CHA

February 22, 2010

New York State Department of Environmental Conservation
1130 N. Westcott Road
Schenectady, New York 12306
Attn: Mr. Howard Brezner

RE: Updated Feasibility Study for the Congress Street Facility of SI Group, Inc.
NYSDEC Site Code: HW447007

Dear Mr. Brezner:

On behalf of SI Group, enclosed is the Updated Feasibility Study for the Congress Street Facility of SI Group, Inc. The Updated Feasibility Study has been revised based on the comments received from New York State Department of Environmental Conservation (NYSDEC) on October 22, 2009.

The electronic copies of the Updated Feasibility Study are being provided on the enclosed CDs. Hard copies of the Study can be provided upon request.

If you have any questions, please call me at (518) 453-2897.

Sincerely,

Laury Bibighaus,
Associate

cc: Mr. Vimal Minocha
Bureau of Radiation & Hazardous Site Mtg.
Division of Solid & Hazardous Materials
New York State Department of Environmental Conservation
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Mr. Charles Gardner, SI Group, chuck.gardner@siigroup.com
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Mr. Keith Cowan, CHA, kcowan@chacompanies.com

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Updated Feasibility Study

Congress Street Facility
Congress Street
Schenectady, New York

NYSDEC Site Code: HW447007

CHA Project Number: 15091.2010.1102

Prepared for:

SI Group, Inc.
Rotterdam Junction, New York

Prepared by:

CHA

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Albany, New York, 12205
(518) 453-4500

May 1, 2009
Revised September 30, 2009
Revised February 22, 2010

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TABLES

APPENDIX

LIST OF ACRONYMS & ABBREVIATIONS

AMSL	Above Mean Sea Level
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
AWQC	Ambient Water Quality Criteria
BGS	Below Ground Surface
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980 (as amended)
CFR	Code of Federal Regulations
CHA	Clough, Harbour & Associates LLP
CRA	Conestoga-Rover and Associates
COC	Contaminant of Concern
DER	Division of Environmental Remediation
DPT	Direct-push technology
ECD	Electron Capture Detector
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
FID	Flame-Ionization Detector
FS	Feasibility Study
GRA	General Response Actions
GWCS	Groundwater Collection and Treatment System
HSA	Hollow Stem Auger
ICs	Institutional Controls
IRM	Interim Remedial Measure
ISTD	In-Situ Thermal Desorption
LDR	Land Disposal Restrictions
LNAPL	Light Non-Aqueous Phase Liquid
MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
MIP	Membrane Ion Probe
MNA	Monitored Natural Attenuation
MPE	Multi-Phase Extraction
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
NYCRR	New York Code, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NWI	National Wetlands Inventory
OSHA	Occupational Safety and Health Act
OU1	Operable Unit 1
OU2	Operable Unit 2

PID	Photoionization Detector
PPE	Personal Protection Equipment
PPM	Parts Per Million
PRGs	Preliminary Remediation Goals
QA/QC	Quality Assurance/Quality Control
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RFCM	Rapid Field Characterization Method
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SC	Soil Conductivity
SCGs	standards, criteria and guidance
SCOs	Soil Cleanup Objectives
SDWA	Safe Drinking Water Act
SPDES	State Pollutant Discharge Elimination System
SVE	Soil Vapor Extraction
SVI	Soil Vapor Investigation
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	To Be Considered
TCL	Target Compound List
TCLP	Toxicity Leaching Characteristic Procedure
TMP	Tax Map Parcel
TOC	Total Organic Carbon
TOGS	Technical & Operational Guidance Series
US	United States
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
VOC	Volatile Organic Compound
WP	Work Plan

1.0 INTRODUCTION

SI Group, Inc. (SI Group) owned and operated a chemical manufacturing facility located in Schenectady, New York at Congress Street and Tenth Avenue that has been referred to as the Congress Street facility (Figure 1). The Congress Street facility (Site) began operations in 1910 and expanded operations over the years by adding buildings and developing the Site. In 1996, the facility was producing wire enamels for electrical insulation, insulating varnishes for electrical motors, industrial enamels, and others resins for coatings and adhesives. In addition, the Site served as the corporate headquarters for SI Group's domestic and international operations.

During the facility's more than 85 years of operation, a number of spills occurred at the Site which resulted in chemical releases to the environment. During the period of 1984 through late 1995, when the facility was still in operation, a number of investigations were completed with the objective of defining environmental concerns at the Site.

In 1994-1995, SI Group conducted a Remedial Investigation/Feasibility Study (RI/FS) of the Congress Street facility. The results of the RI were presented in the report entitled "Remedial Investigation Report" (RI Report) and dated January 16, 1996. The RI Report was approved by New York State Department of Environmental Conservation (NYSDEC) in their letter dated March 5, 1996.

Based on the results of the RI Report, a Feasibility Study (FS) was conducted that evaluated a number of general response actions, technologies and process options for remediation at the Site. Remedial alternatives for the Site were assembled using the general response actions, technologies and process options retained from the initial screening. In total, seven remedial alternatives were retained for detailed analysis.

The results of the Feasibility Study were presented in the report entitled "Feasibility Study Report" (FS Report) that was submitted to NYSDEC on July 5, 1996. Based on a review of Site conditions and the remedial alternatives, NYSDEC decided to split the remediation of the Site into two separate programs or operable units. The first operable unit (OU1) would address the potential migration of contamination off-site. The RI indicated that contaminated groundwater was leaving the Site and discharging to the Cowhorn Creek. To address the migration of contaminated groundwater off-site, NYSDEC approved one of the selected remedial options detailed in the FS Report which would contain and treat the groundwater. The remedial system would consist of a "french drain" with a number of vertical wells to assure capture of contaminated groundwater leaving the Site. The collected groundwater and light non-aqueous phase liquid (LNAPL) would be treated either on-site or off-site. Institutional controls would also be implemented that would involve the continued maintenance of the security fence around the perimeter of the Site and the implementation of appropriate deed restrictions on the property. NYSDEC's determination was recorded in a "Record of Decision" (ROD) that was issued in March 1998.

The second operable unit (OU2) represented the Site and the contaminated soils that are present on-site. In 1996, the Congress Street facility was in operation with most of the Site covered in buildings, roads, utilities, and other structures that significantly restricted access to the contaminated soils. It was agreed to with NYSDEC that potential remedial options would be evaluated for the remediation of the contaminated soils. The results of the evaluation were submitted to NYSDEC as an addendum to the Feasibility Study Report in January 1997 (Supplemental FS). Due to the inaccessibility of the soils, SI Group agreed to re-evaluate potential remedial options on an annual basis to determine if new remedial technologies had become available that could be used or if Site conditions had changed that would allow remediation of the Site. Annual updates to the Supplemental FS, which reviewed new remedial technologies and Site conditions, were submitted to NYSDEC until 2007, when work was initiated to update the RI and FS for the Site.

Production at the Site ceased in 1997, and in 2004, SI Group removed all the process equipment, storage tanks, piping and buildings remaining on-site except for a small building used to house the groundwater treatment system (Figure 3). With the buildings removed, Site conditions changed, resulting in the on-site soils becoming accessible and, thereby, allowing investigation of the entire Site and evaluation of potential remedial alternatives to address OU2. A "Work Plan to Update the Remedial Investigation/Feasibility Study" (Work Plan) was prepared in August 2007 describing the work to be performed to update the Remedial Investigation and Supplemental Feasibility Study (RI/FS) for the Congress Street Site. The Work Plan was approved by NYSDEC in a letter dated August 16, 2007.

The objectives of the Updated RI/FS for the Site include the following components:

1.) A remedial investigation defining the nature and extent of contamination remaining on-site;
2.) An assessment of the stability of on-site soils to allow for informed decision making regarding the feasibility of excavation activities; and,
3.) Characterization of Site conditions to assess potential remedial options.

The field activities to update the RI were conducted in accordance with the approved Work Plan from September 2007 to December 2007. The results of the investigation were presented in the "Updated Remedial Investigation Report" dated February 22, 2008 (Updated RI Report). Comments from the NYSDEC and the New York State Department of Health (NYSDOH) were received on May 29, 2008. SI Group submitted a revised Updated RI Report in response to those comments on September 16, 2008.

In addition to minor revisions to the Updated RI Report, NYSDOH required SI Group to complete a Soil Vapor Intrusion Investigation (SVI) along the property's boundaries. This investigation was completed in December 2008. Additional comments were received from NYSDEC and NYSDOH on December 8, 2008 based on a preliminary review of the SVI Report. On January 8, 2009, the final Updated RI Report, along with the SVI Report and responses to NYSDEC comments, were submitted to NYSDEC. The Updated RI Report was approved by NYSDEC in a letter dated February 1, 2009.

1.1 Updated Supplemental Feasibility Study

Based on NYSDEC's acceptance of the Updated RI, this Updated Supplemental FS has been prepared to identify the remedial alternative, or alternatives, which will address the on-site environmental conditions associated with the Congress Street Site.

The remedial alternative evaluation presented in this Updated Supplemental FS was conducted in accordance with Title 6 of the New York Codes, Rules and Regulations, Part 375 (6 NYCRR Part 375), the National Contingency Plan (NCP), the United States (US) Environmental Protection Agency (EPA) guidance document entitled "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA" (EPA/540/G-89/004) (EPA RI/FS Guidance) dated October 1988, the NYSDEC Technical and Administrative Memorandum (TAGM) entitled "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (HWR-90-4030) dated May 15, 1990 (TAGM 4043), and the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation (DER-10).

In accordance with the NCP (40 CFR 300), the appropriate remedy will be a "cost effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment".

1.2 Report Organization

This report includes the following sections:

1.0 Introduction – presents background information and report organization.

2.0 Overview of Remedial Investigation and Current Remedial Action Plan – presents information about existing on-site soil contamination and the current remedial program that is being implemented on-site.

3.0 Development of Performance Goals – presents an identification of Applicable or Relevant and Appropriate Requirements (ARARs) and a summary of Remedial Action Objectives (RAOs).

4.0 Identification and Screening of General Response Actions, Technologies and Process Option – presents an identification of general response actions (GRAs), an identification and initial screening of technologies, and a detailed screening of technologies based on effectiveness, implementability, and cost.

5.0 Development, Detailed Analysis and Comparison of Remedial Alternatives for the Process Area – presents the development of remedial action alternatives for the Process Area utilizing the general response actions, technologies, and process options retained from the initial screening conducted in Section 4.0. Also presents a comparison of the remedial alternatives for the Process Area.

6.0 Development, Detailed Analysis and Comparison of Remedial Alternatives for the Fill Area – presents the development of remedial action alternatives for the Fill Area utilizing the general response actions, technologies, and process options retained from the initial screening conducted in Section 4.0. Also presents a comparison of the remedial alternatives for the Fill Area.

7.0 Recommendation of a Remedial Alternative – Presents the recommended alternatives for both the Process and Fill Areas based on the detailed analyses of alternatives presented in Sections 5.0 and 6.0.

2.0 OVERVIEW OF REMEDIAL INVESTIGATION AND CURRENT REMEDIAL ACTION PLAN

SI Group, Inc. (SI Group) owned and operated a chemical manufacturing facility located in Schenectady, New York at Congress Street and Tenth Avenue that has been referred to as the Congress Street facility (Figure 1). The Congress Street facility began operations in 1910 and expanded operations over the years by adding buildings and developing the Site. In 1996, the facility was producing wire enamels for electrical insulation, insulating varnishes for electrical motors, industrial enamels, and others resins for coatings and adhesives. In addition, the facility served as the corporate headquarters for SI Group's domestic and international operations.

During the facility's more than 85 years of operation, a number of spills occurred at the Site which resulted in chemical releases to the environment. During the period of 1984 through late 1995, when the facility was still in operation, a number of investigations, including a formal Remedial Investigation (RI) were completed with the objective of defining any and all environmental concerns at the Site. However, due to the fact that the facility was in operation during this period, the previous investigations were constrained due to access issues within the process areas. As a result, there were a number of data gaps associated with the extent of potential subsurface impacts defined by the historical investigations.

Production ceased in 1997, and in 2004, SI Group removed all the process equipment, storage tanks, piping and buildings remaining on the Site except for a small building used to house the groundwater treatment system. With the buildings removed, Site conditions changed, resulting in the on-site soils becoming accessible, thereby allowing investigation of the entire Site and evaluation of potential remedial alternatives. A "Work Plan to Update the Remedial Investigation/Feasibility Study" was prepared in August 2007 to describe the work to be completed to update the Remedial Investigation and Supplemental Feasibility Study for the Congress Street Site. The RI was completed in 2007 with the final Updated RI Report approved by NYSDEC on February 1, 2009. The following sections summarize the results of the Updated Remedial Investigation.

2.1 Site Setting

The Congress Street Site is located in the City of Schenectady at Congress Street and Tenth Avenue as shown on Figure 1. The facility encompasses an area approximately 7 acres in size with approximately 5.1 acres having been developed. The area south and west of the Site consists of light industrial areas; commercial facilities are located east and northwest; and residential areas to the north and northeast. The Site is located on a steep slope that has been developed over the years. Figure 2 shows the Site as it was in the late 1990's with a number of buildings located on the Site. Some of the buildings were constructed such that the lower portion of the buildings acted as retaining structures for the upper slope area. The Cowhorn Creek is located at the bottom of the slope. Between the Cowhorn Creek and the Site is an active rail line owned by CSX Transportation. The rail line serves as one of the main rail lines between Albany and western New York.

As noted above, nearby water bodies consist solely of the Cowhorn Creek, which discharges directly into the Mohawk River. The Site is situated on the side of the creek valley, which slopes down to the southwest to Cowhorn Creek. The relief across the Site is approximately 45 feet, with several relatively flat surfaces where facility structures once existed. From the Site boundary and beyond the CSX rail line, the topography drops an additional 35 feet to the Cowhorn Creek channel.

2.2 Regulatory Overview

Although some investigation activities were conducted at the Site between 1984 and 1993, the first major investigation activities to be performed at the Site were activities associated with the "Hydrogeologic Investigation Report" submitted by Conestoga-Rover and Associates (CRA) in 1993. Between 1994 and 1995, a Remedial Investigation (RI) of the Congress Street Site was completed. The results of the RI were presented in the report entitled "Remedial Investigation Report" dated September 12, 1995 (CRA, 1995). The RI Report was revised and resubmitted to NYSDEC on January 22, 1996 following comments from NYSDEC. Subsequently, NYSDEC approved the RI Report in their letter dated March 5, 1996. The investigation was completed while the facility was in operation. The results of the investigation were limited to specific areas of the Site due to the inaccessibility to the soils beneath the buildings located on the Site at that time.

Based on results of the RI, a Feasibility Study (FS) was completed by CRA and submitted to NYSDEC in July 1996. On September 18, 1996, NYSDEC issued a letter containing concerns with the FS Report and comments. The major comments to the FS Report concerned the fact that the FS Report did not address elimination of on-site contamination. Based on NYSDEC comments, SI Group prepared an Addendum to the FS Report to address NYSDEC concerns with on-site contamination. Revisions to the FS Report were submitted to NYSDEC as Addendum I on January 27, 1997 and subsequently approved by NYSDEC on February 28, 1997.

The FS recommended the control of groundwater migration from the Site and soil remediation, if and when practicable. An additional investigation was recommended to further delineate the extent of contamination in the vicinity of the buildings. At this time, the Congress Street facility was in operation with most of the Site covered with buildings, roads, utilities, and other structures that significantly restricted access to the contaminated soils. A Supplemental Remedial Investigation Work Plan was prepared and submitted to NYSDEC on April 18, 1997 to complete the investigation recommended in Addendum I of the FS.

As a result of the RI and FS actions, NYSDEC issued a Record of Decision (ROD) on March 11, 1998. The ROD split the Site into two operable units. The first operable unit (OU1) addressed migration of contamination off-site in the surface water and groundwater requiring the installation of a “french drain”. The second operable unit (OU2) was to address the on-site soil contamination by completing the investigation proposed in the Supplemental Remedial Investigation Work Plan, as well as preparing a supplemental feasibility study.

The supplemental investigation was completed in January 1998 with the results of the investigation submitted to NYSDEC on April 27, 1998. The investigation concluded that significant soil contamination existed next to and beneath the buildings, and was inaccessible for remediation. The Supplemental Remedial Investigation Report was revised and resubmitted on July 30, 1998 following comments from NYSDEC. The Report was subsequently accepted by NYSDEC on August 31, 1998. With acceptance of the Report, NYSDEC required an annual review to identify any new or improved soil remediation technologies that may be appropriate for the Site.

As a result of the annual review submitted to NYSDEC in 1999, an updated feasibility study was required to be submitted in 2000 to address NYSDEC’s request for a more detailed annual evaluation of new remedial technologies or previously rejected remedial technologies that have been improved or become feasible. On December 15, 2000, a Supplemental Feasibility Study Report was submitted to NYSDEC. The Supplemental Feasibility Study Report was accepted by NYSDEC on April 13, 2001 and has been updated annually until 2007 when work was initiated to update the RI and FS.

Since 1997, Site conditions have changed significantly. Manufacturing operations ceased at the Site in 1997, and the on-site buildings were demolished in 2004. These actions resulted in the on-site soils becoming accessible, thereby allowing investigation of the entire Site and evaluation of potential remedial alternatives. In addition, since completing the original RI/FS, potential remedial technologies have been tested at the Rotterdam Junction facility of SI Group that could potentially be used at the Congress Street Site.

As a result of these actions, a Work Plan to Update the Remedial Investigation/Feasibility Study was prepared in July 2007 describing the work to be performed to update the Remedial Investigation and Supplemental Feasibility Study for the Congress Street Site. The Work Plan was approved by NYSDEC in a letter dated August 16, 2007. The field activities associated with the approved Work Plan were completed during the period from September through December, 2007. The Updated Remedial Investigation Report, submitted February 15, 2008, presented the results of the investigation and included a comprehensive description of the nature and extent of contamination at the Site, including the previously inaccessible areas. Comments from NYSDEC and the New York State Department of Health (NYSDOH) were received on May 29, 2008. SI Group submitted a revised Updated RI Report in response to those comments on September 16, 2008.

In addition to requiring minor revisions to the Updated RI Report, NYSDOH required SI Group to complete a Soil Vapor Intrusion Investigation (SVI) along the property's boundaries. This investigation was completed in December 2008, and additional comments were received from NYSDEC and NYSDOH on December 8, 2008. On January 8, 2009, the final Updated RI Report, along with the SVI Report and responses to NYSDEC comments, were submitted to NYSDEC. The Updated RI Report was approved by NYSDEC in a letter dated February 1, 2009.

