilings and vinyl composition tile flooring. All other rooms were left with an unfinished concrete floor.

3.2.3.4.8 Building Electrical

ACI subcontracted installation of electrical components to JKE. JKE installed the under-slab conduits, lightning protection system, transformers, surge suppression equipment, and motor control units. All electrical work was completed without incident and was considered substantially complete by November 2011.

New secondary underground conductors were installed between the 75 kilovolt-amp slab-mounted primary service transformer and the treatment building to supply 480-volt (V), 3-phase service to the building. A meter and a service disconnect switch, fused at 250 amps, were installed on the southern exterior of the building. All other associated electrical distribution panels, step-down transformer, and the motor control center (MCC) are located inside the treatment building electrical room.

ACI installed all process control instruments and devices, including a PLC. Programming and testing of all control equipment was completed by ACI's subcontractor, ChemTech. Process motor control is via independent combination motor starters or variable-frequency drives (VFDs) and under normal operations is configured for automatic operation by PLC. Process equipment with supplied control panels received service drops as required. Non-process loads also received individual service drops as required.

Safety disconnect switches were installed in each extraction well vault, along with pressure transducers to provide level feedback to the PLC. The extraction well pumps are designed to run continuously via the human-machine interface (HMI) local function or automatically through the PLC using the remote function. The well flow rates are controlled using motorized globe valves located in the process area in the GWTS.

Interior and exterior lighting was installed by ACI. Exterior lighting is controlled via photo eye switch and interior lighting is controlled via proximity switches and lighting contactors where applicable. Emergency shutdown is provided for the entire building by a shunt trip on the main service breaker.

The building has the following electrical classifications:

- Administrative area/control room – General purpose

- Process area – Damp
- Chemical storage room – Corrosive

3.2.3.4.9 Plumbing and HVAC

ACI subcontracted GMA Mechanical Corporation to install the heating, ventilation, and air conditioning (HVAC) system for the building. ACI subcontracted T&F to install all potable and sanitary plumbing items within the treatment building, including potable water piping and fixtures, the lavatory and sinks, the water heater, backflow prevention, air service piping, and sanitary piping. All plumbing and HVAC work was completed without incident by November 2011.

The treatment building's plumbing system performs the following functions:

- Provides potable water to the process area and hose bibs
- Provides hot/cold potable water to the restroom plumbing fixtures and mop basin
- Provides cold water to the electric water fountain/cooler in the process area
- Provides tepid emergency water to the eyewash station in the laboratory and to the safety shower/eyewash systems located in the center of the process area
- Provides sanitary waste collection to be discharged into the septic holding tank

Potable water for the GWTS is provided by the Garden City Water Department. Domestic hot water and emergency tepid water is heated by an electric water heater located in the process area. Upon activation of the safety shower or eyewash, the flow alarm sensor sends a signal to the supervisory control and data acquisition (SCADA) system. Two hose spigots supplying potable water were installed in the process area: one along the eastern wall and one in the middle of the GWTS. One hose spigot was also installed on the exterior western wall near the entrance door.

The treatment building includes plumbing to collect water and sanitary waste. Subsurface plumbing connects to a newly installed pre-cast concrete septic holding tank on the western side of the building, supplied by T&F. The septic tank is 9 feet long, 4.33 feet wide, and 5.33 feet deep, and includes two compartments separated by a baffle to enhance the settling of solids. The lid has a 2-foot-diameter access opening fitted with a watertight plastic cover. Water from the restroom, water fountain, mop basin, and laboratory sink in the office is collected and fed to the septic tank by gravity.

The treatment building's HVAC system performs the following functions:

- Space heating of the entire building
- Ventilation of the process equipment area for heat removal
- Space cooling of the control room and bathroom

The HVAC system serves two areas with different requirements. In the process area, two 5-kilowatt unit heaters were installed to maintain temperatures above 60 degrees Fahrenheit. Exhaust fans activated by a wall-mounted thermostat are interlocked with sidewall intake louvers to provide mechanical ventilation in the process area. Much of the heat generated by the process equipment is reclaimed and recirculated during the winter months.

The administrative area is heated and cooled by a Florida Heat Pump Model ES-018 geothermal heat pump. Ductwork conveys conditioned air to the electrical room, bathroom, and office.

As-built drawings of the plumbing and HVAC systems are included in **Appendix M**.

3.2.4 Groundwater Treatment System

The GWTS was constructed in accordance with all shop drawings approved by CDM Smith. Flow diagrams depicting the major process equipment units and flows are shown on as-built drawing Sheets I-01 and I-02, included in **Appendix M**.

3.2.4.1 Extraction Wells EW-1S, EW-1I, and EW-1D

A series of extraction wells, EW-1S, EW-1I, and EW-1D, were installed by CDM Smith during Phase 1. Installation and development of the extraction wells is discussed in detail in **Section 3.1.5**. A 4-foot-long by 4-foot-wide by 4-foot-deep, bottomless, pre-cast concrete well vault was installed for each well. Wellheads were completed in accordance with approved design and shop drawings, including installation of a gate valve, air release valve, check valve, y-strainer, and sample tap/pressure gauge. A submersible pump was installed in each extraction well to pump water at the combined design flow rate of 250 gpm. A level transducer was installed in each well to provide continuous water level readings to the PLC and HMI and allow flow control via motorized globe valves located inside the GWTS.

Photographs 3-12 and 3-13: Extraction well vault cover (left) and the typical piping inside the vault (right).

3.2.4.2 Influent Groundwater Header

Groundwater from each extraction well is pumped to the treatment plant through an independent conveyance line. Upon entering the treatment plant, each line is outfitted with a sample port, magnetic flow meter, actuated globe valve (to facilitate flow control), check valve, and isolation valve. Each influent line includes identical valving, metering, and controls. The influent piping terminates in a

6-inch combined flow header pipe, which transfers water to the influent tank. The combined influent line also contains a sample port and a high-pressure switch monitored by the PLC.

3.2.4.3 Influent Tank

Groundwater from the influent header enters the influent tank prior to treatment. The 12.67-foot-tall HDPE tank has a capacity of 5,500 gallons. The influent tank provides a minimum of 20 minutes of storage/detention time based on the design flow rate of 250 gpm. Inlet piping enters the storage tank and extends to within 1 foot of the bottom of the tank. The piping is fitted with four eductors to facilitate accelerated mixing of the stored water and to prevent settling of suspended particles. The tank is constructed with a closed top and a vent pipe that exits through the treatment plant roof.

Water is directed from the influent tank through the duplex bag filter system, discussed in **Section 3.2.4.4**, and then to the air stripper, discussed in **Section 3.2.4.5,** by discharge pump P-1. Pump P-1 is controlled by a VFD that receives information from a level transmitter. The level transmitter is mounted to the influent tank and monitors the tank water level. Set water level points in the PLC program control pump operation and speed to maintain a near-continuous flow rate to the air stripper.

3.2.4.4 Duplex Bag Filter System

A duplex bag filter system was installed between the influent tank and air stripper. The system removes suspended solids and any precipitated iron to prevent fouling of the air stripper. The bag filter units are Pentair Industrial Model LR3304FAC15, constructed of carbon steel with four 30-inch-deep baskets, each basket with a 4.4-square-foot surface area. The units are each designed to accommodate the design flow rate of 250 gpm and are installed in parallel to allow filter bag change-out without shutting down the system.

A local differential pressure gauge and transmitter, monitored by the PLC, are installed across the duplex unit to measure the backpressure that develops as filter elements foul. Upon reaching a pre-determined set point, the PLC notifies the plant operator that filter elements require service. The PLC is programmed using high- and high-high-pressure set points; the high set point notifies the operator that service is required but allows the system to continue operating. The high-high set point initiates the treatment plant shutdown sequence. The bag filters' 5-micron pore size was selected to capture solids that would impair air stripper operation.

3.2.4.5 Air Stripper System

Air stripping involves the mass transfer of volatile contaminants from water to air by increasing the surface area of the water exposed to air. Low-profile air strippers increase removal efficiency using several trays packed in a small chamber to maximize air-water contact while minimizing the space occupied by the equipment. The air stripper serves as primary treatment for VOC-contaminated groundwater, capable of reducing VOC concentrations to levels below the SPDES-DGW permit equivalency requirements prior to discharge from the treatment plant.

Photograph 3-14: Bag filter housing and air stripper in place, facing northeast.

ACI installed a NEEP ShallowTray Model 41231 air stripper consisting of three trays. This model is capable of treating VOCs to less than 5 µg/L at a maximum flow rate of 250 gpm with three trays, and can be expanded up to six trays to handle a maximum flow rate of 550 gpm, if additional future treatment capacity is required.

Air is supplied to the air stripper unit by a direct-drive rotary blower, New York Blower Company Model F08871, and a 15-HP electric motor unit that supplies a constant 2,400 cubic feet per minute of air through the air stripper unit with a maximum design pressure of 26 inches of water column (WC). The blower/air stripper system is configured as a forced-air operation, which delivers pressurized air through the air stripper. Operation of the blower is controlled by a motor starter located in the MCC.

Water is directed from the air stripper sump through the static mixer, discussed in **Section 3.2.4.6**, and discharged to Recharge Basin #124 via pump P-2. Pump P-2 is controlled by a VFD, which receives information from a level transmitter. The level transmitter is mounted to the air stripper sump and monitors its water level. Set level points in the PLC program control pump operation and speed based on the water level to maintain a near-constant water level in the sump.

3.2.4.6 pH Control/Chemical Metering System and Storage Tank

A pH control/chemical metering system was installed to ensure that effluent pH meets the SPDES-DGW permit equivalency criterion of 6.5 to 8.5. Effluent pH is continuously monitored with an insertion-style pH probe located in the effluent line following discharge pump P-2. Data from the pH sensor are transmitted to the PLC, which activates a chemical metering pump for pH adjustment if the set point is exceeded. The chemical metering pump injects a 50 percent solution of sodium hydroxide (caustic soda) into the effluent stream through an injection port located directly upstream of the static mixer, which speeds blending of the solution with the effluent stream, and the pH sensor. Using this configuration, a feedback loop is generated and controls the dosing rate of caustic soda.

The 50 percent caustic soda solution is stored in the chemical storage room in a 275-gallon tote supplied by Pariser Industries, Inc. Spill protection is provided by a portable secondary containment basin designed for chemical storage and one-man assembly/removal during tote replacement. Caustic soda is transferred from the chemical storage room to the injection port via a Walchem E-Class Model EHE31E1 metering pump. The chemical metering system employs two pumps: one in operation and one as a "hot standby" in case of failure of the pump in operation.

3.2.4.7 Transfer Pumps

The GWTS includes seven water transfer pumps:

- The submersible pump in EW-1S is a Grundfos Model 85S50-3 with a 5-HP, 480-V motor rated for 60 gpm at 111 feet total dynamic head (TDH).
- The submersible pump in EW-1I is a Grundfos Model 85S50-3 with a 5-HP, 480-V motor rated for 60 gpm at 111 feet TDH.
- The submersible pump in EW-1D is a Grundfos Model 150S100-5 with a 15-HP, 480-V motor rated for 130 gpm at 230 feet TDH.
- The air stripper feed pump is a centrifugal end suction pump, Summit Model 2196STO, rated for 250 gpm at 63 feet TDH with a 7.5-HP motor.
- The air stripper discharge pump is a centrifugal end suction pump, Summit Model 2196STO, rated for 250 gpm at 49 feet TDH with a 7.5-HP motor.
- The pump used to transfer water from the building process sump to the influent tank is a submersible pump, Zoeller Model N140, rated for 30 gpm at 24 feet TDH.

3.2.4.8 Process Control System

The process control system is designed to allow automatic operation of the treatment facility without a full-time operator. The treatment system is equipped with level, temperature, and pressure switches to provide the proper inputs to the PLC. The controls are designed with safety interlocks to shut down the system if an alarm condition is detected. If an alarm condition occurs, notification is provided by telephone to the operator, who can access the PLC panel via remote telecommunication. The system is also capable of limited remote control by the plant operator.

A continuous extraction rate from each well is desired to maintain constant drawdown, resulting in a constant cone of depression. This is accomplished using level transducers and motorized control valves. Level transducers are used to monitor the water levels within the wells and prevent the submersible pumps from running dry. Hand/Auto/Off switches for each extraction well are located on the pump control panels in the treatment building. "Hand" mode bypasses transducer signals and the system permissive signal. "Auto" mode requires the system permissive signal. In the "Off" position, the pump is completely disconnected from any auto or manual signal and will not operate.

The automated process control system includes the following controls:

- **Extraction Well Pumps:** The extraction well pumps will start when switched to "Auto" and stop on detection of low water level in the well (less than or equal to 155 feet amsl for EW-1S, 152 feet amsl for EW-1I, and 158 feet amsl for EW-1D), low flow from the well (less than or equal to

15 gpm for EW-1S and EW-1I and 20 gpm for EW-1D), or high water level in the influent tank (greater than or equal to 70 percent full).

- **Air Stripper Feed Pump (P-1):** Pump P-1 starts when switched to "Auto" and is equipped with a VFD to maintain a constant level in the influent tank. Pumping will stop if the low-level set point in the influent tank (less than or equal to 17 percent full) is reached and resume when the high-level set point (45 percent full) is reached.

- **Chemical Metering Pumps (MP-1 and MP-2):** Caustic soda metering pumps operate in "Auto" mode based on the desired pH set point (less than or equal to 6.5), as monitored by a pH analyzer downstream of the injection point.

- **Building Sump Pump (SMP-1):** A pump in the building sump is used to transfer water generated during plant washdown and service of the air stripper trays to the influent tank for treatment by the air stripper. The sump pump operates when the high-level set point (60 percent full) is reached and stops operating when the low-level set point (15 percent) is reached.

- **Air Stripper Blower (B-1):** The air stripper blower starts when switched to "Auto." The process control system is programmed to require full blower operation prior to startup of any other motors to prevent discharge of untreated effluent. The blower will also continue to operate for five minutes after all other processes shut down to allow any remaining water in the air stripper trays to be fully treated prior to entering the air stripper sump.

- **Air Stripper Discharge Pump (P-2):** The air stripper discharge pump starts when switched to "Auto" and is equipped with a VFD to maintain a constant level in the air stripper sump. Pumping will stop if the low-level set point in the air stripper sump is reached (less than 64 percent full) and resume when the high-level set point (70 percent) is reached.

- **Alarm Conditions:** The process control system is programmed to shut down the entire treatment system if any of the following alarm conditions are triggered:

  - Failure of pump P-1, or pump P-2 or VFD fault due to under/over voltage, dry run, speed reduction, over temperature, or overload

  - Low flow (less than or equal to 50 gpm) to pump P-1

  - High-high differential pressure (greater than or equal to 30 psi) across the bag filter system

  - High-high level (greater than 80 percent full) in the influent tank

  - High-high level (greater than 95 percent full) in the air stripper sump

  - High pressure (greater than or equal to 20 inches WC) or low pressure (less than or equal to 2 inches WC) in the air stripper blower discharge line

  - High-high level (greater than 75 percent) in the building sump

  - High level (greater than 80 percent) in the stormwater manhole used for effluent discharge

3.2.4.9 Treatment System Installation

Major components of the treatment system were procured by ACI from H2K Technologies, Inc. (H2K), located in Corcoran, Minnesota. ACI began installation of the treatment system equipment in October 2011. ACI installed all GWTS equipment and aboveground technology and performed all associated finishing work.

ACI subcontracted electrical services to JKE, including installation of power wiring for process equipment, control and instrumentation wiring, control panels and the MCC, and miscellaneous building electrical components. H2K was subcontracted for installation and calibration of instrumentation, and ChemTech was subcontracted for PLC programming.

System startup testing commenced post-installation on December 7, 2011. System startup testing is discussed in detail in **Section 6**.

3.2.5 Transportation and Disposal

Non-recyclable construction debris was disposed of by Winter Brothers for the duration of construction activities at the Site. Debris was placed into 30-CY roll-off containers and hauled off site for disposal as municipal waste. Recyclable wastes including wood, cardboard, metal, and plastic were segregated and disposed of at a local recycling facility.

Table 3-6 summarizes the quantities of each waste type disposed of or recycled during the construction activities, as well as disposal facility names and addresses. Certificates of disposal and waste manifests are included in **Appendix I**.

3.2.6 Access Road and Parking Area Installation

A 12-foot-wide gravel access road was constructed from the entrance on Clinton Road to the location of the new treatment building. In addition, an approximately 30-foot by 60-foot parking area was constructed in front of the treatment building. Soils excavated during construction of the access road that were not suitable for reuse as structural fill were stockpiled and used for grading purposes during site restoration, described in **Section 3.2.7**. The stockpiles were covered with polyethylene sheeting in the interim.

The sub-base for the road and parking area was constructed with geotextile fabric and a minimum 6-inch layer of commercial-grade RCA, used as DGA. The existing soil and DGA were compacted using a vibratory plate compactor. ACI enlisted the services of CM Testing, a local geotechnical testing firm, for in-place density testing of native soil and DGA prior to paving the access road and parking area. In-place soil density testing results are included in **Appendix P**. The access road and parking area were paved with a 4-inch asphalt binder course followed by a 2-inch asphalt surface course.

Photograph 3-15: Access road running from the Clinton Road entrance to the GWTS, facing east.

3.2.7 Site Restoration and Demobilization

Site restoration activities were conducted in November 2011. The Site was brought to finished grades by ACI using soil that was stockpiled during excavation of the treatment building footprint, described in **Section 3.2.3.4.1**, and the access road subgrade, described in **Section 3.2.6**. Stockpiled soil was supplemented with topsoil from an offsite source. All imported topsoil was analyzed in accordance with the Contract Specifications prior to use. Topsoil was installed in the area of the pipeline trench, around the GWTS and parking area, and along the main access road between the GWTS and Clinton Road. Because grading activities were conducted during November 2011, the Site was not entirely seeded. Hydroseeding was performed in all areas where topsoil was installed after winter passed.

Temporary facilities were demobilized from the Site in December 2011. This included disconnection of temporary utilities from the field trailers and removal of the field trailers, portable restroom facilities, and the sea-carton storage container. SESC features were removed periodically during construction upon completion of each phase of work.

3.3 Phase 3 Activities

Phase 3 RA activities consisted of installing one test boring (TB-1) and three extraction wells (SEW-1S, SEW-1I, and SEW-1D) in the southern area of the contaminant plume to intercept VOC contamination. CDM Smith subcontracted UTD of Franklinville, New Jersey to perform drilling activities and Seacoast of Lincroft, New Jersey for the disposal of soil and water IDW. Field activities began in November 2012 and concluded in April 2013. All field work and sampling were conducted in accordance with the subcontract drilling SOW, the approved UFP-QAPP (CDM Smith 2010b), and FCN #03. FCN #03 (CDM Smith 2012c), which is included in **Appendix T**, lists the changes to the approved UFP-QAPP (CDM Smith 2010b) for installation of the additional test boring and three extraction wells, collection of soil samples from the new test boring, and collection of groundwater samples from the new extraction wells.

Well permits were obtained from Nassau County by UTD for the installation of the southern extraction wells, and are included in **Appendix C**.

3.3.1 Surface Geophysical Survey and Subsurface Utility Survey

Refer to **Section 3.1.2** for discussion of the surface geophysical and subsurface utility surveys. CDM Smith used the survey results to finalize the test boring and extraction well locations.

3.3.2 Test Boring Installation

Test boring TB-1 was installed to obtain lithological and analytical data for the subsurface soil correlating to the proposed screened intervals of the southern extraction wells as described in **Section 3.1.3**. TB-1 was installed to a final depth of 555 feet bgs and data obtained was used to finalize the designs of the three southern extraction wells.

Split-spoon soil samples were obtained every 10 feet between 5 feet bgs and 345 feet bgs (5 feet above the top of the proposed screened interval for SEW-1S) and every 5 feet from 345 feet bgs to 555 feet bgs. Upon retrieval, CDM Smith screened the soil for organic vapors using a PID and recorded a description of the soil using the Burmeister soil classification system. The majority of the soil collected consisted of sand-sized particles. However, significant deposits of silt, silty sand, and silty clay were also present, generally at depths greater than 340 feet bgs. No organic vapors were detected using the PID. Lithological data are included on the TB-1 test boring log in **Appendix D**.

Soil samples were collected and shipped to DESA and Johnson Screens for TOC and grain size analysis, respectively. TOC data were used to refine the retardation factor used in the site-specific groundwater model. Grain size data were used to finalize the well screen design, including the size of the well screen and sand filter pack. Depths at which samples were collected for TOC and grain size analysis are presented in **Table 3-7**.

A total of 14 soil samples were collected for TOC analysis and 17 soil samples were collected for grain size analysis. TOC analytical data are presented in **Table 3-8.** Grain size analytical data are presented in the Johnson Screens report included in **Appendix E**. Johnson Screens provided a recommended design for the well screen slot size and filter pack based on results of the grain size analysis and lithologic descriptions.

Following split-spoon sample collection, UTD performed natural gamma downhole geophysical logging of the TB-1 borehole. Gamma logging was conducted through the drill rods, providing stability as the probe was both lowered and raised within the borehole. The result was a continuous record of subsurface lithology to be used with visual descriptions of the split-spoon samples in selecting the final screened intervals for the wells. The TB-1 geophysical log is included in **Appendix E**.

After geophysical logging was complete, an outer steel casing was installed in the borehole to 110 feet bgs, as described in **Section 3.1.5.1**. TB-1 was then backfilled with sand as a temporary closure. The borehole was later converted into SEW-1D using the procedures described in **Section 3.3.3**.

CDM Smith reviewed the gamma log, the lithological data, the grain size distribution results, and the Johnson Screens report to select the final screened intervals, screen slot sizes, and filter packs for the wells. Johnson Screens recommended 20-slot well screens and #0 sand filter packs for all three southern extraction wells. CDM Smith submitted the TB-1 geophysical log to Johnson Screens and, in consultation with Johnson Screens, revised the screened intervals, screen slot sizes, and sand filter pack sizes for the southern extraction wells. The revised designs for the three southern extraction wells are presented in FCN #04 (CDM Smith 2012d), included in **Appendix T**.

3.3.3 Southern Extraction Well Installation

Between January 2013 and March 2013, CDM Smith installed three extraction wells (SEW-1D, SEW-1I, and SEW-1S) to capture the southern extent of the contaminant plume as described in **Section 3.1.5**. Due to the presence of minimally cohesive fine-grained material (i.e., silt) within the SEW-1D and SEW-1I screened intervals, the designs for these wells were modified (FCN #04, **Appendix T**) to incorporate casing blanks between two separate, shortened screened intervals. Casing blanks consisted of well riser sections placed at depths corresponding to silty units. SEW-1D was screened from 480 to 500 feet bgs and from 510 to 525 feet bgs with a casing blank from 500 to 510 feet bgs, and SEW-1I was screened from 414 to 434 feet bgs and from 457 to 467 feet bgs with a casing blank from 434 to 457 feet bgs. Thus, the final screened intervals vary from the initial proposed well designs, but this is not anticipated to affect contaminant plume control. Southern extraction well locations are shown on **Figure 2-1**. The southern extraction well construction logs and NYSDEC well completion reports are included in **Appendix D**.

3.3.3.1 Outer Steel Casing Installation

Outer steel casings were installed in each well as described in **Section 3.1.5.1** to prevent potential borehole collapse caused by a significant gravel unit encountered at approximately 100 feet bgs. A 16-inch OD carbon steel outer casing was installed in each borehole to a depth of 110 feet bgs.

3.3.3.2 Drilling and Well Installation

The extraction wells were installed as described in **Section 3.1.5.2**. Extraction wells SEW-1S, SEW-1I, and SEW 1D were installed to a depth of 405 feet, 472 feet, and 530 feet bgs, respectively. Each well assembly consisted of a wire-wrapped well screen (20- or 30-slot), sump, casing blank (for SEW-1D and SEW-1I), and riser sections. The sections of the well assembly were connected via welding. Centralizers were attached to the outside of the well assembly approximately every 100 feet. A U.S. Silica Filpro #1 sand pack was used for SEW-1D and SEW-1S, and a U.S. Silica Filpro #0 sand pack was used for SEW-1I.

3.3.3.3 Plumbness and Alignment Testing

Plumbness and alignment testing were completed as described in **Section 3.1.5.3.** Records of these activities are provided in the Phase 3 Bi-Weekly Reports No. 6 and No. 7 (**Appendix F**).

3.3.3.4 Well Development

Extraction wells were developed between February 19, 2013 and March 5, 2013 using a combination of air lift/swabbing and constant rate pumping to remove fine-grained material from the wells, stabilize the filter packs, and repair damage to the formation caused by drilling as described in **Section 3.1.5.4**. Following completion of air lift/swabbing, SEW-1D was pumped at 168 gpm for 3 hours, SEW-1I was pumped at 165 gpm for 2 hours, and SEW-1S was pumped at 165 gpm for 3 hours to complete well development. Pumping continued until water quality parameters (pH, temperature, specific conductivity, DO, ORP, and turbidity) stabilized to within 10 percent over three consecutive readings, the turbidity was less than 10 NTU, and sand content was less than 5 mg/L. Purge water was pumped into 21,000-gallon tanks located in the extraction well area. Well development data are presented in the Phase 3 Bi-Weekly Reports (**Appendix F**).

Photographs 3-16 and 3-17: SEW-1S (left) and SEW-1I (right) final purge water.

3.3.3.5 Well Disinfection

Well disinfection was completed as described in **Section 3.1.7** with a sodium hypochlorite solution. Records of this activity are provided in the Phase 3 Bi-Weekly Report No. 7 (**Appendix F**).

3.3.3.6 Well Completion

Extraction wells were welded with stainless steel lids and secured as described in **Section 3.1.5.6**.

3.3.4 Investigation-Derived Waste Handling

During well drilling, installation, development, and disinfection activities, soil and water IDW was contained by UTD. Seacoast provided 20-CY roll-off containers and 21,000-gallon tanks to contain the soil and water IDW, respectively.

Drill cuttings from the boreholes were discharged directly into UTD’s soil holding container. The drillers transferred the cuttings from this container into the 20-CY roll-off containers using a backhoe. Seacoast collected composite samples of the soil IDW for waste characterization analysis. Analytical results indicated that the drill cuttings were non-hazardous. Kiln dust was delivered to the Site and added to the roll-off containers as necessary to dewater the saturated soil prior to transport. Eleven roll-off containers, storing a total of 172 tons of soil IDW, were transported to 110 Sand Company in Melville, New York for disposal.

Purge water was discharged directly into UTD’s container during field activities. UTD transferred the water from this container into four 21,000-gallon tanks located near the extraction wells using trash pumps. Seacoast transported the water from these tanks into the 21,000-gallon tank placed at the Village of Garden City Pumping Station and subsequently pumped the water from this tank through a portable 10-micron filter housing unit into the holding tank of the onsite treatment system. The water IDW was ultimately processed through the treatment system and discharged to Recharge Basin #124. Approximately 300,000 gallons of purge water was treated at the onsite treatment system during this phase of the project.

Photograph 3-18: Portable filter housing system.

Seacoast cleaned out the Adler tanks at the conclusion of field activities. IDW that had settled at the bottom of the Adler tanks and could not easily be removed was treated as sludge IDW. A total of 6,866 gallons of sludge IDW was pumped into a vacuum truck and transported to Environmental Recovery Corporation of Pennsylvania for disposal.

Table 3-6 summarizes the quantities of material disposed of for each waste type, as well as disposal facility names, addresses, and offsite transportation company names. Waste manifests, bills of lading, and certificates of disposal are included in **Appendix I**.

3.3.5 Equipment Decontamination

Equipment decontamination was performed during field activities as described in **Section 3.1.10**. Rinsate was contained and placed in the Adler tanks.

3.3.6 Gravel Roadway

UTD constructed a 15-foot-wide gravel roadway to provide vehicle access to the southern extraction wells. This roadway was necessary due to treacherous, muddy conditions at the ground surface caused by UTD’s repeated vehicle traffic and precipitation events. Gravel was also placed laterally at the extraction well locations to create a firm surface for vehicle entry/egress and equipment staging.

3.3.7 Site Restoration

Site restoration was not completed immediately following installation of the extraction wells due to cold weather and the need to retain the gravel roadway for the pending southern pipeline installation, completed during the Phase 4 RA. CDM Smith completed site restoration in April 2013.

3.4 Phase 4 Activities

Phase 4 RA activities included geophysical boring installation, force main construction, HDD, existing groundwater treatment plant upgrades, and final site restoration in accordance with the Contract Documents. ACI served as the RA Contractor to complete the Phase 4 activities and construction oversight was completed by CDM Smith. Hemlock Directional Boring (HDB) of Torrington, Connecticut was responsible for the force main and electrical conduit installation and the HDD. JKE completed the electrical connections. H2K was responsible for operator interface terminal (OIT) start-up and testing. Construction activities began on October 6, 2014 and were completed at the conclusion of the second ITP on July 30, 2015.

3.4.1 Pre-Construction Activities

Pre-construction activities included required submittals and meetings, permitting, photographs, site clearing and grubbing, implementation of SESC measures, an initial site survey, site security, and installation of temporary facilities.

3.4.1.1 Pre-Construction Submittals

Following RA Contract award, ACI prepared the required work plans and submitted them to CDM Smith for approval. ACI's approved work plans are included in **Appendix J**.

3.4.1.2 Pre-Construction Conference

A pre-construction meeting was held on December 13, 2013 to coordinate the efforts of all parties involved. The pre-construction meeting discussed expectations, points of contact, and change order and billing procedures. Representatives from EPA, CDM Smith, and ACI participated in the pre-construction meeting. The pre-construction meeting minutes are included in **Appendix K**.

3.4.1.3 Permitting

The following permits and approvals were required for the RA work. Copies of all permits are included in **Appendix C**.

- **Road Opening/Drainage Construction Permit** – A Road Opening/Drainage Construction permit was obtained by ACI from the Nassau County Department of Public Works. This permit covered HDD underneath Stewart Avenue.

- **New York State Pollutant Discharge Elimination System** – CDM Smith obtained a New York SPDES-DGW permit equivalent from NYSDEC for discharge of treated groundwater to the subsurface via Recharge Basin #124. This permit equivalent was obtained during Phase 1 of the RA. CDM Smith submitted the renewal application for the SPDES-DGW permit equivalent to NYSDEC for the increased flow rate and change in monitoring parameters. CDM Smith received verbal approval from the NYSDEC project manager to discharge at 500 gpm under the existing permit; however, the final permit has not yet been issued.

- **Soil Erosion and Sediment Control Certification** – No SESC certifications or permits were required; however, HDB installed SESC measures as described in **Section 3.4.2.3**.

3.4.1.4 Pre-Construction Photographs

Photographs were taken prior to the start of Phase 4 construction. All photographs and photographic logs are included in the bi-weekly progress reports in **Appendix F**.

3.4.1.5 Subsurface Mark-Outs

Prior to drilling activities, ACI subcontracted Premier Utility Services (Premier) to perform an underground utility survey using ground penetrating radar, and electromagnetic methods. Premier was on site on October 17, 2014 to locate underground utilities prior to the start of underground construction. The utility mark-out was completed to ensure that the proposed force main route did not coincide with the location of existing underground utilities. CDM Smith used the survey results to finalize the underground pipeline locations.

Premier returned to the project site on November 10, 2014 and November 14, 2014 to complete mark-outs of an unknown steel pipe and the discharge piping, respectively. The steel pipe and discharge piping were encountered in the Old Meadowbrook Road section during trenching activities.

3.4.2 Site Preparation

Site preparation activities began on October 6, 2014, immediately after mobilization and prior to commencement of construction. Site preparation activities included temporary facilities mobilization, site security, stormwater management and SESC implementation, and site clearing and grubbing.

3.4.2.1 Temporary Facilities Mobilization

Prior to mobilization, no temporary facilities were present at the Site. ACI procured one work trailer from Mobile Mini for CDM Smith personnel. The work trailer was originally located on the south side of the existing groundwater treatment plant property (Block 77, Lot 1A). A temporary construction electrical service connection was submitted to Public Service Enterprise Group (PSEG), but after repeated attempts to complete installation, the service was never installed. ACI arranged to move the work trailer to allow connection to the GWTS main service panel by a temporary connection. In the interim, the trailer was powered by a 5-kilowatt portable generator. The trailer was moved on January 9, 2015, with electrical service installed on January 12, 2015.

Two portable restroom facilities were also procured and maintained on Block 48, Lot D, south of Stewart Avenue.

3.4.2.2 Site Security

Temporary facilities and the main construction staging area were all located within the existing groundwater treatment plant property, owned by the Village of Garden City. The property is entirely fenced in with locked access gates. The entrance gate was generally left open during normal work hours, and was closed and locked at all times that the Site was unattended. All contractors used this area as the main staging location for equipment and material storage.

The force main installation included work on Stewart Field, owned and operated by the Village of Garden City. The field is entirely fenced in with locked access gates. During construction activities at the field, the access gate was left unlocked during normal work hours. The gate was locked at all times that the Site was unattended. This served as a secondary staging location for equipment and materials for the force main construction.

Temporary construction fence was installed around all open trench during construction activities.

No significant security issues were reported over the course of the RA construction activities.

3.4.2.3 Stormwater Management and Soil Erosion and Sediment Control

ACI developed an SESCP covering the installation of influent and effluent pipes and utilities. The SESCP outlined procedures to be implemented during construction, soil excavation, backfilling, and grading operations. A copy of the SESCP is included in **Appendix J**.

HDB installed SESC measures where applicable on site in accordance with the SESCP, immediately upon mobilization and prior to ground disturbance. SESC measures included silt fence, hay bales, and plastic sheeting to cover stockpiles. The condition of SESC features was inspected on a daily basis by the CDM Smith construction supervisor, and issues were immediately brought to the attention of ACI's QC personnel, who directed repairs as necessary. Silt fence was maintained along the length of the trench on the downgradient side where existing vegetation was not present. These areas included the north side of the trench on Block 48, Lot D, the north and east sides of the trench on Stewart Field, the north side of the trench on the Treeline Properties right-of-way (ROW), and the west side of the trench along Clinton Road. Silt fence remained installed on the Site until completion of site restoration activities.

3.4.2.4 Site Clearing and Grubbing

ACI initiated site clearing and grubbing on October 6, 2014. Clearing activities were limited to areas required to complete construction, including force main installation, temporary facilities setup, and electrical connection to the southern extraction wells. Clearing included removing brush and trees within the Treeline Properties and Simon Property Group ROWs. The brush and trees were left within the ROWs to decompose naturally.

3.4.3 Site Work

Between October 9, 2014 and March 26, 2015, the installation of approximately 2,700 feet of 6-inch HDPE force main and 2-inch PVC conduit was completed by HDB, including a directional drill, SESC measures, and preliminary site grading and restoration. This work is further described in the sections that follow.

3.4.3.1 Geophysical Test Borings

Woodard & Curran was subcontracted by HDB to complete the geotechnical investigation and design of the proposed HDD. Woodard & Curran used Soil Mechanics as their drilling company to install the two 30-foot bgs borings on November 26, 2014. The first boring was completed in the area of the proposed HDD receiving pit on the east side of Block D, Lot 48. The second boring was advanced as close to the HDD starting pit as was practical. Due to heavy rain, the starting pit area was unsuitable for supporting the drilling equipment. The boring was installed at the edge of the Stewart Field parking area, approximately 15 feet from the starting pit location.

The geotechnical investigation results were used to complete the HDD design, which was reviewed by CDM Smith, and the revised HDD design was submitted to Nassau County for approval and issuance of the Road Opening Permit. The borings did not encounter any soil that would have prohibited installation of the pipeline by the HDD method. The geotechnical boring information and HDD design and plans are included in **Appendix J**.

3.4.4 Force Main Construction

The force main was designed as shown in the Contract Drawings to connect the southern extraction wells SEW-1S, SEW-1I, and SEW-1D to the existing groundwater treatment facility. The complete design begins with the influent piping starting at the extraction wells and connecting to the influent pipeline at the northeast corner of the existing groundwater treatment facility. The effluent line begins at the northeast corner of the treatment building and extends north to the Treeline Properties ROW and west to connect to an existing stormwater manhole. The discharged treated water then flows through the storm sewer into Nassau County Recharge Basin #124. The entire pipe layout is shown on the as-built drawings included in **Appendix M**.

HDB mobilized to the project site to begin construction of the new force main on October 9, 2014. Activities performed by HDB included HDPE pipe fusion, trenching, force main and electrical conduit installation, backfilling and compaction, temporary pavement replacement, site clearing, SESC measure installation, and the HDD. HDB completed the force main construction on March 26, 2015.

HDB began construction activities by accepting delivery of HDPE pipe, communication handholes, and cleanout boxes. The 6-inch HDPE pipe was fused in 360-foot sections prior to the start of trenching using a butt fusion machine with a detachable heat plate. HDB kept a pipe fusion log containing the specific heat plate temperatures and heating and compression times for the pipe lengths.

HDB completed pneumatic pressure testing on each pipe section prior to installation to ensure that no faulty welds were present. Hydrostatic testing of the completed pipeline was conducted following installation of the HDD.

ACI recorded top-of-pipe elevation readings using a laser level every 40 feet installed (at the welds). These data were collected to develop the pipe profile for the as-built drawings. The as-built drawings are provided in **Appendix M**.

3.4.4.1 Trenching and Pipe Installation

HDB began trenching on October 29, 2014. Trenching began on the southwest corner of Stewart Field (Block 75, Lot 10) at the edge of the proposed HDD sending pit. HDB used a mini excavator to trench 45 to 48 inches bgs. Native spoils were piled adjacent to the trench as the excavation progressed. The fused pipe lengths were laid in the bottom of the trench, along with sections of 2-inch, Schedule 40 PVC conduit pipe, separated by approximately 1 foot of backfill per the Contract Drawings.

Installation of the groundwater conveyance piping in paved areas required saw cutting and removal of asphalt prior to excavation. J.P. Hogan was subcontracted to complete saw cutting at the Old Meadowbrook Road location (Block 77, Lot 2). This area contained 3 to 6 inches of asphalt, which the mini excavator was unable to break apart. J.P. Hogan made two cuts over the entire length of the trench, and approximately 26 to 30 inches wide. This allowed for easy removal of the asphalt during trenching activities. The asphalt was stockpiled adjacent to the trench, separate from other native spoils, and later transferred to a 30-CY roll-off container for recycling. Further details regarding disposal are provided in **Section 3.4.6**.

HDB used a mini excavator and spotter to pothole for utilities in the Nassau County ROW on Block D, Lot 48. Multiple mark-outs were completed. This prevented accidental damage to existing electrical connections to local businesses.

Force main and conduit installation on Block D, Lot 48 required an open cut of the existing FedEx driveway. This driveway is used by FedEx delivery trucks and therefore contains a high flow of traffic. On November 19, 2014, one side was saw cut at a time using a k-saw to break the asphalt. The asphalt was stockpiled separately from other spoils and deposited into a 10-CY roll-off container for recycling. Once the trench was excavated and the pipe was laid, a road plate was placed on top of the open trench to allow for the continuous flow of traffic. HDB used flaggers to direct the traffic and communicate with the mini excavator operator.

The driveway was repaired with temporary pavement restoration techniques, using asphalt cold patch. The cold patch was installed in 4-inch lifts and compacted using the single-direction vibrating plate. The temporary pavement was inspected every 2 days for seepage. Additional cold patch was added and compacted as necessary to promote an even driving surface.

The proposed pipe layout crossed a 69-kilovolt oil static line, which was marked out by Premier during the subsurface utility survey. A representative from Premier was on site to verify utility locations on December 1, 2014 along with a representative from PSEG for a pre-work meeting. Trenching was completed on December 2, 2014, with the PSEG representative present during all intrusive work. HDB dug with shovels to approximately 6 feet bgs, and the oil static line was not encountered. PSEG used a utility marking device to verify the line's location. The new force main and conduit were then installed within the trench without encountering the utility or the existing water main. A conductor pipe was installed over the marked-out water main location as a precautionary measure.

Connections to the groundwater treatment facility piping were completed by fusing flanged ends to the 6-inch HDPE yard piping. The PVC piping from inside the building was routed under the building foundation. The interior piping was then connected with a flanged end and a gasket to the yard piping. The flanges were bolted together, wrapped in polyethylene sheeting, and cast in concrete to provide complete support to the connection.

A 14-inch OD HDPE sleeve was installed at the three locations where the force main crossed over the existing water main: west of the FedEx driveway on Block D, Lot 48; over the marked-out location on the southeast corner of the Simon Property Group ROW; and upstream of the connection to the stormwater manhole at Clinton Road on the discharge line. The sleeve is not required by the National Standard Plumbing Code, but was installed in accordance with the requirements of a sanitary sewer line crossing over a potable water line. The intent is to provide protection to the potable water line in the event that the overlying line, which contains contaminants, ruptures. The sleeve minimizes the likelihood that contaminants will come in contact with the potable water line and thereby the possibility for cross-contamination.

A cleanout was installed every 500 linear feet within 26.25-inch by 37.875-inch fiberglass/polymer concrete vaults to flush the force main in the event of a clog. The cleanout apparatus was surrounded by expanding polystyrene foam for freeze protection. Electric handholes were installed approximately

200 linear feet apart. The handholes were used to install fiber optic cable through the 2-inch, Schedule 40 PVC conduit.

The unmarked plastic irrigation piping was cut in three separate locations on October 29, 2014 during trenching on Stewart Field. HDB purchased couplings and piping to mend the irrigation lines prior to backfilling. On November 5, 2014, HDB encountered a 2-inch copper water service line at the northeast boundary of Stewart Field and the Old Meadowbrook road area (Block 77, Lot 2 and Block 75, Lot 10, respectively). The water valve was on, causing a leak into the trench. The Village of Garden City was notified and agreed to make the repair. The copper service line was repaired on November 12, 2014.

Large sections of concrete were encountered on Block D, Lot 48 below the FedEx driveway and on the boundary of the Simon Property Group ROW to the east of the existing GWTS building. As discussed in **Section 2**, the property was the previous location of an air base. Multiple buildings were demolished since its original use. It is suspected that the concrete encountered was the footings of previous structures. HDB used a mini excavator and a jackhammer powered by a 3,000-watt generator to break through and/or remove the concrete for piping installation.

Adjustments and fixes were completed in the field as complications arose during force main installation. ACI completed and submitted Field Variance forms to CDM Smith for approval prior to making any changes to the design drawings. For example, Field Variance 1 requested the replacement of 90-degree, 6-inch HDPE bends with a sweeping curve of the pipe. This required less welding and allowed for better flow within the system. Where the 90-degree bends remained, thrust blocks were installed using a QUICKRETE® mix to ensure that the pipe remained stationary.

3.4.4.2 Backfilling and Compaction

The pipe was backfilled using native spoils in three 8- to 12-inch lifts and a minimum of 36 inches of cover. Detectable utility marking tape was installed between the second and third lift, approximately 1 foot bgs. Each lift was compacted using a sheepsfoot trench roller or vibratory plate. Each lift was tested for soil compaction by CM Testing in one location for every 200 feet of pipe installed. Per the Contract Documents, each was required to meet 95 percent of optimum density. CM Testing completed the compaction testing by comparing the compaction to soil proctors collected by ACI in October 2014. The proctor data and backfill compaction test results are included in **Appendix P**.

Native spoils were used as backfill except along an approximately 300-foot section on the east side of Stewart Field. This section contained spoils from trenching with particle sizes too large to be used as pipe bedding material. On October 31, 2014, Liotta & Sons, Inc. delivered two loads, a total of approximately 46 tons, of sand for use as pipe bedding material. The sand was sampled by ACI upon delivery and submitted to TestAmerica for chemical analysis in accordance with the approved UFP-QAPP. The sand results met the requirements of Specification Section 01450. Results of this analysis can be found in the CDFR, included in **Appendix O**.

3.4.4.3 Horizontal Directional Drill

HDD was selected for installation of groundwater conveyance piping and communication conduit at the crossing of Stewart Avenue. The use of trenchless technology minimized the impact to traffic on

Stewart Avenue and reduced project costs through the elimination of additional planning and permitting, traffic control, and restoration work. A Road Opening Permit was issued by Nassau County to ACI for HDD installation per the approved plan.

HDB was subcontracted by ACI to design and complete the HDD under Stewart Avenue. The 6-inch SDR 11 HDPE pipe and continuous roll of 2-inch PVC conduit was received on site on March 19, 2015. Butt fusion was used to connect the full length of HDPE required for the HDD prior to drilling.

The one-call dig ticket was issued on March 18, 2015, 1 week in advance of the proposed HDD start date of March 23, 2015. PSEG requested that all mains in Stewart Avenue be daylighted prior to HDD activities. Per PSEG's request, all marked utilities were visually located by vacuum hydro truck and hand digging on March 24, 2015. National Grid and PSEG representatives were on site to verify the gas and electric mains, respectively. All notes on these activities are available in the field log book scans included with the Bi-weekly Reports in **Appendix F**.

The HDD was completed on March 25 and 26, 2015 by HDB using an American Augers DD-6 directional drill and MPR-6000 drilling fluid mixing/pumping system. During advancement of the bore, the location and depth of the drill lead bit was monitored using a walk-over locating receiver. The depth and angle of the bore head was recorded at 15-foot intervals during the entire bore advancement and marked at the surface with white paint, which was surveyed by the surveyor. This information was incorporated into the as-built drawings indicating the actual bore alignment compared to the design location. Refer to **Appendix M** for the as-built drawings. No problems were encountered during installation of the piping and all work was completed in accordance with the approved plan and permit.

Photographs 3-19 and 3-20: HDD rig (left), and 2-inch and 6-inch HDPE pipe pulled by drill rig.

A bentonite slurry was used to advance the reamer from the receiving pit to the sending pit prior to the HDPE and PVC installation on March 26, 2015. The piping was pulled through the HDD borehole on March 27, 2015. Fusion of the HDD HDPE to the previously installed HDPE, including cleanout wyes and vaults, was completed on March 31, 2015. The receiving and sending pits were backfilled with native soils and compacted using a single-direction vibrating plate.

3.4.4.4 Electrical

Work included in Specification Division 16 included modifications to the treatment facility, new construction of the southern extraction well vaults, and installation of fiber-optic communication between the local control panel (by the well vault) and the master control panel (in the treatment building). Work within the treatment building included installation of new service conductors to transfer pumps P-1/P-2 and air stripper blower B-1. Additionally, the larger transfer pumps and blower required larger VFDs and motor starters. All motor control equipment is located in the electrical room MCC. Replacement of all necessary MCC components was completed by the project treatment equipment vendor, H2K.

New construction of the southern extraction well vaults and local control panel was completed by JKE. The wellhead electrical service was provided by a dedicated 208-V, 400-amp, 3-phase power from PSEG. A customer-owned step-up transformer provides 480-V, 100-amp, 3-phase service to the local control panel. The local control panel contains all equipment required for electrical distribution, motor control, and instrumentation data I/O. Communication to the master control panel is via fiber-optic cable. The master control panel contains the PLC, which receives data from the local control panel and provides logic control for all southern extraction well operations.

Photograph 3-21: Southern extraction wells transformer and control panel.

3.4.5 Groundwater Treatment System

The OIT failed unexpectedly on October 22, 2014, 9 days prior to the planned shutdown of the treatment system to allow for plant modifications. During the treatment system downtime, the existing groundwater treatment facility underwent modifications. Existing piping and equipment was removed and replaced. The PLC was replaced and the new equipment was put on line. The southern extraction wells were connected to the new force main and control system. The new control panel was installed and hooked up to the SCADA system. Full details of the work pertaining to the GWTS are provided in the sections below.

3.4.5.1 SEW Extraction Well Vaults

The area around the existing southern extraction wells SEW-1S, SEW-1I, and SEW-1D was opened by HDB using a mini excavator. George Brenseke Welding was subcontracted by ACI to remove the upper portion of the outer casing at each extraction well to allow for installation of the concrete well vault. On January 8, 2015, the three 9-foot, 4-inch by 7-foot, 4-inch precast concrete well vaults and associated tops with access hatches were delivered to the Site and installed at each well. Each vault was placed on a bedding of 3/4-inch native blue stone and backfilled with the same material.

Each extraction well vault contains discharge piping, valves, and instrumentation necessary to operate the well. All discharge piping is 3-inch diameter Schedule 40 galvanized steel with y-strainer, check valve, air release valve, sample tap, pressure gauge, and isolation valves constructed of brass. All piping is insulated and contains heat trace for freeze protection. Refer to **Appendix M** for as-built drawings detailing well vault construction.

Photograph 3-22: Southern extraction well vault.

R&L installed submersible pumps in the extraction wells to pump water at the combined design flow rate of 250 gpm. A level transducer (MEAS KPSI 700) was installed in each well to provide continuous water level readings to the PLC and HMI, and allow flow control via VFD. The transducer and pump were connected to 160 feet of 3-inch Schedule 40 stainless steel drop pipe. R&L also installed 100 linear feet of 1.5-inch Schedule 40 PVC level transducer sounding tube in each well.

- The submersible pump in SEW-1S is a Grundfos Model 85S50-3 with a 5-HP, 480-V motor rated for 60 gpm at 87 feet TDH.
- The submersible pump in SEW-1I is a Grundfos Model 85S50-4 with a 5-HP, 480-V motor rated for 90 gpm at 97 feet TDH.
- The submersible pump in SEW-1D is a Grundfos Model 150S75-4 with a 7.5-HP, 480-V motor rated for 120 gpm at 111 feet TDH.

3.4.5.2 Treatment System Demolition and Replacement

To accommodate the additional flow from the southern extraction wells, the existing groundwater treatment facility infrastructure was updated for flow up to 500 gpm. This required an increase in pipe diameters, transfer pump replacement, an additional bag filter (for a total of three), blower replacement, and the addition of three air stripper trays (for a total of six). The plans, specifying the previous equipment to be demolished and the new replacements, are in the Contract Drawings. Full plans of the treatment building upgrades are included in the as-built drawings, located in **Appendix M**.

ACI performed all construction activities for the groundwater treatment facility as follows:

- Removed all influent and effluent piping, pumps, and blower required to be upgraded to handle the flow up to 500 gpm.
- Saw-cut the concrete floor in the northeast corner of the treatment facility and excavated underneath in preparation for the new influent pipe connection.
- Replaced the non-functional globe valve V-203 with a new globe valve in kind.
- Replaced blower B-1 with New York Blower Company Pressure Blower Model 2410, and a 24-HP electric motor unit that supplies a constant 2,400 cubic feet of air per minute through the air stripper unit with a maximum design pressure of 47.7 inches WC.
- Replaced transfer pumps P-1 and P-2 with Goulds Model 12BF2M5B0 end suction pumps fitted with 15-HP motors.
- Installed a third Pentair Industrial Model #LR3304FAC15 bag filter, BF-3, and relocated bag filters BF-1 through BF-3 to run east to west between the influent tank and the air stripper.
- Installed all influent and effluent piping, valves, flow meter, static mixer, pipe support and appurtenance in accordance with the approved shop drawings.
- Installed 2.5 CY of flowable fill to approximately 6 feet below the finished floor around the new pipe connections in the northeast corner of the GWTS. The floor was restored to match original condition with concrete and joint sealant at the perimeter of the repair.
- Added three NEEP Model 41231 trays to the existing air stripper, and completed all duct piping. The duct piping was changed from forced-air operation to an induced draft configuration.

Photograph 3-23: Upgraded air stripper, bag filter housing, and duct pipe.

3.4.5.3 Process Control System

The upgraded process control system included upgrading the OIT software to the most recent version and additional programming of the PLC and OIT to include operation of the SEW wells. Additionally, minor edits to existing programming were necessary to facilitate the increased flow rate through the treatment plant.

3.4.6 Transportation and Disposal

For site activities between October 6, 2014 and July 16, 2015, the transportation and disposal of all materials from the Site was recorded by ACI. **Table 3-6** summarizes the quantities of each waste type disposed of or recycled during the construction activities, as well as disposal facility names and addresses. All completed IDW manifests and bills of lading are included in **Appendix I**.