Based on NYSDEC's acceptance of the Updated RI Report, this Updated FS has been prepared to identify the remedial alternative, or alternatives, which will best address the site-specific environmental conditions associated with the Congress Street Site.

2.3 Site Operational History

As noted above, the Congress Street facility began operations in 1910 and expanded operations over the years by adding buildings and developing the Site. In 1996, the facility was producing wire enamels for electrical insulation, insulating varnishes for electrical motors, industrial enamels, and others resins for coatings and adhesives. In addition, the Site served as the corporate headquarters for SI Group's domestic and international operations.

The products produced at the facility were sold to other manufacturing facilities. The manufacturing processes generated several hazardous waste streams. In addition, the facility applied for interim status under the hazardous waste regulations that allowed the facility to store hazardous waste in containers and storage tanks for more than 90-days. A Part 373 Permit Application for the waste management areas was submitted to NYSDEC in 1988 but, as described below, the permit was never issued.

In 1994, SI Group changed their operating procedures such that hazardous waste was no longer stored at the facility for more than 90 days. This enabled the Congress Street facility to be reclassified as only a generator of hazardous waste. A permit under New York State hazardous waste regulations was no longer required. Thus, a Part 373 Permit was never issued for the facility and the permit application was withdrawn from further consideration.

In the mid-90’s, manufacturing operations were relocated to other SI Group facilities with manufacturing operations finally ceasing at the Site in December 1997. Administrative and warehousing activities continued at the Congress Street Site until October 2001 when these activities were also relocated. Since October 2001, the only activities that have been on-going at the Site have been related to the decommissioning and demolition of Site facilities, maintenance activities and remedial activities as described below.

2.4 Updated Remedial Investigation

The main objective of the recently completed remedial investigation was to adequately identify the nature and extent of contamination remaining on-site. With the removal of the potential sources of contamination aboveground, the only sources of contamination remaining are those contained in the soils. Since the original remedial investigation was limited to those areas of the Site that were accessible, this remedial investigation focused primarily on completing the delineation and characterization of soil contamination in the previously inaccessible areas.

Task 1 of the remedial investigation entailed the installation of 33 borings using a membrane interface probe (MIP) which is equipped with direct sensing capabilities to measure the level of soil contamination as the boring is installed. In conjunction with the direct sensing probe, soil samples and discrete groundwater samples were collected using Geoprobe™ direct-push technology (DPT) to confirm the results of the direct sensing probe. These initial activities enabled the efficient collection of a large amount of data that was used to further refine Task 2 of the investigation.

Task 2 of the remedial investigation involved the installation of soil borings and groundwater monitoring wells using a conventional hollow stem auger (HSA) drill rig. The borings were located in confirmed areas of subsurface contamination to allow for further delineation, as well as to further investigate the lithology of the Site and provide geotechnical data for the soils at each boring location. Continuous sampling was performed for the entire boring using a split spoon sampler. At select boring locations, a cluster of two monitoring wells were installed, one at a shallow depth at the groundwater interface and a second at a deeper depth below the observed contamination. This placement was designed to allow for a determination of the differences in the vertical contamination levels. In addition, a single shallow monitoring well was installed at two HSA boring locations in order to provide additional groundwater elevation data.

The following is a summary of the field investigation activities conducted during the Updated Remedial Investigation:

- Installation of 33 MIP borings (Figure 4);
- Installation and sampling of 13 DPT soil borings (Figure 4);
- Installation and sampling of 9 HSA soil borings (Figure 5);
- Collection and analysis of 70 Rapid Field Characterization Method (RFCM) samples;
- Collection and analysis of 24 subsurface soil samples;
- Collection and analysis of 12 grab groundwater samples;
- Installation of 8 shallow and 6 deep groundwater observation wells (Figure 6);
- Slug-testing of 13 of the 14 newly installed groundwater observation wells;
- One round of water level measurements from all wells; and
- One round of groundwater sample collection and analysis for the newly installed and all existing groundwater observation wells.

Data collected during the Updated RI were used to characterize and delineate both soil and groundwater contamination at the Site. Sampling summaries for both soil and groundwater samples are provided in Tables 1 through 4. Tables 5 and 6 present monitoring well construction details as well as groundwater elevations measured during the Updated RI.

It is noted that the data collected during the investigation indicated the presence of LNAPL in at least some portions of the Site. As part of the Remedial Program at the

Congress Street Site, an interim remedial measure (IRM) was initiated by SI Group to recover the LNAPL and to determine the amount of LNAPL that could be recovered over an extended time period. Details of the IRM are presented in Section 2.8.3.

A Soil Vapor Investigation was also completed as required by NYSDEC and NYSDOH based on comments received by the two agencies in a May 2008 letter. As part of this investigation, a total of five soil vapor samples were collected along the Site's perimeter with Congress Street, 10th Avenue and Oak Street. The results of this investigation, which was completed in December 2008, are presented in Section 2.8.4.

2.5 Site Geology

In general, the Site is underlain by a sequence of glaciolacustrine deposits which consist of inter-bedded sand, silt and clay. Three cross-sections were presented in the Updated RI Report which showed the general lithology of the Site (Figures 7 through 10). A thin unit of fill is present across much of the Site, varying from a minimum depth of 0.5 feet to a maximum depth of 6 feet. In general, the fill is comprised of a mixture of displaced natural soils of fine to coarse-grained sands and silt, with trace amounts of brick, stone, concrete, and/or asphalt. The only exception is a significant area of historic fill material, located at the northwest end of the Site, which is discussed below.

Underlying the fill is a unit of inter-bedded fine to medium sands and silt. This unit, continuous across the entire Site, is thickest on the eastern edge of the Site, with approximate thickness of 40-45 feet, and is thinnest in the area of the fill material, with an approximate thickness of only 5-10 feet. For the most part, the sand layers are comprised of fine- to medium-grained sands with variable amounts of silt. The silt layers are comprised of brown to gray silt with variable amounts of fine sands. Based on local topography, it is likely that the surface of this unit is indicative of the historic topography, prior to both Site development and fill placement in the area of the Groundwater Treatment Facility.

Boring logs, which extend deeper into the substrata, indicate that there is a continuous silt and clay unit underlying the inter-bedded sand and silt unit. Although there are some inter-bedded layers of silt and fine sand and the thickness of this unit is unknown, the surface of the unit appears to be relatively consistent in elevation. The unit is comprised of a mixture of gray silt and clay, ranging from moderately stiff to very stiff, with thin layers of silt or silt and fine sand.

Previous drilling activities at the Site that were conducted as part of the 1995 Remedial Investigation indicate that the thickness of the sequence of these glaciolacustrine deposits is at least 132 feet. Regional geologic conditions indicate that the average thickness of these deposits is approximately 150. Bedrock has not been encountered in any subsurface investigations conducted at the Site to date.

It was reported in the Hydrogeological Investigation Report completed in 1993 by CRA that an area of fill exists at the Site, which was previously placed in the vicinity of the former location of Building 9. The fill material was reported to consist of construction rubble and other Site materials.

During the Updated Remedial Investigation, a number of borings were installed in the area previously identified as the fill area, shown on Figure 11. Boring logs indicate that fill extends to a maximum depth of 11.5 feet bgs within the southern portion of the fill area and up to 26 feet bgs in the western portion of the fill area. Fill materials in this area consist of black ash, brick fragments, cardboard, stone/concrete, carpet, fibers, metal, glass and wood mixed with sand and silt. In addition, a yellow crystalline or a black tar/hardened resin material, both with a chemical odor, was present in some borings.

Regionally, many natural slopes in the area of the Site are often unstable and the disturbance of the slopes or unusual conditions such as heavy soaking rains that locally raise the water table can destabilize the slopes causing failure. Like this Site, these soils are often in the form of steeply sloped bluffs overlooking stream and river valleys. These bluffs, historically, are marginally stable in their natural condition, and become instable in situations such as when excavations are made near the base of the slopes. Major slope failures have occurred west of the Congress Street Site along Broadway that resulted in major property loss in recent years. The project Site has similar topography and geology to the failure prone areas.

Instability of Site soils was previously demonstrated during the excavation of the “french drain”. Shoring was installed on both sides of the excavation that was dug for installation of the “french drain”. A small section of the excavation was not shored due to the fact the excavation was not very deep and shoring was not considered to be necessary. During excavation, difficulties were encountered due to the sloughing of soils into the excavation. This movement of the soils also resulted in the undermining of the loading dock located at a higher elevation near the excavation.

In order to allow for informed decision making regarding the feasibility of excavation and/or other remedial activities, the stability of the soils was considered as part of the RI and assessed by evaluating soil boring logs generated.

The extent of fill area shown in Figure 11 extends vertically to about 270 feet above mean sea level (AMSL), which would require an excavation of about 30 feet deep. Although in some areas, such as to the south/southeast, the excavation side wall could be sloped back to provide adequate stability, which would remain within the confines of the property, other portions of the excavation would require substantial shoring to remain stable and not impact adjacent features such as 10th Avenue, Cowhorn Creek and the railroad tracks.

2.6 Site Hydrogeology

Groundwater elevation surface contours maps indicated that groundwater flow across the majority of the Site follows the Site topography in a southwesterly direction towards Cowhorn Creek (Figure 12). However, in the northwestern portion of the Site, the groundwater flow is predominately westward towards Cowhorn Creek and the wet well. Across Cowhorn Creek, a similar flow pattern exists with groundwater generally flowing in an easterly direction towards the Cowhorn Creek.

The horizontal hydraulic gradient across the southern part of the Site (i.e. from OW15A-07 to OW21A-07) is approximately 0.11 feet per foot (ft/ft). The horizontal hydraulic gradient across the northern part of the Site (i.e. from OW12-94 to OW7A-92) is approximately 0.19 ft/ft. Based on these data, the average horizontal hydraulic gradient across the Site is approximately 0.15 ft/ft.

It was previously reported in the Remedial Investigation Report (CRA, 1995) that, although the glaciolacustrine deposits underlying the Site are locally heterogeneous, it was expected that the stratigraphic sequence behaved as a single hydrostatic unit on a macroscopic scale. Hydraulic conductivities calculated as part of the 1995 RI were approximately 1.4×10^{-4} centimeters per second (cm/sec) for the shallow wells and 3.0×10^{-5}cm/sec for the deeper wells.

Hydraulic conductivities measured on the shallow monitoring wells installed as part of the Updated Remedial Investigation ranged from 2.23×10^{-5} cm/sec to 2.58×10^{-4} cm/sec. The geometric mean hydraulic conductivity value for the shallow monitoring wells is 1.25×10^{-4} cm/sec. Hydraulic conductivities measured on the newly installed deep monitoring wells ranged from 6.85×10^{-5} cm/sec to 4.31×10^{-4} cm/sec. The geometric mean hydraulic conductivity value for the deep monitoring wells is 2.04 x 10^{-4} while the geometric mean for the shallow wells is 1.25 x 10^{-4} cm/sec. These data suggest that the upper, inter-bedded sand and silt unit has a similar permeability as the deeper silt and clay unit, and that the stratigraphic sequence is behaving as a single hydrostatic unit. Although previous hydraulic conductivities calculated for the Site were approximately one order of magnitude lower for the deep wells, these wells were on average, approximately 50 feet deeper than the deep monitoring wells installed as part of the Updated RI.

2.7 Nature and Extent of Contamination

Based on the historical investigations conducted at the Site and the data collected during the Updated RI, three distinct areas at the Site have been identified that exhibit different characteristics associated with the nature and extent of contamination. These differences generally correlate to the past use/operations within the following areas:

- Historic Fill Area;
- Non-Process/Administration Area; and
- Former Process Area.

Discussion of the extent of contamination within each of these areas focuses first on soil contamination and second on groundwater contamination. It should be noted that due to the fact that the MIP was used as a preliminary Site-wide screening tool, a general discussion of the MIP results, including a preliminary interpretation of the potential distribution of Site contaminants, precedes the discussion of each distinct area. The MIP data, in conjunction with the historical Site data, helped in defining the limits in each of these specific areas of potential concern.

2.7.1 Determination of Soil and Groundwater Screening Levels

Overall, 49 groundwater and 94 soil samples were collected for analysis during this investigation. In addition, approximately 30 to 50 feet of qualitative data was collected using MIP technology at each of 33 locations across the Site. For this investigation, soil samples were sent to an outside contract laboratory (TestAmerica, Inc.) while additional samples were analyzed in-house by SI Group using their NYSDEC-approved Rapid Field Characterization Method (RFCM). Table 7 presents the analytical results for the soil samples analyzed by the RFCM Method by SI Group. Table 8 presents the analytical results for the soil samples analyzed by EPA Methods 8260 and 8270 for VOCs and SVOCs, respectively. For the purpose of comparison, soil data results have been compared to 6 NYCRR Part 375 Soil Cleanup Objectives for Unrestricted Use (Part 375 SCOs).

With the exception of the parameter ethylbenzene, the method detection limits associated with the RFCM analytical method are higher than the Part 375 SCOs. As a result, it is important to note that the original intent of the RFCM data was to supplement the analytical results obtained via EPA Methods 8260 and 8270, and to aid in evaluating the distribution of contaminants across the Site.

2.7.2 Discussion of MIP Results

A comparison of MIP soil conductivity (SC) measurements with Geoprobe™ boring logs from the same locations indicate that, at this Site, SC measurements have limited value in interpreting changes in lithology and do not provide the data necessary to analyze changes in lithology over depth at this Site.

In addition to SC, the MIP was equipped with an electron capture detector (ECD) that is used to detect the type of contaminants. The ECD has a limited dynamic range and is most often used for the detection of halogenated compounds (i.e. chlorinated solvents). ECD data collected at the Site show low ECD response, which is assumed to be an indication that there is minimal, if any, chlorinated solvents present in the soils and groundwater at the Site. The only locations where ECD response corresponds to either photoionization detector (PID) or flame-ionization detector (FID) measurements are MIP 18-07 and MIP 19-07, which are both located in the former fill area. This suggests that some contaminants present at these locations may be halogenated compounds.

Because the MIP produced limited results with the SC and ECD, discussion of MIP results that follows is limited to FID and PID measurements. MIP locations are presented in Figure 4.

In general, the FID and PID showed similar response and often trended together. Locations where the FID showed a response and the PID did not respond are likely indicative of methane produced by organic material. This was confirmed by a number of confirmatory Geoprobe™ borings, where wood or other organic material was present at those locations. It should be noted that the data generated by the MIP provides semi-qualitative data and is most useful as a screening tool to identify areas of potential contamination. Subsurface investigation data collected during the subsequent phases of the investigation were used to confirm the level and distribution of contaminants in the soil and groundwater.

A map of FID response across the Site was created to provide an estimate of the area(s) of highest contamination (Figure 13). The numbers listed beneath each MIP location on Figure 13 were determined by taking the maximum FID response throughout the entire depth of the borehole and dividing it by 1,000 to equalize all data. Data was then contoured at intervals of 995, 750, 500 and 250 to spatially represent different levels of contamination.

The FID response indicates that the highest levels of contamination, indicated by red shading, are present along the southeastern edge of the Site. Higher levels of contamination appear to extend inward on the Site in the areas of MIP 08-07 and MIP 14-07. Because groundwater generally flows in a southwesterly direction across the Site, these areas can be identified as potential source areas.

Figure 13 shows that the northern, eastern and southern portions of the Site have little to no potential contamination as suggested by FID response. As such, these MIP data, in conjunction with representative confirmatory sample data, can be used to adequately define the limits of contamination to the north, east and south. To the west, the groundwater collection trench serves as a barrier for migrating contaminants. Previously installed monitoring wells OW6A/6B and OW5A/B confirm that soil and groundwater contamination is not present further to the west, across the CSX rail line.

Of additional note is a clearly outlined area of low FID response at MIP 18-07 in the central part of the Site. While the area is surrounded by areas of higher response, low response at this location suggests relatively low levels of contamination.

Cross-sections of FID measurements are presented in Figures 14a through 14d. The locations of the cross-sections are represented on Figure 4. The cross-sections represent each of the four NW/SE transects of MIP borings that were installed and provide an initial assessment of the vertical limits of contamination. Figure 14a shows that there is very little FID response across the northeastern portion of the Site. This area, located on the topographically highest portion of the Site, is the area of the former administration buildings.

Figures 14b and 14c represent transects that span from the Groundwater Treatment Facility, through the process areas and to the southern edge of the Site. Low FID response in the MIP borings closest to the Groundwater Treatment Facility (MIP 15-07) shows that the soils and groundwater in this area are relatively clean. However, FID logs from the remaining borings in these transects indicate two distinct areas of contamination, one of which is within the historic fill area, and the second area located beneath the former process buildings. High FID response in borings located in the historic fill area shows that the fill material contains high levels of contamination that extend to depths of up to 25 to 30 feet bgs. There is a distinct area of cleaner soils/groundwater separating the fill area from the contamination present beneath the former process buildings to the south. FID logs of borings located in the area of former process buildings show that contamination extends to depths of 25 to 30 feet bgs.

Figure 14d represents a transect that spans from the loading dock near the Groundwater Treatment Facility and along the rail siding and berm on the southwest portion of the Site. High FID measurements in these borings indicate that contamination is present along the entire transect. FID logs show that contamination is contained within the upper 20 feet of soil and groundwater to the south along the transect. However, the FID log of MIP 33-07, located in the historic fill area, shows that contamination may extend to depths of up to 30 to 35 feet bgs in this area. There is some variability associated with FID measurements in the fill area and it is assumed to be a reflection of the variability of the fill material itself. It is anticipated that many small, isolated areas of contamination exist within the fill area, along with void space. Both FID logs and field screening of subsequently installed borings located in the fill area confirm this.

2.7.3 Extent of On-site Contamination

2.7.3.1 Fill Area

An historical fill area exists in the southwest corner of the Congress Street facility that encompasses approximately 0.5 acres. This area is bordered to the north by the embankment leading up to 10th Avenue, to the west and south by the security fence, and to the east by the middle of the former Building No. 9 as shown in Figure 11. The Remedial Investigation Report that was submitted to NYSDEC in September 2008 reported that the area was used for the disposal of construction rubble and other Site generated materials and debris. In response to comments received from NYSDEC on June 30, 2009 concerning the Updated Feasibility Study submitted on May 1, 2009, SI Group agreed to complete a study to further characterize the Fill Area and the waste materials that were potentially placed in the area. The study evaluated the historical use of the Fill Area and the materials potentially placed in the area, and included an analysis of the black tar-like material that has been identified as one of the major waste materials in the Fill Area. The results of the study are discussed in this section.