3.4.6.1 Asphalt and Excavation Spoils

During trenching activities on Block 77, Lot 2 and in the FedEx driveway on Block D, Lot 48, asphalt was removed and stockpiled. ACI used a rented skid steer to transport the asphalt spoils into a 30-CY roll-off container located at the end of Raymond Court. HDB transported the FedEx driveway asphalt waste into a 10-CY roll-off container on the concrete pad at Block D, Lot 48. Liotta & Sons, Inc. collected roll-off containers for recycling at their facility.

On November 25, 2014, HDB and ACI overturned the fusion machine while transporting it over the trench on Block 77, Lot 1A. The machine spilled approximately 3 gallons of hydraulic oil into the trench and along the side of the trench near the adjacent chain link fence. HDB and ACI collected all free liquid from the spill using a spill containment kit followed by over-excavation of soils in the impacted area. Approximately 1 CY of soil was stockpiled on site, placed onto and covered by polyethylene sheeting. ACI obtained information from HDB regarding the type of hydraulic fluid used to determine the requirements for sampling and disposal.

ACI collected samples from the oil-saturated soil for laboratory analysis. ACI also conducted in situ soil sampling. The samples were sent to TestAmerica to determine the presence of VOCs, semivolatile organic compounds (SVOCs), and petroleum-based compounds per NYSDEC requirements. The concentrations reported from the in situ soil were below the limits specified in Tables 2 and 3 in NYSDEC CP-51/Soil Cleanup Guidance (NYSDEC 2010b). The stockpiled soil was mixed with HDD waste for disposal, as discussed in **Section 3.4.6.3**.

3.4.6.2 General Waste

Eastern Waste Services (EWS) was contracted by ACI to dispose of all general garbage and construction waste. This waste included delivery packaging, chunks of concrete, and office waste. The waste was stored in a 20-CY roll-off container and transported to Westbury Recycling Facility for segregation and disposal as local municipal waste.

3.4.6.3 Horizontal Directional Drilling Waste

Waste material generated during the HDD was collected on Stewart Field and transferred into a 10-CY roll-off container on the water treatment building property. The waste consisted of excavation spoils and the bentonite slurry mix used to advance the pilot hole. This roll-off container was covered using polyurethane to protect the material from precipitation and contamination.

ACI collected waste characterization samples and sent them to TestAmerica for toxicity characteristic leaching procedure metals analysis. The testing identified that the material was non-hazardous. A total of 5.4 tons of drilling waste was disposed of at Environmental Recycling Corp in Lancaster, Pennsylvania.

3.4.7 Site Restoration and Demobilization

Site restoration included grading of all disturbed areas to match the surrounding grade, seeding, placement of blue stone along the former motorway, and repair of the asphalt driveway at the FedEx facility.

The Stewart Field property was restored per the requirements discussed in a meeting with the Village of Garden City on April 1, 2015. The area along the eastern edge of the Stewart Field, used as a maintenance driveway, was restored with crushed native blue stone and fines. The remainder of the disturbed property was smoothed to an even grade and hydroseeded.

Temporary facilities were demobilized from the Site in March 2015. This included disconnection of temporary utilities from the field trailer and removal of the field trailer and portable restroom facilities. SESC features were demobilized periodically during construction upon completion of each phase of work.

3.5 Green Remediation

Green remediation practices implemented during construction included the purchase of renewable energy credits from the utility provider (LIPA; later PSEG), execution of a recycling program, use of RCA in place of quarried stone where possible, use of recycled steel in the treatment plant framing, and reuse of excavated soil from the treatment plant building footprint and access road.

The groundwater treatment facility was designed, constructed, and operated to meet the requirements of the U.S. Green Building Council LEED certification program. The facility has met the requirements for energy efficiency, reduced water usage, local use of materials, use of recyclable materials, and minimizing waste materials. This groundwater treatment facility is the first of its kind in EPA Region 2 to achieve LEED certification. The LEED certification is included in **Appendix R**.

A detailed summary of the green technologies and practices implemented during construction is provided in **Table 3-9**.

Section 4

Chronology of Events

Date	Event
September 2007	EPA ROD
May 2008 through October 2008	PDI
June 2009 through August 2009	Supplemental PDI
September 2009	Final Design
September 24, 2009	WA 023 RAC Award/Notice to Proceed
October 2009 through June 2010	Phase 1 and 2 RA project planning, including subcontract procurement and consent approval
April 12, 2010	Phase 1 RA Subcontract Award/Notice to Proceed
May 4, 2010 through September 23, 2010	Phase 1 RA activities, including installation of extraction wells and monitoring wells and aquifer testing
June 30, 2010	Phase 2 RA Subcontract Award/Notice to Proceed
July 2010 through February 2011	Preparation of Phase 2 detailed design, shop drawings, and planning documents
March 21, 2011 through December 6, 2011	Phase 2 RA activities, including force main installation, groundwater treatment plant construction, and process equipment installation
November 30, 2011	Pre-Final Inspection – Phase 2
December 7, 2011 through December 30, 2011	Phase 2 GWTS ITP
January 1, 2012 through December 31, 2012	Year 1 O&M
June 18, 2012	Amendment of WA 023 for southern plume extraction wells design and installation
June 2012 through November 2012	Phase 3 RA project planning, including groundwater modeling, subcontract procurement, and consent approval
November 14, 2012 through April 4, 2013	Phase 3 RA activities, including installation of southern extraction wells and a gravel access road
January 1, 2013 through December 31, 2013	Year 2 O&M
March 27, 2013	WA 048 RAC Award/Notice to Proceed
April 2013 through November 2013	Phase 4 RA project planning, including southern plume RD, subcontract procurement, and consent approval
November 13, 2013	Phase 4 Subcontract Award/Notice to Proceed
January 1, 2014 through October 22, 2014	Year 3 O&M until plant shutdown

Date	Event
October 6, 2014 through July 16, 2015	Phase 4 RA activities, including force main installation and treatment plant upgrades
July 20 through July 31, 2015	Phase 4 GWTS ITP
August 7, 2015	Pre-Final/Final Inspection – Phase 4

Section 5

Performance Standards and Construction Quality Assurance/Quality Control

5.1 Project QA/QC Organization

The RA was supported by both field and office personnel. The RA was performed in several phases, as defined in **Section 3**. During Phases 1 and 3 of the RA, CDM Smith and UTD implemented a QC program incorporating the requirements of the SOW and approved UFP-QAPP for RA drilling, aquifer testing, and sampling activities. During Phases 2 and 4 of the RA, ACI implemented a QC program that incorporated the requirements of the project specifications and the approved Contractor Quality Control Plans (CQCPs). ACI onsite personnel consisted of the Project Manager, Site QC Officer, Site Safety and Health Officer, and Project Superintendent. ACI's overall project organizational chart for Phases 2 and 4 is presented in **Figure 5-1**. CDM Smith provided QA during all RA activities through the use of onsite personnel to monitor project performance.

5.2 Construction QA/QC Implementation

This section describes the QA/QC procedures that were implemented during RA activities. The intent of the construction QA/QC was to ensure that all work was completed in accordance with the requirements of the Contract Documents. In addition, the QA/QC program requirements for RA construction were specified in the approved ACI CQCP (**Appendix J**).

The QA/QC activities performed during the RA construction included the following:

- Technical submittals were reviewed to verify conformance with the Contract Documents and industry standards.
- Weekly progress meetings were conducted to address health and safety, work progress, observations and findings, schedule, submittals, QC, change orders, cost tracking, community relations, test results, issues of non-compliance, and upcoming activities (**Appendix K**).

Contractor quality control (CQC) reports were prepared daily to document site conditions, construction activities, inspections, testing results, and site-specific issues including site security. Field inspections and testing were performed to verify compliance with the Contract Documents and the approved project plans. Inspections included observations of all construction materials and workmanship. All inspection and testing results were evaluated to determine areas that required reworking and/or repair. Deficiencies were documented by the CDM Smith construction supervisor and RA contractors. During Phases 2 and 4, a three-phase system quality check was implemented in accordance with the CQCP, which included Preparatory, Initial, and Follow-Up phases to ensure that QC issues were addressed.

5.2.1 Review of Technical Submittals

CDM Smith reviewed all RA Subcontractor construction submittals for conformance with the RA Subcontract Documents and industry standards. The submittal and review process allowed for the monitoring and control of the quality of construction before work was initiated. The submittals generally included project plans, shop drawings, material samples, material test results, chemical data sample results, manufacturer's literature, engineering calculations, engineering drawings, operating instructions, and QC test procedures and results.

5.2.2 Field Inspection and Testing of Materials, Equipment and Installation

Construction oversight was performed by CDM Smith and included routine inspections and observations of all construction activities and testing procedures. The deficiencies identified during routine inspections and corrective actions taken were noted on the Daily Status Reports, included with the Bi-Weekly Reports (**Appendix F**).

5.2.2.1 Phases 1 and 3

In addition to routine CDM Smith resident engineering inspections, additional inspection and testing activities were performed by CDM Smith and its subcontractors (UTD and Seacoast) to ensure that drilling, sampling, O&M of the temporary treatment system, and aquifer testing were carried out in accordance with the drilling SOW and approved UFP-QAPP and submittals. The inspection and testing activities are listed below.

- Two test borings were advanced to collect samples for lithological characterization and for grain size analysis at the location of the extraction wells to design the filter pack gradations and determine the screen slot size.
- Alignment and plumbness testing of newly installed extraction wells were performed to ensure proper construction.
- Alignment testing of newly installed monitoring wells was performed to ensure proper construction.
- Inspections of well casings and fabrication were performed upon delivery of building materials to the Site.
- Inspections of the temporary treatment system were performed to verify that it complied with the approved shop drawings.
- Inspection of the horizontal drill rig bit was performed during drilling to ensure that the boring depth and alignment met the approved shop drawing requirements.
- Sampling of the temporary water treatment system used to treat well development and aquifer testing water was performed to ensure compliance with the SPDES-DGW permit equivalent requirements during system operations.
- During development of monitoring wells and extraction wells, water quality parameters were measured to ensure completion of well development.

- Completion of well development was determined based on visual inspection of the water, measurement and monitoring of water quality parameters (pH, temperature, specific conductivity, DO, ORP, and turbidity), and sand content testing.

In addition, QA audits were performed by CDM Smith during the Phase 1 and 3 RAs to ensure that all activities were performed in accordance with the applicable QA/QC requirements. The audit reports are included in **Appendix S**.

5.2.2.2 Phases 2 and 4

Construction oversight was performed by CDM Smith and included routine inspections and observations of all construction activities and testing procedures. The deficiencies identified during routine inspections and corrective actions taken were noted on the Daily Status Reports, included with the Bi-Weekly Reports (**Appendix F**).

In addition to routine CDM Smith resident engineering inspections, additional inspection and testing activities were performed by CDM Smith, ACI, and ACI subcontractors to ensure construction was carried out in accordance with the design and approved shop drawings. The inspection and testing activities are listed below. The pre-final and final site inspections are discussed in **Section 6**.

- Inspection of reinforcing steel was performed prior to concrete pouring activities by ACI.
- Concrete placement inspection was completed for slump, air content, and temperature by CM Testing to verify that the concrete mix met the approved mix design and specification requirements (**Appendix Q**).
- Concrete break testing was completed by CM Testing in accordance with the contract specifications to verify that the concrete met the 28-day compressive strength requirement of 4,000 psi for structural concrete (**Appendix Q**).
- Inspections of structural steel and fabrication were performed by CDM Smith and ACI upon delivery of building materials onsite and completion of fabrication.
- Inspections of all equipment and tanks were performed upon delivery to verify that they met the contract specifications and approved shop drawings.
- Inspection and testing of the control panel was performed by CDM Smith and ACI's subcontractor ChemTech and included the following:
  - Visually inspect terminations.
  - Verify that powered devices are wired to receive 120 volts of alternating current (VAC) power.
  - Turn off all circuit breakers and apply 120 VAC power to connection points. Check terminals and fuses for proper voltage.
  - Turn on circuit breakers one at a time and check voltage and status lights of all 120 VAC powered devices.

  - Check panel light and door switch operation.
  - Check DC voltage on output of DC power supplies.
  - Check and set PLC switches for proper voltage, power supply location, rack configuration, analog channels, etc.
  - Switch on PLC power supply. Check status lights.
  - Connect laptop computer to PLC for programming, establish communications, and load program developed offline.
  - Check Ethernet communications and configuration.
  - Check wiring for motor control and other 120 VAC circuits:
    - Install jumpers where appropriate to simulate contacts from the MCC or the field.
    - Operate all switches, remove and re-apply jumpers.
    - Read voltage with a voltmeter where appropriate and check activation of relays where appropriate.
    - Perform tests sufficient to positively verify all wiring connections.
  - Simulate each individual discrete PLC input by applying jumpers or operating switches and read the result in the PLC through the connected computer.
  - Force each individual discrete PLC output in the PLC using the connected computer and read voltage with a voltmeter at the appropriate terminal or check operation of the appropriate device (light, relay, auto-dialer, etc.). Where relay contacts feed external devices, check voltage at terminals fed.
  - Simulate each individual analog input signal using a 4-20 milliamp (mA) signal generator connected at the appropriate field connection or lightning protection unit. Apply 4 mA, 12 mA, and 20 mA (zero, half, and full scale, respectively) and verify proper operation of each input.
  - Simulate each individual analog output signal by entering register values of zero, half scale, and full scale. Confirm proper output (voltage or current) with a meter at the output terminals in the panel.
  - Check proper operation of digital display units by inputting signal from signal generator.
- For the building foundation, placement of backfill material was inspected to verify that each lift of structural fill did not exceed 12 inches in thickness. Each lift was tested with a nuclear density gauge by CM Testing to ensure that it was compacted to 95 percent of the laboratory maximum density (**Appendix P**).

- For the pipeline, placement of backfill material was inspected to verify that each lift of common fill did not exceed 6 inches loose thickness for compaction by hand-operated machine compactors, and 8 inches loose thickness for all other machines. Each lift was tested with a nuclear density gauge by CM Testing to ensure that it was compacted to 95 percent of the laboratory maximum density under pavement and sidewalks, and 90 percent of the maximum laboratory density for Hazelhurst Park (**Appendix P**).

- Final grading was inspected by CDM Smith to ensure that the final grades were constructed in accordance with the contract drawings.

- Final pavement was inspected by ACI and CDM Smith to verify that it met the contract document requirements.

In addition, QA and health and safety audits were performed by CDM Smith during the Phase 2 RA to ensure that all activities were performed in accordance with the contract documents, including the approved CQCP and Health and Safety Plan. The audit reports are included in **Appendix S**.

5.2.3 Documentation

Both CDM Smith and the RA Contractors maintained accurate and comprehensive records of RA construction activities in accordance with the RA Contract and the approved project plans. A summary of the record documents is provided below.

- **Log Book Notes** – Log book notes were maintained for all site activities. Pertinent information regarding personnel on site, weather conditions, health and safety, and site activities were recorded on a daily basis. Log book notes can be found in the bi-weekly progress reports in **Appendix F**.

- **Project Progress Photographs** – Progress of site activities was photographically documented on a routine basis. Copies of progress photographs, including photo logs, are included in the bi-weekly progress reports in **Appendix F**.

- **Contractor Quality Control Reports** – Daily CQC reports were completed by ACI to document site conditions, QC activities, construction activities, labor and equipment hours, and accident reporting and submitted to CDM Smith.

- **Inspector's Quality Assurance Reports** – Daily logs were completed by the resident engineer to summarize the construction activities and document inspections performed on site. The reports are included in the bi-weekly progress reports in **Appendix F**.

- **Meeting Minutes** – Weekly meeting minutes were prepared as a record of the construction progress meetings to document the RA activities as discussed in **Section 5.2**. The meeting minutes are included in **Appendix K**.

- **As-Built Drawings** – Record as-built drawings for all site activities were prepared by ACI and are included in **Appendix M**.

5.2.4 Field Changes

Field changes were generally associated with unforeseen field conditions and were documented in the Modifications included in **Appendix T**. Modifications are a contractual mechanism to document and manage changes under a fixed-fee contract. Changes that required modifications are described in **Section 8**.

5.3 Sampling and Analysis QA/QC

During Phase 1 of the RA activities, sampling activities associated with the temporary water treatment system were performed by UTD's subcontractor, INTEX. During Phases 1 and 3 of the RA activities, groundwater sampling associated with monitoring well development, extraction well development, step drawdown testing, and sustained yield testing was performed by CDM Smith. A QA/QC system was implemented to ensure the accuracy, completeness, and precision of sampling data were in accordance with CDM Smith's approved UFP-QAPP.

During Phases 3 and 4 of the RA activities, all sampling activities were performed by ACI. A QA/QC system was implemented to ensure the accuracy, completeness, and precision of sampling data were in accordance with ACI's approved UFP-QAPP. Sampling and analysis QC activities are summarized in the CDFR prepared by ACI (**Appendix O**).

The QA/QC field samples collected include field duplicates, matrix spikes (MSs), matrix spike duplicates (MSDs), trip blanks, equipment rinsate blanks, and temperature blanks.

5.3.1 Field Duplicates

A field duplicate is defined as a homogenized sample collected from a unique location that is divided into two separate sets of containers and submitted to the laboratory as two unique samples for analysis. Field duplicates were collected at a frequency of one duplicate for every 20 samples. The results from the original and duplicate were compared by determining a relative percent difference value for each target analyte above the reporting limit for the given sample.

5.3.2 Matrix Spike/Matrix Spike Duplicate

MS/MSD samples were collected to document the precision and consistency of the laboratory equipment. MS/MSD samples were collected at a frequency of one sample for every 20 field samples.

5.3.3 Equipment Rinsate, Trip, and Temperature Blanks

An equipment rinsate blank is collected for non-dedicated sampling equipment to verify the effectiveness of the equipment decontamination process. Equipment rinsate blanks were collected once per decontamination event, or once per day.

A trip blank is used to document contamination attributable to shipping and field handling procedures. Each trip blank consisted of two 40-milliliter glass vials filled at the field with organic-free deionized water. The trip blanks accompanied the analytical sample bottles from the field to the laboratory. One trip blank was collected each day of sample shipment for VOCs analysis.

A temperature blank is collected to assess the temperature of the incoming sample shipment without disturbing any of the field samples. A temperature blank accompanied each sample cooler from the field to the laboratory. One temperature blank per sample cooler was shipped to the laboratory.

5.3.4 Data Review/Validation

All sampling data were validated and subjected to review to assess data precision, completeness, and accuracy in accordance with the methods specified in CDM Smith's and ACI's approved UFP-QAPPs . Phases 1 and 3 groundwater sampling data were validated by EPA. Phases 2 and 4 sampling data were validated by ACI, and a summary of data assessment, including data quality objectives, usability, data validation, corrective actions, etc., for all samples collected is provided in the CDFR (**Appendix O**).

5.3.5 Sample Numbering

The sample numbering scheme was developed to identify each sample designated for laboratory analysis. The purpose of this numbering scheme was to provide a tracking system for retrieval of field and analytical data for each sample. A summary of the sample numbering scheme is included in CDM Smith's and ACI's approved UFP-QAPPs.

5.4 In-Place Soil Moisture and Density Testing

During Phases 2 and 4, soil moisture and density testing of in-place backfill was performed as described in **Section 3**. Field testing was performed by subcontracted personnel using a nuclear moisture density gauge. Copies of the field density test reports are included in **Appendix P**.

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Section 6

Inspection and Certification

The ITP and a pre-final inspection were performed following the completion of the remedial construction. The purpose of these inspections was to ensure that all work was performed to the satisfaction of EPA and in accordance with the contract documents. A final inspection will be performed after completion of the southern plume RA activities to ensure that the remedy is constructed and functioning as designed.

6.1 Initial Testing Program

The ITPs, as specified under Section 01800 of the Contract Specifications, were conducted before initiating normal plant operation. The first ITP was completed following the completion of the Phase 2 RA and the second ITP was completed following the completion of the Phase 4 RA. The specified ITP comprised a 14-day operational test. The objective of the 14-day operational test was to demonstrate long-term operability of the system while confirming performance expectations with regard to contaminant removal. During the 14-day testing period, 90 percent run time was required.

Baseline groundwater samples were collected prior to the performance of both ITPs to establish baseline conditions prior to treatment system startup and allow evaluation of cleanup progress over time. Groundwater samples were collected from 27 wells and sent to the DESA and CLP laboratories for analysis. Wells sampled, sample number, and analytical parameters for baseline sampling events are summarized in **Table 6-1**. Groundwater samples from the second baseline event were only analyzed for VOCs. The groundwater sample results for the site-specific COCs are summarized in **Tables 6-2 and 6-3** for the first and second round of baseline sampling events, respectively.

6.1.1 First ITP

The first ITP was performed over 17 days in two segments (December 6 through 9, 2011 and December 16 through 30, 2011) due to interruptions in continuous system operation during the onset of the ITP. From December 6 through 9, 2011, EW-1S and EW-1I were run independently for 24 hours successfully. However, the ITP was suspended on December 9, 2011 upon receiving laboratory results indicating exceedances of the SPDES-DGW permit equivalent criteria. The system was immediately put into recirculation mode to prevent additional discharge. ACI troubleshot the system and determined that the blower damper was incorrectly set. After ACI reset the damper to full position, CDM Smith directed ACI to divert effluent to a frac tank during re-startup of the system and to collect samples to confirm the discharge was below the permitted criteria. ACI mobilized a 20,000 gallon frac tank to the Site, restarted the system, and collected the effluent samples for offsite analysis. Effluent sample results were reviewed by CDM Smith and all the parameters were below the discharge permit criteria. Subsequently, CDM Smith directed ACI to resume the ITP for an additional 14 days.

On December 16, 2011, the ITP resumed. Between December 16 and 30, 2011, EW-1D was successfully run independently for 24 hours, and all extraction wells were run simultaneously for the remainder of the period. Analytical sampling and monitoring were performed in accordance with the

Contract Specifications and approved shop drawings. ACI successfully demonstrated that the quality of the effluent from the GWTS did not exceed the discharge limits required by the SPDES-DGW permit equivalency. On December 30, 2011 the ITP was considered complete, marking the onset of the 1-year operational and functional (O&F) period. Sample results from the ITP are provided in the ITP Report included in **Appendix U**.

Due to operational issues, the automatic flow control valves for the extraction well headers were not in service for the ITP. Therefore, the process system pumps were cycling to accommodate for non-uniform flow through the system. The valves were inspected and repaired in January 2012.

6.1.2 Second ITP

The second ITP was performed over 22 days in two segments (February 24 through 26, 2015, and July 20 through August 7, 2015) due to difficulties encountered while connecting electrical service to the southern extraction wells. From February 24 through 26, 2015, EW-1S, EW-1I, and EW1D were run simultaneously, and influent and effluent samples were collected. ACI successfully demonstrated that the quality of the effluent from the GWTS did not exceed the discharge limits required by the SPDES-DGW permit equivalency. The GWTS was run in testing mode from February 27 through July 19, 2015. On July 20, 2015, the ITP resumed after power was supplied to the southern extraction wells. Between July 20 and August 7, 2015, the southern extraction wells (SEW-1S, SEW-1I, and SEW-1D) were first run simultaneously for 24 hours, then all six extraction wells were operated simultaneously. Analytical sampling and monitoring were performed in accordance with the Contract Specifications and approved shop drawings. ACI successfully demonstrated that the quality of the effluent from the GWTS did not exceed the discharge limits required by the SPDES-DGW permit equivalency. On August 7, 2015 the ITP was considered complete, marking the onset of the 1-year O&F period. Sample results from the ITP are provided in the ITP Report included in **Appendix U**.

6.2 Pre-Final and Final Inspections

Upon completion of the Phase 2 RA activities at the Site, a pre-final inspection was conducted on November 30, 2011. Representatives from EPA, Nassau County, the Village of Garden City, CDM Smith, and ACI were present. During the pre-final inspection, a punch list documenting observed deficiencies was prepared. Punch list items identified during the pre-final inspection are included as **Appendix V**.

ACI was required to correct all deficiencies prior to the final inspection. All pre-final inspection items were verified to have been resolved by December 30, 2011 except for epoxy sealing of the GWTS process room concrete floor, which was completed during the Phase 4 RA.

Upon completion of the Phase 4 RA and ITP, representative of EPA, State, Village of Garden City, CDM Smith and ACI conducted a final inspection on August 7, 2015. The purpose of this inspection was to verify that the system is constructed in compliance with EPA approved specifications and it is functioning as designed. A letter documenting the final inspection is included in Appendix V.

6.3 Health and Safety

As of July 30, 2015 (the end of the construction phase), over 98,563 man hours were worked on site without any lost time due to injury. The breakdown of man hours is as follows:

- CDM Smith Phase 1 and 2: 7,571 man hours
- CDM Smith Phase 3 and 4: 1,560 man hours
- ACI Phase 2: 80,700 man hours
- ACI Phase 4: 4,532 man hours
- UTD Phase 1: 2,600 man hours
- UTD Phase 3: 1,600 man hours

As required by the Site Safety and Health Plan (SSHP), daily tailgate health and safety meetings were conducted. Special health and safety considerations were discussed as they pertained to the daily activities. Weekly progress meetings were held to review issues related to new activities. CDM Smith conducted health and safety audits during construction activities on August 11, 2010 and October 13 and 14, 2011. Copies of the health and safety audit reports are provided in **Appendix S**.

General site workers were required to be trained and medically monitored for Hazardous Waste Operations and Emergency Response, including excavation and trenching, in accordance with 29 Code of Federal Regulations 1919.120. All work was conducted in Level D or Modified Level D personal protective equipment with a contingency for Level C upgrade for personnel in direct contact with the excavated material based on air monitoring results.

In accordance with the approved SSHP, ambient air monitoring using real-time direct reading instruments was performed during intrusive activities such as drilling, excavation of yard piping and building foundation, and groundwater sampling to verify that personnel and the public were not exposed to VOCs. In addition, respirable dust was monitored using visual inspection with a goal of zero visible dust. The VOCs and respirable dust action levels set forth by the site safety and health officer were never exceeded.