The first building (Building No.1) at the Congress Street site was built in 1907 for the manufacture of varnishes that were used as insulation material for electrical devices. Until World War 2, the insulating resins consisted of naturally derived resins. Man-made or synthetic resins were developed during World War 2 and replaced many of the naturally derived products. The new polymer technology impacted the electrical insulation industry in the 1950s with the development of heat-resistant resins, allowing the development of smaller motors with higher capacities. In 1963, SI Group was granted a patent for ISONEL®, an insulating varnish made up of oil-modified alkyd resin and an oil-soluble phenol/formaldehyde resin. Following the development of ISONEL®, other products were developed such as the THEIC polyester resins, ISONEL® 200 coatings, ISOMID®, and ISOPOXY®.

According to interviews that were completed in October 1990 for preparation of the RCRA Facility Assessment, the Fill Area was used from 1910 to the 1960s, when the loading dock and the plant entrance on 10th Avenue at the Oak Street bridge were installed. As part of the installation of the new entrance, six houses as shown in old photographs located on the south side of 10th Avenue, west of the Administration Building, were demolished and the associated demolition debris was placed in the Fill Area. Following disposal of the demolition debris in the Fill Area, the area was covered, a loading dock was constructed on top of the area, and a portion of the area was paved.

The area between Building 9 and the loading dock was then used to store drums of hazardous waste until 1987. The area continued to be used for storage of materials until operations at the facility ceased in the 1990's. The date that the area was placed in operation for the storage of drums is unknown.

Boring logs from the Fill Area show a mix of ash, glass, bricks, burlap fabric and organic materials. The organic materials observed were the black tar-like material mentioned above, a yellow crystalline material and a white powder. The black tar-like material and the yellow crystalline material are representative of the insulating resins produced at the facility and the white powder is representative of the raw materials used. The upper portion of the borings consists primarily of construction debris, which is probably representative of the houses that were disposed of in the area prior to closure and is consistent with the timeline established by personnel interviews. Ash is also seen in a number of the borings at all levels. Based on the 1990 interviews, process wastes and ash from burning combustible wastes such as pallets and bags may have been disposed in the area.

Prior to the environmental regulations presently in place, the open burning of waste was a common practice. The Fill Area was probably used for the burning of combustible waste material during the period that it was open. In addition, for many years, the resins that were produced at the Congress Street facility were made in large pots with the raw materials added to these pots and cooked until the desired resin was produced. These pots were contained in large brick ovens with the pots heated by gas burners in the later years. In the early years, these ovens were probably fired by coal or wood (since natural gas was not available) with the ash being disposed in the Fill Area.

The bricks seen in the Fill Area are probably representative of construction debris from the building and expansion that occurred on-site. The early buildings that were located on the site were of brick construction. Based on photos, the area was probably used for the disposal of solid debris including process material and construction rubble generated by the facility.

A sample of the black tar-like material was collected on August 7, 2009 from an area located between two concrete floor slabs in the former Building 9 area. The sample, based on visual observation and olfactory recognition, appeared to be similar to the black tar-like material that has been observed in the borings completed in the Fill Area. The location where the sample was collected from was an area where tar-like material has been observed oozing from the ground during hot summer days. The top layer of material was removed and the sample was collected from material that had not been directly exposed to the outside environment. The sample was then delivered to SI Group's Research Department located in Niskayuna, New York for analysis. The sample was characterized and a treatability analysis was completed on the sample.

The black tar-like material was reported to be a thick, black, gooey material having the typical odor of cresols and xylenols. Testing of the sample showed a composition of:

Water	4-7%
Cresylics and aromatic hydrocarbons	5-10%
Inorganics	4-5%
Polymeric and cellulosic material	75-85%

A gel permeation chromatography analysis of the sample indicates that the bulk of the material is made up of polymeric materials, which is representative of the insulating materials that were produced at the Congress Street Site. These large polymeric materials have the characteristics of a gooey, gel-like material that has a high viscosity and the tendency to encapsulate other materials, including water and organic compounds.

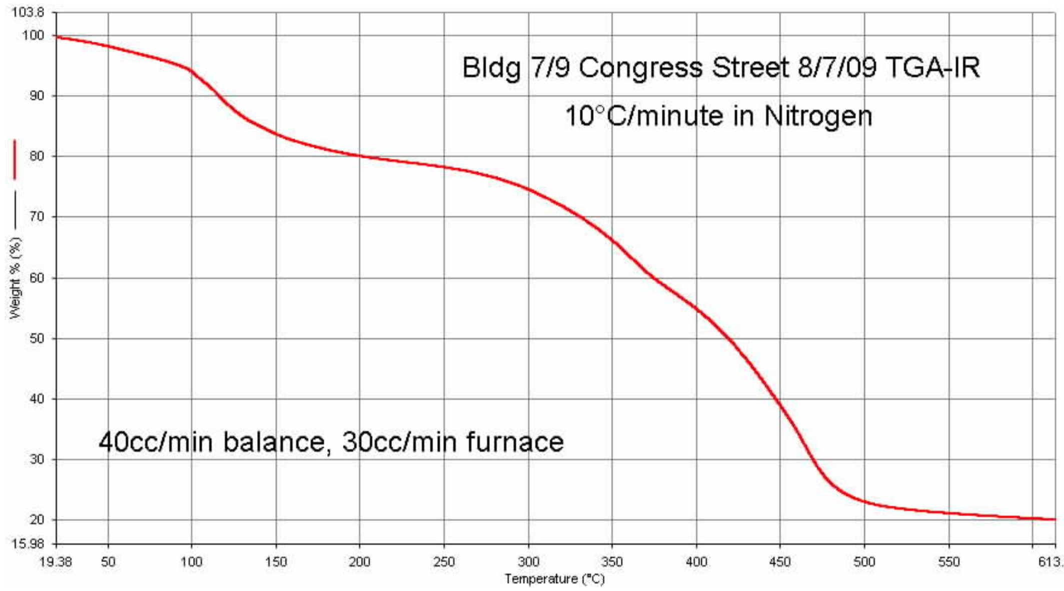
The testing of the water content in the samples by coulometric titration showed very inconsistent results throughout the sample (1.4%, 4.9%, 6.9%), indicating that the water was probably absorbed or partially trapped into the sample. The sample did not show any solubility in water but showed partial solubility in toluene and heptane.

The following solubility test was completed:

	Toluene	*Heptane*
Wt of filter, g	40.7170	40.5826
Sample wt, g	1.4495	1.3617
Solvent, g	30.6	30
Residue, g	0.6348	0.6918
Soluble mass, g	0.8147	0.6699
% Soluble	56.12	49.20
Total Filtrate content, g	27.5	19.3
GC Analysis of Filtrate		
% Cresylics	0.17	0.17
% Solvent	97.3	99.2
% Cresylics in Sample	3.23	2.41

The semi-volatile, soluble material contained in the toluene and heptane were analyzed by GC and GC-MS and were determined to be a blend of cresylic acid and aromatic hydrocarbons that included phenols and naphthalene. The non-volatile, soluble material was determined to be polymeric in nature by gel permeation chromatography and shown to have an average molecular weight, M_w, of 21,000 daltons, which is typical of the materials produced at the Congress Street Facility. The insoluble residue was analyzed by IR and was identified to be cellulosic (small wood particles) and polymeric materials.

A thermogravimetric analysis (TGA) of the sample was completed. TGA shows the change in weight of a sample with temperature. Weight change may be associated with moisture, solvents, semi-volatile materials, and thermal degradation of the sample. The analysis was carried out by raising the temperature of the sample from 35ºC to 600ºC at a rate of 10ºC per minute and measuring the weight loss. The atmosphere in the small electrically-heated oven was purged with nitrogen to prevent oxidation or other undesired reactions. As shown in the following graph, at 100ºC, the sample showed a weight loss of 6%, presumed to be representative of the water contained in the sample. At 200ºC, the sample showed a weight loss of 20% that is representative of the water, cresylics and low aromatic hydrocarbons contained in the sample. At 300ºC, thermal decomposition of the sample started. Only 20% of the sample remained at 600ºC.



A treatability analysis of the black tar-like material was completed in order to simulate the potential use of thermally-enhanced soil vapor extraction. A sample of the material was placed in an air-tight Erlenmeyer flask with a nitrogen flow of 1 ml/min. The Erlenmeyer flask was maintained in a water bath at 95ºF. The purge of nitrogen was bubbled through a heptane trap to capture any of the volatile or semi-volatile compounds that were removed from the black tar-like material. An initial sample of 51.769 grams of material was used for the test; the sample was weighed periodically throughout the test to determine the percent loss. During the test, a liquid was observed to be condensing at the end of the outlet tubing prior to the heptane trap. An analysis of this liquid condensate collected over 5 days during the test, starting at day 10, showed it to be water. A GC-MS analysis of the condensate showed trace levels of phenol and cresols. An accurate quantification of these compounds could not be determined as the levels were very low. A sample of the heptane trap collected over this same time period was also analyzed by GC-MS and showed the trace presence of hydrocarbons, but no phenol or cresol. Again, quantification was not possible, as heptane in the trap was lost during the study.

After 41 days of operation, 7% of the material was removed from the sample. The major component removed during the test was water and trace levels of phenol, cresols, and hydrocarbons. These results correspond to those of the thermogravimetric and compositional analyses that were completed on the sample. The thermally-enhanced SVE simulation did not detect the removal of any volatile organic compounds and only trace levels of semi-volatile compounds (boiling point range of 100^o – 200^o C) were removed. The results indicate that there are no VOCs contained within the black tar-like material and that, at 95ºF, only trace levels of SVOCs are removed.

Cresols, which was one of the compounds identified as being removed at trace levels from the black tar-like material is normally a mixture of para, ortho, and meta-cresols or methylphenols that have a sweet, tarry odor. Depending on the type of cresol, the melting point can vary between 54ºF and 95ºF. The low vapor pressure (0.11 to 0.29 mm of Hg at 77ºF) of these compounds results in low volatility, as is evident in the trace amount of cresols identified in the heptane trap and condensate during the thermally-enhanced SVE simulation. The boiling point of cresols is between 376ºF and 396ºF depending on the isomer. Therefore, to increase the rate at which cresol is removed from the black tar-like material, the material would have to be heated substantially. Based on the TGA analysis, the cresols and other high boilers were released at a much faster rate once the material was heated to over 212ºF. At these temperatures, the flash point of cresols (178ºF to 187ºF) is exceeded. Cresol is classified as a combustible solid and under proper conditions, a fire could be initiated.

The solubility of cresols is approximately 2% in water, which is consistent with the solubility results of the black tar-like material that showed it to be insoluble in water. With the cresol having low solubility, disbursed throughout the tar-like material, and encapsulated by the large polymeric materials, the cresols would slowly leach from the black tar-like material as it is flushed with water. The groundwater currently being extracted from the Wet Well, which includes groundwater from the Fill Area, contains methylphenol concentrations in the 50 to 100 ppb range. It is anticipated that, since only very low concentrations of the methylphenol compounds have been detected in Process Area wells, much of the methylphenol detected in the Wet Well samples is from the black tar-like material in the Fill Area.

The results of the collective treatability analyses indicate that the black tar-like material can not be treated using thermally-enhanced SVE. Significantly higher temperatures upwards of 212ºF would be required to effectively remove some portion of the SVOC contamination contained within the black tar-like material. At these temperatures, the flash point of the contaminants is exceeded and poses a significant fire hazard.

The extent of the Fill Area has been estimated on Figure 11. The following sections discuss the nature and extent of contaminants in the Fill Area.

2.7.3.1.1 Soils

Field screening of fill materials using the MIP and a hand-held PID show that high levels of contaminants are present in the fill material in the vicinity of borings GP-14-07, GP-16-07, GP-17-07, GP-33-07, OW18A/B-07 and OW19A/B-07. Analytical data from the samples collected from these locations are summarized in Tables 7 and 8.

Isoconcentration contours for total concentrations of RFCM analytes indicate that a distinct area of contamination exists in both the upper (Figure 15) and lower (Figure 16) portions of the unsaturated zone in the fill area. However, the impacts are much greater in the lower portion of the fill area than in the upper portion. It is important to note that as shown on the MIP log for MIP 33-07, there is high variability in the MIP response that is likely a result of the variability of fill materials themselves. Samples collected from the borings contained materials ranging from burlap to brick to a tar-like material, and are present in small intervals interspersed with void space. It is expected that contamination in the fill area is equally as variable and isoconcentration contours should be viewed as estimates only.

RFCM isoconcentration contours show that while the eastern portion of the fill contains parameters detected at concentrations exceeding Part 375 SCOs in both the upper and lower portions of the fill material, contamination in the western portion of the fill area appears to be limited to depths of 14 feet bgs or more. Benzene, toluene, chlorobenzene, ethylbenzene, total xylenes, phenol and total cresols were all detected at concentrations exceeding Part 375 SCOs in one or more samples from all boring locations except GP-16-07. Despite a high FID response at this location, no parameters were detected in RFCM samples collected at GP-16-07. Deep samples from GP-33-07 contain the highest concentrations of RFCM contaminants across the Site. The sample collected from GP-14-07 is the only shallow soil sample collected from the fill area exhibiting any evidence of severe impacts.

In general, samples analyzed for VOCs and SVOCs by TestAmerica exhibit similar contamination as those samples analyzed by the RFCM. Isoconcentration contour maps of total VOCs and SVOCs (Figure 17), total VOCs (Figure 18), and total SVOCs (Figure 19) indicate that high concentrations of contaminants are present in the fill area. Similar to the RFCM data, boring location GP-33-07 contained the highest total VOCs and SVOCs. The only significant discrepancy between the two analytical methods was in samples from GP-16-07, where low concentrations of contaminants were detected in the

TestAmerica sample from this location and results were below detection limits in the RFCM sample.

A comparison of Figures 18 and 19 suggests that SVOCs are the predominant contaminant type in the fill area. The following table lists the concentration for each major Site contaminant in samples collected from the lower unit of fill area (depths >14 feet bgs) and which had one or more parameters detected at concentrations exceeding Part 375 SCOs:

	Sample Location ***Sample Depth*** ***Part 375 SCOs***	*GP-17-07* *19'-20'*	*GP-33-07* *16.5'-17'*	*OW18A/B-07* *20'-22'*
Benzene	*60*	6.6 U	**780**	3.1 J
Ethyl-benzene	*1000*	6.6 U	**81,000**	160
Toluene	*700*	6.6 U	**130,000**	3.1 U
Total Xylenes	*260*	6.6 U	**710,000**	**330**
2-Methylphenol	*330*	1,700 U	**100,000**	2,100 U
4-Methylphenol	*330*	**1,900**	**580,000**	2,100 U
Naphthalene	*12,000*	730 J	**19,000**	9,500
Phenol	*330*	1,700 U	**210,000**	**910**

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding a Part 375 SCO
All units are in µg/kg

It is noted that some parameters were also detected at concentrations in exceedance of Part 375 SCOs in the sample collected from 6.9 to 7.3 ft bgs in boring GP-14-07; however, this is the only sample collected from above 14 feet bgs that indicated significant contamination. All other data indicates that impacts are primarily limited to depths greater than 14 feet bgs.

These data are generally similar to data collected during previous investigations conducted at the Site in that similar contaminants were detected; however, measured concentrations were considerably lower during the Updated RI. An area of SVOC contamination in the historic fill area was defined by subsurface samples collected as part of the 1995 remedial investigation. The 1995 remedial investigation identified the highest concentrations of SVOCs in the historic fill area, with maximum concentrations of primary contaminants ranging from 190,000 µg/kg to 2,500,000 µg/kg, which are slightly higher than was identified during the current remedial investigation. Samples collected in the historic fill area as well as a soil gas survey conducted as part of the

Hydrogeological Investigation also revealed high VOC concentrations in soils in the historic fill area, similar to those identified during the Updated RI.

2.7.3.1.2 Groundwater

Field screening of saturated soil in the area of historic fill indicates that contamination extends to depths up to 40 feet bgs. Both MIP and field screening of saturated soil samples from GP-14-07 suggest that contamination does not extend into the groundwater table in the eastern portion of the fill area. However, MIP and field screening results suggest that contamination extends to depths ranging from 30 feet bgs (OW18A/B-07) to 40 feet bgs (OW19A/B-07) in the western portion of the fill area, just south of the Treatment Facility. Analytical data for groundwater samples collected from these locations are summarized in Tables 9 and 10.

Although groundwater samples could not be collected at most Geoprobe™ boring locations in the fill area, samples were collected at GP-14-07 and GP-16-07. Analytical data from the discrete samples collected at GP-14-07 and GP-16-07 indicate that groundwater impacts are present in shallow groundwater at these locations. A number of parameters were detected at concentrations that exceed TOGS 1.1.1 groundwater standards in one or both of these grab groundwater samples

Groundwater samples collected from shallow wells OW18A-07 and OW19A-07, located in the historic fill area also contained a number of parameters at concentrations exceeding TOGS 1.1.1 groundwater standards. However, the sample collected from deep monitoring well OW18B-07 did not contain any parameters detected at concentrations exceeding guidance values. The sample from deep monitoring well OW19B-07 contained only total xylenes and 2,4-dimethylphenol at concentrations exceeding guidance values. Collectively, however, these data suggest that only a limited number of contaminants are present in lower concentrations at depths greater than 35 feet bgs in the groundwater within the fill area. The following table lists the concentration for each major Site contaminant in both shallow and deep groundwater samples collected from the fill area and which had one or more parameters detected at concentrations exceeding TOGS 1.1.1 standards:

Sample Location		GP-14-07	GP-16-07	OW18A-07	OW19A-07	OW19B-07
	Sample Depth	19'-20'	13'-15'	20'-30'	17'-27'	40'-50'
	TOGS 1.1.1					
Benzene	*1*	**7.2**	5 U	**1.3 J**	**31 J**	5 U
Ethyl-benzene	*5*	**23**	**26**	**7.7**	**460**	2.3 J
Toluene	*5*	**6.3**	0.77 J	**4.3 J**	**380**	1 J
Total Xylenes	*5*	**200**	**120**	**68**	**5,300**	**35**
2-Methylphenol	*1*	**88 J**	**9.5 J**	**1.9 J**	**180**	10 U
4-Methylphenol	*1*	**730**	**44**	**4.2 J**	**420**	10 U
Naphthalene	*10*	**10 J**	2.7 J	**28**	**130**	0.71 J
Phenol	*1*	**29 J**	**7.6 J**	**1.8 J**	**140**	10 U

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding TOGS 1.1.1 standards
All units are in µg/L

Groundwater analytical data collected during the 1995 remedial investigation are generally consistent with results of the current remedial investigation. The highest concentrations of contaminants were measured in samples collected just downgradient from the historic fill area, in wells OW3 and OW7A-92 (Figure 2), and contained both VOCs and SVOCs at concentrations exceeding groundwater standards. Low level detections in deeper wells suggest that groundwater contamination was generally confined to the fill area and confirm the results of the current remedial investigation.