No recordable accidents occurred during the RA activities. One minor incident occurred during the Phase 1 RA. The driller was moving the water truck from the extraction well area to the staging area when a car merging from the right hit the water truck. The light assembly and fender on the passenger side of the car was damaged with no personal injury.

The Health and Safety Phase-Out Report prepared by ACI is included in **Appendix W**.

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Section 7

Operation and Maintenance

Plant operation officially started on January 1, 2012 after completion of the first ITP for the treatment system. Plant operation was suspended between October 22, 2014 and May 30, 2015 for the Phase 4 RA and between July 20 and 30, 2015 for the second ITP. During this period, the groundwater was extracted from the extraction wells EW-1S, EW-1I, and EW-1D at the design flow rate of 225 gpm, treated, and discharged to Recharge Basin #124. Routine O&M sampling and monitoring were performed to verify that the treatment system was functioning as designed per the RA requirements. In addition, routine site-wide groundwater sampling and monitoring were performed to verify remedy effectiveness and hydraulic control. Any deficiencies identified during this period were covered under the RA Contractor's warranty and were corrected. All sampling and monitoring were performed in accordance with the approved UFP-QAPP.

Detailed O&M of the treatment system and groundwater sampling performed from 2012 through 2014 are summarized in the RA Annual Progress Reports for Years 1, 2, and 3 (CDM Smith 2013c, CDM Smith 2014, CDM Smith 2015), including downtime, specific problems encountered, system maintenance and modifications, and all monitoring and sampling activities. Analysis of treatment system effectiveness and capture zone analysis are also included in the Annual Progress Reports.

Plant operation with all six extraction wells started on August 1, 2015 after completion of the second ITP for the treatment system. During the O&M period, routine O&M sampling and monitoring and site-wide groundwater sampling will continue to be performed as described below. O&M procedures for the treatment system are detailed in the O&M Manual included in **Appendix X**.

7.1 Routine Operation and Maintenance

Routine O&M activities include:

- Operation of all equipment, systems, processes, and appurtenances in accordance with the contract documents and manufacturers' specifications
- Procurement, management and maintenance of all equipment, spare parts, supplies, and services required for continuous operation with minimal downtime
- Optimization of process equipment and chemicals to minimize operational costs
- Maintenance of the treatment plant to achieve an uptime of greater than 90 percent during the first year of operation
- Monitoring of treatment system performance, permit compliance, and remedial progress by collecting samples and field measurements in accordance with the contract requirements
- Routine preventative and corrective maintenance of the treatment system and recharge basin, including all processes, equipment, controls, facilities, and appurtenances

- Routine inspections and maintenance of exterior facilities, equipment, the grounds along the underground pipeline, fencing and locks, control panel, touch-up painting, well vaults, and building openings and access ways
- Bag filter change-out as required
- Routine well maintenance to prevent excessive buildup of iron fouling in the wells and submersible pumps
- Routine inspection of the stormwater manhole used for treatment plant effluent discharge and the recharge basin to ensure proper operation

7.2 O&M and Site-Wide Groundwater Sampling/Monitoring

The following O&M and site-wide groundwater sampling/monitoring will be performed as part of the O&M activities:

- Performance sampling/monitoring of the GWTS will be performed to verify proper operation. Compliance sampling of effluent water will be performed to verify that the GWTS is operating in compliance with the requirements of the SPDES-DGW permit equivalent. A summary of the GWTS performance and compliance sampling/monitoring program is provided in **Table 7-1**.
- Routine sampling/monitoring of site-wide groundwater will be performed to verify remedy effectiveness and hydraulic control and to monitor remedial progress. A summary of the groundwater sampling and monitoring program is provided in **Table 7-2**.

7.3 Reporting

7.3.1 Monthly O&M Report

Information and data collected during O&M and environmental sampling/monitoring activities will be documented by ACI and submitted to CDM Smith for review and approval. CDM Smith will include these reports as part of the Remedial Progress Reports, as discussed in **Section 7.3.2**. Monthly O&M Reports will include the following:

- Inspection report including system integrity, presence of settling or subsidence, solids buildup, scaling, plugging, fouling, vandalism, etc.
- Maintenance recommendations and completed maintenance and/or repairs
- Operating conditions, including quantities of consumables used and flow records with flow rates and total flow to the recharge basin
- Any operational problems encountered
- Samples submitted for laboratory analysis
- Operational data collected as part of permit equivalencies and monthly report to EPA
- Validated laboratory results of collected and analyzed samples

- Any health and safety activities that occurred or issues that were identified

7.3.2 Remedial Progress Reports

The Remedial Progress Report will be prepared on an annual basis. The reports will include a detailed summary and analysis of remedy performance, and recommendations regarding future maintenance activities. Remedial Progress Reports will also include tabulated summaries of groundwater data and field measurements, and tabulated summaries of compliance sampling and monitoring results to demonstrate conformance with the discharge criteria in accordance with SPDES-DGW permit equivalency requirements. Graphical summaries of GWTS performance, including average flow rates, cumulative volume of groundwater extracted, mass removal rates, and cumulative mass removed, will be provided.

7.3.3 Optimization Report

An Optimization Report will be prepared at the end of the fifth year of operation, or as directed by EPA. This report will include recommendations for changes or improvements to the system that will minimize future O&M costs. At a minimum, this report will:

- Identify each piece of equipment and provide brief background information on the theory of operation for each piece of equipment
- Summarize what variations in operation for each piece of equipment were tried and the results of the variations
- Describe what operating parameters were determined to be optimum for each piece of equipment

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Section 8

Summary of Project Costs

The Old Roosevelt Field Contaminated Groundwater Area Superfund Site Remedial Action construction contract was executed as a cost-plus contract. The work was completed under RAC No. EP-W-09-002, Work Assignment Nos. 023-RARA-02PE and 048-RARA-02PE.

The forecasted cost at completion of the Old Roosevelt Field RA is $11,157,300, including Phases 1 through 4 of construction and associated modifications, 37 months of O&M, three rounds of annual groundwater sampling, and preparation of three annual reports. **Table 8-1** provides a summary of CDM Smith subcontractor costs for the project. Seven contract modifications were issued during the drilling activities, and 11 were issued during the construction and O&M activities. The total value of the costs incurred due to modifications was $505,971, which is summarized in **Table 8-2**. The most significant line items were generally related to the following: addition of a union worker; construction of the temporary pad and access road; design/construction modifications to achieve LEED certification; substitution of process equipment (replacement of PVC proportional control valves with glove valves, air stripper model); additional excavation below the treatment building footprint to remove structurally inadequate soil; structural engineering design to increase building height; installation of removable bollard posts at the extraction wellheads; and additional O&M. The modifications and total value of the costs incurred had no impact on the project schedule.

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Section 9

Contact Information

A summary of the key project personnel contacts is presented below.

Name/Organization	Title	Address	Phone Number	Email Address
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Thomas Mathew, CDM Smith	Project Manager	110 Fieldcrest Ave #8, 6th Floor Edison, NJ 08837	(732) 590-4638	mathewt@cdmsmith.com
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Doug Ronk, ACI	Project Manager	10981 Eicher Drive Lenexa, KS 66219	(913) 814-9994	dronk@arrowhead-usa.com
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Greg Wallace, ACI	Program Manager	10981 Eicher Drive Lenexa, KS 66219	(913) 814-9994	gwallace@arrowhead.org

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Section 10
References

American Concrete Institute. 2005a. Building Code Requirements for Structural Concrete. American Concrete Institute Standard 318-05.

_______. 2005b. Building Code Requirements and Specification for Masonry Structures. American Concrete Institute Standard 530-05.

American Institute of Steel Construction (AISC). 2006. Steel Construction Manual, 13th Edition. February 1.

American National Standards Institute (ANSI). 2003. Accessible and Usable Buildings and Facilities. ANSI A117.1. January 1.

American Society of Civil Engineers (ASCE). 2005. Minimum Design Loads for Buildings and Other Structures. ASCE Standard 7-05. November 15.

American Society for Testing and Materials International (ASTM). 2008. Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. ASTM D1586-08a. October 1.

American Water Works Association (AWWA). 2006. Water Wells. AWWA A100-06. August 1.

Arrowhead Contracting, Inc. 2011. 100 Percent Design Drawings for Groundwater Remediation at the Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. March.

CDM Federal Programs Corporation (CDM Smith). 2007a. Final Remedial Investigation Report, Old Roosevelt Field Contaminated Groundwater Area Site, Garden City, New York. July 24.

_______. 2007b. Final Feasibility Study Report, Old Roosevelt Field Contaminated Groundwater Area Site, Garden City, New York. August 20.

_______. 2008. Technical Memorandum – Infiltration Rate Analysis for Nassau County Recharge Basin #124, Roosevelt Field, Garden City, New York. November 10.

_______. 2009a. Draft Pre-Remedial Design Investigation Technical Memorandum, Old Roosevelt Field Contaminated Groundwater Area Site Remedial Design, Garden City, New York. March 6.

_______. 2009b. Draft Supplemental Pre-Remedial Design Investigation Technical Memorandum, Old Roosevelt Field Contaminated Groundwater Area Site Remedial Design, Garden City, New York. November 10.

_______. 2009c. Final Design Analysis Report, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. September 18.

_______. 2010a. Final Site Management Plan, Remedial Action, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. July 14.

_______. 2010b. Final Quality Assurance Project Plan, Remedial Action, Old Roosevelt Field Contaminated Groundwater Area Site, Garden City, New York. May 24.

_______. 2010c. FCN #01 Field Change Notification, RA-01, Groundwater Sampling Method Change and Addition of Monitoring Wells During Aquifer Testing, August 15.

_______. 2010d. FCN #02 Field Change Notification, RA-02, Changes of Groundwater Sampling During Aquifer Testing, August 26.

_______. 2010e. Iron Removal System Letter, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. October 7.

_______. 2011. Sustained Yield Test Technical Memorandum, Old Roosevelt Field Contaminated Groundwater Area Superfund Site Remedial Action, Garden City, Long Island, NY. November 9.

_______. 2012a. Baseline Remedial Action/Round 5 Well Sampling Technical Memorandum, Old Roosevelt Field Contaminated Groundwater Area Superfund Site Remedial Action, Garden City, Long Island, NY. January 31.

_______. 2012b. Simulation of Extraction Well for Southern Plume of Groundwater Plume, June 20.

_______. 2012c. FCN #03 Field Change Notification, RA-03, Installation of Additional Test Boring and Extraction Wells, October 19.

_______. 2012d. FCN #04, Field Change Notification, RA-04, Revised Southern Extraction Well Screen Intervals, December 31.

_______. 2013a. Remedial Design for Groundwater Remediation at the Old Roosevelt Field Contaminated Groundwater Area Site, Garden City, New York. June.

_______. 2013b. Site Management Plan, Remedial Action, Old Roosevelt Field Contaminated Groundwater Area Site – Southern Plume, Garden City, New York. April 18.

_______. 2013c. Remedial Action Annual Progress Report – Year 1, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. May 24.

_______. 2014. Remedial Action Annual Progress Report – Year 2, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. October 24.

_______. 2015. Remedial Action Annual Progress Report – Year 3, Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York. May 8.

International Code Council (ICC). 2006a. International Building Code – New York Edition.

_______. 2006b. International Mechanical Code® – New York Edition.

_______. 2006c. Fire Code of New York State.

_______. 2006d. International Energy Conservation Code® – New York Edition.

Lockheed Martin. 2008. Roosevelt Field Groundwater Contamination Superfund Site, Garden City, NY, Work Assignment #EAC00254 - Trip Report. April 18, 2008.

National Fire Protection Association (NFPA). 2005. National Electrical Code.

New York State Department of Environmental Conservation (NYSDEC). 2004. Permit Exempt and Trivial Activities. 6 New York Codes, Rules and Regulations (NYCRR) Subpart 201-3. October 22.

_______. 2010a. General Process Emission Sources. 6 NYCRR Part 212. September 30.

_______. 2010b. CP-51/Soil Cleanup Guidance. October 21.

Plumbing-Heating-Cooling Contractors National Association (PHCC). 2006. National Standard Plumbing Code.

United States Environmental Protection Agency (EPA). 2007. Record of Decision (ROD), Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, Nassau County, New York. September.

_______. 2011. Close Out Procedures for National Priorities List Sites. Office of Solid Waste and Emergency Response (OSWER) Directive 9320.2-22. May.

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Tables

Table 3-1
TB-01 Soil Sample and Depth Summary
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sampling Depth (feet bgs)	Analysis
60	Grain Size
80	TOC
140	Grain Size
150	TOC
215	TOC
225	TOC
230	TOC
235	Grain Size and TOC
245	Grain Size and TOC
260	Grain Size and TOC
270	Grain Size and TOC
280	TOC
285	Grain Size and TOC
290	Grain Size and TOC
295	TOC
310	Grain Size and TOC
315	Grain Size and TOC
325	Grain Size and TOC
330	TOC
340	Grain Size and TOC
350	Grain Size and TOC
355	Grain Size and TOC
360	Grain Size and TOC
370	Grain Size and TOC
380	Grain Size and TOC
390	Grain Size and TOC
400	Grain Size and TOC
405	Grain Size and TOC
410	TOC

Notes:
bgs = below ground surface
TOC = total organic carbon

Table 3-2
TB-01 Soil TOC Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample ID	Sample Date	TOC Concentration (mg/kg)
TB-01-80-82	5/12/2010	223
TB-01-150-152	5/12/2010	481
TB-01-215-217	5/12/2010	1,098
TB-01-225-227	5/12/2010	14,266
TB-01-230-232	5/12/2010	12,675
TB-01-235-237	5/12/2010	24,125
TB-01-245-247	5/12/2010	1,245
TB-01-260-262	5/12/2010	796
TB-01-270-272	5/12/2010	305
TB-01-280-282	5/12/2010	32,810
TB-01-285-287	5/12/2010	3,807
TB-01-290-292	5/12/2010	1,457
TB-01-295-297	5/12/2010	652
TB-01-310-312	5/12/2010	406
TB-01-315-317	5/12/2010	830
TB-01-325-327	5/12/2010	830
TB-01-330-332	5/12/2010	845
TB-01-340-342	5/12/2010	3,464
TB-01-350-352	5/13/2010	521
TB-01-355-357	5/13/2010	643
TB-01-360-362	5/13/2010	618
TB-01-370-372	5/13/2010	1,421
TB-01-380-382	5/13/2010	611
TB-01-390-392	5/13/2010	754
TB-01-400-402	5/13/2010	588
TB-01-405-407	5/13/2010	375
TB-01-410-412	5/13/2010	13,453

Notes:
TOC was analyzed using EPA Method 9060.
EPA = United States Environmental Protection Agency
ID = identification
mg/kg = milligram per kilogram
TOC = total organic carbon

Table 3-3
Post-Development Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D		EW-1I		EW-1S		EW-1S (Duplicate)	
TCL VOCs										
71-55-6	1,1,1-Trichloroethane	µg/L	1.2		0.5	U	0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.96		0.5	U	0.5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	µg/L	1.8		0.5	U	0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	µg/L	6.4		1.9		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	µg/L	1	U	1	U	1	U	1	U
120-82-1	1,2,4-Trichlorobenzene	µg/L	1	U	1	U	1	U	1	U
96-12-8	1,2-Dibromo-3-chloropropane	µg/L	1	U	1	U	1	U	1	U
106-93-4	1,2-Dibromoethane	µg/L	5	U	5	U	5	U	5	U
95-50-1	1,2-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	µg/L	0.5	U	0.5	U	1.2		1.2	
78-87-5	1,2-Dichloropropane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
78-93-3	2-Butanone	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
591-78-6	2-Hexanone	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	µg/L	0.5	U	5	U	0.5	U	0.5	U
67-64-1	Acetone	µg/L	0.5	U	0.5	U	0.5	U	0.5	UL
71-43-2	Benzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
74-97-5	Bromochloromethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-27-4	Bromodichloromethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-25-2	Bromoform	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
74-83-9	Bromomethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-15-0	Carbon Disulfide	µg/L	5	U	5	U	5	U	5	U
56-23-5	Carbon tetrachloride	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
108-90-7	Chlorobenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-00-3	Chloroethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
67-66-3	Chloroform	µg/L	0.76		0.9		1.5		1.4	
74-87-3	Chloromethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	µg/L	13		7.2		7		7.2	
10061-01-5	cis-1,3-Dichloropropene	µg/L	5	U	5	U	5	U	5	U
110-82-7	Cyclohexane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
124-48-1	Dibromochloromethane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	µg/L	45		26		1.4		1.4	
100-41-4	Ethylbenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
98-82-8	Isopropylbenzene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
179601-23-1	m,p-Xylene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
79-20-9	Methyl Acetate	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	µg/L	0.5	UJ	6.3	J	23	J	23	J
108-87-2	Methylcyclohexane	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
75-09-2	Methylene chloride	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
95-47-6	o-Xylene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
100-42-5	Styrene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
127-18-4	Tetrachloroethene	µg/L	170		160		3.7		3.5	
108-88-3	Toluene	µg/L	0.5	U	0.52		0.5	U	0.5	U

Table 3-3
Post-Development Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D		EW-1I		EW-1S		EW-1S (Duplicate)	
TCL VOCs										
156-60-5	trans-1,2-Dichloroethene	µg/L	2.7		0.5	U	0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
79-01-6	Trichloroethene	µg/L	160		190		270		260	J
75-69-4	Trichlorofluoromethane	µg/L	32		2.6		3.5		3.5	
75-01-4	Vinyl Chloride	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
Metals										
7439-89-6	Iron (total)	µg/L	50	U	320		210		190	
7439-89-6	Iron (dissolved)	µg/L	50	U	310		190		190	
7439-96-5	Manganese (total)	µg/L	10		34		31		30	
7439-96-5	Manganese (dissolved)	µg/L	12		36		31		31	

Notes:
1. Where qualifier is U for a non-detect result, the reporting detection limit for the analyte per the laboratory analysis is reported.

µg/L = microgram per liter
J = result is estimated
U = result is non-detect
CAS = Chemical Abstracts Service
TCL = Target Compound List
VOC = volatile organic compound

Table 3-4
Step Drawdown Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D		EW-1I		EW-1S	
TCL VOCs								
71-55-6	1,1,1-Trichloroethane	µg/L	1.3		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	µg/L	0.5	U	0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.93		0.5	U	0.5	U
79-00-5	1,1,2-Trichloroethane	µg/L	0.5	U	0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	µg/L	1.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	µg/L	6.6		1.8		0.5	U
87-61-6	1,2,3-Trichlorobenzene	µg/L	50	U	0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-chloropropane	µg/L	0.5	U	0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	µg/L	5	U	5	U	5	U
95-50-1	1,2-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	µg/L	0.5	U	0.55		1.3	
78-87-5	1,2-Dichloropropane	µg/L	0.5	U	0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	µg/L	0.5	U	0.5	U	0.5	U
78-93-3	2-Butanone	µg/L	0.5	U	0.5	U	0.5	U
591-78-6	2-Hexanone	µg/L	0.5	U	0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	µg/L	0.5	U	0.5	U	0.5	U
67-64-1	Acetone	µg/L	2	UL	2	UL	2	UL
71-43-2	Benzene	µg/L	0.5	U	0.5	U	0.5	U
74-97-5	Bromochloromethane	µg/L	0.5	U	0.5	U	0.5	U
75-27-4	Bromodichloromethane	µg/L	0.5	U	0.5	U	0.5	U
75-25-2	Bromoform	µg/L	0.5	U	0.5	U	0.5	U
74-83-9	Bromomethane	µg/L	0.5	U	0.5	U	0.5	U
75-15-0	Carbon Disulfide	µg/L	5	U	5	U	5	U
56-23-5	Carbon tetrachloride	µg/L	0.5	U	0.5	U	0.5	U
108-90-7	Chlorobenzene	µg/L	0.5	U	0.5	U	0.5	U
75-00-3	Chloroethane	µg/L	0.5	U	0.5	U	0.5	U
67-66-3	Chloroform	µg/L	0.68		0.71		0.97	
74-87-3	Chloromethane	µg/L	0.5	U	0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	µg/L	13		7.2		7	
10061-01-5	cis-1,3-Dichloropropene	µg/L	5	U	5	U	5	U
110-82-7	Cyclohexane	µg/L	0.5	U	0.5	U	0.5	U
124-48-1	Dibromochloromethane	µg/L	0.5	U	0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	µg/L	43		22		1.2	
100-41-4	Ethylbenzene	µg/L	0.5	U	0.5	U	0.5	U
98-82-8	Isopropylbenzene	µg/L	0.5	U	0.5	U	0.5	U

Table 3-4
Step Drawdown Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D		EW-1I		EW-1S	
TCL VOCs								
179601-23-1	m,p-Xylene	µg/L	0.5	U	0.5	U	0.5	U
79-20-9	Methyl Acetate	µg/L	0.5	U	0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	µg/L	0.5	U	8		24	
108-87-2	Methylcyclohexane	µg/L	0.5	U	0.5	U	0.5	U
75-09-2	Methylene chloride	µg/L	0.5	U	0.5	U	0.5	U
95-47-6	o-Xylene	µg/L	0.5	U	0.5	U	0.5	U
100-42-5	Styrene	µg/L	0.5	U	0.5	U	0.5	U
127-18-4	Tetrachloroethene	µg/L	180		140		3.6	
108-88-3	Toluene	µg/L	0.5	U	0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	µg/L	2.8		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	µg/L	0.5	U	0.5	U	0.5	U
79-01-6	Trichloroethene	µg/L	140		170		270	
75-69-4	Trichlorofluoromethane	µg/L	24	J	1.9	J	3	J
75-01-4	Vinyl Chloride	µg/L	0.5	U	0.5	U	0.5	U
Metals								
7439-89-6	Iron (total)	µg/L	50	U	310		220	
7439-89-6	Iron (dissolved)	µg/L	51		310		200	
7439-96-5	Manganese (total)	µg/L	9.5		34		30	
7439-96-5	Manganese (dissolved)	µg/L	9.7		33		30	

Notes:
1. Where qualifier is U for a non-detect result, the reporting detection limit for the analyte per the laboratory analysis is reported.