Consistent with the MIP data in the immediate vicinity of the Groundwater Treatment Facility, groundwater analytical results from monitoring well OW13, located just north of the treatment building, indicate that there is no contamination in this area. There were no parameters detected at levels above the laboratory method detection limits in this well during this remedial investigation and historically, there were no detections in samples collected from this well during the 1995 remedial investigation.

2.7.3.2 Non-Process/Administrative Area

The portion of the Site located along the northeastern most edge consists of a relatively flat area, sloping upwards to the east/northeast towards 10th Avenue (Figure 3). This area was historically used for driveways and the former administration buildings, and is at an elevation approximately 20 feet higher than the rest of the Site. In addition, this area is upgradient of all previously identified source areas and the process area. Soil and groundwater analytical data from this area have been used to define the limits of horizontal contamination in this area.

2.7.3.2.1 Soils

Field screening using MIP and a hand-held PID suggest that, in general, soil on the northeastern portion of the Site is not contaminated. Analytical results for total concentrations of RFCM analytes are summarized on Figures 15 and 16. Isoconcentration contours of total analytes indicate that shallow soils (0' to 6') are not impacted in this area. However, phenol was detected at a concentration exceeding Part 375 SCOs (13,500 µg/kg) in a deep (9-10' bgs interval) RFCM soil sample collected at GP-01-07. Since there were no field indicators of contamination in this area or FID response in the associated MIP boring (MIP 01-07), this detection appears to be an anomaly. In addition, there were no other detections in either shallow or deep RFCM soil samples collected from the top of the slope.

Analytical results for total VOCs and SVOCs in soil samples collected from the non-process area and analyzed via EPA Methods 8260 and 8270 are summarized on Figures 17-19. Isoconcentration contours of total VOCs and SVOCs indicate an area of slightly impacted soil in the vicinity of OW15A/B-07. Parameters detected above Part 375 SCOs consist only of seven (7) SVOCs. However, the parameters were detected at low concentrations relative to the remaining portions of the Site. There were no detections in the sample collected from GP-01-07. The following table lists the concentrations for each compound detected above Part 375 SCOs in the soil sample collected from boring OW15A/B-07:

Parameter	***Concentration (µg/kg)***
Benzo(A)Anthracene	450
Benzo(A)Pyrene	320 J
Benzo(B)Fluoranthene	390 J
Benzo(K)Fluoranthene	150 J
Chrysene	400 J
Dibenzo(A,H)Anthracene	72 J
Indeno(1,2,3-Cd)Pyrene	290 J

Notes
J: Indicates an estimated value

A soil gas survey conducted as part of the Hydrogeological Investigation in 1993 identified an isolated area of VOC-impacted soil near the Administration Building. However, these results were not substantiated in the 1995 RI, as no samples contained VOCs or SVOCs at concentrations greater than 20 µg/kg.

In general, impacts to soils in the vicinity of the former administration building are minimal. However, the detection of select parameters in samples from GP-01-07 and OW15A/B-07 suggest that there may be isolated portions of the upper slope with minor soil contamination. While the source of these detections is unknown at this time, concentrations are low relative to the rest of the Site, and are not considered to be associated with any significant source. In addition, the former administration/non-process area is upgradient from the process area. Similar to the 1995 RI, VOCs were not detected in samples collected from the area in the vicinity of the former administration building.

2.7.3.2.2 Groundwater

Field screening of saturated soil in the area formerly used for the administration building indicates that groundwater is not impacted. Neither MIP nor hand-held PID readings of saturated soil showed any indication of groundwater contamination. Groundwater samples were collected in this area at GP-01-07, OW12-94, OW15A-07 and OW15B-07. Analytical data for groundwater samples collected from these locations are summarized in Tables 9 and 10.

No parameters were detected in any of the groundwater samples at concentrations that exceed TOGS 1.1.1 groundwater standards. Concentrations of compounds detected below TOGS 1.1.1 groundwater standards ranged from 0.59 J µg/L to 2.3 J µg/L. The following table lists the concentrations of compounds detected in groundwater samples collected from the non-process area:

Parameter	*Sample Locations*	*Concentration (µg/kg)*
Xylene	OW15A-07	0.59 J
Xylene	OW15B-07	1.6 J
Bis(2-ethylhexyl) phthalate	GP-01-07	2.3 J

Notes
J: Indicates an estimated value

Isoconcentration contours of both shallow (Figures 20 through 22) and deep (Figure 23) groundwater confirm that groundwater along the northeastern edge of the Site has not been impacted by Site activities. These data are generally consistent with the results of previous investigations conducted at the Site. Of the wells sampled in the non-process area during the 1995 remedial investigation (OW2A-87, OW2B-87 [Figure 2], and OW12-94), there were no detected parameters in samples collected from these wells. Results from groundwater monitoring performed as part of the 1995 Remedial

Investigation support the results of this remedial investigation and further suggest that groundwater along the northeastern portion of the Site is not impacted.

Overall, groundwater in the vicinity of the former administration building does not appear to have been impacted by Site activities and indicates that remedial measures for groundwater are not necessary at this time.

2.7.3.3 Process Area

The remaining portion of the Site consists primarily of an area that was historically used for chemical processing, storage, and handling. In previous investigations, this area had been identified as most severely impacted and contained the major source areas at the Site. However, the nature and extent of contamination in the process area has been poorly defined prior to this investigation. Soil and groundwater analytical data collected during this investigation confirm both the horizontal and the vertical extent of contamination. In addition, analytical data collected during this investigation allows for the characterization of the major area of contamination, beneath the former process area, by the type of contaminant (VOCs versus SVOCs). Impacts to this area are discussed in detail below.

2.7.3.3.1 Soils

Field screening of soils using MIP and a hand-held PID suggest that contamination exists in both shallow and deep unsaturated soils in the process area (Figures 14b through 14d). Analytical results for total concentrations of RFCM analytes are summarized on Figures 15 and 16. Isoconcentration contours of total RFCM analytes show that highest concentrations of contaminants are present in the vicinity of GP-29-07. In fact, the soil sample from this location, collected from 0.7 to 1.3 feet bgs, contains the highest concentration of RFCM analytes across the entire process area. However, a deeper sample from this location shows that soil contamination is confined to the upper 4 to 6 feet of the subsurface soils. The isoconcentration contours (Figure 15) of shallow soils indicate that while the highest concentrations are in the vicinity of GP-29-07, shallow contamination extends eastward to GP-08-07 and as far south as OW21A/B-07. The isoconcentration contours of deep RFCM soil samples, however, suggest that contamination is more extensive in deep soils than in shallow soils. Because the RFCM is limited with respect to the number of analytes as well as the method detection limits, soil sample data obtained via EPA Method 8260 and 8270 were reviewed to further define the limits of soil contamination in the former Process Area.

Analytical results for total VOCs and SVOCs in soil samples collected from the process area and analyzed via EPA Method 8260 and 8270 are summarized on Figures 17 through 19. An isoconcentration contour map of total VOCs and SVOCs (Figure 17) indicates that impacted soils are present beneath the majority of the former process area. The only exception is soils in the area of GP-18-07; a soil sample collected at this location had no detected parameters. This area appears to separate highly-impacted soils to the southeast, presumably related to chemical process activities, from the highly-impacted area to the northwest associated with the historic fill area, and provides further evidence that this location represents the edge of the fill area.

Isoconcentration contours of total VOCs (Figure 18) further define the two distinct areas of contamination, i.e. the historic fill area and the process area. The highest levels of total VOCs are present in a soil sample collected at OW22-07, showing that it is serving as a source area. Soil samples collected at GP-29-07, OW17A/B-07, GP-08-07, and OW16A/B-07 also have relatively higher levels of total VOCs than soil samples collected from other boring locations in the process area. The only VOCs that exceeded Part 375 SCOs in soil samples from the process areas are ethylbenzene, toluene, trichloroethane and total xylenes. Acetone and methylene chloride were also detected at low concentrations in GP-09-07 and OW16A/B-07, respectively. However, both compounds are common laboratory contaminants, were detected at relatively low, estimated values, and are therefore considered to be associated with laboratory contamination. The following table lists the concentration for each major VOC in soil samples collected from the process area and which had one or more parameters detected at concentrations exceeding Part 375 SCOs:

	Sample Depth	*Ethylbenzene*	*Toluene*	*Total Xylenes*	*Trichloroethylene*
Part 375 SCOs		*1000*	*700*	*260*	*470*
GP-08-07	*5' – 6'*	**13,000**	1,300 U	**83,000**	1,300 U
GP-19-07	*10' – 11'*	64	6.7 U	210	6.7 U
GP-29-07	*3' – 4'*	**54,000**	**240,000**	**150,000**	13,000 U
OW16A/B-07	*10' –12'*	**28,000**	**12,000**	**120,000**	1,500 U
OW17A/B-07	*10' –12'*	**25,000**	1,300 U	**84,000**	**490 J**
OW21A/B-07	*2' –5'*	250 J	620 U	**5,100**	620 U
OW22-07	*8' –10'*	**190,000**	**2,300 J**	**700,000**	12,000 U

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
***BOLD** indicates parameter detected at concentration exceeding a Part 375 SCO*
All units are in µg/kg

The limit of VOC-impacted soils is generally defined to the north by GP-19-07, to the east by GP-09-07, to the south by GP-24-07, and to the west by OW20-07 and the groundwater collection trench. These data are generally comparable to previous investigations conducted at the Site. An area of VOC contamination in this area was initially defined by a soil gas survey performed as part of the Hydrogeological Investigation in 1993, and by subsurface soil samples collected as part of the 1995 RI. The primary contaminants identified included ethylbenzene, toluene and total xylenes. The primary area of VOC contamination was generally determined to be along the southwest side of the Site near former Building Nos. 1, 5, 9 and 10, which was historically a railroad tank car loading/unloading area, as well as a former raw material and tank area. It should be noted that the 1995 RI reported somewhat higher levels of VOCs than were detected during the current RI.

Isoconcentration contours of total SVOCs (Figure 19) show that soils are more highly impacted by SVOCs in the vicinity of OW17A/B-07 and GP-29-07. In general, however, SVOCs are present at lower concentrations than VOCs in soils. Similarly, to the extent of VOC contamination, SVOCs are present in relatively higher concentrations in the vicinity of OW22-07, GP-08-07 and OW16A/B/-07. SVOCs were also detected at high concentrations in OW21A/B-07. SVOCs present in one or more process-area soil samples at concentrations exceeding Part 375 SCOs are listed in the following table:

	Sample Depth	*4-Methylphenol*	*Naphthalene*	*Phenol*
Part 375 SCOs		330	12,000	330
GP-29-07	*3' – 4'*	20,000 U	**180,000**	20,000 U
OW17A/B-07	*10' –12'*	8,600 U	**21,000**	8,600 U
OW20-07		**1,300**	2,400	**510**
OW21A/B-07	*2' –5'*	3,900 U	**25,000 J**	810 U
OW22-07	*8' –10'*	400 U	220 J	**620**

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding a Part 375 SCO
All units are in µg/kg

These data are generally consistent with the results of previous investigations conducted at the Site. An area of SVOC contamination in this area was defined by subsurface soil samples collected as part of the 1995 RI, but was generally defined to be the same area as VOC contamination (i.e. the area near former Building Nos. 1, 5, 9 and 10). The primary contaminants of concern identified were phenolic and naphthalene compounds.

Overall, subsurface soils in much of the former process areas are highly impacted by both VOC and SVOC contamination. Analytical data show the presence of a source area in the vicinity of OW16A/B-07, GP-08-07, OW17A/B-07, and GP-29-07. While contamination in the vicinity of OW17A/B-07 and GP-29-07 appears to be mainly related to SVOC contamination, impacts to soil in the vicinity of GP-08-07 and OW16A/B-07 are mainly related to VOC contamination. These results are generally consistent with the findings of previous investigations. However, previous investigations did not identify the two areas of VOC and SVOC contamination that were delineated during the current remedial investigation.

2.7.3.3.2 Groundwater

Field screening of saturated soil in the process area indicates that groundwater is impacted at varying depths. Both MIP and hand-held PID readings of saturated soil showed evidence of groundwater contamination to depths of 15-20 feet in some samples. Shallow groundwater samples were collected in the process area at GP-09-07, GP-19-07, and from each of the shallow monitoring wells installed in the process area. Analytical data for groundwater samples collected from these locations are summarized in Tables 9 and 10.

Results from the samples collected at GP-09-07 and GP-19-07 indicate that shallow groundwater in these areas is not impacted, and aids in defining the limits of shallow groundwater contamination. Analytical results for total VOCs and SVOCs in shallow groundwater samples collected from the process area are summarized on Figures 20-22. An isoconcentration contour map of total VOCs and SVOCs (Figure 20) indicates that shallow groundwater is most impacted in the vicinity of OW16A-07, OW17A-07, and OW22-07.

Shallow Groundwater – Isoconcentration contours of total VOCs (Figure 21) further supports the distinction between the two distinct areas of contamination, i.e. the historic fill area and the process area. The highest levels of total VOCs are present in soil samples collected at OW16A-07 and OW22-07, showing it as a source area. Groundwater samples collected at these locations also had a relatively higher level of total VOCs than groundwater samples collected from other boring locations. These data further show that source areas are present in the vicinity of OW22-07 and OW16A-07. High concentrations of VOCs were also present in OW17A-07 and OW20-07. VOCs present in one or more process-area shallow groundwater samples at concentrations exceeding TOGS 1.1.1 standards are listed in the following table:

TOGS 1.1.1	*Sample Depth*	*Benzene* 1	*Ethylbenzene* 5	*Toluene* 5	*Total Xylenes* 5
OW16A-07	*8'-18'*	400 U	**4,900**	**10,000**	**22,000**
OW17A-07	*8'-18'*	**6 J**	**2,100**	**21 J**	**6,700**
OW20-07	*8'-18'*	5 U	**440**	**120**	**3,600**
OW21A-07	*8'-18'*	**6.7 J**	**110**	**5.3 J**	**590**
OW22-07	*8.5'-18.5'*	500 U	**14,000**	**1,800**	**45,000**

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding TOGS 1.1.1 standards
All units are in µg/L

The limit of VOC-impacted groundwater is generally defined to the north by GP-19-07, to the east by GP-09-07, and to the west by the groundwater collection trench.

An isoconcentration contour map of total SVOCs (Figure 22) shows that the highest levels of total SVOCs are present in the shallow groundwater samples collected at OW17A-07 and OW20-07. A layer of LNAPL was observed on the water table surface in monitoring well OW17A-07 and extraction well EW-2. Measured thickness at OW17A-07 was approximately 0.5 ft and 2.25 ft at EW-2. The approximate extent of LNAPL is presented on Figure 22 and shows that the high levels of SVOCs are associated with the presence of LNAPL. Groundwater samples collected from OW17A-07 indicate that the major chemical constituents in the LNAPL are primarily SVOCs, including: ethylbenzene, xylene, 2-methylnaphthalene, naphthalene, and di-n-butylphthalate. As reported in the original Remedial Investigation (CRA, 1995), LNAPL had previously been observed in abandoned well OW10-94, located near OW17A-07 and EW-2. It is noted that LNAPL has not been observed in nearby wells OW21A-07 or OW20-07 or in boring GP-09-07, and therefore shows that the distribution of LNAPL is confined to a relatively small area situated in the area of OW17A-07, EW-2 and former OW10-94. An IRM was initiated in 2008 to recover the LNAPL observed in OW17a-07 and EW-2 on a monthly basis in order to determine the amount of LNAPL that could be recovered over an extended time period. Results from the IRM show that the amount or extent of the LNAPL that collects on the groundwater surface is very limited and the LNAPL layer flows to the wells at a very slow rate. The IRM is discussed in detail in Section 2.8.4.

SVOCs present in one or more process-area shallow groundwater samples at concentrations exceeding TOGS 1.1.1 standards are listed in the following table:

TOGS 1.1.1	Sample Depth	2-Methylnaphthalene	2-Methylphenol	4-Methylphenol	Naphthalene	Phenol
TOGS 1.1.1		50	1	1	10	1
OW16A-07	*8'-18'*	1.4 J	**14**	**14**	**25**	**10 U**
OW17A-07	*8'-18'*	**1,700**	500 U	500 U	1,800	500 U
OW20-07	*8'-18'*	500 U	**420 J**	**2,500**	**80 J**	500 U
OW21A-07	*8'-18'*	200 U	**200 U**	**13 J**	200 U	200 U

Note
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding TOGS 1.1.1 standards
All units are in µg/L

The limits of SVOC contamination are generally defined to the north by GP-19-07, to the east by GP-09-07, to the south by OW21A-07 and to the west by the groundwater collection trench.

While the groundwater analytical data that was generated during the 1995 remedial investigation is limited due to the on-site buildings still being in place, the results are somewhat consistent with the results of the current remedial investigation. Contamination was reported to be present at that time in wells OW11-94 and abandoned well OW10-94 (Figure 2), located near the current well OW21A-07. Contamination in these wells was confirmed during the current remedial investigation. However, concentrations of total VOCs and SVOCs were reported at considerably higher concentrations during the 1995 remedial investigation. Of note is that a shallow groundwater sample collected at well OW4A-87 (Figure 2), located just south of where the groundwater collection trench is currently located, had no detected parameters. This suggests that even prior to the installation of the groundwater collection trench, there was limited to no contamination extending southward off the Site.

Deep Groundwater – Deep groundwater samples (22 ft bgs to 35 ft bgs) were collected in the process area at boring locations GP-08-07, GP-12-07, GP-23-07, GP-24-07, GP-29-07 and in each of the deep monitoring wells installed in the process area. Analytical data for groundwater samples collected from these locations is summarized in Tables 9 and 10. An isoconcentration contour map of total VOCs and SVOCs in deep groundwater samples (Figure 23) indicates that the highest levels of contaminants are present in deep groundwater samples collected at OW16B-07 and OW21B-07. VOCs and SVOCs present in one or more process-area deep groundwater samples at concentrations exceeding TOGS 1.1.1 standards are listed in the following table:

	Sample Depth	Ethylbenzene	Toluene	Total Xylenes	Phenol
TOGS 1.1.1		5	5	5	1
OW16B-07	28'-38'	**82**	**47**	**340**	10 U
OW17B-07	23'-33'	1.1 J	5 U	**7.3**	**1.2 J**
OW21B-07	23'-33'	**8.3**	5 U	**41**	10 U

Notes
U: Compound was analyzed for but not detected above the reporting limit
J: Indicates an estimated value
BOLD indicates parameter detected at concentration exceeding TOGS 1.1.1 standards
All units are in µg/L

It is important to note that the extent of deep groundwater contamination is clearly defined by groundwater samples collected at GP-08-07, GP-24-07, and GP-29-07. Within the process area, deep groundwater contamination is generally confined to the southeast portion of the Site, and does not appear to be connected to shallow SVOC contamination associated with the presence of LNAPL.

The extent of deep groundwater contamination reported during the 1995 remedial investigation is consistent with the results of the current investigation. The highest concentrations of contaminants were detected in the southern portion of the Site in abandoned well OW1B-97 (Figure 2). Deep groundwater contamination was also reported for two groundwater samples collected in the fill area and just downgradient of the fill area, at wells OW3B-97 and OW7B-92. Although generally consistent, this historical data was limited and was not sufficient to fully delineate deep groundwater contamination.

In general, shallow groundwater contamination is present below much of the process area. However, this contamination is relatively well defined by non-detect groundwater samples to the north, south and east. Shallow groundwater contamination in the vicinity of OW17A-07 appears to be related to the presence of LNAPL. Within the process area, deep groundwater contamination is limited to the southeastern most portion of the Site, and is defined by non-detect groundwater samples to the north, south and east. Lastly, the groundwater collection trench serves to intercept groundwater to the west. A comparison of the data generated during the remedial investigation in 2007 with historical data indicate that, although the data is relatively consistent, previous data was limited and did not provide sufficient information to delineate either shallow or deep groundwater contamination. The remedial investigation completed in 2007 has filled in numerous gaps in data, both horizontally and vertically, and has allowed for a thorough delineation of groundwater contamination in the former process areas.

2.8 Current Remedial Action Program

This Section only describes the existing remedial actions that are being implemented at this time. The overall remedial program that is being proposed for the Site including the existing actions is presented in Section 6.0.

The current remedial action is in compliance with the ROD issued in March 1998. In addition, SI Group has voluntarily implemented a program to remove all aboveground sources of contamination and secure the Site. The ROD required the installation of a remedial system consisting of a “french drain” with a sufficient number of vertical wells to assure containment of contaminated groundwater leaving the Site. The vertical wells were located in areas where installation of the “french drain” could not be located due to topography and access issues. The collected groundwater is properly treated along with any LNAPL that is collected prior to being discharged from the Site. As described in Section 1.0, the groundwater collection and treatment system was installed and placed in operation as specified in the ROD.

Since the remedial action did not address on-Site contamination remaining at the Site, a long term monitoring program was required to monitor the effectiveness of the remedial system. To address the issue of potential sources of contamination remaining at the Site, SI Group has completed a program to remove the buildings and equipment contained on the Site and to secure the area. The purpose of this program was to remove all aboveground sources of contamination remaining on-site.

2.8.1 Groundwater Collection and Treatment System

In 2001, SI Group installed a groundwater collection and treatment system (GWCS) to control the off-site migration of contaminated groundwater from the Site. The collection system consists of a 700-foot long “french drain” connected to a wet-well and four groundwater extraction wells. The “french drain” was installed along the drainage ditch alignment that parallels the southwestern property boundary, and consists of an 8-inch perforated high-density polyethylene (HDPE) collection pipe and drainage media. The collection pipe was placed at the bottom of the trench and was sloped in a northwesterly direction to allow the groundwater to flow to the wet well located at the end of the “french drain”. The collection pipe was initially placed at a depth of 12 feet bgs and extends to a depth of approximately 28 feet bgs at the wet well. The groundwater collected in the wet well is pumped via a force main to a groundwater treatment system.

The groundwater treatment system consists of an oil-water separator, feed tank, bag filters, and carbon adsorption. The groundwater is initially pumped to a coalescing oil-water separator. The purpose of the oil-water separator is to remove any liquid phase present in the groundwater. The separator is designed to remove liquid phases that are both lighter and heavier than water. The effluent from the oil-water separator is sent to a 530-gallon, stainless steel feed tank.

The groundwater collected in the feed tank is pumped through four bag filters to the carbon adsorption units. The bag filters are used to remove any particulates that are contained in the groundwater. The groundwater is finally passed through two, 2,000-pound carbon adsorption units to remove the organic contamination contained in the groundwater. The treated groundwater is discharged to the Cowhorn Creek through Outfall 001 as authorized under a State Pollutant Discharge Elimination System (SPDES) Permit (NY – 0260525) issued by NYSDEC.

In addition to the wet well, four groundwater extraction wells discharge to the groundwater treatment system. The extraction wells are located on the western end of the facility between the plant facility and Cowhorn Creek. The wells were located in areas where the collection trench could not be installed due to access problems. The groundwater is pumped from each well by force main to the groundwater treatment system.

2.8.2 Removal of Site Structures and Securing the Site

In December 1997, manufacturing operations ceased at the Congress Street facility. With the shutdown of manufacturing operations, SI Group initiated a program to remove storage tanks, process piping and equipment, and materials remaining on-site. The storage tanks that were classified as Chemical Bulk Storage Tanks under 6 NYCRR Part 596 and other storage tanks were emptied and cleaned. In addition, some process equipment and material left at the Site was sent to other SI Group facilities for reuse or sent for off-site disposal.

In October 2003, SI Group initiated a program to remove the remaining process and other equipment, storage tanks and piping remaining on-site. Prior to removal, all equipment, piping, and vessels were characterized based on their past use and the materials potentially contained within the equipment. This characterization was used to determine how each item was to be removed and disposed. Where applicable, the process equipment and piping were drained of any liquids and sent off-site to Material Resource and Recovery (MRR) in Cornwell, Ontario, Canada, for reclamation. Any liquids contained in the equipment, piping, or vessels was collected and characterized for disposal. Containers of material that were still present at the Site were characterized and sent off-site for disposal.

Due to the age of the facility, a number of the buildings contained asbestos materials including roofing materials, transite, and asbestos insulation. These materials were identified and removed in conformance with an asbestos abatement plan. The asbestos material was contained and sent off-site for disposal. Following removal of the process equipment, tanks, and asbestos materials, the buildings were then demolished. The steel and other metals contained within the buildings were separated from the building rubble and sent off-site for metal recovery. The building rubble including the brick and concrete was collected and disposed off-Site.

Removal of the buildings was completed in January 2004. The buildings were demolished such that all structures above grade were removed. The bottom floors of the buildings and any wall in direct contact with the surrounding soil were left in-place. A number of the lower level walls in Buildings 3, 5 and 8 were functioning as retaining walls for the hillside and were left in-place. The floors and walls that remained were cleaned to remove any visual contamination prior to removal of the buildings. The ground floors of the buildings, the on-site roads and the outside storage areas were left in place. The intent of the demolition work was to remove all structures to grade level. The current Site conditions are shown in Figure 3 with the buildings removed and the groundwater treatment building located in the northwestern portion of the Site.

The Site was serviced by two sewer systems. The storm sewer system that serviced the eastern side of the facility was connected to the City of Schenectady sanitary sewer system along with the sanitary sewer system that serviced the buildings. This system was abandoned by disconnecting and removing the different discharge points; and filling the manholes, catch basins, and floors drains connected to the sanitary sewer system. The storm sewer system that serviced the western portion of the facility was left in-service. This system collects storm water from the western side of the facility and discharges the collected water to the Cowhorn Creek through outfall 001 as shown on Figure 3. The discharge point is currently permitted under the existing SPDES permit.

2.8.3 LNAPL Removal Interim Remedial Measure (IRM)

As noted in Section 2.7.3, LNAPL was observed in monitoring well OW17a-07 and extraction well EW-2 during the remedial investigation activities that were completed in 2007 and the quarterly monitoring events conducted since that time at the Site. In

November 2007, approximate 2.25 feet of LNAPL was observed in OW17a-07 and in March 2008, approximately 2.0 feet of LNAPL was observed. As part of the Remedial Program at the Site, SI Group initiated an IRM to recover the LNAPL observed in OW17a-07 and EW-2 on a monthly basis to determine the amount of LNAPL that could be recovered over an extended time period.

Results from this IRM indicate that the amount or extent of the LNAPL that collected on the groundwater surface is limited and the LNAPL layer flows to the wells at a very slow rate. The rate of movement is believed to be a function of both soil tightness and the viscosity of the LNAPL.

As a result of the low recovery rates, SI Group requested a reduction in the measurement and recovery program to a quarterly basis in a letter to NYSDEC dated November 20, 2008. This request was approved by NYSDEC in a letter dated December 8, 2008. The IRM is continuing with LNAPL recovery occurring on a quarterly basis to coincide with quarterly sampling.

2.8.4 Soil Vapor Intrusion Investigation

As part of the Updated RI, NYSDOH required SI Group to complete a SVI along the property's boundaries. The investigation, completed in December 2008, consisted of the installation and sampling of five soil vapor sampling implants installed on-site to determine if soil vapor contamination is present along the Site's border with 10th Avenue, Congress Street and Oak Street.

As shown in Table 11, a number of VOCs were detected in each soil vapor sample. Across the Site, a total of 21 different VOCs were detected. However, all parameters were detected at concentrations well below the EPA Screening Levels. In addition, most parameters were detected at concentrations only slightly higher than the reporting limit. No significant concentration of any chlorinated compound was detected in any of the soil vapor samples analyzed. Of note is that most parameters detected were detected in multiple (or all) samples collected at the Site. These data would suggest that those detections are more representative of background soil concentrations rather than of Site-associated contamination. The samples were collected from locations adjacent to urban residential and commercial areas that have been developed and in use for many years.

Based on the soil vapor results obtained, low levels of soil vapor contamination were identified. These levels are believed to be representative of background levels in the area. In addition, the levels detected do not indicate that they present any potential off-site environmental or health effects. The SVI Report recommended that no further action be taken concerning the investigation of potential migration of soil vapor contamination off-site. However, should any buildings be constructed on-site in the future, a vapor intrusion evaluation should be performed under a Site-specific work plan or a Site Management Plan as part of the institutional controls established for the Site. Furthermore, if contaminant levels in the groundwater are at levels above standards and the groundwater collection trench is taken off-line or becomes inoperable in the future, the need for a soil vapor intrusion investigation downgradient and potentially off-site should be evaluated at that time.

The results of the SVI were presented in the “Soil Vapor Intrusion Investigation Report”, submitted in January 2009 as an addendum to the Updated Remedial Investigation Report. The Updated RI Report was approved in a letter from NYSDEC date February 1, 2009.

3.0 DEVELOPMENT OF PERFORMANCE GOALS

Alternatives for site remediation are developed by assembling the appropriate technologies and process options for each medium of concern into alternatives that address site-wide contamination. This process involves the following steps:

1. Develop remedial action objectives for each medium of interest based on risks to human health and the environment and chemical-specific applicable or relevant and appropriate requirements (ARARs);
2. Develop general response actions (GRAs) that are medium-specific and satisfy the remedial action objectives (RAOs);
3. Identify and screen technologies applicable to each general response action;
4. Identify and evaluate technology process options to select a representative process for each technology type retained for alternative development; and,
5. Assemble the selected representative technologies and process options into viable alternatives for detailed evaluation using the criteria in DER-10 § 4.1(e) and 6 NYCRR § 375-1.8(f).

It is important to note that the installation of the groundwater collection system in 2001 addressed migration of contamination off-site in the surface water and groundwater and satisfied the remedial requirements of the first operable unit (OU1). The second operable unit (OU2) was to address the remaining on-site soil contamination by completing the supplemental remedial investigation presented in the Updated Remedial Investigation Report (2008), as well as preparing this Updated Supplemental FS. As such, this Updated FS addresses only the performance goals and remedial objectives associated with risks to human health and the environment resulting from the remaining on-site contaminants (OU2) with the understanding that the OU2 remedy may have an impact on the operation and maintenance for the UO1 remedy that has been implemented.

3.1 Introduction

This section presents an identification of applicable or relevant and appropriate requirements (ARARs) and a summary of remedial action objectives (RAOs). A description of ARARs that are used to develop RAOs and to scope and formulate remedial action technologies and alternatives is presented in Section 3.2. The RAOs for the Site are based on Site-associated chemical constituents and the media of interest as presented in Section 3.3. The preliminary remediation goals are established based upon risk-related factors and chemical-specific ARARs.

3.2 Applicable or Relevant and Appropriate Requirements

ARARs are used in determining the need for remedial action, to develop remedial action objectives, and to scope, formulate and evaluate remedial action technologies and alternatives. ARARs are cleanup standards, control standards, or other substantive environmental limitation promulgated under federal or New York State law. The consideration of ARARs is made in accordance with 6 NYCRR § 375-2.8(c), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, §121, 42 U.S.C. §9621, and 40 CFR § 300. ARARs are further defined in the following titled paragraphs.

Applicable Requirements - Applicable requirements are promulgated federal and state requirements such as cleanup standards, standards of control, and other environmental protection criteria or limitations that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site.

Relevant and Appropriate Requirements - Relevant and appropriate requirements are those promulgated federal and state requirements that, while not applicable as defined above to the circumstances at a site, address problems or situations sufficiently similar to those encountered at a site that their use is well suited. The regulations provide specific criteria for determining whether a requirement is relevant and appropriate. During the feasibility study process, relevant and appropriate requirements are accorded the same weight and consideration as applicable requirements.

Other Requirements to be Considered - This category contains other requirements and non-promulgated documents to be considered in the process of developing and screening remedial alternatives. The “to be considered” (TBC) category includes federal and state non-regulatory requirements, such as guidance documents, advisories, or criteria. Non-promulgated advisories or guidance documents do not have the status of standards. However, if no standards for a contaminant or situation exist, guidance or advisories would be consulted in evaluating whether a remedy is protective.

ARARs are categorized as follows:

1. Chemical-specific requirements that define acceptable exposure limits and can, therefore, be used in establishing preliminary remediation goals;
2. Location-specific requirements that may restrict activities within specific locations such as floodplains or wetlands; and

3. Action-specific requirements which may establish controls or restrictions for specific treatment and disposal activities.

In the New York State regulations (6 NYCRR Part 375), the equivalent term for "ARARs" is "standards and criteria" and the equivalent term for TBCs is "guidance". Within New York State regulations, these terms are grouped together and referred to as "Standards, Criteria, and Guidance" or SCGs. Both on-site and off-site remedial actions must meet all federal ARARs and all state SCGs. The state SCGs must be followed if they are more stringent than the related federal ARARs.

3.2.1 Location-Specific ARARs/SCGs

Location-specific ARARs/SCGs are restrictions placed on the type of activities to be conducted based upon site-specific characteristics or the site's location. The local characteristics of the site must be evaluated with regard to potential adverse effects that remedial activities may have on existing features (e.g., wetlands, floodplains, endangered species habitats, historically significant features, etc.). These ARARs/SCGs provide a basis for assessing restrictions during the formulation and evaluation of potential site-specific remedies.

Remedial activities will only be conducted on-site. It is expected that the GWCS will prevent any off-site migration of contaminants in groundwater during any on-site remedial activities. Therefore, no location-specific ARARs/SCGs were identified for the potential on-site remedial activities that may take place.

3.2.2 Action-Specific ARARs/SCGs

Action-specific ARARs/SCGs are triggered by particular activities that are selected to accomplish the remedy; they govern the design, construction, and operation of remedial actions. Action-specific ARARs/SCGs provide a basis for assessing the implementability and effectiveness of the potential remedial alternatives. Remedial activities potentially subject to action-specific ARAR/SCGs include:

- Site grading, excavation, and capping
- Removal and off-site disposal of solid and hazardous waste
- In-situ treatment
- Groundwater collection and discharge

Major action-specific ARARs/SCGs that must be considered are summarized below.

New York State Hazardous Waste Regulations: 6 NYCRR Parts 370-374 are considered SCGs and affect the treatment, storage, and disposal of hazardous waste originating from a site. In most cases, these regulations are more stringent and more prescriptive than the equivalent federal ARARs in Resource Conservation and Recovery Act (RCRA) Subtitle C. 6 NYCRR Part 375 governs the investigation and remediation of inactive hazardous waste sites. These regulations provide the framework for conducting this feasibility study.

Clean Water Act and New York State Water Quality Regulations: The Clean Water Act (40 CFR Part 122) and the New York State Water Quality Regulations for Surface Waters and Groundwaters (6 NYCRR Parts 700 – 705) apply to remedial alternatives that involve groundwater collection, treatment, and discharge to surface water or groundwater. The National Pollution Discharge Elimination System (NPDES) permitting program is considered an ARAR. The equivalent SPDES permitting program is considered a SCG.

Clean Air Act (CAA) and New York State Air Quality Regulations: Alternatives that involve excavation and potential air emissions from treatment facilities are subject to the National Air Quality Standards for Total Suspended Particulates under the CAA. State requirements will include specific provisions under the applicable state air quality regulations (6 NYCRR Parts 200, 201, and 257).

Occupational Safety and Health Act (OSHA): Federal OSHA requirements that regulate worker safety and employee records must be followed during all site work.

Department of Transportation (DOT) Rules for Transportation of Hazardous Materials: If materials containing hazardous wastes are to be transported off-site, DOT general and manifest requirements apply.

3.2.3 Chemical-Specific ARARs/SCGs

Chemical-specific ARARs/SCGs set health or risk-based concentration limits or ranges for various environmental media for specific substances. These requirements provide protective site cleanup levels or a basis for the calculation of cleanup levels. These ARARs/SCGs are also used to indicate an acceptable level of discharge, to determine treatment and disposal requirements, and to assess the effectiveness of the remedy. The chemical-specific ARARs/SCGs identified for the Congress Street facility are discussed below by applicable media, i.e. soil and groundwater.

3.2.3.1 Soil

New York State Remedial Program Soil Cleanup Objectives: The NYSDEC has established these objectives which apply to the development and implementation of the remedial programs for soil and other media set forth in 6 NYCRR Subparts 375-2 through 375-4. Two different classifications of soil cleanup objectives have been identified: unrestricted use and restricted use. The unrestricted use soil cleanup objectives represent the concentration of a contaminant in soil (identified in 6 NYCRR Subpart 375-6.8[a]), which, when achieved at a site, will require no use restrictions on the site for the protection of public health, groundwater and ecological resources due to the presence of contaminants in the soil. Unrestricted use, as set forth in 6 NYCRR Subpart 375-1.8, is achieved when a remedial program for soil meets the unrestricted use soil cleanup objectives. The restricted use objectives are applicable where contamination has been identified in soil above the unrestricted use soil cleanup objectives and the Department has determined the level of remediation required, based on the use of the Site, which is protective of public health.