µg/L = microgram per liter
J = result is estimated
L = result is biased low
U = result is non-detect
CAS = Chemical Abstracts Service
TCL = Target Compound List
VOC = volatile organic compound

Table 3-5
Sustained Yield Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D 9/7/2010	EW-1D 9/10/2010	EW-1I 9/7/2010	EW-1I 9/10/2010	EW-1S 9/7/2010	EW-1S (Duplicate) 9/7/2010	EW-1S 9/10/2010	EW-TOTAL 9/7/2010	EW-TOTAL (Duplicate) 9/7/2010	EW-TOTAL 9/10/2010
TCL VOCs												
71-55-6	1,1,1-Trichloroethane	µg/L	1.3	1.1	0.5 U	0.5 U	0.5 U	--	0.5 U	0.72	0.65	0.58
79-34-5	1,1,2,2-Tetrachloroethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	1	1.3	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.6
79-00-5	1,1,2-Trichloroethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-34-3	1,1-Dichloroethane	µg/L	2	1.8	0.5 U	0.5 U	0.5 U	--	0.5 U	0.95	0.88	0.94
75-35-4	1,1-Dichloroethene	µg/L	6.9	5	1.5	2.1	0.5 U	--	0.5 U	3.6	3.3 K	2.8
87-61-6	1,2,3-Trichlorobenzene	µg/L	5 U	0.5 U	5 U	0.5 U	5 U	--	5 U	5 U	5 U	5 U
120-82-1	1,2,4-Trichlorobenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
96-12-8	1,2-Dibromo-3-chloropropane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
106-93-4	1,2-Dibromoethane	µg/L	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	5 U
95-50-1	1,2-Dichlorobenzene	µg/L	0.5 U	1 U	0.5 U	1 U	0.5 U	--	1 U	0.5 U	0.5 U	1 U
107-06-2	1,2-Dichloroethane	µg/L	0.5 U	0.5 U	0.5 U	0.51	1.3	--	0.99	0.71	0.76	0.55
78-87-5	1,2-Dichloropropane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
541-73-1	1,3-Dichlorobenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
106-46-7	1,4-Dichlorobenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
78-93-3	2-Butanone	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
591-78-6	2-Hexanone	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
108-10-1	4-Methyl-2-Pentanone	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
67-64-1	Acetone	µg/L	2 UL	1 U	2 UL	1 U	2 UL	--	1 U	2 UL	2 UL	1 U
71-43-2	Benzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
74-97-5	Bromochloromethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-27-4	Bromodichloromethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-25-2	Bromoform	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
74-83-9	Bromomethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-15-0	Carbon Disulfide	µg/L	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	5 U
56-23-5	Carbon tetrachloride	µg/L	0.5 U	0.54	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
108-90-7	Chlorobenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-00-3	Chloroethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
67-66-3	Chloroform	µg/L	0.7	0.78	0.65	0.59	0.5 U	--	0.55	0.63	0.58	0.66
74-87-3	Chloromethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
TCL VOCs												
156-59-2	cis-1,2-Dichloroethene	µg/L	13	11	6.8	8.5	7.2	--	8.1	9.8	9.7	9.2
10061-01-5	cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	5 U

Table 3-5
Sustained Yield Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D 9/7/2010	EW-1D 9/10/2010	EW-1I 9/7/2010	EW-1I 9/10/2010	EW-1S 9/7/2010	EW-1S (Duplicate) 9/7/2010	EW-1S 9/10/2010	EW-TOTAL 9/7/2010	EW-TOTAL (Duplicate) 9/7/2010	EW-TOTAL 9/10/2010
110-82-7	Cyclohexane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
124-48-1	Dibromochloromethane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-71-8	Dichlorodifluoromethane	µg/L	47	32	21	26	1	--	2.2	27	25	21
100-41-4	Ethylbenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
98-82-8	Isopropylbenzene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
179601-23-1	m,p-Xylene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
79-20-9	Methyl Acetate	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
1634-04-4	Methyl tert-Butyl Ether	µg/L	0.5 U	0.5 U	8.6	5.9	24	--	19	9.6	9.9	7.2
108-87-2	Methylcyclohexane	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
75-09-2	Methylene chloride	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
95-47-6	o-Xylene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
100-42-5	Styrene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
127-18-4	Tetrachloroethene	µg/L	190	160	130	150	4.1	--	3.4	110	91 J	100
108-88-3	Toluene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
156-60-5	trans-1,2-Dichloroethene	µg/L	2.8	2.3	0.5 U	0.5 U	0.5 U	--	0.5 U	1.4	1.3	1
10061-02-6	trans-1,3-Dichloropropene	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
79-01-6	Trichloroethene	µg/L	150	110	160	200	250	--	250	200	160 J	190
75-69-4	Trichlorofluoromethane	µg/L	25	39	2.9	2.3	2.5	--	4.5	9.9	9.2	22
75-01-4	Vinyl Chloride	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
TAL Metals												
7429-90-5	Aluminum (total)	µg/L	8 U	8 U	8 U	8 U	8 U	--	8 U	8 U	8 U	8 U
7429-90-5	Aluminum (dissolved)	µg/L	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U
7440-36-0	Antimony (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U	20 U	20 U
7440-36-0	Antimony (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7440-38-2	Arsenic (total)	µg/L	100 U	100 U	100 U	100 U	100 U	--	100 U	100 U	100 U	100 U
7440-38-2	Arsenic (dissolved)	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
7440-39-3	Barium (total)	µg/L	3 U	3 U	3 U	3 U	3 U	--	3 U	3 U	3 U	3 U
7440-39-3	Barium (dissolved)	µg/L	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
TAL Metals												
7440-41-7	Beryllium (total)	µg/L	3 U	3 U	3 U	3 U	3 U	--	3 U	3 U	3 U	3 U
7440-41-7	Beryllium (dissolved)	µg/L	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
7440-43-9	Cadmium (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U	20 U	20 U
7440-43-9	Cadmium (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7440-70-2	Calcium (total)	µg/L	15000	16000	13000	13000	21000	--	19000	17000	17000	17000

Table 3-5
Sustained Yield Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D 9/7/2010	EW-1D 9/10/2010	EW-1I 9/7/2010	EW-1I 9/10/2010	EW-1S 9/7/2010	EW-1S (Duplicate) 9/7/2010	EW-1S 9/10/2010	EW-TOTAL 9/7/2010	EW-TOTAL (Duplicate) 9/7/2010	EW-TOTAL 9/10/2010
7440-70-2	Calcium (dissolved)	µg/L	15000	16000	13000	13000	22000	22000	19000	17000	17000	16000
7440-47-3	Chromium (total)	µg/L	10 U	10 U	10 U	10 U	10 U	--	10 U	10 U	10 U	10 U
7440-47-3	Chromium (dissolved)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
7440-48-4	Cobalt (total)	µg/L	5 U	5 U	5 U	5 U	5 U	--	5 U	5 U	5 U	5 U
7440-48-4	Cobalt (dissolved)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
7440-50-8	Copper (total)	µg/L	50 U	50 U	10 U	10 U	10 U	--	10 U	10 U	10 U	10 U
7440-50-8	Copper (dissolved)	µg/L	10 U	50 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
57-12-5	Cyanide	µg/L	10 U	11	11	5 U	11	--	5 U	11	14	13
7439-89-6	Iron (total)	µg/L	50 U	50 U	320	200	210	--	140	170	170	99
7439-89-6	Iron (dissolved)	µg/L	51	50 U	330	200	210	210	140	160	160	98
7439-92-1	Lead (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	8.2	20 U	20 U
7439-92-1	Lead (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7439-95-4	Magnesium (total)	µg/L	6500	6600	5600	5300	9400	--	8300	7400	7300	6900
7439-95-4	Magnesium (dissolved)	µg/L	6400	6600	5600	5400	9700	9600	8100	7300	7300	6800
7439-96-5	Manganese (total)	µg/L	9.1	7.5	32	30	26	--	29	21	21	20
7439-96-5	Manganese (dissolved)	µg/L	9.2	7.7	32	30	27	27	29	21	21	20
7439-97-6	Mercury	µg/L	10 U	0.2 U	0.2 U	10 U	0.2 U	--	10 U	0.2 U	0.2 U	0.2 U
7440-02-0	Nickel (total)	µg/L	8 U	8 U	8 U	8 U	8 U	--	8 U	20 U	8 U	8 U
7440-02-0	Nickel (dissolved)	µg/L	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U	8 U
7440-09-7	Potassium (total)	µg/L	5400	4600	3300	2800	3600	--	3300	4400	4300	3700
7440-09-7	Potassium (dissolved)	µg/L	5400	4700	3300	2800	3700	3700	3200	4400	4300	3800
7782-49-2	Selenium (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U	20 U	20 U
7782-49-2	Selenium (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7440-22-4	Silver (total)	µg/L	100 U	100 U	100 U	100 U	100 U	--	100 U	100 U	100 U	100 U
7440-22-4	Silver (dissolved)	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
TAL Metals												
7440-23-5	Sodium (total)	µg/L	28000	29000	37000	36000	67000	--	62000	45000	45000	42000
7440-23-5	Sodium (dissolved)	µg/L	28000	29000	37000	37000	70000	70000	61000	45000	45000	41000
7440-28-0	Thallium (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U	20 U	20 U
7440-28-0	Thallium (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7440-62-2	Vanadium (total)	µg/L	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U	20 U	20 U
7440-62-2	Vanadium (dissolved)	µg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
7440-66-6	Zinc (total)	µg/L	280	240	250	250	430	--	420	360	350	310
7440-66-6	Zinc (dissolved)	µg/L	280	250	250	250	420	420	410	340	350	300

Table 3-5
Sustained Yield Test Extraction Well Analytical Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

CAS No.	Analyte	Unit	EW-1D 9/7/2010	EW-1D 9/10/2010	EW-1I 9/7/2010	EW-1I 9/10/2010	EW-1S 9/7/2010	EW-1S (Duplicate) 9/7/2010	EW-1S 9/10/2010	EW-TOTAL 9/7/2010	EW-TOTAL (Duplicate) 9/7/2010	EW-TOTAL 9/10/2010
Water Quality												
NA	Oil & Grease, Hydrocarbon	mg/L	--	--	--	--	--	--	--	5 UJ	5 UJ	5 UJ
NA	Total Suspended Solids	mg/L	--	--	--	--	--	--	--	10 U	10 U	10 U
NA	Total Dissolved Solids	mg/L	--	--	--	--	--	--	--	250	250	250
471-34-1	Hardness	mg/L	--	--	--	--	--	--	--	73	72	70
71-52-3	Bicarbonate	mg/L	--	--	--	--	--	--	--	5.7	6	5.7
NA	Acid-Base Potential	mg/L	--	--	--	--	--	--	--	--	0 U	--
NA	Alkalinity, Total (as $CaCO_3$)	mg/L	--	--	--	--	--	--	--	1 U	1 U	1 U
7727-37-9	Nitrogen	mg/L	--	--	--	--	--	--	--	3.3	3.5	4.2

Notes:
1. Where qualifier is U for a non-detect result, the reporting detection limit for the analyte per the laboratory analysis is reported.

µg/L = microgram per liter
mg/L = milligram per liter
CAS = Chemical Abstracts Service
VOC = volatile organic compound
TCL = Target Compound List
TAL = Target Analyte List
NA = not applicable
$CaCO_3$ = calcium carbonate

J = result is estimated
L = result is biased low
U = result is non-detect
K = result may be exagerate

Table 3-6
Summary of Waste Disposal
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Waste Stream	Quantity Disposed	Disposal Facility Name & Address	Off-site Transportation
Phase 1			
Soil Drill Cuttings	196 Tons	Modern Landfill 4400 Mt. Pisgah Road York, PA 17402	Freehold Cartage Inc.
Drilling Mud Sludge	15,200 gallons	Environmental Recovery Corporation 1062 Old Manheim Pike Lancaster, PA 17601	
Phase 2			
Recycled Material (Metal)	3 Tons	Lonnie-Jo 70 Kinkle St. Westbury, NY 11590	Winters Brothers
Recycled Materials (Cardboard)	1 Ton	Winters Bros. 107 Mahan St. West babylon, NY 11704	
Recyled Material (Asphalt)	93.46	Testani Recycling 117 117 Magnolia Avenue Westbury, NY 11590	
Recycled Material (Wood)	5 Tons		
Construction Debris (Dirt & Rock)	9.2 Tons		
Recycled Material (Plastic)	1.66 Ton		
Non-Recycled Material (Misc. Debris)	12.5 Tons	North Hempstead Transfer 999 West Shore Rd. Port Washington, NY 11050	
Phase 3			
Soil Drill Cuttings	172 Tons	110 Sand Co. 136 Spagnoli Rd Melville, NY 11747	Freehold Cartage Inc.
Drilling Mud Sludge	6,866 gallons	Environmental Recovery Corporation 1062 Old Manheim Pike Lancaster, PA 17601	
Phase 4			
Non-Hazardous Material (Drilling Mud)	5.4 Tons	Environmental Recovery Corporation 1062 Old Manheim Pike Lancaster, PA 17601	McVac Environmental Sevices
Recycled Material (Asphalt)	46 Tons	Liotta Bros. Recycling Corp. Corner of Daily Blvd & Hampton Road Oceanside, NY 11572	Liotta & Sons, Inc. Roll-off Division
Construction Debris	20 cubic yards	Westbury Recycling Facility 117 Magnolia Ave. Westbury, NY 11590	Eastern Waste Services

Table 3-7
TB-1 Soil Sample and Depth Summary
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sampling Depth (feet bgs)	Analysis
275	TOC
295	TOC
315	TOC
350	TOC
355	Grain Size
360	Grain Size
365	Grain Size
370	TOC
375	Grain Size
380	Grain Size
385	Grain Size
390	TOC
397	Grain Size
400	Grain Size
410	TOC
420	Grain Size
430	Grain Size and TOC
440	Grain Size
450	TOC
470	TOC
480	Grain Size
490	Grain Size and TOC
500	Grain Size
510	TOC
520	Grain Size
530	TOC
545	Grain Size
550	TOC
570	Grain Size

Notes:
bgs = below ground surface
TOC = total organic carbon

Table 3-8
TB-1 Soil TOC Results
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample ID	Sample Date	TOC Concentration (mg/kg)
TB-1-275	11/27/2012	1,600
TB-1-295	11/27/2012	7,100
TB-1-315	11/28/2012	6,400
TB-1-350	11/28/2012	25,000
TB-1-370	11/28/2012	1,300
TB-1-390	11/29/2012	5,900
TB-1-410	11/29/2012	2,600
TB-1-430	11/29/2012	3,200
TB-1-450	11/29/2012	12,000
TB-1-470	12/3/2012	U
TB-1-490	12/3/2012	U
TB-1-510	12/3/2012	24,000
TB-1-530	12/4/2012	U
TB-1-550	12/4/2012	U
TB-901-295*	11/27/2012	17,000

Notes:
*Duplicate of TB-1-295
TOC was analyzed using ASTM D5916-96 methods.
The reporting limit for all samples was 1,000 mg/kg.
ASTM = American Society for Testing and Materials
ID = identification
mg/kg = milligram per kilogram
TOC = total organic carbon
U = not detected at or above the reporting limit

Table 3-9
Clean Green Initiative Implementation Tracking Log
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Technology/Practice Description	Total Usage to Date	Source/Disposal Facility	Transporter	Percent of Technology/Practice meeting Green Practice
Ultra Low Sulfur Diesel Fuel (Clear/Dyed)	2,380 gallons	Various	NA	100
Renewable Energy (Electric)	1,085,270 kwh	LIPA/PSEG	NA	100
Recycled concrete aggregate	200 tons	Liotta and Sons	Liotta and Sons	100
Recycled steel in pre-engineered metal building	10 tons	American Buildings	NA	100
"Green" Concrete (Fly Ash containing Mix)	52 cubic yards	Nicolia	Nicolia	100
Recycled asphalt (Phase 2)	93.64 tons	Testani Recycling 117 Magnolia Avenue Westbury, NY 11590	Winter Brothers	100
Recycled asphalt (Phase 4)	46 tons	Liotta Bros. Recycling Corp. Corner of Daily Blvd & Hampton Road Oceanside, NY 11572	Liotta & Sons	100
Recycled waste wood	6.45 tons	Testani Recycling 117 Magnolia Avenue Westbury, NY 11590	Winter Brothers	100
Recycled waste metal	2.81 tons	Lonnie-Jo 70 Kinkle Street Westbury, NY 11590	Winter Brothers	100
Recycled waste plastic	1.66 tons	Testani Recycling 117 Magnolia Avenue Westbury, NY 11590	Winter Brothers	100
Recycled waste cardboard	1.36 tons	Winter Bros. 107 Mahan Street West Babylon, NY 11704	Winter Brothers	100

kwh - kilowatt hour
LIPA - Long Island Power Authority
PSEG - Public Service Enterpirse Group

Table 6-1
Summary of Baseline RA Groundwater Sampling
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well ID	2011			2014		
	Sample ID	Analysis	Collection/ Shipment Date	Sample ID	Analysis	Collection/ Shipment Date
SVP-1	SVP-1-1/RAB	Trace VOC	9/15/2011	SVP-1-1-111014	Trace VOC	11/10/2014
	SVP-1-2/RAB	Trace VOC	9/15/2011	SVP-1-2-111014	Trace VOC	11/10/2014
	SVP-1-3/RAB	Trace VOC	9/15/2011	SVP-1-3-111014	Trace VOC	11/10/2014
	SVP-1-4/RAB	Trace VOC	9/15/2011	SVP-1-4-111014	Trace VOC	11/10/2014
	SVP-1-5/RAB	Trace VOC	9/15/2011	SVP-1-5-111014	Trace VOC	11/10/2014
	SVP-1-6/RAB	Trace VOC	9/15/2011	SVP-1-6-111014	Trace VOC	11/10/2014
	SVP-1-7/RAB	Trace VOC	9/15/2011	SVP-1-7-111014	Trace VOC	11/10/2014
	SVP-1-8/RAB	Trace VOC	9/15/2011	SVP-1-8-111014	Trace VOC	11/10/2014
	SVP-1-9/RAB	Trace VOC	9/15/2011	SVP-1-9-111014	Trace VOC	11/10/2014
	SVP-1-10/RAB	Trace VOC	9/15/2011	SVP-1-10-111014	Trace VOC	11/10/2014
				SVP-101-8-111014	Trace VOC	11/10/2014
SVP-2	SVP-2-1/RAB	Trace VOC	9/13/2011	SVP-2-1-111114	Trace VOC	11/11/2014
	SVP-2-2/RAB	Trace VOC	9/13/2011	SVP-2-2-111114	Trace VOC	11/11/2014
	SVP-2-3/RAB	Trace VOC	9/13/2011	SVP-2-3-111114	Trace VOC	11/11/2014
	SVP-2-4/RAB	Trace VOC	9/13/2011	SVP-2-4-111114	Trace VOC	11/11/2014
	SVP-2-5/RAB	Trace VOC	9/13/2011	SVP-2-5-111114	Trace VOC	11/11/2014
	SVP-2-6/RAB	Trace VOC	9/13/2011	SVP-2-6-111114	Trace VOC	11/11/2014
	SVP-2-7/RAB	Trace VOC	9/13/2011	SVP-2-7-111114	Trace VOC	11/11/2014
	SVP-2-8/RAB	Trace VOC	9/13/2011	SVP-2-8-111114	Trace VOC	11/11/2014
	SVP-2-9/RAB	Trace VOC	9/13/2011	SVP-2-9-111114	Trace VOC	11/11/2014
	SVP-2-10/RAB	Trace VOC	9/13/2011	SVP-2-10-111114	Trace VOC	11/11/2014
				SVP-102-8-111114	Trace VOC	11/11/2014
SVP-3	SVP-3-1/RAB	Trace VOC	9/14/2011	SVP-3-1-111114	Trace VOC	11/11/2014
	SVP-3-2/RAB	Trace VOC	9/14/2011	SVP-3-2-111114	Trace VOC	11/11/2014
	SVP-3-3/RAB	Trace VOC	9/14/2011	SVP-3-3-111114	Trace VOC	11/11/2014
	SVP-3-4/RAB	Trace VOC	9/14/2011	SVP-3-4-111114	Trace VOC	11/11/2014
	SVP-3-5/RAB	Trace VOC	9/14/2011	SVP-3-5-111114	Trace VOC	11/11/2014
	SVP-3-6/RAB	Trace VOC	9/14/2011	SVP-3-6-111114	Trace VOC	11/11/2014
	SVP-3-7/RAB	Trace VOC	9/14/2011	SVP-3-7-111114	Trace VOC	11/11/2014
SVP-4	SVP-4-1/RAB	Trace VOC	9/13/2011	SVP-4-1-111714	Trace VOC	11/17/2014
	SVP-4-2/RAB	Trace VOC	9/13/2011	SVP-4-2-111714	Trace VOC	11/17/2014
	SVP-4-3/RAB	Trace VOC	9/13/2011	SVP-4-3-111714	Trace VOC	11/17/2014
	SVP-4-4/RAB	Trace VOC	9/13/2011	SVP-4-4-111714	Trace VOC	11/17/2014
	SVP-4-5/RAB	Trace VOC	9/13/2011	SVP-4-5-111714	Trace VOC	11/17/2014
	SVP-4-6/RAB	Trace VOC	9/13/2011	SVP-4-6-111714	Trace VOC	11/17/2014
	SVP-4-7/RAB	Trace VOC	9/13/2011	SVP-4-7-111714	Trace VOC	11/17/2014
	SVP-4-8/RAB	Trace VOC	9/13/2011	SVP-4-8-111714	Trace VOC	11/17/2014
	SVP-4-9/RAB	Trace VOC	9/13/2011	SVP-4-9-111714	Trace VOC	11/17/2014
	SVP-4-10/RAB	Trace VOC	9/13/2011	SVP-4-10-111714	Trace VOC	11/17/2014
				SVP-104-6-111714	Trace VOC	11/17/2014
SVP-5	SVP-5-1/RAB	Trace VOC	9/14/2011	SVP-5-1-111014	Trace VOC	11/10/2014
	SVP-5-2/RAB	Trace VOC	9/14/2011	SVP-5-2-111014	Trace VOC	11/10/2014
	SVP-5-3/RAB	Trace VOC	9/14/2011	SVP-5-3-111014	Trace VOC	11/10/2014
	SVP-5-4/RAB	Trace VOC	9/14/2011	SVP-5-4-111014	Trace VOC	11/10/2014
	SVP-5-5/RAB	Trace VOC	9/14/2011	SVP-5-5-111014	Trace VOC	11/10/2014
	SVP-5-6/RAB	Trace VOC	9/14/2011	SVP-5-6-111014	Trace VOC	11/10/2014
	SVP-5-7/RAB	Trace VOC	9/14/2011	SVP-5-7-111014	Trace VOC	11/10/2014
	SVP-5-8/RAB	Trace VOC	9/14/2011	SVP-5-8-111014	Trace VOC	11/10/2014
	SVP-5-9/RAB	Trace VOC	9/14/2011	SVP-5-9-111014	Trace VOC	11/10/2014
	SVP-5-10/RAB	Trace VOC	9/14/2011	SVP-5-10-111014	Trace VOC	11/10/2014
	SVP-105-1/RAB	Trace VOC	9/14/2011			
SVP-6	SVP-6-1/RAB	Trace VOC	9/14/2011	SVP-6-1-111214	Trace VOC	11/12/2014
	SVP-6-2/RAB	Trace VOC	9/14/2011	SVP-6-2-111214	Trace VOC	11/12/2014
	SVP-6-3/RAB	Trace VOC	9/14/2011	SVP-6-3-111214	Trace VOC	11/12/2014
	SVP-6-4/RAB	Trace VOC	9/14/2011	SVP-6-4-111214	Trace VOC	11/12/2014
	SVP-6-5/RAB	Trace VOC	9/14/2011	SVP-6-5-111214	Trace VOC	11/12/2014
	SVP-6-6/RAB	Trace VOC	9/14/2011	SVP-6-6-111214	Trace VOC	11/12/2014

Table 6-1
Summary of Baseline RA Groundwater Sampling
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well ID	2011			2014		
	Sample ID	Analysis	Collection/ Shipment Date	Sample ID	Analysis	Collection/ Shipment Date
SVP-7	SVP-7-1/RAB	Trace VOC	9/14/2011	SVP-7-1-111314	Trace VOC	11/13/2014
	SVP-7-2/RAB	Trace VOC	9/14/2011	SVP-7-2-111314	Trace VOC	11/13/2014
	SVP-7-3/RAB	Trace VOC	9/14/2011	SVP-7-3-111314	Trace VOC	11/13/2014
	SVP-7-4/RAB	Trace VOC	9/14/2011	SVP-7-4-111314	Trace VOC	11/13/2014
	SVP-7-5/RAB	Trace VOC	9/14/2011	SVP-7-5-111314	Trace VOC	11/13/2014
	SVP-7-6/RAB	Trace VOC	9/14/2011	SVP-7-6-111314	Trace VOC	11/13/2014
SVP-8	SVP-8-1/RAB	Trace VOC	9/15/2011	SVP-8-1-111214	Trace VOC	11/12/2014
	SVP-8-2/RAB	Trace VOC	9/15/2011	SVP-8-2-111214	Trace VOC	11/12/2014
	SVP-8-3/RAB	Trace VOC	9/15/2011	SVP-8-3-111214	Trace VOC	11/12/2014
	SVP-8-4/RAB	Trace VOC	9/15/2011	SVP-8-4-111214	Trace VOC	11/12/2014
	SVP-8-5/RAB	Trace VOC	9/15/2011	SVP-8-5-111214	Trace VOC	11/12/2014
	SVP-8-6/RAB	Trace VOC	9/15/2011	SVP-8-6-111214	Trace VOC	11/12/2014
SVP-9	SVP-9-1/RAB	Trace VOC	9/13/2011	SVP-9-1-111314	Trace VOC	11/13/2014
	SVP-9-2/RAB	Trace VOC	9/13/2011	SVP-9-2-111314	Trace VOC	11/13/2014
	SVP-9-3/RAB	Trace VOC	9/13/2011	SVP-9-3-111314	Trace VOC	11/13/2014
	SVP-9-4/RAB	Trace VOC	9/13/2011	SVP-9-4-111314	Trace VOC	11/13/2014
	SVP-9-5/RAB	Trace VOC	9/13/2011	SVP-9-5-111314	Trace VOC	11/13/2014
	SVP-9-6/RAB	TraceVOC	9/13/2011	SVP-9-6-111314	Trace VOC	11/13/2014
	SVP-9-7/RAB	Trace VOC	9/13/2011	SVP-9-7-111314	Trace VOC	11/13/2014
	SVP-9-8/RAB	Trace VOC	9/13/2011	SVP-9-8-111314	Trace VOC	11/13/2014
	SVP-9-9/RAB	Trace VOC	9/13/2011	SVP-9-9-111314	Trace VOC	11/13/2014
	SVP-9-10/RAB	Trace VOC	9/13/2011	SVP-9-10-111314	Trace VOC	11/13/2014
	SVP-109-7/RAB	Trace VOC	9/13/2011	SVP-109-5-111314	Trace VOC	11/13/2014
SVP-10	SVP-10-1/RAB	Trace VOC	9/13/2011	SVP-10-1-111714	Trace VOC	11/17/2014
	SVP-10-2/RAB	Trace VOC	9/13/2011	SVP-10-2-111714	Trace VOC	11/17/2014
	SVP-10-3/RAB	Trace VOC	9/13/2011	SVP-10-3-111714	Trace VOC	11/17/2014
	SVP-10-4/RAB	Trace VOC	9/13/2011	SVP-10-4-111714	Trace VOC	11/17/2014
	SVP-10-5/RAB	Trace VOC	9/13/2011	SVP-10-5-111714	Trace VOC	11/17/2014
	SVP-10-6/RAB	Trace VOC	9/13/2011	SVP-10-6-111714	Trace VOC	11/17/2014
	SVP-10-7/RAB	Trace VOC	9/13/2011	SVP-10-7-111714	Trace VOC	11/17/2014
	SVP-10-8/RAB	Trace VOC	9/13/2011	SVP-10-8-111714	Trace VOC	11/17/2014
	SVP-10-9/RAB	Trace VOC	9/13/2011	SVP-10-9-111714	Trace VOC	11/17/2014
	SVP-10-10/RAB	Trace VOC	9/13/2011	SVP-10-10-111714	Trace VOC	11/17/2014
	SVP-110-6/RAB	Trace VOC	9/13/2011			
SVP-11	SVP-11-1/RAB	Trace VOC	9/15/2011	SVP-11-1-111114	Trace VOC	11/11/2014
	SVP-11-2/RAB	Trace VOC Filtered TAL Metals Unfiltered TAL Metals	9/15/2011	SVP-11-2-111114	Trace VOC	11/11/2014
	SVP-11-3/RAB	Trace VOC	9/15/2011	SVP-11-3-111114	Trace VOC	11/11/2014
	SVP-11-4/RAB	Trace VOC Filtered TAL Metals Unfiltered TAL metals	9/15/2011	SVP-11-4-111114	Trace VOC	11/11/2014
	SVP-11-5/RAB	Trace VOC	9/15/2011	SVP-11-5-111114	Trace VOC	11/11/2014
	SVP-11-6/RAB	Trace VOC	9/15/2011	SVP-11-6-111114	Trace VOC	11/11/2014
	SVP-11-7/RAB	Trace VOC Filtered TAL Metals Unfiltered TAL metals	9/15/2011	SVP-11-7-111114	Trace VOC	11/11/2014
	SVP-11-8/RAB	Trace VOC	9/15/2011	SVP-11-8-111114	Trace VOC	11/11/2014
	SVP-11-9/RAB	Trace VOC	9/15/2011	SVP-11-9-111114	Trace VOC	11/11/2014
	SVP-11-10/RAB	Trace VOC Filtered TAL Metals Unfiltered TAL Metals	9/15/2011	SVP-11-10-111114	Trace VOC	11/11/2014
	SVP-111-9/RAB	Trace VOC	9/15/2011	SVP-111-2-111114	Trace VOC	11/11/2014

Table 6-1
Summary of Baseline RA Groundwater Sampling
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well ID	2011			2014		
	Sample ID	Analysis	Collection/ Shipment Date	Sample ID	Analysis	Collection/ Shipment Date
SVP-12	SVP-12-1/RAB	Trace VOC	9/15/2011	SVP-12-1-111314	Trace VOC	11/13/2014
	SVP-12-2/RAB	Trace VOC	9/15/2011	SVP-12-2-111314	Trace VOC	11/13/2014
	SVP-12-3/RAB	Trace VOC	9/15/2011	SVP-12-3-111314	Trace VOC	11/13/2014
	SVP-12-4/RAB	Trace VOC	9/15/2011	SVP-12-4-111314	Trace VOC	11/13/2014
	SVP-12-5/RAB	Trace VOC	9/15/2011	SVP-12-5-111314	Trace VOC	11/13/2014
	SVP-12-6/RAB	Trace VOC	9/15/2011	SVP-12-6-111314	Trace VOC	11/13/2014
SVP-13	SVP-13-1/RAB	Trace VOC	9/15/2011	SVP-13-1-111314	Trace VOC	11/13/2014
	SVP-13-2/RAB	Trace VOC	9/15/2011	SVP-13-2-111314	Trace VOC	11/13/2014
	SVP-13-3/RAB	Trace VOC	9/15/2011	SVP-13-3-111314	Trace VOC	11/13/2014
	SVP-13-4/RAB	Trace VOC	9/15/2011	SVP-13-4-111314	Trace VOC	11/13/2014
	SVP-13-5/RAB	Trace VOC	9/15/2011	SVP-13-5-111314	Trace VOC	11/13/2014
	SVP-13-6/RAB	Trace VOC	9/15/2011	SVP-13-6-111314	Trace VOC	11/13/2014
	SVP-113-5/RAB	Trace VOC	9/15/2011			
SVP-14	SVP-14-1/RAB	Trace VOC TAL total metals	9/19/2011	SVP-14-1-111214	Trace VOC	11/12/2014
	SVP-14-2/RAB	Trace VOC Total TAL Metals Filtered TAL Metals Ammonia Hardness TDS TKN	9/19/2011	SVP-14-2-111214	Trace VOC	11/12/2014
	SVP-14-3/RAB	Trace VOC Total TAL Metals	9/19/2011	SVP-14-3-111214	Trace VOC	11/12/2014
	SVP-14-4/RAB	Trace VOC Total TAL Metals Filtered TAL Metals Ammonia Hardness TDS TKN	9/19/2011	SVP-14-4-111214	Trace VOC	11/12/2014
	SVP-14-5/RAB	Trace VOC Total TAL Metals	9/19/2011	SVP-14-5-111214	Trace VOC	11/12/2014
	SVP-14-6/RAB	Trace VOC Total TAL Metals	9/19/2011	SVP-14-6-111214	Trace VOC	11/12/2014
	SVP-14-7/RAB	Trace VOC Total TAL Metals Filtered TAL Metals Ammonia Hardness TDS TKN	9/19/2011	SVP-14-7-111214	Trace VOC	11/12/2014
	SVP-14-8/RAB	Trace VOC Total TAL Metals	9/19/2011	SVP-14-8-111214	Trace VOC	11/12/2014
	SVP-14-9/RAB	Trace VOC Total TAL Metals	9/19/2011	SVP-14-9-111214	Trace VOC	11/12/2014
	SVP-14-10/RAB	Trace VOC Total TAL Metals Filtered TAL Metals Ammonia Hardness TDS TKN	9/19/2011	SVP-14-10-111214	Trace VOC	11/12/2014
	SVP-114-10/RAB	Trace VOC Total TAL Metals Ammonia Hardness TDS TKN	9/19/2011			

Table 6-1
Summary of Baseline RA Groundwater Sampling
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well ID	2011			2014		
	Sample ID	Analysis	Collection/ Shipment Date	Sample ID	Analysis	Collection/ Shipment Date
GWP-10	GWP-10/RAB	Trace VOC	9/15/2011	GWP-10-111714	Trace VOC	11/17/2014
				GWP-110-111714	Trace VOC	11/17/2014
GWP-11	GWP-11/RAB	Trace VOC	9/15/2011	GWP-11-111714	Trace VOC	11/17/2014
N-10019	GWX-10019/RAB	Trace VOC	9/12/2011	GWX-10019-112014	Trace VOC	11/20/2014
N-10020	GWX-10020/RAB	Trace VOC	9/12/2011	GWX-10020-111014	Trace VOC	11/10/2014
N-8068	8068/RAB	Trace VOC	9/19/2011	NS		
MW-01S	MW-01S/RAB	Trace VOC	9/20/2011	MW-1S-111214	Trace VOC	11/12/2014
MW-01I	MW-01I/RAB	Trace VOC	9/20/2011	MW-1I-111314	Trace VOC	11/13/2014
MW-02S	MW-02S/RAB	Trace VOC	9/16/2011	MW-2S-111114	Trace VOC	11/11/2014
MW-02I	MW-02I/RAB	Trace VOC	9/16/2011	MW-2I-111114	Trace VOC	11/11/2014
MW-03S	MW-03S/RAB	Trace VOC	9/20/2011	MW-3S-111414	Trace VOC	11/14/2014
MW-03I	MW-03I/RAB	Trace VOC	9/20/2011	MW-3I-111414	Trace VOC	11/14/2014
				MW-103I-111414	Trace VOC	11/14/2014
MW-3D	NS			MW-3D-111714	Total TAL Metals	11/17/2014
					Sulfate	
					Nitrate/Nitrite	
					Methane, Ethane, Ethene	
					Alkalinity	
					Total Organic Carbon	
					Trace VOC	
MW-08D	MW-08D/RAB	Trace VOC	9/20/2011	MW-8D-111114	Trace VOC	11/11/2014
	MW-108D/RAB	Trace VOC	9/20/2011			
MW-12S	MW-12S/RAB	Trace VOC Filtered TAL Metals Unfiltered TAL metals	9/20/2011	MW-12S-111014	Trace VOC	11/10/2014

Notes:

SVP-105-1/RAB is a duplicate of SVP-5-1/RAB
SVP-109-7/RAB is a duplicate of SVP-9-7/RAB
SVP-111-9/RAB is a duplicate of SVP-11-9/RAB
SVP-113-5/RAB is a duplicate of SVP-13-5/RAB
MW-108D/RAB is a duplicate for MW-08D/RAB
SVP-101-8-111014 is a duplicate of SVP-1-8-111014
SVP-102-8-111114 is a dpulicate of SVP-2-8-111114
SVP-104-6-111714 is a duplicate of SVP-4-6-111714
SVP-109-5-111314 is a duplicate of SVP-9-5-111314
SVP-111-2-111114 is a duplicate of SVP-11-2-111114
GWP-110-111714 is a duplicate of GWP-10-111714
MW-103I-111414 is a duplicate of MW-3I-111414

NS = not sampled
VOC = volatile organic compounds
TDS = total dissolved solids
TKN = total Kjeldahl nitrogen
TAL = Target Analyte List

Table 6-2
Baseline Groundwater VOC Results - 2011
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	SVP-1-1/RAB	SVP-1-2/RAB	SVP-1-3/RAB	SVP-1-4/RAB	SVP-1-5/RAB	SVP-1-6/RAB	SVP-1-7/RAB	SVP-1-8/RAB	SVP-1-9/RAB	SVP-1-10/RAB	SVP-2-1/RAB	SVP-2-2/RAB	SVP-2-3/RAB	SVP-2-4/RAB
		Location ID	SVP/GWM-1-1	SVP/GWM-1-2	SVP/GWM-1-3	SVP/GWM-1-4	SVP/GWM-1-5	SVP/GWM-1-6	SVP/GWM-1-7	SVP/GWM-1-8	SVP/GWM-1-9	SVP/GWM-1-10	SVP/GWM-2-1	SVP/GWM-2-2	SVP/GWM-2-3	SVP/GWM-2-4
		Sample Date	9/15/11 10:30	9/15/11 10:45	9/15/11 10:55	9/15/11 11:10	9/15/11 11:25	9/15/11 11:40	9/15/11 11:55	9/15/11 12:05	9/15/11 12:15	9/15/11 12:30	9/13/11 13:50	9/13/11 14:05	9/13/11 14:21	9/13/11 14:40
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	1.2	3.3	5.8	9
Tetrachloroethene	5	µg/L	0.5 U	0.47 J	0.77	0.6	0.52	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	1.3	2.8	4.8	4.4
Trichloroethene	5	µg/L	1.1	0.81	0.99	0.43 J	0.41 J	0.14 J	0.5 UJ	0.5 UJ	0.5 U	0.5 U	13	20	29	32

		Sample ID	SVP-2-5/RAB	SVP-2-6/RAB	SVP-2-7/RAB	SVP-2-8/RAB	SVP-2-9/RAB	SVP-2-10/RAB	SVP-3-1/RAB	SVP-3-2/RAB	SVP-3-3/RAB	SVP-3-4/RAB	SVP-3-5/RAB	SVP-3-6/RAB	SVP-3-7/RAB	SVP-4-1/RAB
		Location ID	SVP/GWM-2-5	SVP/GWM-2-6	SVP/GWM-2-7	SVP/GWM-2-8	SVP/GWM-2-9	SVP/GWM-2-10	SVP/GWM-3-1	SVP/GWM-3-2	SVP/GWM-3-3	SVP/GWM-3-4	SVP/GWM-3-5	SVP/GWM-3-6	SVP/GWM-3-7	SVP/GWM-4-1
		Sample Date	9/13/11 14:54	9/13/11 15:08	9/13/11 15:26	9/13/11 15:40	9/13/11 15:55	9/13/11 16:08	9/14/11 8:28	9/14/11 8:50	9/14/11 9:09	9/14/11 9:25	9/14/11 9:39	9/14/11 9:53	9/14/11 10:06	9/13/11 10:31
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.2	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.33 J
cis-1,2-Dichloroethene	5	µg/L	8.3	7.9	0.9	0.71	0.65	0.5 U	0.55	0.55	0.23 J	0.5 U	0.5 U	0.5 U	0.5 U	0.7
Tetrachloroethene	5	µg/L	4.2	4	2.8	3.1	0.36 J	0.5 U	0.5 U	0.5 U	0.5 U	0.36 J	0.45 J	0.45 J	0.5 U	20
Trichloroethene	5	µg/L	45	30	17	20	21	0.36 J	13	23	16	0.84	0.76	0.13 J	0.14 J	12

		Sample ID	SVP-4-2/RAB	SVP-4-3/RAB	SVP-4-4/RAB	SVP-4-5/RAB	SVP-4-6/RAB	SVP-4-7/RAB	SVP-4-8/RAB	SVP-4-9/RAB	SVP-4-10/RAB	SVP-105-1/RAB	SVP-5-1/RAB	SVP-5-2/RAB	SVP-5-3/RAB	SVP-5-4/RAB
		Location ID	SVP/GWM-4-2	SVP/GWM-4-3	SVP/GWM-4-4	SVP/GWM-4-5	SVP/GWM-4-6	SVP/GWM-4-7	SVP/GWM-4-8	SVP/GWM-4-9	SVP/GWM-4-10	SVP/GWM-5-1	SVP/GWM-5-1	SVP/GWM-5-2	SVP/GWM-5-3	SVP/GWM-5-4
		Sample Date	9/13/11 10:55	9/13/11 11:10	9/13/11 11:30	9/13/11 11:45	9/13/11 12:00	9/13/11 12:10	9/13/11 12:25	9/13/11 12:35	9/13/11 12:50	9/14/11 8:20	9/14/11 8:20	9/14/11 8:40	9/14/11 8:50	9/14/11 9:05
		Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.38 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 J	0.25 J	1	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.63	2.9	3.4	4.4	4.3	1.5	0.76	0.25 J	0.5 UJ	0.5 U	0.4 J	1.9	0.39 J	0.55
Tetrachloroethene	5	µg/L	16	100	84	120	120	13	10	1.1	0.23 J	0.22 J	0.21 J	0.99	0.59	0.48 J
Trichloroethene	5	µg/L	8.9	41	41	47	55	49	18	1.6	0.36 J	6.2	6.1	41	4.5	8

Notes:

J - result is estimated	N - normal field sample
K - result biased high	FD - field duplicate
L - result biased low	ROD - Record of Decision
NJ - result is tentatively identified	µg/L - microgram per liter
U - result is non-detect	
Q - qualifier	

Result above ROD Cleanup Criteria

Table 6-2
Baseline Groundwater VOC Results - 2011
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	SVP-5-5/RAB	SVP-5-6/RAB	SVP-5-7/RAB	SVP-5-8/RAB	SVP-5-9/RAB	SVP-5-10/RAB	SVP-6-1/RAB	SVP-6-2/RAB	SVP-6-3/RAB	SVP-6-4/RAB	SVP-6-5/RAB	SVP-6-6/RAB	SVP-7-1/RAB	SVP-7-2/RAB
		Location ID	SVP/GWM-5-5	SVP/GWM-5-6	SVP/GWM-5-7	SVP/GWM-5-8	SVP/GWM-5-9	SVP/GWM-5-10	SVP/GWM-6-1	SVP/GWM-6-2	SVP/GWM-6-3	SVP/GWM-6-4	SVP/GWM-6-5	SVP/GWM-6-6	SVP/GWM-7-1	SVP/GWM-7-2
		Sample Date	9/14/11 9:20	9/14/11 9:30	9/14/11 9:45	9/14/11 10:00	9/14/11 10:10	9/14/11 10:25	9/14/11 11:30	9/14/11 11:45	9/14/11 12:00	9/14/11 12:10	9/14/11 12:30	9/14/11 12:40	9/14/11 11:48	9/14/11 12:03
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.38 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.69	0.5 U	2	15 J	17 J
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.24 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.65	0.76	0.5 U	0.5 U	0.5 U	0.5 U	2.4	0.5 U	4.9	2.6	2.2	0.16 J	0.34 J	1.5 J
Tetrachloroethene	5	µg/L	0.46 J	0.41 J	0.22 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	31	45
Trichloroethene	5	µg/L	8.5	5.7	0.62	0.64	0.14 J	0.5 U	0.67	0.5 U	2.3	0.35 J	0.64	0.4 J	38	43

		Sample ID	SVP-7-3/RAB	SVP-7-4/RAB	SVP-7-5/RAB	SVP-7-6/RAB	SVP-8-1/RAB	SVP-8-2/RAB	SVP-8-3/RAB	SVP-8-4/RAB	SVP-8-5/RAB	SVP-8-6/RAB	SVP-9-1/RAB	SVP-9-2/RAB	SVP-9-3/RAB	SVP-9-4/RAB
		Location ID	SVP/GWM-7-3	SVP/GWM-7-4	SVP/GWM-7-5	SVP/GWM-7-6	SVP/GWM-8-1	SVP/GWM-8-2	SVP/GWM-8-3	SVP/GWM-8-4	SVP/GWM-8-5	SVP/GWM-8-6	SVP/GWM-9-1	SVP/GWM-9-2	SVP/GWM-9-3	SVP/GWM-9-4
		Sample Date	9/14/11 12:19	9/14/11 12:33	9/14/11 12:46	9/14/11 12:59	9/15/11 13:00	9/15/11 13:20	9/15/11 13:40	9/15/11 14:00	9/15/11 14:10	9/15/11 14:20	9/13/11 9:10	9/13/11 9:51	9/13/11 10:12	9/13/11 10:30
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.7	2.3	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.78	0.5 U	0.5 U	0.5 U	0.22 J	0.61	0.26 J	0.22 J	0.16 J	0.5 U	0.5 U	0.22 J	0.21 J	0.5 U
Tetrachloroethene	5	µg/L	3.9	0.44 J	0.5 U	0.5 U	6.6	20	26	21	29	2	0.5 U	0.31 J	1.3	10
Trichloroethene	5	µg/L	10	0.42 J	0.24 J	0.5 U	1.6	4.8	1.5	1.5	0.99	0.24 J	2	2.7	4.8	1.5

		Sample ID	SVP-9-5/RAB	SVP-9-6/RAB	SVP-109-7/RAB	SVP-9-7/RAB	SVP-9-8/RAB	SVP-9-9/RAB	SVP-9-10/RAB	SVP-10-1/RAB	SVP-10-2/RAB	SVP-10-3/RAB	SVP-10-4/RAB	SVP-10-5/RAB	SVP-10-6/RAB	SVP-110-6/RAB
		Location ID	SVP/GWM-9-5	SVP/GWM-9-6	SVP/GWM-9-7	SVP/GWM-9-7	SVP/GWM-9-8	SVP/GWM-9-9	SVP/GWM-9-10	SVP/GWM-10-1	SVP/GWM-10-2	SVP/GWM-10-3	SVP/GWM-10-4	SVP/GWM-10-5	SVP/GWM-10-6	SVP/GWM-10-6
		Sample Date	9/13/11 10:44	9/13/11 11:04	9/13/11 11:22	9/13/11 11:22	9/13/11 11:38	9/13/11 11:53	9/13/11 12:07	9/13/11 14:20	9/13/11 14:35	9/13/11 14:50	9/13/11 15:05	9/13/11 15:15	9/13/11 15:35	9/13/11 15:35
		Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	FD
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.37 J	1	0.5 U	0.59	1.2	0.5 U	0.5 U	0.5 U	0.5 U	6.1 J	12 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.74	0.5 U	12 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.65	25	1.9	1.8	6.1	0.98	0.5 U	12	73	7.6 J	3.7 J	1.6	0.95	1
Tetrachloroethene	5	µg/L	19	6.5	6.2	5.9	4.7	2.9	0.5 U	0.55	26	230	12 UJ	4.1	0.5 U	0.5 U
Trichloroethene	5	µg/L	3	210	41	63	330	7.3	4.6	25	630	50	77 D	60	4.1	4.7

Notes:

J - result is estimated	N - normal field sample
K - result biased high	FD - field duplicate
L - result biased low	ROD - Record of Decision
NJ - result is tentatively identified	µg/L - microgram per liter
U - result is non-detect	
Q - qualifier	

Result above ROD Cleanup Criteria

Table 6-2
Baseline Groundwater VOC Results - 2011
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	SVP-10-7/RAB	SVP-10-8/RAB	SVP-10-9/RAB	SVP-10-10/RAB	SVP-11-1/RAB	SVP-11-2/RAB	SVP-11-3/RAB	SVP-11-4/RAB	SVP-11-5/RAB	SVP-11-6/RAB	SVP-11-7/RAB	SVP-11-8/RAB	SVP-111-9/RAB	SVP-11-9/RAB
		Location ID	SVP/GWM-10-7	SVP/GWM-10-8	SVP/GWM-10-9	SVP/GWM-10-10	SVP/GWM-11-1	SVP/GWM-11-2	SVP/GWM-11-3	SVP/GWM-11-4	SVP/GWM-11-5	SVP/GWM-11-6	SVP/GWM-11-7	SVP/GWM-11-8	SVP/GWM-11-9	SVP/GWM-11-9
		Sample Date	9/13/11 15:50	9/13/11 16:00	9/13/11 16:10	9/13/11 16:25	9/14/11 15:25	9/14/11 15:40	9/14/11 16:15	9/14/11 16:35	9/14/11 17:10	9/14/11 17:20	9/14/11 17:35	9/14/11 18:00	9/14/11 18:10	9/14/11 18:10
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	FD	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4.3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.16 J	0.5 U	0.5 U	0.5 U	0.46 J	0.61	0.5 U	0.5 U	0.29 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	12	6.1	0.13 J	0.5 U	66	6.5	10	10	10	3.2	0.89	0.14 J	0.5 U	0.5 U
Tetrachloroethene	5	µg/L	2.4	1.2	0.5 U	0.5 U	1.6	42	2	3.2	11	4.9	1.1	0.39 J	0.5 U	0.5 U
Trichloroethene	5	µg/L	79	49	1.2	0.58	230	110	51	58	110	38	9.1	1.7	0.3 J	0.3 J

		Sample ID	SVP-11-10/RAB	SVP-12-1/RAB	SVP-12-2/RAB	SVP-12-3/RAB	SVP-12-4/RAB	SVP-12-5/RAB	SVP-12-6/RAB	SVP-13-1/RAB	SVP-13-2/RAB	SVP-13-3/RAB	SVP-13-4/RAB	SVP-113-5/RAB	SVP-13-5/RAB	SVP-13-6/RAB
		Location ID	SVP/GWM-11-10	SVP/GWM-12-1	SVP/GWM-12-2	SVP/GWM-12-3	SVP/GWM-12-4	SVP/GWM-12-5	SVP/GWM-12-6	SVP/GWM-13-1	SVP/GWM-13-2	SVP/GWM-13-3	SVP/GWM-13-4	SVP/GWM-13-5	SVP/GWM-13-5	SVP/GWM-13-6
		Sample Date	9/14/11 18:35	9/15/11 9:15	9/15/11 10:05	9/15/11 10:30	9/15/11 10:55	9/15/11 11:10	9/15/11 11:30	9/15/11 8:05	9/15/11 8:20	9/15/11 8:35	9/15/11 8:45	9/15/11 9:00	9/15/11 9:00	9/15/11 9:20
		Sample Type	N	N	N	N	N	N	N	N	N	N	N	FD	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.72	0.75	0.5 U	0.5 U	0.5 U	0.11 J	1.9	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.64	0.72	0.5 U	0.17 J	0.5 U	0.5 U	0.58	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.5 U	0.5 U	5.2	13	13	1.8	2.1	0.51	0.5 U	4.7	0.76	1.1	1.3	0.89
Tetrachloroethene	5	µg/L	0.5 U	0.5 U	0.8	4.8	5.1	4.7	4.8	5.6	1.2	17	9.2	3.6	3.9	4.3
Trichloroethene	5	µg/L	0.5 U	1	61	90	70	20	25	8.9	3.2	63	19	16	19	18

		Sample ID	SVP-14-1/RAB	SVP-14-2/RAB	SVP-14-3/RAB	SVP-14-4/RAB	SVP-14-5/RAB	SVP-14-6/RAB	SVP-14-7/RAB	SVP-14-8/RAB	SVP-14-9/RAB	SVP-114-10/RAB	SVP-14-10/RAB	MW-01I/RAB	MW-01S/RAB	MW-02S/RAB
		Location ID	SVP/GWM-14-1	SVP/GWM-14-2	SVP/GWM-14-3	SVP/GWM-14-4	SVP/GWM-14-5	SVP/GWM-14-6	SVP/GWM-14-7	SVP/GWM-14-8	SVP/GWM-14-9	SVP/GWM-14-10	SVP/GWM-14-10	MW-1I	MW-1S	MW-2S
		Sample Date	9/19/11 9:23	9/19/11 10:10	9/19/11 11:15	9/19/11 11:50	9/19/11 12:50	9/19/11 13:35	9/19/11 14:05	9/19/11 15:00	9/19/11 15:20	9/19/11 15:50	9/19/11 15:50	9/20/11 8:58	9/20/11 9:55	9/16/11 8:55
		Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4.7	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.23 J	0.2 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.22 J	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	9.7	2.2	0.5 U	1.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	22	5.7	0.12 J
Tetrachloroethene	5	µg/L	1.4	0.52	0.5 U	1.4	4	1.1	0.51	0.5 U	0.5 U	0.26 J	0.25 J	16	2.3	1.1
Trichloroethene	5	µg/L	60	17	0.38 J	17	1.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	310	340	5.3

		Sample ID	MW-02I/RAB	MW-03I/RAB	MW-03S/RAB	MW-108D/RAB	MW-8D/RAB	MW-12S/RAB	8068/RAB	GWP-11/RAB	GWP-10/RAB	GWX-10019/RAB	GWX-10020/RAB
		Location ID	MW-2I	MW-3I	MW-3S	MW-8D	MW-8D	MW-12S	8068	GWP-11	GWP-10	GWX-10019	GWX-10020
		Sample Date	9/16/11 9:35	9/20/11 11:30	9/20/11 12:13	9/20/11 14:20	9/20/11 14:20	9/20/11 14:21	9/19/11 10:30	9/15/11 7:35	9/15/11 7:40	9/12/11 16:45	9/12/11 17:05
		Sample Type	N	N	N	FD	N	N	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/l	0.5 U	7.5 J	0.79	0.5 U	0.5 U	0.5 U	10	2.5	3.4 J	0.5 UJ	0.5 U
Carbon Tetrachloride	5	µg/l	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.36 J	0.21 J	0.45 J	0.5 UJ	0.5 U
cis-1,2-Dichloroethene	5	µg/l	0.5 U	12	1.6	0.5 U	0.5 U	0.5 U	6 J	9.8	3.1 J	6.7 J	0.5 U
Tetrachloroethene	5	µg/l	0.5 U	180	310	0.19 J	0.5 U	0.45 J	350	130	54	5.3 J	0.3 J
Trichloroethene	5	µg/l	0.33 J	58	6.2	1.2	0.97	0.21 J	120	96	25	98	0.25 J

Notes:

J - result is estimated
K - result biased high
L - result biased low
NJ - result is tentatively identified
U - result is non-detect
Q - qualifier
N - normal field sample
FD - field duplicate
ROD - Record of Decision
µg/L - microgram per liter