New York State Recommended Soil Cleanup Objectives: These objectives have been prepared by NYSDEC in a revised Technical and Administrative Guidance Memorandum (TAGM) 4046 issued on November 24, 1994 (NYSDEC 1994). This guidance document outlines the basis and procedure for determining soil cleanup levels at state Superfund sites. Soil cleanup objectives are based on the protection of human health and groundwater quality, and are dependent on soil total organic carbon (TOC) content for organic compounds.

3.2.3.2 Groundwater

New York State Groundwater Standards: Class GA groundwater is fresh groundwater found in the saturated zone of unconsolidated deposits and bedrock. The best usage of Class GA groundwater is as a potable water supply (6 NYCRR Part 701.15). Groundwater in the area of the Site is not currently used as a drinking water source. However, unless specific deed restrictions exist, groundwater potentially could be used as a potable water source and, therefore, the appropriate groundwater quality standards apply. The Class GA groundwater standards are intended for protection of human health where groundwater is used as drinking water. Numerical groundwater standards and guidance values are presented in 6 NYCRR Part 703 and in the NYSDEC's Technical and Operational Guidance Series (TOGS) 1.1.1 document, entitled, *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC 1998).

These groundwater standards and guidance values are listed in Tables 9 and 10 of the Updated RI. The Class GA groundwater standards are equivalent to criteria established by the New York State Department of Health (NYSDOH) for public water supplies. The NYSDOH criteria were promulgated in 10 NYCRR Chapter I (State Sanitary Code) Subpart 5-1.

USEPA Drinking Water Standards: These federal standards include the Safe Drinking Water Act (SDWA) promulgated by the National Primary Drinking Water Standards (40 CFR Part 141) for the regulation of contaminants in all surface water or groundwater utilized as potable water supplies. The primary standards include both Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs). MCLs are enforceable standards for specific contaminants based on human health factors and the technical and economic feasibility of removing contaminants from the water supply. MCLGs are non-enforceable standards that do not consider the feasibility of contaminant removal. The SDWA also includes secondary MCLs (40 CFR Part 143) that are non-enforceable guidelines for those contaminants that may adversely affect the aesthetic quality of drinking water, such as taste, color, and odor. The constituents addressed in the SDWA are also addressed in the New York State groundwater standards and guidance values described above.

New York State Groundwater Effluent Limitations: The NYSDEC's Division of Water regulates point source discharges to Class GA groundwater primarily through the use of effluent limitations that have been established statewide. The effluent limitations are set at concentrations that should prevent contaminants from exceeding New York State ambient groundwater standards and guidance values. These numerical values are also presented in the NYSDEC's TOGS 1.1.1 document (NYSDEC 1998).

Federal Ambient Water Quality Criteria: In accordance with Section 304(a) of the Clean Water Act, USEPA has developed the Federal Ambient Water Quality Criteria (AWQC) for priority toxic pollutants. AWQCs are not legally enforceable, but may be referenced by states when developing enforceable water quality standards. AWQCs are available for both the protection of human health from exposure to contaminants in drinking water and for the protection of aquatic life.

3.2.3.3 Selected Cleanup Objectives

The unrestricted use soil cleanup objectives (SCOs) as set forth in 6 NYCRR Part 375-6.8(a) are the soil cleanup objectives that are being applied to the Congress Street site. Based on the

Updated Remedial Investigation, the following Contaminants of Concern (COCs) have been identified as exceeding SCGs:

- VOCs, including: acetone, benzene, ethylbenzene, methylene chloride, toluene, total xylenes, and trichloroethylene

- SVOCs, including: 2-methylphenol, 4-methylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b) fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-Cd), naphthalene, and phenol.

The remedial objective would be to obtain soil cleanup levels where possible for the specific COCs as shown in the following table.

SUBSURFACE SOILS	CONTAMINANTS OF CONCERN	SCG (ppm)
VOCs	Acetone	0.05
	Benzene	0.06
	Ethylbenzene	1.0
	Methylene Chloride	0.05
	Toluene	0.7
	Total Xylenes	0.26
	Trichloroethylene	0.47
SVOCs	2-Methylphenol	0.33
	4-Methylphenol	0.33
	Benzo(a)anthracene	1.0
	Benzo(a)pyrene	1.0
	Benzo(b)fluoranthene	1.0
	benzo(k)fluoranthene,	0.8
	Chrysene	1.0
	dibenzo(a,h)anthracene	0.33
	indeno(1,2,3-Cd)	0.5
	Naphthalene	12
	Phenol	0.33

3.3 Media Area/Volume Summary

Remedial action objectives have been developed for soil, shallow groundwater and deep groundwater in the following section. The contaminants of concern (COC) are those identified during the Updated RI as being present at concentrations above applicable SCGs (Tables 7 through 10). These media, potentially requiring remediation, are summarized in the following subsections.

Estimates of media volume were based on interpretation of sample data collected during the Updated RI. It is noted that the volumes presented in Sections 3.3.1 and 3.3.2 are pre-remedy estimates. They represent impacted volumes prior to the implementation of any remediation or field work. The actual amount of media to be remediated during the cleanup action will be based on actual field conditions encountered during implementation of the technology selected.

For the purpose of the evaluation, screening and detailed analysis of alternatives, the Site has been divided into two separate remediation units: the Process Area and the Fill Area. To compute the volume of contamination in each area, the results of the Updated RI were used to estimate the amount of contamination present within each area. The basic methods and assumptions for delineating areas for remediation were as follows:

Process Area

1. In the Process Area, as described in Section 2.7, an isoconcentration contour map of total VOCs and SVOCs (Figure 17) contamination was developed for the Process Area.
2. Based on these delineated areas, the soil sample results obtained from within these areas was used to estimate the amount of contamination within each area.

Fill Area

1. The volume of the Fill Area was estimated based on the existing topography of the area and a projection of the topography prior to use. The original topography estimate was checked with the results obtained from the borings.
2. Since limited information was available on the types of material placed in the Fill Area, the results that were obtained from different borings and historical information were used to delineate the different areas of contamination.

Table 12 presents the estimates of the in-situ volume of impacted soils by remediation unit. These estimated soil volumes were used to further estimate the total chemical mass for each contaminant and for each the Fill and Process Areas. Total contaminant mass values are also presented in Table 12. The methods used for making these estimates are presented in detail in the following sections. The estimates will be used as the basis for:

- The screening of technologies and process options;
- Screening and analysis of alternatives; and,
- Selecting the preferred alternative.

3.3.1 Process Area

Soils: The primary area of soils with total concentrations of VOCs and SVOCs exceeding 100 mg/kg is presented as "Area A" on Figure 24. This area, the Primary Source Area, is estimated to be approximately 26,260 ft^2. Based on an average depth of 12 feet to the groundwater table, plus an additional three (3) feet to account for the smear zone, the volume of soils in this area is approximately 393,300 $ft^{3.}$ The average VOC and SVOC concentrations and chemical mass for each compound detected in samples collected from the Primary Source Area are presented in Appendix A. The mass of each chemical was determined by using the average concentration of the entire volume for the Primary Source Area. Where two data points were present in the same boring, data from both points was used to calculate the average concentration. The concentrations are considered conservative as they were calculated using soil analytical data from samples collected from intervals with the highest field evidence of contamination, averaged, and assumed representative of the entire area.

In order to estimate the total mass of contaminants in the entire Process Area, Area B was defined as the area of soils with total concentrations of VOCs and SVOCs less than 100 mg/kg and is presented on Figure 24. The area is approximately 44,340 ft^2. Based on an average vadose zone depth of 12 feet bgs plus an additional three (3) feet to account for the smear zone, the volume of soils in Area B is approximately 665,100 ft^3. The average VOC and SVOC concentrations for each compound detected in samples collected from within Area B are presented in Appendix A. The chemical mass for Area B is presented in Table 12.

Based on these volumes, average concentrations, and an assumed bulk density of 90 lbs/ft^3, the total mass of contaminants in the Process Area was estimated. The results are presented in the following table:

	Area (ft^2)	Depth (ft)	Volume (ft^3)	Total VOCs (lbs)	Total SVOCs (lbs)	Total Contaminant Mass (lbs):
Area A	26,260	15	393,300	13,290	6,899	20,189
Area B	44,340	15	665,100	103	289	392
Total Process Area Soils	70,600	15	1,058,400	13,393	7,188	20,581

Groundwater: Similar volume and associated contaminant mass calculations were performed for groundwater in the Process Area. For the purpose of these calculations, the groundwater was divided into two vertical intervals: shallow and deep groundwater.

The thickness of the shallow groundwater interval was determined to be 12 ft to 20.5 ft bgs based on the depth of shallow well screens and associated available data. The thickness of the deep groundwater interval was determined to be 20.5 ft to 38 ft bgs. Based on these thicknesses and an assumed porosity of 40%, the volume of the shallow groundwater interval is 1,795,625 gallons (gal) and the deep groundwater interval is 3,696,874 gal.

In order to estimate the total mass of contaminants in the groundwater in the Process Area, the average VOC and SVOC concentrations and chemical mass for each compound detected in the Process Area were calculated. The mass of each chemical was determined by assuming that the average concentration for samples collected in the appropriate groundwater interval applies to the entire volume of the shallow or deep groundwater. The average VOC and SVOC concentrations for each compound detected in samples collected from the shallow and deep groundwater intervals are presented in Appendix A and the associated chemical masses are presented on Table 12.

Based on these average concentrations and volumes, the total mass of contaminants in the Process Area groundwater was estimated. The results are presented in the following table:

	Area (ft^2)	Thickness (ft)	Volume (gal)	Total VOCs (lbs)	Total SVOCs (lbs)	Total Contaminant Mass (lbs):
Shallow Groundwater	70,600	8.5	1,797,180	334	63	397
Deep Groundwater	70,600	17.5	3,696,871	6	0	6
Total Process Area	70,600	25.5	5,492,499	340	63	403

<u>Process Area Summary:</u> Based the estimates of mass presented above, approximately 96% of the contaminant mass in the Process Area is contained within the upper 12 ft of the Primary Source Area (Area A). Less than 2% of the contaminant mass is contained in the remaining Process Area soils. Approximately 2% of the contaminant mass is contained within the shallow groundwater in the Process Area. Less than 0.05% mass of contamination is present in the deep groundwater in the Process Area.

	Area (ft^2)	Depth (ft)	Volume	Total VOCs (lbs)	Total SVOCs (lbs)	% Process Area Contamination
Area A	26,260	15	393,300 ft^3	13,290	6,899	96.2%
Area B	44,340	15	665,100 ft^3	103	289	1.9%
Shallow Groundwater	70,600	8.5	1,797,180 gal	334	63	1.9%
Deep Groundwater	70,600	17.5	3,696,871 gal	6	0	0.03%

3.3.2 Fill Area

Soils: In order to determine the volume of the Fill Area, it was necessary to first estimate the limits of the Fill Area. Although samples were not collected to the north and west of the Groundwater Treatment Building, the extent of the Fill Area was estimated by determining the approximate elevation of natural soils in each boring location and extending the associated topographic contours northwest to meet existing contours. The limit of the Fill Area to the north and west was generally defined as where these contours meet. This estimation of the Fill Area is approximate and is based on the best available information; actual volume can only be determined by actually removing all the fill material or by extensive investigation.

Based on the above methodology, the Fill Area is estimated to be approximately 27,275 ft^2 in size. Although the elevation of the groundwater table is approximately 16 feet bgs, it is known that impacted fill extends to at least 28 feet bgs in some locations. Based on local topography and known hydraulic characteristics of similar materials, the groundwater in the Fill Area is likely to be artificially elevated due to the presence of the fill materials. Based on this information and on the maximum depth to natural soils of 28 feet, we have estimated that the volume of impacted material in the Fill Area is approximately 763,700 ft^3 or 28,285 yd^3.

Seven (7) soil borings (B37-07, GP14-07, GP16-07, GP17-07, GP33-07, OW18A/B-07, and OW19A/B-07) were installed in the Fill Area during the updated RI. Of the seven borings, only one boring exhibited field or analytical evidence of significant chemical contamination in shallow materials less than 14 feet bgs. Field observations made during the installation of this boring, GP14-07, indicate that one limited interval of contamination from approximately six (6) to eight (8) feet bgs is present in the vicinity of GP14-07. No other significant impacts were observed through the shallow fill unit across the entire Fill Area. Based on field observations and the analytical results of samples collected from the Fill Area, the area located between 0 to 14 feet below grade shows limited chemical contamination within the soil and waste material and is therefore being classified as non-hazardous. The area located between 14 to 28 feet below grade showed significant chemical contamination. The soil and waste material that would be removed from this deep unit will likely be classified as impacted soils due to the high levels of contamination and the potential that some of the material may be classified as hazardous waste.

As a result, the analytical results of soil samples collected between 14 and 28 feet bgs have been used to calculate the estimated chemical contaminant mass present. Furthermore, the volume used for these calculations is based on the Fill Area (27,275 ft^2) multiplied by the height of the deep fill unit (14 feet to 28 feet bgs). The resulting estimated volume of chemically-impacted material in the Fill Area is approximately 381,850 ft^3 or 14,143 yd^3.

The average VOC and SVOC concentrations for each compound detected in samples collected from the deep fill unit in the Fill Area are included in Appendix A and chemical mass data is presented in Table 12. The mass of each chemical was determined by assuming that the average concentration applies to the entire volume of material in the deep fill unit in the Fill Area. The concentrations are considered conservative as they were calculated using analytical data from samples collected from intervals with the highest field evidence of contamination, averaged, and assumed representative of the entire area.

Based on these volumes, calculated average concentrations, and an assumed bulk density of 90 lbs/ft^3, the total mass of chemical contamination in the deep fill unit of the Fill Area was estimated. The results are presented in the following table:

	Area (ft^2)	Depth (ft)	Volume	Total VOCs (lbs)	Total SVOCs (lbs)	Total Contaminant Mass (lbs)
Fill Area Soils	27,275	14	381,850	18,228	48,258	66,486

<u>Groundwater</u>: Based on the above information and for the purpose of these calculations, groundwater was assumed to extend from 28 feet bgs to 50 feet bgs. Based on this thickness and an assumed porosity of 40%, the volume of the groundwater interval is estimated to be approximately 1,795,500 gallons. In order to estimate the total mass of contaminants in the groundwater in the Fill Area, the average VOC and SVOC concentrations and chemical mass for each compound detected in the Fill Area were

calculated. The average VOC and SVOC concentrations for each compound detected in groundwater samples collected in the Fill Area are included in Appendix A; chemical mass data is presented in Table 12. It is noted that all groundwater data, regardless of depth, was used to calculate the average contaminant concentrations. This was done in order to include higher contaminant concentrations present at shallower depths that otherwise would have been excluded from the calculation.

Based on these average concentrations and volumes, the total mass of contaminants in the Fill Area groundwater was estimated. The results are presented in the following table:

	Area (ft^2)	Depth (ft)	Volume (gal)	Total VOCs (lbs)	Total SVOCs (lbs)	Total Contaminant Mass (lbs):
Fill Area Groundwater	27,275	22	1,795,500	16.9	10.96	28

Fill Area Summary: Based the estimate of mass presented above, approximately 99.95% of the contaminant mass in the Fill Area is contained within the 14 to 28 feet bgs interval. Less than 0.05% of the contaminant mass is contained in Fill Area groundwater.

	Area (ft^2)	Depth (ft)	Volume	Total VOCs (lbs)	Total SVOCs (lbs)	% Fill Area Contamination
Fill Area Soils	27,275	14	381,850 ft^3	18,228	48,258	99.95
Fill Area Groundwater	27,275	22	1,795,500 gal	16.9	10.96	0.04

3.3.3 Additional Groundwater Considerations

In order to properly evaluate the alternatives that were developed for both the Process Area and the Fill Area, it is useful to have a general understanding of the quantity and rate at which groundwater moves through the Site and is collected by the GWCS on an annual basis. This information has been used to estimate how long the GWCS would potentially operate past active remediation in order to remove residual contamination from the Site.

The total volume of groundwater in both the shallow and deep intervals was estimated for the Process Area and the Fill Area. Assuming an average porosity of 40%, it is estimated that approximately 5.5 million gallons of water are present in the Process Area while 1.8

million gallons are present in the Fill Area. The total volume of groundwater at the Site is thus 7.3 million gallons. Treatment data collected for all of 2008 from the Treatment Facility indicate that approximately 6.4 million gallons of water was collected by the GWCS and treated during 2008. Based on these numbers, it is estimated that approximately one volume of water moves through the Site (Process Area and Fill Area) every 14 months.

If all impacted soils were either remediated or removed from the Process Area, only residual groundwater contamination would remain in this area. The remaining contamination would effectively be removed with the through-flow o of groundwater and associated biodegradation. It is anticipated that, with a remedial approach leaving only residual contamination, the GWCS would need to continue operating for a short time period. For estimating purposes only, a time period of 3 to 5 years was used for groundwater to reach ARARs.

If only source area soils were either remediated or removed from the Process Area, more extensive soil contamination and residual groundwater contamination would remain on-site. A time period of 15 years of GWCS operation to effectively remove Site contamination to below ARARs was used for estimating purposes only for those alternatives which either remediate or remove source area soils.

It should be noted that these estimates of "operation years" are used solely for cost estimation purposes, but are considered reasonable estimates.

3.4 Remedial Action Objectives

Goals for the remedial program have been established through the remedy selection process described in 6 NYCRR Part 375-2.8. These regulations state, "The goal of the remedial program for a specific site is to restore that site to pre-disposal conditions, to the extent feasible. At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the site through the proper application of scientific and engineering principles..."

Specifically, the RAOs for OU2 correspond to and address the risks associated with contaminated soil and groundwater remaining on the Site. A previous Human Health Risk Assessment, conducted as part of the 1996 Remedial Investigation, addressed risks to human health and the environment associated with the potential off-site migration of contaminants. However, this Updated Supplemental FS addresses only the remaining on-site contamination. Nevertheless, many of the remedial alternatives considered herein will serve to reduce or eliminate future potential impacts from the Site on the nearby environment.

The overarching goal for the Congress Street facility is the elimination or mitigation of all significant threats to human health and the environment. Based on the results of the remedial investigation and the use of the Site and surrounding areas, the following general RAOs were developed:

- Reduce/eliminate potential source areas;
- Restore groundwater quality to levels which meet state and federal groundwater standards;
- Prevent human contact with contaminated soils, waste, and groundwater; and
- Restore subsurface soil quality to levels which meet state and federal requirements for redevelopment of the Site.