Result above ROD Cleanup Criteria

CDM Smith

Table 6-3
Baseline Groundwater VOC Results - 2014
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	**SVP-1-1-111014**	**SVP-1-2-111014**	**SVP-1-3-111014**	**SVP-1-4-111014**	**SVP-1-5-111014**	**SVP-1-6-111014**	**SVP-1-7-111014**	**SVP-1-8-111014**	**SVP-101-8-111014**	**SVP-1-9-111014**	**SVP-1-10-111014**
		Location ID	**SVP/GWM-1-1**	**SVP/GWM-1-2**	**SVP/GWM-1-3**	**SVP/GWM-1-4**	**SVP/GWM-1-5**	**SVP/GWM-1-6**	**SVP/GWM-1-7**	**SVP/GWM-1-8**	**SVP/GWM-1-8**	**SVP/GWM-1-9**	**SVP/GWM-1-10**
		Sample Date	**11/10/2014 10:52**	**11/10/2014 11:14**	**11/10/2014 11:25**	**11/10/2014 11:36**	**11/10/2014 11:45**	**11/10/2014 11:55**	**11/10/2014 12:07**	**11/10/2014 12:18**	**11/10/2014 12:18**	**11/10/2014 12:30**	**11/10/2014 12:43**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**	**N**	**N**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.83 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.14 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	µg/L	0.5 U	0.58 U	0.88 U	0.59 U	0.61 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	µg/L	0.88	0.57	0.56	0.3 J	0.31 J	0.18 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

		Sample ID	**GWP-10-111714**	**GWP-110-111714**	**SVP-2-1-111114**	**SVP-2-2-111114**	**SVP-2-3-111114**	**SVP-2-4-111114**	**SVP-2-5-111114**	**SVP-2-6-111114**	**SVP-2-7-111114**	**SVP-2-8-111114**	**SVP-102-8-111114**
		Location ID	**GWP-10**	**GWP-10**	**SVP/GWM-2-1**	**SVP/GWM-2-2**	**SVP/GWM-2-3**	**SVP/GWM-2-4**	**SVP/GWM-2-5**	**SVP/GWM-2-6**	**SVP/GWM-2-7**	**SVP/GWM-2-8**	**SVP/GWM-2-8**
		Sample Date	**11/17/2014 8:20**	**11/17/2014 8:20**	**11/11/2014 10:08**	**11/11/2014 10:27**	**11/11/2014 10:40**	**11/11/2014 10:50**	**11/11/2014 11:01**	**11/11/2014 11:12**	**11/11/2014 11:23**	**11/11/2014 11:33**	**11/11/2014 11:33**
		Sample Type	**N**	**FD**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	2.7	2.8	0.75 U	0.52 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.47 J	0.48 J	0.11 J	0.053 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	2.6	2.9	1.8	2.7 J+	4.3	5.8	6.8	6.2	0.63	0.63	0.54
Tetrachloroethene	5	µg/L	25	27	2.2	3.4 J+	5	5.1	5.1	5	3.8	2.9	2.5
Trichloroethene	5	µg/L	11	12	17	19 J+	31	36	36	29	15	22	23

		Sample ID	**SVP-2-9-111114**	**SVP-2-10-111114**	**SVP-3-1-111114**	**SVP-3-2-111114**	**SVP-3-3-111114**	**SVP-3-4-111114**	**SVP-3-5-111114**	**SVP-3-6-111114**	**SVP-3-7-111114**	**SVP-4-1-111714**	**SVP-4-2-111714**
		Location ID	**SVP/GWM-2-9**	**SVP/GWM-2-10**	**SVP/GWM-3-1**	**SVP/GWM-3-2**	**SVP/GWM-3-3**	**SVP/GWM-3-4**	**SVP/GWM-3-5**	**SVP/GWM-3-6**	**SVP/GWM-3-7**	**SVP/GWM-4-1**	**SVP/GWM-4-2**
		Sample Date	**11/11/2014 11:46**	**11/11/2014 11:59**	**11/11/2014 8:30**	**11/11/2014 8:42**	**11/11/2014 8:53**	**11/11/2014 9:04**	**11/11/2014 9:15**	**11/11/2014 9:25**	**11/11/2014 9:34**	**11/17/2014 10:03**	**11/17/2014 10:20**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	2.2	1.1	0.51 U	0.5 U	0.5 U	0.5 U	0.5 U	2.7	0.74
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.16 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.22 J	0.2 J
cis-1,2-Dichloroethene	5	µg/L	0.41 J	0.5 U	0.72	0.32 J	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5	0.39 J
Tetrachloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.64 U	0.5 U	0.57 U	0.55 U	15	17
Trichloroethene	5	µg/L	21 J+	0.51	13	21	13	1	0.5 U	0.094 J	0.093 J	8.6	5.8

Notes:

J - result is estimated
K - result biased high
L - result biased low
NJ - result is tentatively identified
U - result is non-detect
Q - qualifier

N - normal field sample
FD - field duplicate
ROD - Record of Decision
µg/L - microgram per liter

Result above ROD Cleanup Criteria

Table 6-3
Baseline Groundwater VOC Results - 2014
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	SVP-4-3-111714	SVP-4-4-111714	SVP-4-5-111714	SVP-4-6-111714	SVP-104-6-111714	SVP-4-7-111714	SVP-4-8-111714	SVP-4-9-111714	SVP-4-10-111714	SVP-5-1-111014	SVP-5-2-111014
		Location ID	SVP/GWM-4-3	SVP/GWM-4-4	SVP/GWM-4-5	SVP/GWM-4-6	SVP/GWM-4-6	SVP/GWM-4-7	SVP/GWM-4-8	SVP/GWM-4-9	SVP/GWM-4-10	SVP/GWM-5-1	SVP/GWM-5-2
		Sample Date	11/17/2014 10:29	11/17/2014 10:37	11/17/2014 10:48	11/17/2014 11:00	11/17/2014 11:00	11/17/2014 11:14	11/17/2014 11:22	11/17/2014 11:33	11/17/2014 11:44	11/10/2014 13:20	11/10/2014 13:35
		Sample Type	N	N	N	N	FD	N	N	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.51	0.46 J	0.4 J	0.26 J	0.5 UJ	0.21 J	0.5 U	0.5 U	0.5 U	0.89 UJ	0.52 U
Carbon Tetrachloride	5	µg/L	0.11 J	0.065 J	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.3 J	0.72
cis-1,2-Dichloroethene	5	µg/L	1.8	1.7	1.5	1.5	1.1 J-	0.83	0.47 J	0.27 J	0.5 U	0.63 J+	1.9
Tetrachloroethene	5	µg/L	76	57	73	42	38	5.8	4.3	0.5 U	0.5 U	0.5 U	1
Trichloroethene	5	µg/L	28	18	20	19	17	31	11	1.1	0.5 U	19	39

		Sample ID	SVP-5-3-111014	SVP-5-4-111014	SVP-5-5-111014	SVP-5-6-111014	SVP-5-7-111014	SVP-5-8-111014	SVP-5-9-111014	SVP-5-10-111014	SVP-6-1-111214	SVP-6-2-111214	SVP-6-3-111214
		Location ID	SVP/GWM-5-3	SVP/GWM-5-4	SVP/GWM-5-5	SVP/GWM-5-6	SVP/GWM-5-7	SVP/GWM-5-8	SVP/GWM-5-9	SVP/GWM-5-10	SVP/GWM-6-1	SVP/GWM-6-2	SVP/GWM-6-3
		Sample Date	11/10/2014 13:51	11/10/2014 14:02	11/10/2014 14:13	11/10/2014 14:24	11/10/2014 14:35	11/10/2014 14:46	11/10/2014 14:55	11/10/2014 15:05	11/12/2014 8:27	11/12/2014 8:45	11/12/2014 9:02
		Sample Type	N	N	N	N	N	N	N	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.2 J	0.5 UJ	0.5 UJ
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.68 J	0.5 UJ	0.5 UJ
cis-1,2-Dichloroethene	5	µg/L	0.19 J	0.22 J	0.27 J	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	5 J	0.5 UJ	5.7 J
Tetrachloroethene	5	µg/L	0.63 U	0.5 U	0.55 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ
Trichloroethene	5	µg/L	3.2	3.8	4.7	2.1	0.2 J	0.33 J	0.12 J	0.099 J	4 J	0.5 UJ	6.1 J

		Sample ID	SVP-6-4-111214	SVP-6-5-111214	SVP-6-6-111214	SVP-7-1-111314	SVP-7-2-111314	SVP-7-3-111314	SVP-7-4-111314	SVP-7-5-111314	SVP-7-6-111314	SVP-8-1-111214	SVP-8-2-111214
		Location ID	SVP/GWM-6-4	SVP/GWM-6-5	SVP/GWM-6-6	SVP/GWM-7-1	SVP/GWM-7-2	SVP/GWM-7-3	SVP/GWM-7-4	SVP/GWM-7-5	SVP/GWM-7-6	SVP/GWM-8-1	SVP/GWM-8-2
		Sample Date	11/12/2014 9:18	11/12/2014 9:34	11/12/2014 9:50	11/13/2014 11:35	11/13/2014 11:46	11/13/2014 11:57	11/13/2014 12:05	11/13/2014 12:14	11/13/2014 12:23	11/12/2014 10:22	11/12/2014 10:35
		Sample Type	N	N	N	N	N	N	N	N	N	N	N
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	14 J+	57 J+	0.5 UJ	6.8 J+	57 J	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ
Carbon Tetrachloride	5	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ
cis-1,2-Dichloroethene	5	µg/L	9.6 J+	24 J+	0.058 J	1.2 J+	4.1 J	0.16 J	0.5 U	0.5 U	0.5 U	0.42 J	1.1 J
Tetrachloroethene	5	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	200	460	1.3 J-	0.21 J	0.5 U	0.5 U	11 J	32 J
Trichloroethene	5	µg/L	3.4 J	15 J-	0.16 J	39	220	2.3 J-	0.5 U	0.5 U	0.5 U	4.2 J	11 J

Notes:

J - result is estimated
K - result biased high
L - result biased low
NJ - result is tentatively identified
U - result is non-detect
Q - qualifier

N - normal field sample
FD - field duplicate
ROD - Record of Decision
µg/L - microgram per liter

Result above ROD Cleanup Criteria

Table 6-3
Baseline Groundwater VOC Results - 2014
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	**SVP-8-3-111214**	**SVP-8-4-111214**	**SVP-8-5-111214**	**SVP-8-6-111214**	**SVP-9-1-111314**	**SVP-9-2-111314**	**SVP-9-3-111314**	**SVP-9-4-111314**	**SVP-9-5-111314**	**SVP-109-5-111314**	**SVP-9-6-111314**
		Location ID	**SVP/GWM-8-3**	**SVP/GWM-8-4**	**SVP/GWM-8-5**	**SVP/GWM-8-6**	**SVP/GWM-9-1**	**SVP/GWM-9-2**	**SVP/GWM-9-3**	**SVP/GWM-9-4**	**SVP/GWM-9-5**	**SVP/GWM-9-5**	**SVP/GWM-9-6**
		Sample Date	**11/12/2014 11:00**	**11/12/2014 11:09**	**11/12/2014 11:24**	**11/12/2014 11:36**	**11/13/2014 13:38**	**11/13/2014 13:49**	**11/13/2014 14:00**	**11/13/2014 14:10**	**11/13/2014 14:25**	**11/13/2014 14:25**	**11/13/2014 14:37**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FD**	**N**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	3.6	1.3	0.5 UJ	0.5 U	0.5 UJ	0.88
Carbon Tetrachloride	5	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	0.073 J	0.5 U	0.5 UJ	0.5 U	0.5 UJ	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.36 J	0.77 J	1.1 J	0.5 J	0.5 U	0.17 J	0.16 J	0.5 UJ	0.5 U	0.5 UJ	27
Tetrachloroethene	5	µg/L	40 J	49 J	62 J	34 J	0.5 U	0.5 U	2.1	4 J-	16	6.7 J-	8.6
Trichloroethene	5	µg/L	3.7 J-	7.7 J	7.9 J	13 J	0.59	2.5	1.9	3.2 J-	1.3	0.66 J-	250

		Sample ID	**SVP-9-7-111314**	**SVP-9-8-111314**	**SVP-9-9-111314**	**SVP-9-10-111314**	**SVP-10-1-111714**	**SVP-10-2-111714**	**SVP-10-3-111714**	**SVP-10-4-111714**	**SVP-10-5-111714**	**SVP-10-6-111714**	**SVP-10-7-111714**
		Location ID	**SVP/GWM-9-7**	**SVP/GWM-9-8**	**SVP/GWM-9-9**	**SVP/GWM-9-10**	**SVP/GWM-10-1**	**SVP/GWM-10-2**	**SVP/GWM-10-3**	**SVP/GWM-10-4**	**SVP/GWM-10-5**	**SVP/GWM-10-6**	**SVP/GWM-10-7**
		Sample Date	**11/13/2014 14:48**	**11/13/2014 15:01**	**11/13/2014 15:09**	**11/13/2014 15:17**	**11/17/2014 13:17**	**11/17/2014 13:28**	**11/17/2014 13:41**	**11/17/2014 13:53**	**11/17/2014 14:02**	**11/17/2014 14:10**	**11/17/2014 14:19**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	2.5 U	11 J+	0.5	2.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.65 J	0.5 U	0.11 J	2.5 U	0.5 U	0.12 J
cis-1,2-Dichloroethene	5	µg/L	2.5	3.6	0.5 U	0.5 U	3.2	33	6.8 J+	2.1	6.4	0.68	6.4 J+
Tetrachloroethene	5	µg/L	8.3	3.5	4.6	0.5 U	0.5 U	14	86	160	20	0.5 U	1.5
Trichloroethene	5	µg/L	33	200	7.3	0.74	13	340	97	19	350	3.9	36

		Sample ID	**SVP-10-8-111714**	**SVP-10-9-111714**	**SVP-10-10-111714**	**SVP-11-1-111114**	**SVP-11-2-111114**	**SVP-111-2-111114**	**SVP-11-3-111114**	**SVP-11-4-111114**	**SVP-11-5-111114**	**SVP-11-6-111114**	**SVP-11-7-111114**
		Location ID	**SVP/GWM-10-8**	**SVP/GWM-10-9**	**SVP/GWM-10-10**	**SVP/GWM-11-1**	**SVP/GWM-11-2**	**SVP/GWM-11-2**	**SVP/GWM-11-3**	**SVP/GWM-11-4**	**SVP/GWM-11-5**	**SVP/GWM-11-6**	**SVP/GWM-11-7**
		Sample Date	**11/17/2014 14:30**	**11/17/2014 14:37**	**11/17/2014 14:48**	**11/11/2014 13:25**	**11/11/2014 13:45**	**11/11/2014 13:45**	**11/11/2014 14:05**	**11/11/2014 14:18**	**11/11/2014 14:33**	**11/11/2014 14:47**	**11/11/2014 15:02**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**FD**	**N**	**N**	**N**	**N**	**N**
Chemical	**ROD Cleanup Criteria**	**Unit**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**	**Result / Q**
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	2.5 U	8.3 J+	9 J+	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.27 J	0.73	0.93	0.5 U	0.15 J	0.23 J	0.074 J	0.5 U
cis-1,2-Dichloroethene	5	µg/L	4.3	0.5 U	0.5 U	72	4.5 J+	5.7 J+	6	9.1	3.3	1.3	0.83
Tetrachloroethene	5	µg/L	1	0.5 U	0.5 U	2.5 U	24 J+	27	4.6	7.1	10	6.2	1.6
Trichloroethene	5	µg/L	48	0.5 U	0.73 U	300	40 J+	48	53	110	80	29	9.3

Notes:

J - result is estimated
K - result biased high
L - result biased low
NJ - result is tentatively identified
U - result is non-detect
Q - qualifier

N - normal field sample
FD - field duplicate
ROD - Record of Decision
µg/L - microgram per liter

Result above ROD Cleanup Criteria

Table 6-3
Baseline Groundwater VOC Results - 2014
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, NY

		Sample ID	SVP-11-8-111114	SVP-11-9-111114	SVP-11-10-111114	SVP-12-1-111314	SVP-12-2-111314	SVP-12-3-111314	SVP-12-4-111314	SVP-12-5-111314	SVP-12-6-111314	SVP-13-1-111314	SVP-13-2-111314
		Location ID	SVP/GWM-11-8	SVP/GWM-11-9	SVP/GWM-11-10	SVP/GWM-12-1	SVP/GWM-12-2	SVP/GWM-12-3	SVP/GWM-12-4	SVP/GWM-12-5	SVP/GWM-12-6	SVP/GWM-13-1	SVP/GWM-13-2
		Sample Date	11/11/2014 15:15	11/11/2014 15:26	11/11/2014 15:37	11/13/2014 8:20	11/13/2014 8:33	11/13/2014 8:45	11/13/2014 8:56	11/13/2014 9:04	11/13/2014 9:15	11/13/2014 9:54	11/13/2014 10:03
		Sample Type	N	N	N	N	N	N	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.6 U	0.61 U	0.5 U	0.5 U	0.57 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.13 J	0.69	0.76	0.5 U	0.14 J	0.075 J	0.05 J
cis-1,2-Dichloroethene	5	µg/L	0.18 J	0.5 U	0.5 U	0.5 U	4.1	10	10	1.4	1.6	0.81	0.16 J
Tetrachloroethene	5	µg/L	0.5 U	0.57	0.5 U	0.5 U	1.1	8.2	7.1	4.2 J+	4.9 J+	7.4	1.8
Trichloroethene	5	µg/L	1.8	0.22 J	0.5 U	0.77	40	79	88	22	23	13	4.2

		Sample ID	SVP-13-3-111314	SVP-13-4-111314	SVP-13-5-111314	SVP-13-6-111314	SVP-14-1-111214	SVP-14-2-111214	SVP-14-3-111214	SVP-14-4-111214	MW-12S-111014	SVP-14-5-111214	SVP-14-6-111214
		Location ID	SVP/GWM-13-3	SVP/GWM-13-4	SVP/GWM-13-5	SVP/GWM-13-6	SVP/GWM-14-1	SVP/GWM-14-2	SVP/GWM-14-3	SVP/GWM-14-4	MW-12S	SVP/GWM-14-5	SVP/GWM-14-6
		Sample Date	11/13/2014 10:15	11/13/2014 10:26	11/13/2014 10:37	11/13/2014 10:48	11/12/2014 13:38	11/12/2014 13:56	11/12/2014 14:07	11/12/2014 14:23	11/10/2014 15:30	11/12/2014 14:39	11/12/2014 14:52
		Sample Type	N	N	N	N	N	N	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	3.1	0.5 U	0.5 U	0.5 U	0.68 UJ	0.69 UJ	0.5 UJ	0.5 U	0.5 U	0.25 J	0.29 J
Carbon Tetrachloride	5	µg/L	0.56	0.5 U	0.5 U	0.5 U	0.63 J+	0.43 J	0.5 UJ	0.072 J	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	4.2	0.42 J	1.3	1.1	18 J	6.3 J	0.5 UJ	1.8	0.5 U	0.19 J	0.5 U
Tetrachloroethene	5	µg/L	35	8.6	5.1	3.7	3.3 J+	1.2 J	0.5 UJ	1.3	0.5 U	3.9	1.2
Trichloroethene	5	µg/L	180	15	21	17	130 J	69 J	0.5 UJ	16	0.5 U	1.7	0.5 U

		Sample ID	SVP-14-7-111214	SVP-14-8-111214	SVP-14-9-111214	SVP-14-10-111214	GWX-10019-112014	GWX-10020-111014	MW-1I-111314	MW-1S-111214	MW-2I-111114	MW-2S-111114	MW-103I-111414
		Location ID	SVP/GWM-14-7	SVP/GWM-14-8	SVP/GWM-14-9	SVP/GWM-14-10	GWX-10019	GWX-10020	MW-1I	MW-1S	MW-2I	MW-2S	MW-3I
		Sample Date	11/12/2014 15:08	11/12/2014 15:19	11/12/2014 15:30	11/12/2014 15:41	11/20/2014 11:22	11/10/2014 12:00	11/13/2014 16:50	11/12/2014 17:45	11/11/2014 16:20	11/11/2014 16:45	11/14/2014 11:05
		Sample Type	N	N	N	N	N	N	N	N	N	N	FD
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.9	5 U	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.13 J	0.5 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	7.9	0.5 U	12	5.3	0.5 U	0.14 J	0.36 J
Tetrachloroethene	5	µg/L	2.2	0.5 U	0.68	0.61	2.3	0.5 UJ	29	5.1	0.66	1.4	18
Trichloroethene	5	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	71	0.13 J	260 J+	450	0.55	4	5.4

		Sample ID	MW-3D-111714	MW-3I-111414	MW-3S-111414	MW-8D-111114	GWP-11-111714
		Location ID	MW-3D	MW-3I	MW-3S	MW-8D	GWP-11
		Sample Date	11/17/2014 12:30	11/14/2014 11:05	11/14/2014 11:50	11/11/2014 12:30	11/17/2014 8:10
		Sample Type	N	N	N	N	N
Chemical	ROD Cleanup Criteria	Unit	Result / Q	Result / Q	Result / Q	Result / Q	Result / Q
1,1-Dichloroethene	5	µg/l	0.5 U	0.5 U	0.93 J	0.5 U	1.5
Carbon Tetrachloride	5	µg/l	0.5 U	0.5 U	2.5 U	0.092 J	0.13 J
cis-1,2-Dichloroethene	5	µg/l	0.5 U	0.31 J	1.1 J	0.91	5.1
Tetrachloroethene	5	µg/l	0.5 U	16	230	1.3	68
Trichloroethene	5	µg/l	0.5 U	4.7	5.8	9.8	44

Notes:

J - result is estimated
K - result biased high
L - result biased low
NJ - result is tentatively identified
U - result is non-detect
Q - qualifier

N - normal field sample
FD - field duplicate
ROD - Record of Decision
µg/L - microgram per liter

Result above ROD Cleanup Criteria

Table 7-1
Performance and Compliance Sampling-Monitoring Schedule
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

ACTIVITY	LOCATIONS	PARAMETERS[3]	FREQUENCY
Influent sampling	Influent sample ports (EW-1S, EW-1I, EW-1D, SEW-1S, SEW-1I, SEW-1D)	VOCs	Monthly (min)
	Combined Influent	VOCs	Bi-monthly
		TAL Metals, TSS, TDS, Nitrate and Nitrite, Oil & Grease	Monthly
		Mercury, Total Cyanide	Quarterly
Influent monitoring	Influent sample ports	Water quality parameters[1]	Weekly (min)
	Flow and pressure indicators	Flow, pressure	Weekly (min)
Effluent compliance sampling[2]	Effluent sample port	VOCs, Oil & Grease	Bi-monthly
		TAL Metals, TSS, TDS, Nitrate and Nitrite	Monthly
		Mercury, Total Cyanide	Quarterly
Process monitoring	After equalization tank	Water quality parameters[1]	Weekly (min)
	pH indicating transmitter in influent line	pH	continuous
	pH indicating transmitter on effluent	pH	continuous
	Flow and pressure indicators	Flow, pressure	Weekly (min)
Offgas system sampling	Sample port on air stripper offgas effluent line to roof stack	VOCs via TO-14	Monthly
Offgas system monitoring	The offgas effluent pipe port	VOCs via PID	Weekly (min)
Extraction well monitoring	EW-1S, EW-1I, EW-1D, SEW-1S, SEW-1I, SEW-1D	Water levels	Daily
Transfer pump monitoring	Flow and pressure indicators	Flow rate, discharge pressure	Weekly (min)
Air stripper monitoring	Flow and pressure indicators	Flow rate, vacuum and discharge pressures	Weekly (min)
Bag filter monitoring	Pressure indicators	Differential pressure	Daily

Notes:
1. Monitoring parameters: dissolved oxygen, pH, conductivity, temperature, oxidation-reduction potential.
2. As per NYSDEC SPDES permit equivalent requirements.
3. Sample analysis should be conducted in accordance with specification 01451-CHEMICAL DATA QUALITY CONTROL.

GWTP - groundwater treatment plant
NYSDEC - New York State Department of Environmental Conservation
SPDES - State Pollutant Discharge Elimination System
TSS - total suspended solids
min - minimum

PID - photo-ionization detector
VOCs - volatile organic compounds
TAL - target analyte list
TDS - total dissolved solid

Table 7-2
Groundwater Monitoring Program
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well Type	Well ID	Port	Ground Surface Elevation (ft amsl, NAVD88)	Measurement Port Depth (ft bgs)	Port Elevation (ft amsl, NAVD88)	Annual Monitoring for Trace TCL VOCs	5th Annual Sampling
Multiport Well	SVP-1	10	86.58	53	33.58		X
		9		103	-16.42		X
		8		153	-66.42		X
		7		203	-116.42		X
		6		253	-166.42		X
		5		293	-206.42		X
		4		318	-231.42		X
		3		373	-286.42		X
		2		403	-316.42		X
		1		450	-363.42		X
Multiport Well	SVP-2	10	89.39	53	36.39		X
		9		103	-13.61		X
		8		153	-63.61		X
		7		193	-103.61		X
		6		253	-163.61	X	X
		5		293	-203.61	X	X
		4		333	-243.61		X
		3		373	-283.61	X	X
		2		413	-323.61		X
		1		450	-360.61	X	X
Multiport Well	SVP-3	7	87.17	53	34.17		X
		6		103	-15.83		X
		5		173	-85.83	X	X
		4		293	-205.83	X	X
		3		373	-285.83	X	X
		2		393	-305.83		X
		1		450	-362.83	X	X
Multiport Well	SVP-4	10	88.85	48	40.85		X
		9		103	-14.15	X	X
		8		148	-59.15	X	X
		7		188	-99.15		X
		6		248	-159.15	X	X
		5		288	-199.15		X
		4		308	-219.15	X	X
		3		353	-264.15	X	X
		2		400	-311.15		X
		1		420	-331.15	X	X
Multiport Well	SVP-5	10	85.55	48	37.55		X
		9		98	-12.45		X
		8		153	-67.45		X
		7		193	-107.45		X
		6		253	-167.45	X	X
		5		293	-207.45		X
		4		313	-227.45	X	X
		3		358	-272.45	X	X
		2		408	-322.45	X	X
		1		430	-344.45	X	X
Multiport Well	SVP-6	6	60.88	50	10.88		X
		5		105	-44.12		X
		4		180	-119.12		X
		3		250	-189.12		X
		2		370	-309.12		X
		1		447	-386.12		X

Table 7-2
Groundwater Monitoring Program
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well Type	Well ID	Port	Ground Surface Elevation (ft amsl, NAVD88)	Measurement Port Depth (ft bgs)	Port Elevation (ft amsl, NAVD88)	Annual Monitoring for Trace TCL VOCs	5th Annual Sampling
Multiport Well	SVP-7	6	82.58	48	34.58		X
		5		103	-20.42		X
		4		208	-125.42		X
		3		315	-232.42		X
		2		428	-345.42		X
		1		445	-362.42		X
Multiport Well	SVP-8	6	62.26	48	14.26		X
		5		103	-40.74		X
		4		158	-95.74		X
		3		238	-175.74		X
		2		373	-310.74		X
		1		435	-372.74		X
Multiport Well	SVP-9	10	90.27	47	43.27		X
		9		102	-11.73	X	X
		8		147	-56.73	X	X
		7		187	-96.73		X
		6		247	-156.73	X	X
		5		287	-196.73		X
		4		307	-216.73	X	X
		3		352	-261.73		X
		2		402	-311.73	X	X
		1		482	-391.73		X
Multiport Well	SVP-10	10	87.83	47	40.83		X
		9		102	-14.17	X	X
		8		147	-59.17		X
		7		187	-99.17	X	X
		6		247	-159.17	X	X
		5		287	-199.17		X
		4		307	-219.17	X	X
		3		352	-264.17	X	X
		2		402	-314.17	X	X
		1		482	-394.17	X	X
Multiport Well	SVP-11	10	80.32	47	33.32		X
		9		102	-21.68		X
		8		147	-66.68		X
		7		187	-106.68	X	X
		6		247	-166.68	X	X
		5		287	-206.68	X	X
		4		307	-226.68	X	X
		3		352	-271.68	X	X
		2		402	-321.68	X	X
		1		482	-401.68	X	X
Multiport Well	SVP-12	6	76.20	245	-168.8	X	X
		5		295	-218.8	X	X
		4		355	-278.8	X	X
		3		405	-328.8	X	X
		2		485	-408.8	X	X
		1		515	-438.8	X	X
Multiport Well	SVP-13	6	74.06	245	-170.94	X	X
		5		295	-220.94	X	X
		4		355	-280.94	X	X
		3		405	-330.94	X	X
		2		485	-410.94	X	X
		1		520	-445.94	X	X

Table 7-2
Groundwater Monitoring Program
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Well Type	Well ID	Port	Ground Surface Elevation (ft amsl, NAVD88)	Measurement Port Depth (ft bgs)	Port Elevation (ft amsl, NAVD88)	Annual Monitoring for Trace TCL VOCs	5th Annual Sampling
Multiport Well	SVP-14	10	69.06	85	-15.94		X
		9	69.06	100	-30.94		X
		8	69.06	145	-75.94		X
		7	69.06	185	-115.94		X
		6	69.06	250	-180.94		X
		5	69.06	300	-230.94		X
		4	69.06	360	-290.94		X
		3	69.06	410	-340.94		X
		2	69.06	490	-420.94		X
		1	69.06	530	-460.94		X
Regular Monitoring Wells	GWX-10019		85.52	Well Screen: 223 to 228 ft bgs		X	X
	GWX-10020		81.66	Well Screen: 185 to 190 ft bgs			X
	MW-1I		86.51	Well Screen: 305 to 315 ft bgs		X	X
	MW-1S		86.26	Well Screen: 235 to 245 ft bgs		X	X
	MW-2I		86.96	Well Screen: 306 to 316 ft bgs		X	X
	MW-2S		87.29	Well Screen: 236 to 246 ft bgs		X	X
	MW-3I		79.28	Well Screen: 304 to 314 ft bgs			X
	MW-3S		79.29	Well Screen: 234 to 244 ft bgs			X
	MW-8D		62.65	Well Screen: 515 to 535 ft bgs			X
	MW-12S		76.06	Well Screen: 90 to 110 ft bgs			X
Garden City Pumping Wells	GWP-10		86.00	Well Screen: 377 to 417 ft bgs			X
	GWP-11		84.00	Well Screen: 370 to 410 ft bgs			X
Cooling Wells	GWX-8068		NA[1]	Well Screen: 265 to 291 ft bgs			X
					Total:	**55**	**130**

Notes:

1. Elevation not measured due to well's location within a building.

No sample collected at these ports or wells.

msl - mean sea level
ID - identification
bgs - below ground surface
ft - feet
NAVD88 - North American Vertical Datum of 1988
TCL - target compound list
VOC - volatile organic compound
NA - not applciable

Table 8-1
Summary of Subcontractor Costs
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Subcontractor	Activity	Cost
Arrowhead Contracting Inc.	Phases 2 and 4 Remedial Construction, and Operation and Maintenance	$5,169,253.00
Kennon Surveying Services, Inc.	Civil and Utility Survey - Southern Plume	$26,159.00
National Construction Rental	Temporary Fence Rental	$21,599.00
Richard Grubb & Associates, Inc.	Cultural Resources Survey	$16,203.00
Seacoast Environmental Services, Inc.	Investigaiton Derived Waste Disposal	$274,018.00
Uni-Tech Drilling Co., Inc.	Drilling Services	$2,019,973.00
Earth Data Northeast, Inc.	Multi-port Well Sampling	$15,284.00
Total		**$7,542,489.00**

Table 8-2
Summary of Modifications
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Modification Number	Item Number	Description	Value Change
		Drilling	
Uni-Tech - Phase 1			
1	15A	Purchase of 15 drums	$1,275.00
2	17	Costs for union labor	$36,250.00
3	014	Additional costs for equipment decontamination	$5,250.00
	017	Additional costs for union labor	$11,600.00
Uni-Tech - Phase 3			
1	NA	Temporary pad and access road construction	$22,857.00
2	NA	Increase in cost due to modification of pad and access road construction	$843.00
National Construction Rental - Phase 1			
1		Trip charge for fence repair	$550.00
Seacoast - Phase 1			
1	3A	Increase of water IDW handling/dispsoal cost	$7,600.00
2	NA	Increase the incremental funding level	$0.00
3	NA	Increase the incremental funding level	$0.00
		Subtotal	$86,225.00
		Remedial Construction	
Arrowhead - Phase 2			
1	0026	Additional funding to achieve LEED Certification	$45,953.47
2	0027	Over-excavate to replace unsuitable soil under treatment plant footprint	$13,378.20
	0028	Structural engineering design to increase building height per CDM Smith's request	$7,097.31
	0029	Asphalt seal coat to treeline property parking lot in areas restricted during drilling operations by others	$5,653.60
	0030	Substitution of globe valves and operators in lieu of motor operated PVC proportional control valves	$26,400.10
	0031	Substitution of NEEP Model 42131 air stripper in place of QED unit	$20,109.05
	0032	Install removable bollard posts at extraction wellheads	$17,217.81
3	0033	Remove and replace fencing at entrance to facility	$3,808.89
	0034	Complete land surveying for monitoring wells MW-12S, SWP-14, and MW-08D	$4,494.96
	0035	Provide 100 KW temporary generator for operation of treatment plant prior to electric hookup	$4,994.90
	0036	Provide recycling containers and disposal of recycled material as required for LEED certification	$3,148.05
4	NA	Incorporate the Service Contract Act and associated wage determinations for the O&M portion of the Subcontract Agreement	$0.00
5	NA	Increase in period of performance through June 2013	$0.00
6	026A	Additional LEED certification cost	$19,280.07
7	019	Additional 3 months of O&M (5/1/2013 - 7/31/2013)	$85,203.00
8	019	Additional 2 months of O&M (8/1/2013 - 9/30/2013)	$56,802.00
9	019	Additional 1 month of O&M (October 2013)	$28,401.00
10	019	Additional 2 months of O&M (11/1/2013 - 12/31/2013)	$56,802.00
Arrowhead - Phase 4			
1	NA	Increase the incremental funding level	$0.00
2	NA	Replacement of globe valve	$2,670.00
3	NA	Replacement of OIT with desktop computer	$10,506.09
4	NA	Replacement of PLC communication module, repair of transducers cable, and repair of existing bag filter housing	$7,826.10
		Subtotal	$419,746.60
		Total	$505,971.60

Figures

N

0 12,500 25,000 50,000 Feet

CDM Smith

Figure 1-1

Site Location Map

Old Roosevelt Field Contaminated Area Groundwater Site

Garden City, New York

- Extraction Well
- Pumping Well
- Influent Pipeline
- Effluent Pipeline

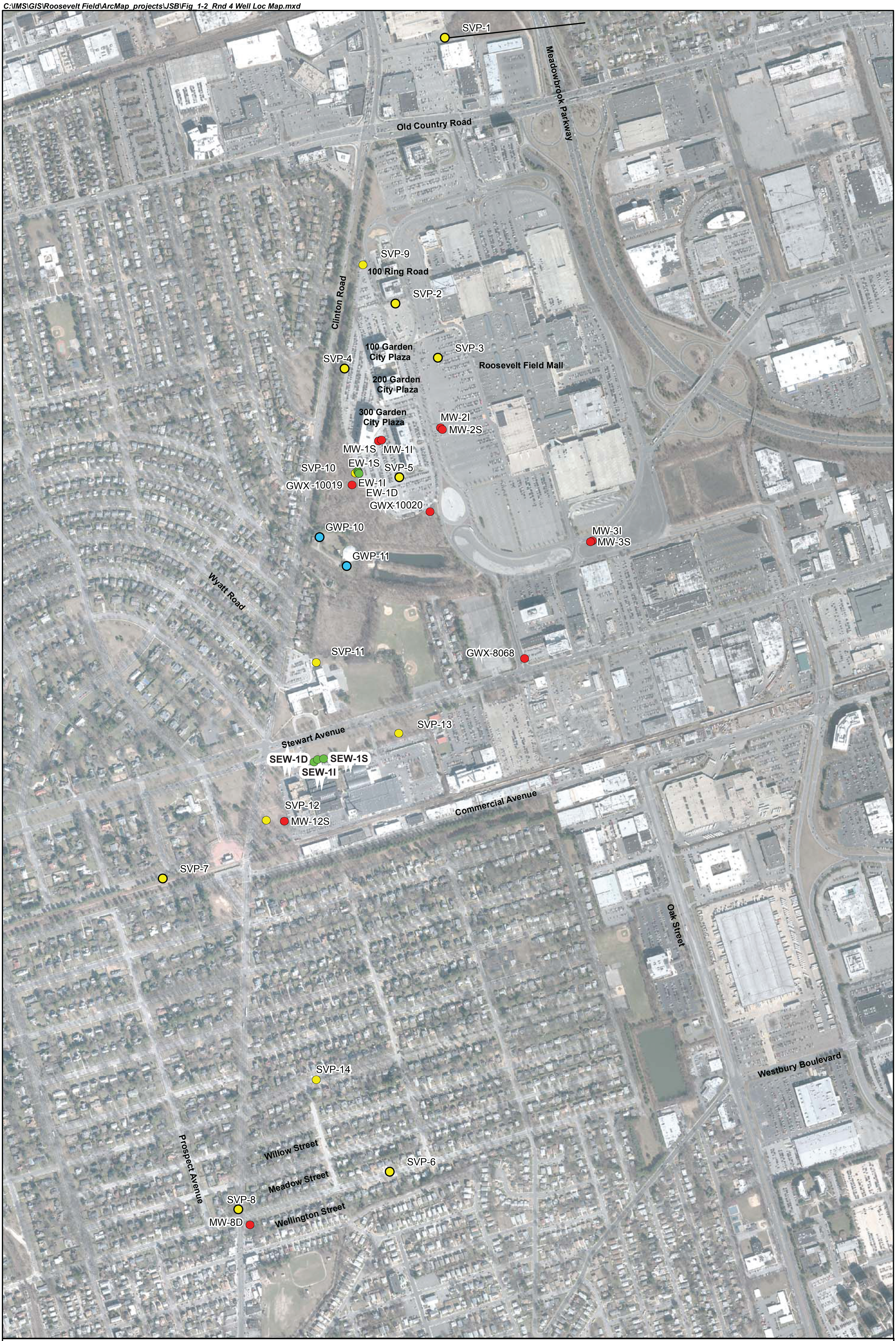
N

0 200 400 800 Feet

CDM Smith

Figure 1-2
Site Map
Old Roosevelt Field Contaminated Area Groundwater Site
Garden City, New York

Krupkaea C:\Roosevelt Field\MXD\Figure 1-2 Site Map.mxd 8/2/2015



- Municipal Pumping Well
- Multiport Well
- Conventional Well
- Extraction Well

N

0 350 700 Feet

CDM Smith

Figure 2-1
Well Locations
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

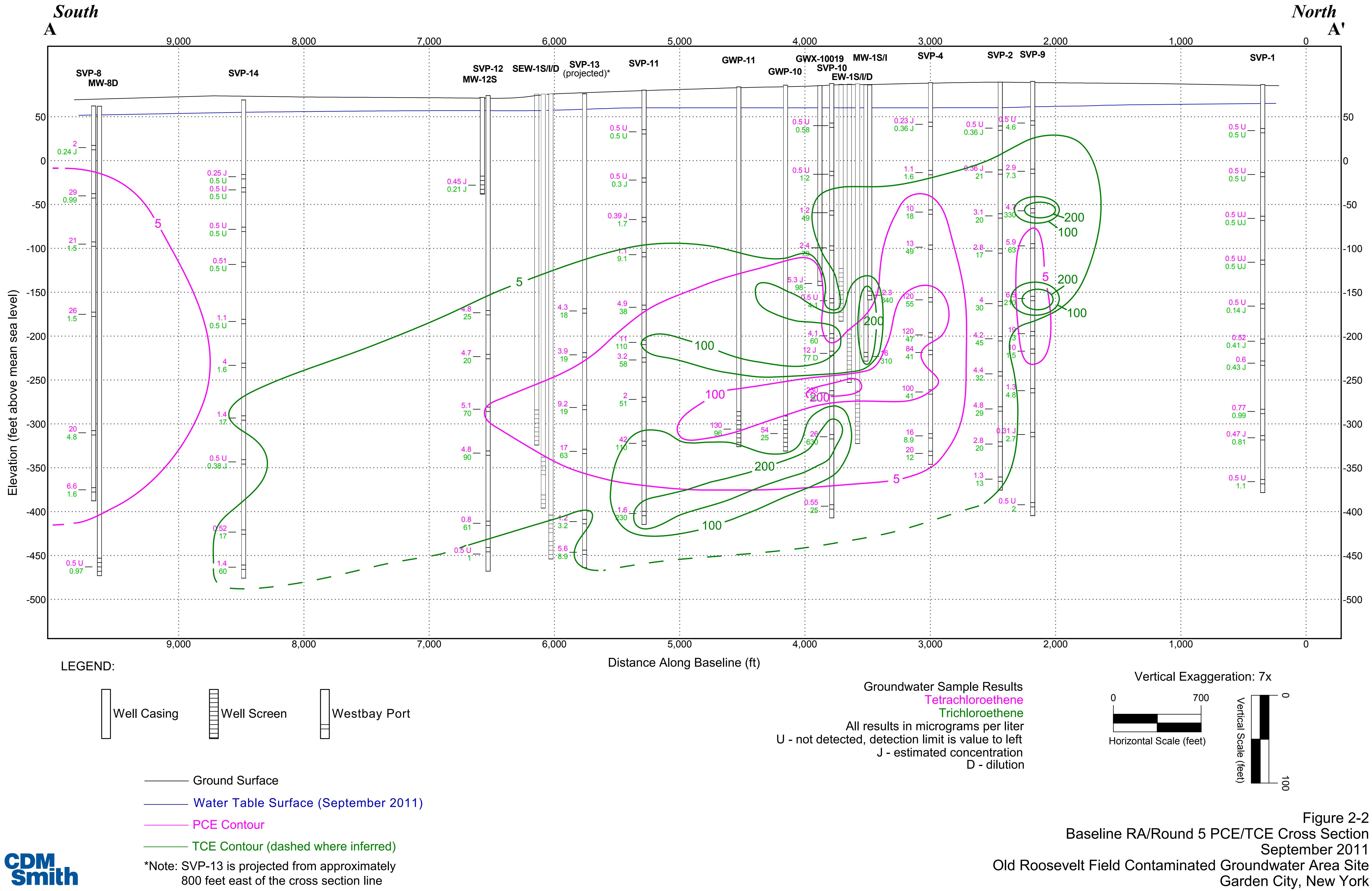
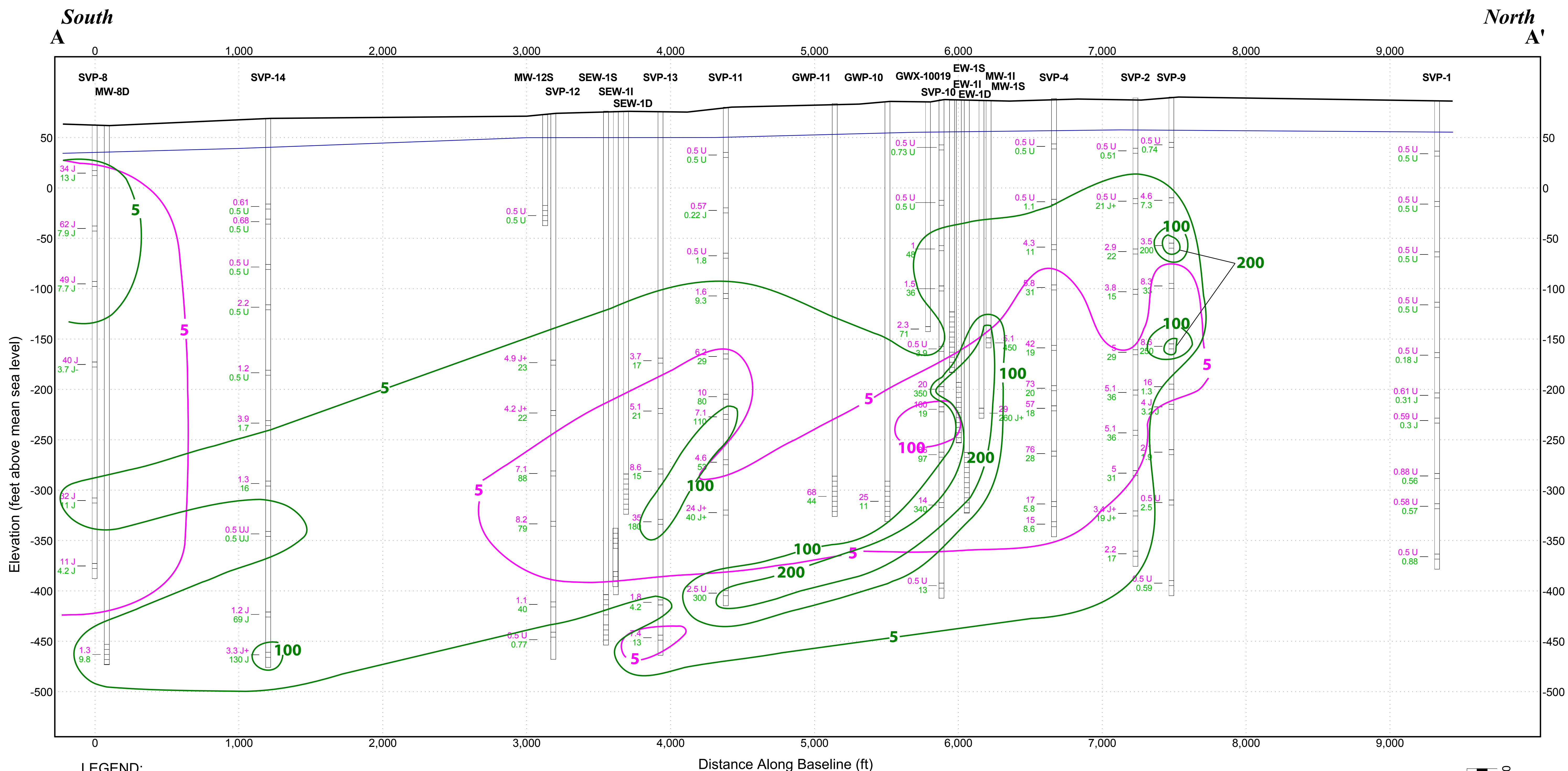


Figure 2-2
Baseline RA/Round 5 PCE/TCE Cross Section
September 2011
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

STANDARD CROSS SECTION ROOSEVELT-1-BRITCH_2010-12-07.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 1/17/12 REV.



LEGEND:

Well Casing

Well Screen

Westbay Port

Ground Surface

Water Table Surface (November 2014)

PCE Contour

TCE Contour

Groundwater Sample Results
Tetrachloroethene
Trichloroethene
All results in micrograms per liter
U - not detected, detection limit is value to left
J - estimated concentration

*SVP-13 is projected from approximately 800 feet east of the cross section line

*SEW-1S, SEW-1I, SEW-1D was not sampled in November 2014

0 700
Horizontal Scale (feet)

0 100
Vertical Scale (feet)

Vertical Exaggeration: 7x

Figure 2-3
Baseline RA/Round 6 PCE/TCE Cross Section
November 2014
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

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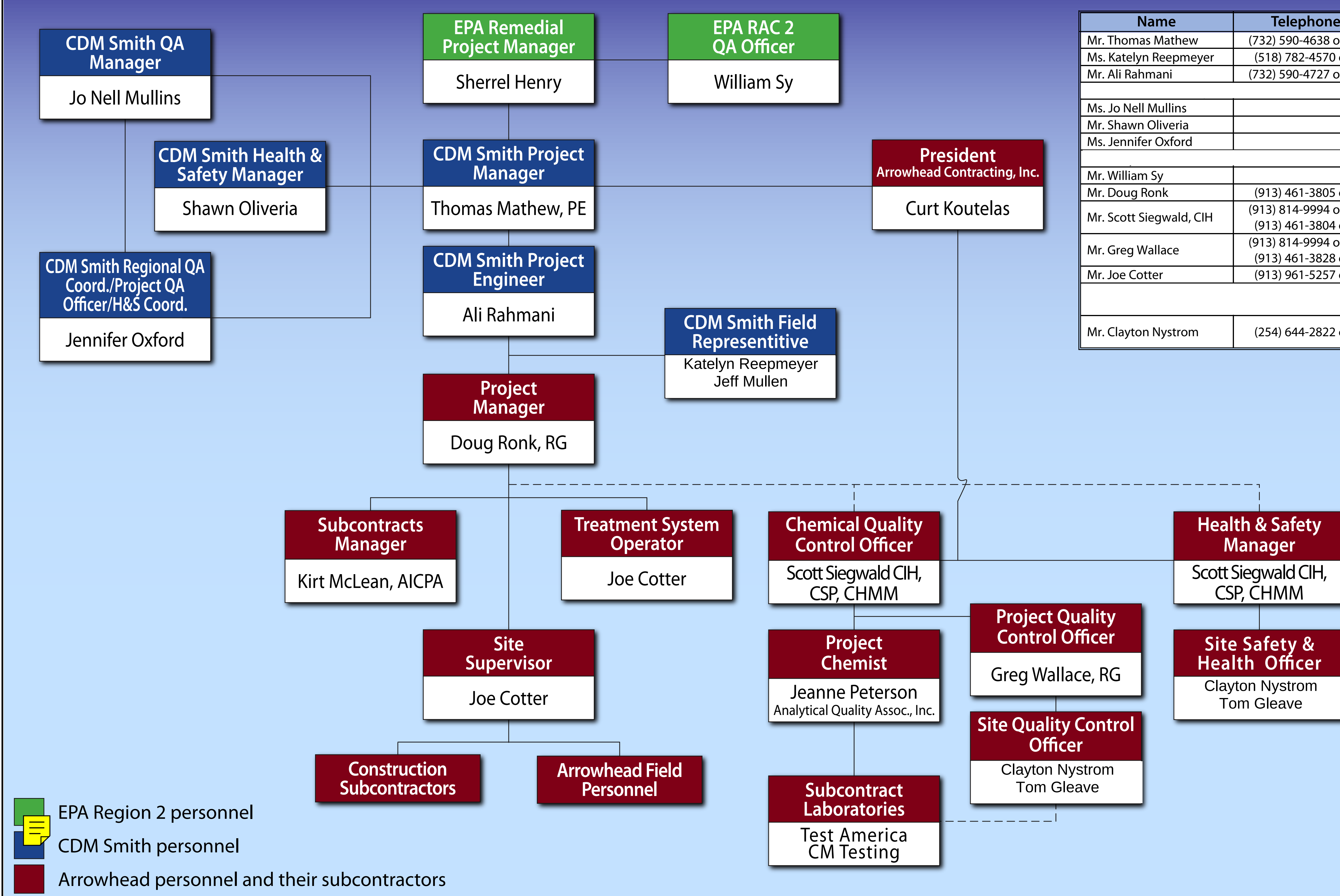
STANDARD CROSS SECTION ROOSEVELT_FIELD_04-11-2013_AE.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 7/9/15 REV.



Name	Telephone	Responsibility
Mr. Thomas Mathew	(732) 590-4638 office	CDM Smith Project Manager
Ms. Katelyn Reepmeyer	(518) 782-4570 cell	CDM Smith Field Representative
Mr. Ali Rahmani	(732) 590-4727 office	CDM Smith Project Engineer
Ms. Jo Nell Mullins		CDM Smith QA Manager
Mr. Shawn Oliveria		CDM Smith Health and Safety Manager
Ms. Jennifer Oxford		CDM Smith Regional QA Coordinator
Mr. William Sy		EPA RAC2 QA Officer
Mr. Doug Ronk	(913) 461-3805 cell	Arrowhead Project Manager
Mr. Scott Siegwald, CIH	(913) 814-9994 office (913) 461-3804 cell	Arrowhead Corporate Health and Safety Officer
Mr. Greg Wallace	(913) 814-9994 office (913) 461-3828 cell	Arrowhead Project Quality Control Officer
Mr. Joe Cotter	(913) 961-5257 cell	Arrowhead Site Supervisor
Mr. Clayton Nystrom	(254) 644-2822 cell	Arrowhead Site Health and Safety/Quality Control Officer

CDM Smith

Figure 5-1
Project Organization Chart
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, Nassau County, New York