The screening and evaluation of remedial action technologies and alternatives will focus on the ability to achieve these general RAOs.

The restoration response action involves returning the Site to pre-development conditions. The Site has been used by SI Group since the early 1900’s for manufacturing. The Site, located within the City of Schenectady, and the surrounding area have been developed for many years, including both commercial and industrial activities. The contamination that is present includes both volatile and semi-volatile compounds that exceed soil cleanup guidelines and groundwater cleanup standards. However, the area surrounding the Site has been impacted by its’ own development as well. Considering the Site conditions, the technologies available, implementability and cost-effectiveness, it is not considered feasible to return the Site to pre-development conditions at this time. 6 NYCRR Part 375, however, provides a basis and procedure to determine soil cleanup levels at sites where cleanup to pre-disposal conditions is either not possible or not feasible. The requirements in Part 375, along with TOGS 1.1.1, have been used to determine the appropriate cleanup values for Site-specific COCs contained in both soil and groundwater.

The USEPA guidance document entitled “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” states that “remedial action objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment”. The objectives must not be so specific that the range of remedial alternatives which can be developed becomes overly limited. According to the USEPA guidance document "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", remedial action objectives established to protect human health and the environment are to specify:

- The chemicals of concern;
- The exposure routes and receptors; and,
- An acceptable chemical concentration or range of concentrations for each exposure route, also known as preliminary remediation goals (PRGs).

Specifying remedial action objectives in this manner is deemed to be appropriate since protectiveness may be achieved by reducing exposure to receptors either separately or in conjunction with reducing chemical levels. The remedial objectives themselves are not the motivation for initiating a remedial action. Rather, remedial objectives are a set of performance standards against which to compare remedial alternatives and aid in the selection of the preferred remedy.

The following subsections present, on a media-specific basis, a discussion of the chemicals of interest, potential exposure pathways, and preliminary remedial goals. It is noted that the Risk Assessment performed during the initial FS (1996) estimated that cancer risks associated with all exposure pathways for current and future land use were less than 10^{-4}, and the non-carcinogenic hazards were less than 1.0.

3.4.1 Soils

3.4.1.1 Comparison to SCGs

As an initial step, the potential COCs for on-site soils were determined based on the results of the Updated RI as compared to SCGs. Based on these comparisons, the analytes that exceeded SCGs are:

- Seven individual VOCs: acetone, benzene, ethylbenzene, methylene chloride, toluene, total xylenes and trichloroethylene

- Total VOCs: total concentration of VOCs in a sample greater than 10,000 µg/kg

- Eleven individual SVOCs: 2-methylphenol, 4-,methylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-Cd), naphthalene, and phenol

- Total SVOCs: total concentration of SVOCs in a sample greater than 50,000 µg/kg

3.4.1.2 Exposure Pathways

Based on the comparison of analytical results of the Updated RI to respective SCGs, seven VOCs and 15 SVOCs exceeded NYSDEC soil cleanup guidance values in soils across the Site. Potential exposures to Site trespassers are expected to be low based on the duration of exposure and the depth of contaminants. Therefore, the greatest exposure pathway exists for those who perform work on the Site. Exposure scenarios include:

- Dermal contact
- Incidental ingestion
- Inhalation of volatilized vapor and/or fugitive dust

3.4.1.3 Development of Process Area RAOs

As noted above, the general RAOs for on-site soils are to reduce/eliminate potential source areas, reduce/eliminate contaminant leaching to groundwater, prevent human contact with contaminated soils, and to restore subsurface soil quality to levels which meet state and federal requirements for redevelopment of the Site. These RAOs may be accomplished by limiting exposure to soils while also removing soils containing COCs in excess of criteria such as PRGs.

In order to determine the resources required to clean up the soils, a site-specific evaluation was performed which determined the amount of area that would have to be remediated to remove most of the contamination. In Section 3.3.1, volumes of soils that would require remediation associated with the amount of contamination in those areas were estimated.

For remedial alternatives which address contamination in the Process Area using an in-situ treatment technology or via excavation, cost estimates were prepared for each of these volumes. This comparison of the amount of cleanup to cleanup effort suggests that alternatives which treat 100% of the Process Area are five (5) times as costly as those which treat 96% of the contamination. Based on this analysis, it is determined to be most cost effective to choose a technology which treats at least 96% of the contamination in the Process Area. It is not considered cost-effective to remediate the remaining 4%. Furthermore, the continued operation of the GWCS will continue to contain the Site as well as decrease residual contamination. Cost analysis for the Process Area is provided in Section 5.5.7.

The objective of the cost performance study is not to minimize the cost of treatment, but to compare the amount of resources required to remove all contamination present on-site. Conducting cost/performance studies is an effective means to help narrow the selection of potential technologies, processes, and/or operational concepts to the most optimal solution.

3.4.1.4 Development of Fill Area RAOs

The general RAOs for the waste mass in the Fill Area are to reduce/eliminate the waste mass, reduce/eliminate contaminants leaching to groundwater, and prevent human contact with the waste mass. These RAOs may be accomplished by removing the waste mass or containing the waste mass, thereby limiting further exposure of the waste and associated contaminants to the environment and human health.

In order to determine the resources required, a site-specific evaluation was performed to determine the amount of waste material that would have to be removed or contained. In Section 3.3.2, the amount of waste material contained in the Fill Area was estimated.

Cost estimates were prepared for remedial alternatives which address contamination in the Fill Area using a containment technology or excavation. This comparison shows that alternatives which remove 100% of the contamination in the Fill Area are at least eight (8) times as costly as those which contain 100% of the contamination. Based only on this analysis, a technology which provides containment of the contamination in the Fill Area would be the most cost effective. Furthermore, the continued operation of the GWCS will continue to contain the Site as well as decrease residual contamination. Cost analysis for the Fill Area is provided in Section 6.5.7.

3.4.2 Groundwater

3.4.2.1 Comparison to SCGs

As an initial step, the potential COCs for on-site groundwater was determined based on the results of the Updated RI as compared to SCGs. Based on these comparisons, the analytes that exceeded SCGs are:

- Four individual VOCs: benzene, ethylbenzene, toluene, total xylenes
- Fifteen individual SVOCs: 2,4-dimethylphenol, 2-methylnaphthalene, 2-methylphenol, 4-methylphenol, acenaphthene, anthracene, benzo(a)anthracene, di-n-butylphthalate, di-n-octylphthalate, fluoranthene, flourene, naphthalene, phenanthrene, phenol, and pyrene

3.4.2.2 Exposure Pathways

Based on the comparison of analytical results of the Updated RI to respective SCGs, four VOCs and 15 SVOCs exceeded NYSDEC groundwater cleanup guidance values in groundwater across the Site. While there are no direct exposure pathways from groundwater to humans on-site, any discharge to the Cowhorn Creek would be a potential pathway. However, the operation of the GWCS contains contaminants from moving off-site. One indirect exposure pathway, via volatilization of compounds from groundwater to indoor or outdoor air, exists.

3.4.2.3 Development of Groundwater RAOs

As noted above, the general RAOs for on-site groundwater are to reduce/eliminate potential source areas, reduce/eliminate contaminant leaching to groundwater, prevent human contact with groundwater, and to restore groundwater quality to levels which meet state and federal groundwater standards. These RAOs may be accomplished by limiting exposure to groundwater while also removing and/or containing sources of contamination and allowing residual contamination to naturally attenuate.

Given the nature of the fill materials at the Site, it is not anticipated that it will be practicable to meet SCGs for groundwater in the Fill Area in the near future. As presented in Section 3.3, the percent of overall contamination in the groundwater in the Process Area and Fill Area is relatively low. It is not considered to be cost-effective to actively address contaminated groundwater other than through natural attenuation and the GWCS. Therefore, the remedial goal is to protect further impacts to groundwater quality by removing and/or containing contamination sources and operating the GWCS to fully maintain containment of the Site. These goals are supportive of the overall remedial program's objective to reduce Site contamination (via monitored natural attenuation) and eliminate or mitigate all significant threats to the public health and to the environment.

3.5 Land Use

The Congress Street Site has been used by SI Group since the early 1900's for manufacturing, and has been zoned by the City of Schenectady for heavy industrial use. Furthermore, the surrounding areas have been developed for many years, with the surrounding land used for both commercial and industrial activities. In addition, the land is adjacent to the main rail line that has been in use prior to the development of the Site by SI Group. To return the Site to pre-development conditions would be difficult with limited benefits due to the surrounding area.

While the long-term goal for the Congress Street facility is the elimination or mitigation of all significant threats to human health and the environment, the ultimate goal is to return as much of the Site to some beneficial and economic use consistent with the remedial program, the surrounding area and zoning requirements.

4.0 IDENTIFICATION AND SCREENING OF GENERAL RESPONSE ACTIONS, TECHNOLOGIES AND PROCESS OPTIONS

4.1 Introduction

This section presents an identification of general response actions (GRAs), a summary of the media and volume of media to potentially be remediated, and an identification and initial screening of technologies. General response actions which describe the actions that will satisfy the remedial action objectives are presented in Section 4.2. The technologies are preliminarily screened based on technical implementability in Section 4.3.

It is noted that the current remedial program that has been implemented on-site includes maintaining the security of the Site and the operation of a Groundwater Collection and Treatment System (GWCS). In addition, all aboveground contamination has been removed from the Site as of January 2004. However, since the remedial action did not address subsurface contamination remaining in the Process and Fill Areas at the Site, a long-term monitoring program has been implemented to monitor the effectiveness of the remedial system. Each of the remedial alternatives to be presented will include the continued operation of the GWCS, continued monitoring, and continued maintenance of Site security until it is determined that all significant threats to human health and the environment have been eliminated or mitigated as approved by the NYSDEC.

4.2 General Response Actions

After establishing the RAOs for the Site, several GRAs were evaluated based upon the ability of the response to address the RAOs. The technologies presented are grouped according to GRAs. These are the broad categories of remedial measures that may be implemented alone or in combination to meet the RAOs. A number of these remedial actions are currently being implemented as part of the remedial action plan associated with OU1. These actions are intended to mitigate potential exposure to the COCs, control the migration of the COCs on the Site, and/or remediate the COCs. The purpose of establishing GRAs is to begin to evaluate basic methods of protecting human health and the environment, such as treatment and/or containment of the Site contaminants. The potentially applicable technologies and process options associated with the GRAs are presented in Table 13. Note that process options are a subset of technologies and describe the different systems, equipment, or chemical processes that were considered as potentially applicable alternatives for remediation of the Site. The fourth column of the table includes a brief description of each process option. This description is included to aid the reader in understanding each process option. Detailed descriptions are provided in the following sections.

The technologies and process options may then be combined to form alternatives, such as treating grossly contaminated media and providing containment or post-treatment monitoring of any residual contaminants. Following various guidance documents that address presumptive remedies for CERCLA, the selection of GRAs, technologies, and process options was focused on preferred remedial components that have been historically proven to be effective at similar sites.

The Remedial Action Plan that was implemented for OU1 has resulted in the containment of the Site. The following list summarizes the general response actions that will be considered for remediation of the contamination that remains in the Process and Fill Areas at the Congress Street Site, each of which are described in more detail in the following subsections:

- No Further Action
- Institutional and Administrative Controls
- Monitored Natural Attenuation
- Physical Containment
- In-Situ Treatment
- Ex-Situ Treatment
- Removal with Off-site Disposal

GRAs could be accomplished by implementing several different technology types. In turn, a single technology type might include several different methods, referred to as process options. For example, containment would be considered a GRA, capping would be considered a technology type, and a soil cover or a multi-layer cap would be examples of process options. The initial screening process and the remedial technologies and process options included in the screening are discussed in detail in Section 4.3.

4.3 Identification and Screening of Technologies

The preliminary screening was performed to identify technologies that may be applicable to the Site. The preliminary screening was based on a technology's broad-based effectiveness in reducing Site risks. The preliminary screening eliminated technologies or process options, which, for technical reasons, could not be implemented or would not be effective (i.e., technically infeasible or impractical).

It is noted that, for this Site, contaminated media consists of groundwater, soil, and the waste material contained in the Fill Area. Each technology and process option is evaluated based on the potential effectiveness of treating one or more of these media types. The screening of technologies is applicable to contaminated media in both the Fill and Process Areas.

Table 13 summarizes the preliminary screening of technologies and process options. Technologies and process options deemed not applicable are indicated by shading. The last column presents a brief comment on the applicability of the process option, based on the technology's ability to achieve RAOs. These comments provide explanation as to why a particular process option was retained for further evaluation or rejected. These technologies are discussed in detail in the following sections.

4.3.1 No Further Action

The National Contingency Plan (NCP) requires that No Action be included among the GRAs evaluated. Under the No Action response, no additional measures would be taken to improve the environmental conditions with respect to the Site; however, continued operation of the GWCS and groundwater monitoring would be conducted to ensure continued performance of the existing remedial program and containment of the Site. The No Action response serves as a baseline for comparison to other GRAs.

4.3.2 Institutional and Administrative Controls

Administrative controls may reduce or eliminate exposure risk by restricting some or all access to the impacted areas on the Site. Administrative controls can be used when the contamination is first discovered, when remedies are ongoing, and when contamination remains on-site at a level that does not allow for unrestricted use and unlimited exposure. Examples of administrative controls include the posting of signs, installation of fences or other barriers, security systems, etc. Institutional controls (ICs) typically restrict the type of uses permitted on the Site and/or may restrict the use of groundwater/surface water on the Site. Examples of ICs include zoning changes, easements, and covenants/deed restrictions to limit future land use or prohibit activities that may compromise specific engineering remedies. ICs and administrative controls may be considered an appropriate component of a remedy or may be necessary to ensure that a remedy is protective under the following situations:

- The cleanup is protective for industrial/commercial reuse, but not residential exposures.
- The groundwater will remain contaminated for a period of time such that potable water well drilling should be prevented.
- Soils are remediated at the surface, but contamination at higher concentrations or waste material remains in the subsurface.
- The contamination is covered with clean soil to prevent exposure and/or reduce the leaching of the contamination to groundwater, and activities that could potentially degrade the soil cover must be prohibited.

Controls of this sort are potentially applicable to the Congress Street Site with a number of these elements already implemented.

4.3.3 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is defined as a remedial method that reduces the mass and concentration of contaminants in the environment without human intervention. However, unlike a “take no action” or “walk-away” approach to site cleanup, this approach requires long-term monitoring of the site conditions to confirm whether or not the contaminants are being degraded at reasonable rates to ensure protection of human health and the environment. Site data should clearly indicate whether concentrations of contaminated media are being adequately reduced without active remediation. If not, more aggressive remedial technologies may be necessary. Natural attenuation occurs through a variety of physical, chemical, and/or biological processes, including:

- Biodegradation
- Adsorption
- Volatilization
- Evapotranspiration
- Dispersion
- Dilution
- Chemical or biological stabilization
- Destruction of contaminants

One of the most important components of natural attenuation is biodegradation, which typically involves the transformation of a compound to a less toxic substance(s) by subsurface microorganisms through biotic reactions. Because natural attenuation typically allows contaminants to migrate further than active remedial measures, it is also important to determine whether individual or sensitive environmental receptors may be affected by the release.

MNA is typically implemented in conjunction with other source control measures as MNA is not effective for extremely high contaminant concentrations. MNA also includes long term monitoring of geochemical parameters and contaminant concentrations. MNA is both implementable and applicable to the Congress Street Site. With the remedial actions already taken, preliminary data indicates that natural attenuation is occurring at this time.

4.3.4 Physical Containment

Containment and/or hydraulic control measures are used to control the migration of contaminants in subsurface soils and groundwater. Although it is often impossible to prevent any migration of contaminants, the goal of containment is to at least significantly reduce the migration. Containment techniques are typically utilized at sites where contaminated media are intended to be buried or left in place at a site. For example, containment systems are often used at sites where the subsurface contamination is extensive and removal of the contaminated media is precluded by the potential hazards associated with the removal and/or excessive costs. Extensive monitoring of containment systems is necessary to ensure the competency of the system and ensure that the system has no leaks or is being short-circuited. Containment of the Congress Street Site was completed with implementation of the Remedial Action Plan specified for OU1. Further containment of specific areas on the Congress Street Site is potentially applicable.

4.3.4.1 Soil Containment

The most common surface containment systems involve the use of capping systems. While capping systems reduce the infiltration of precipitation and run-off on the surface of the site into the contaminated area, they also provide a barrier to reduce the likelihood of human contact with the subsurface contaminants and inhalation of potentially hazardous vapors. The type of capping used at a site is based upon the site contaminants present, the physical characteristics of the site, and the intended future use of the site. Gas collection and treatment is a critical component of cap design at sites where volatile contaminants are present to prevent the buildup of hazardous concentrations of volatile gases or methane beneath the cap. Containment of contaminated soils and fill material could be accomplished by the construction of a capping system that would prevent direct contact with contaminated soil and/or groundwater by humans and wildlife.

Typically, the capping objectives for soil remediation are to:

- Minimize infiltration and hence reduce leaching of chemicals in the soils to the groundwater;
- Eliminate the potential dermal contact by chemicals associated with surface soils;
- Minimize volatilization of chemicals in the near-surface soils to the atmosphere; and,
- Minimize the potential transport of chemicals in surface water runoff by eliminating surface water runoff contact with chemicals in the surface soils.

Capping is both implementable and potentially applicable at the Congress Street Site in combination with other technologies.

4.3.4.2 Groundwater Containment

As described in Section 2.8.1, a groundwater collection and treatment system was installed by SI Group in 2001 to control the off-site migration of contaminated groundwater from the Site. The operation of this GWCS is controlled by OU1 of the ROD issued by NYSDEC and will remain in operation as long as the potential migration of on-site contamination remains. As such, each remedial alternative presented in Section 5.0 includes the operation of the groundwater collection and treatment system. However, the duration of operation is ultimately dependent upon the remedial alternative selected.

4.3.5 In-Situ Treatment

In-situ treatment techniques involve the destruction or conversion of contaminants in subsurface media to less toxic compounds without physical removal. There are a variety of biological, chemical, and physical techniques available for in-place treatment of contaminated media. While the costs associated with in-situ techniques are often less than those associated with ex-situ techniques, in-situ methods typically require longer periods of time to reach the remedial objectives established. In addition, it is more difficult to determine whether contaminants have been destroyed using in-situ treatment methods.

In-situ treatment technologies already proposed and evaluated in the original FS included the following biological or physical treatment technologies/process options or combination of these options:

- Enhanced Bioremediation
- Soil Vapor Extraction (SVE)
- Soil Flushing
- Bioventing/Biosparging

A number of variations to these alternatives are also being evaluated in this Updated Supplemental FS and include:

- Air Sparging
- Phytoremediation
- Chemical Oxidation
- Multi-Phase Extraction
- Enhanced SVE
- In-Situ Thermal Desorption

Each of these treatment technologies/process options are presented below.

Enhanced Bioremediation: Enhanced bioremediation is a technology that encourages growth and reproduction of indigenous microorganisms to enhance biodegradation of organic constituents in the saturated zone (USEPA, 2004). The bacteria are utilized to break down the chemicals to non-toxic components (Deuren et al., 2002). Nutrients may be added through nutrient injection trenches at the ground surface to enhance biodegradation. Biodegradation of the chemical constituents depends on the constituents, soils, and climatic conditions. Biological treatment may be enhanced in soils with inadequate oxygen levels by the process of bioventing, which relies on forced air flow through contaminated soils to ensure adequate oxygenation for aerobic biodegradation. In general, enhanced bioremediation is not effective for grossly contaminated soils and waste materials because high initial concentrations of organic compounds can be toxic to the microorganisms. However, enhanced bioremediation is effective at treating both saturated and unsaturated zones (Deuren et al., 2002). Enhanced bioremediation is both implementable and potentially applicable to the Congress Street Site in combination with other technologies.

Soil Vapor Extraction: Soil vapor extraction (SVE) is an in-situ unsaturated zone soil remediation technology in which a vacuum is applied to the soil to induce the flow of air and remove volatile and some semi-volatile contaminants from the unsaturated zone (Deuren et al., 2002). A typical SVE system consists of vapor extraction wells, a vacuum blower or a pump, air/water separator, and a vapor treatment system. Removal of volatile compounds by SVE involves creating a vacuum at the extraction wells. Air in the surrounding soil containing the contaminated vapors then rushes to fill the vacuum. The air and contaminants are then extracted and treated before being released to the atmosphere. It is often necessary to pump groundwater from the target treatment zone in order to reduce ground water upwelling induced by the vacuum and/or to increase the depth of the vadose zone. SVE systems are a medium-term technology and work best in high permeability soils. Lower permeability soils or a high degree of saturation will require higher vacuums and may preclude the efficiency of the SVE system. Since extraction wells are already in place, SVE is often followed by airsparging or biosparging to promote natural biodegradation of semi-volatile organics, which are not as effectively removed by SVE as volatiles. Conventional SVE is both implementable and potentially applicable to the Congress Street Site in combination with other technologies.

Soil Flushing: In soil flushing, large volumes of water, often supplemented with surfactants, co-solvents, or treatment compounds, are either applied directly to the surface soil or injected into the ground to raise the water table into the contaminated soil zone (Deuren et al., 2002). Injected water, treatment agents and dissolved contaminants then must be extracted from the underlying aquifer. Water in this sense is "flushed" through the unsaturated zone, causing chemicals to desorb from soil particles and fill material and become more soluble in the water. The water is collected, treated to remove the chemicals, and often re-injected. Soil flushing is generally only effective at treating the unsaturated zone and is medium-term technology. The target contaminant groups for soil flushing are VOCs and SVOCs. Soil flushing is retained as a remedial technology and is both implementable and potentially applicable to the Congress Street Site if used in combination with other technologies to treat groundwater.

Bioventing/Biosparging: Bioventing provides oxygen to stimulate naturally occurring soil microorganisms to degrade compounds in unsaturated zones. Previous studies have shown that the rate of natural degradation is often limited by the lack of oxygen and other electron acceptors rather than by the lack of nutrients (Deuren et al., 2002). In conventional bioventing systems, oxygen is delivered to the subsurface unsaturated zone by an electric blower to subsurface wells. In contrast to soil vapor vacuum extraction, bioventing uses low airflow rates to provide only enough oxygen to sustain microbial activity. Passive bioventing systems use natural air exchange to deliver oxygen to the subsurface via bioventing wells. A one-way valve, installed on a vent well, allows air to enter the well when the pressure inside the well is lower than atmospheric pressure. When atmospheric pressure drops (due to a change in barometric pressure) below the subsurface pressure, the valve closes, trapping the air in the well and increasing oxygen to the soil surrounding the well. Biosparging is generally the same technology, but delivers oxygen while sparging contaminants from the ground water, thereby enhancing natural biological activity in the soils which further breakdown contaminants. Bioventing does not address contaminated media in the capillary fringe and the saturated zone. Bioventing is most often used at sites with mid-weight petroleum products since lighter weight contaminants are more efficiently removed with SVE and heavier-weight petroleum products take much longer to degrade using bioventing/biosparging. Similar to conventional SVE, initially high concentrations of volatile organics may be toxic to microorganisms, therefore hindering the effectiveness of the technology. Bioventing/biosparging is implementable and potentially applicable to the Congress Street Site in combination with other technologies.

Air Sparging: Air sparging, also referred to as in-situ air stripping, is an in-situ remediation technology that involves the injection of air into the subsurface saturated zone and venting through the unsaturated zone to remove subsurface contaminants (Deuren et al., 2002). During air sparging, air bubbles traverse horizontally and vertically through the saturated and unsaturated zones, creating an underground stripper that removes contaminants by enabling a phase transfer of hydrocarbons from a dissolved or adsorbed state to a vapor phase. When used in combination with SVE, air bubbles carry vapor phase contaminants to a SVE system which removes them. The SVE system controls vapor plume migration by creating a negative pressure in the unsaturated zone through a series of extraction wells. Air sparging has a medium to long duration (Deuren et al., 2002).

Using air sparging as an SVE enhancement technology increases contaminant movement and enhances oxygenation in the subsurface, which in turn increases the rate of contaminant extraction. Air sparging can use either horizontal or vertical wells, and is designed to operate at high flow rates. The target contaminant groups for air sparging are VOCs and fuels. Air sparging is generally more applicable to the lighter volatile constituents such as benzene, ethylbenzene, toluene, and xylene. It is less applicable to heavier constituents such as naphthalene and phenol. In addition, sites with relatively permeable, homogeneous conditions favor the use of air sparging due to greater effective contact between sparged air and the media being treated. In addition, very minute permeability changes can result in localized stripping between the injection and monitoring wells (Deuren et al., 2002). Based on this information, it is concluded that biosparging is a more effective option for addressing both VOCs and SVOCs. As such, air sparging will not be retained for further evaluation.

Phytoremediation: Phytoremediation is a process that uses plants to safely remove, transfer, stabilize, or destroy contaminants in various media (Deuren et al., 2002). There are four main mechanisms by which phytoremediation works:

- Enhanced rhizosphere biodegradation, which takes place in soil or groundwater immediately surrounding plant roots;
- Phytoextraction, which is the uptake of contaminants by plant roots and the translocation/accumulation of contaminants into plant shoots and leaves;
- Phytodegradation, or the metabolism of contaminants within plant tissues; and,
- Phytostabilization which is the production of chemical compounds by the plants to immobilize contaminants at the interface of roots and soil.

Phytoremediation as a remedial technology can apply to all biological, chemical, and physical processes that are influenced by plants and which aid in cleanup of the contaminated subsurface. However, since phytoremediation is an emerging technology, it is not necessarily a proven technology. In addition, phytoremediation is not often applied as a sole remedy at sites since initial high concentrations of contaminants may inhibit plant growth and thus may limit application on some sites or some parts of sites. Furthermore, phytoremediation can require long periods of time to be considered effective (USEPA, 2000). Based on the high VOCs, the depth of contaminants, and the long time-frame required, phytoremediation is not expected to be an appropriate remedy for the site and therefore is not being retained for further evaluation.

Chemical Oxidation: Chemical oxidation (CO) is based on the delivery of chemical oxidants to contaminated media in order to destroy the contaminants by converting them to non-toxic compounds. The oxidants typically used in this process include hydrogen peroxide (H_2O_2), potassium permanganate ($KMnO_4$), ozone, or, to a lesser extent, dissolved oxygen (DO) (Huling and Pivetz, 2006). In contrast to other remedial technologies, contaminant reduction can be seen in short time frames (i.e., weeks or months). Provided there is sufficient contact time with the organic contaminants, chemical oxidants will ultimately convert the contaminant mass to carbon dioxide and water through a series of chemical reactions (USEPA, 2004).

The volume and chemical composition of CO treatments are based on the following factors:

- Volume and concentration of contaminants
- Characteristics of the subsurface
- Bench-scale preliminary studies

The methods for delivery of the chemical may vary based on site features. The oxidant can be injected into an existing well or via an injector head (Geoprobe) directly into the subsurface. Furthermore, the oxidant is often mixed with a catalyst or, in the case of hydrogen peroxide, a stabilizer because of the compound's volatility (USEPA, 1998).

Chemical oxidation can be used to treat most media (USEPA, 1998). Typically, chemical oxidation is effective in treating both VOCs and SVOCs, including polycyclic aromatic hydrocarbons. However, where significant LNAPL is present, other remedial technologies (free product recovery, etc.) may need to be implemented prior to chemical oxidation in order for the remediation to be both cost-effective and safe. Alternatively, oxidants can be supplemented with surfactants, co-solvents, or treatment compounds which promote transfer of contaminants from the insoluble phase to the dissolved phase, thereby increasing the effectiveness of the oxidation process (USEPA, 2004).

Due to the increased rate of vertical transport of oxidants in the unsaturated zone, the residence times of the oxidant would be decreased and would reduce the overall effectiveness in the unsaturated zone. Furthermore, injection in the unsaturated zones results in poor distribution of the oxidants. As a result, treatment of both the saturated and unsaturated zones usually requires the integration of chemical oxidation with other remedial technologies that more effectively target contamination in the unsaturated zone (i.e. soil vapor extraction) (USEPA, 2004). However, surfactants, co-solvents, or treatment compounds can be combined with water and injected into the ground to raise the water table into the contaminated soil zone, thereby increasing the treatment area. Chemical oxidation is implementable and is a potentially applicable remedial technology for the Congress Street Site.

Multi-Phase Extraction: Multi-phase extraction (MPE) involves removal of contaminated groundwater, free-phase product contamination, and soil vapors from a common extraction well under vacuum conditions (USEPA, 1997). Essentially, MPE is the coupling of soil vapor extraction and groundwater pump and treat. Groundwater recovery is achieved by pumping at or below the water table. The applied vacuum extracts soil vapor and enhances groundwater recovery.

MPE can accelerate the removal of both LNAPL and dissolved groundwater contamination while simultaneously remediating smear zone and vadose zone contaminants by lowering the groundwater table. MPE systems are best applied at sites with high VOC concentrations, free-phase product contamination, and sites which have moderate to low permeability (USEPA, 1997). Remediation capabilities of MPE in the vadose zone are similar to those of SVE; however, MPE may accelerate volatilization and removal of vadose zone contaminants over traditional SVE. MPE is most successfully used at sites with saturated soils exhibiting moderate to low hydraulic conductivity (silty sands, silts, and clayey silts) because these soils enable the formation of deeper water table cones of depression, which in turn exposes more saturated zone media and residual contamination to extraction system vapor flow (USEPA, 1997). Finally, less volatile hydrocarbons may also be treated by MPE as well. Introduction of air or oxygen into the subsurface during the vapor extraction process can stimulate the biodegradation of less volatile compounds, and results in in-situ natural bioremediation of soil contaminants that may not typically be removed by an extraction system. Based on this information, MPE is both implementable and potentially applicable to the Congress Street Site.

Enhanced Soil Vapor Extraction: Thermally enhanced SVE is a full-scale technology that uses conduction or convection to transmit heat through the unsaturated zone to increase the volatilization rate of both volatiles and semi-volatiles and to facilitate extraction. The process is otherwise similar to standard SVE, but requires heated extraction wells. High moisture content is a limitation of standard SVE that thermal enhancement may help overcome by evaporating water and improving air flow. Most systems are designed to treat VOCs but will also treat lighter-weight SVOCs. One major benefit of enhanced SVE is that, after application, subsurface conditions are excellent for biodegradation of residual contaminants, particularly SVOCs.

Testing at SI Groups' Rotterdam Junction facility has indicated that in-situ remediation of similar contaminants may be accomplished using a combination of the remedial technologies. It was determined that the level of VOCs within the soils was so high that the natural bioactivity within the soils had been significantly restricted. Reducing the levels of VOCs contained within the soils through SVE resulted in the natural microorganisms within the soil becoming active. The microorganisms then began to break down the VOCs and SVOCs remaining in the soils. Thermal enhancement of the SVE system has shown that the VOCs can be removed at a faster rate, the time required to remediate the area is reduced, and the higher soil temperatures enhance the bio-activity. Since the testing done at Rotterdam Junction was performed under similar conditions (similar permeability, contaminants, and concentrations), it is anticipated that enhanced-SVE is potentially applicable at the Congress Street Site.

A number of methods are available to thermally enhance the SVE system. The methods used at the Rotterdam Junction facility included:

1.) Heating of air that is then injected into the unsaturated zone, resulting in increased temperatures

2.) Heating of the unsaturated zone by hot water using a proprietary injection well design referred to as "Heat Trodes"

It is anticipated that by using either of these methods, the VOC levels will be reduced to a level at which the natural microorganisms would become active. In addition, the warmer soils also help to enhance the natural bioremediation of SVOCs within the unsaturated zone. Using this combined technology, the sources of contamination remaining in the unsaturated zone should be mitigated to a level that no longer represents a significant threat to human health or the environment. Based on this information, enhanced-SVE is both implementable and potentially applicable to the Congress Street Site as a remedial technology.

In-Situ Thermal Desorption: Soils and waste containing VOCs and some SVOCs may be remediated by in-situ low-temperature thermal desorption (ISTD). In ISTD, soil is heated in-situ to higher temperatures than typically used for thermally-enhanced SVE. Volatile and semi-volatile contaminants are vaporized and rise to the unsaturated zone where they are removed by vacuum extraction and then treated (Deuren et al., 2002). This thermal treatment technology should not be confused with incineration, which destroys contaminants. ISTD's primary application uses thermal wells, along with heated extraction wells, which can be placed to virtually any depth in virtually any media. Heat is applied to soil from a high-temperature surface in contact with the soil, so that radiation and thermal conduction heat transfer are effective near the heater. As a result, thermal conduction and convection occur in the bulk of the soil volume. Generally, end-product vapors are treated with an air stripper/carbon unit to remove any vaporized contaminants that have not been destroyed in-situ.

Benefits of ISTD include the ability to treat and/or destroy a wide range of contaminants. In addition, ISTD can treat free product in the form of LNAPL. However, costs associated with this technology are high due to the energy required and extensive operation and maintenance costs. Furthermore, SVOCs are not as readily treated as VOCs. Unless being heated to the higher end of the ISTD temperature range (~300°C), organic components in the soil are not damaged, which enables treated soil to retain the ability to support future biological activity and reduce SVOCs. Temperatures above the boiling point (100°C) will, however, sterilize the soils and require re-introduction of a microorganism colony to support further SVOC degradation. ISTD is anticipated to be both implementable and potentially applicable to the Congress Street Site as a remedial technology.

4.3.6 Ex-Situ Treatment

Ex-situ treatment techniques involve the destruction or conversion of contaminants in subsurface media to less toxic compounds after physically removing them from their original location. Most of the above-mentioned biological, chemical, and physical in-situ techniques are also applicable for the ex-situ treatment of petroleum-impacted soils and/or groundwater. Although the costs associated with ex-situ techniques are often much higher than those associated with in-situ techniques, ex-situ methods typically require shorter periods of time to reach the remedial objectives established. In addition, it is easier to determine whether contaminants have been destroyed using ex-situ treatment methods. Generally, the primary disadvantage for all ex-situ technologies is the increased costs and engineering for equipment, permitting, and materials handling worker safety issues associated with removal, treatment, and disposal or replacement of the impacted medium.

Ex-situ treatment technologies were not proposed or evaluated in the original FS but are being evaluated in this Updated Supplemental FS due to technology advances in recent years.

The following alternatives discussed above are also applicable to ex-situ treatment:

- Enhanced Bioremediation
- Soil Flushing/Washing
- Chemical Oxidation
- Thermal Desorption

Enhanced Bioremediation: The ex-situ approach to bioremediation is carried out aboveground by physically extracting the contaminated soil and groundwater. It is commonly applied to dissolved-phase contamination by pumping groundwater and placing it in aboveground bioreactors where it is put into contact with microorganisms, which then break down the contaminants. Soils are treated aboveground via biopiling and composting. The primary advantage to these ex-situ approaches is the degree of control that can be exerted over the processes being used to enhance natural bioremediation. However, the timeframe of this technology is typically longer and may take several years (Deuren et al., 2002).

Soil Washing: For soil washing, contaminants sorbed onto fine soil particles are separated from bulk soil in a water-based system on the basis of particle size. Soil washing is effective at removing both VOCs and SVOCs. However, due to the nature of the technology, soil washing is most effective on coarser-grained sediments. In soil washing, contaminated soils are excavated, sifted to remove large objects, and placed in a scrubbing unit. The wash water may be supplemented with surfactants, co-solvents, or treatment compounds to help remove organics and heavy metals. The mixture of soil and water is passed through sieves, mixing blades, and water sprays which wash the silt and clay from the larger-grained soil. The wash water and various soil fractions are usually separated using gravity settling. The polluted wash water is then treated and either reused in the scrubbing unit or discharged. Soils are then analyzed for contaminants and any soils that are determined to be free from contaminants can be placed back on the site. While all contamination is occasionally removed in the wash water, most often the silt and clay need further cleanup using a different remedial technology (Deuren et al., 2002).

Chemical Oxidation: The ex-situ approach to chemical oxidation is carried out nearly identical to the in-situ treatment technology. The main difference is that groundwater is pumped from the ground into a tank where it is mixed with oxidizing agents. Ex-situ chemical oxidation is not as effective at treating grossly impacted soils. Advantages include shorter treatment times as well as more control over the uniformity of treatment (Deuren et al., 2002).

In-Situ Thermal Desorption: Soils and waste containing VOCs and some SVOCs may be remediated by ex-situ thermal desorption, which generally involves the destruction or removal of contaminants through exposure to high temperature in treatment cells, combustion chambers, or other means used to contain the contaminated media during the remediation process. The main advantage of ex-situ treatments is that they generally require shorter time periods, and there is more control over the uniformity of treatment (Deuren et al., 2002).

Based on the difficulty in implementation resulting from the need to excavate soils and the similar effectiveness of each of the technologies above to its in-situ counterpart, it is not considered to be significantly advantageous to remove the impacted media and then treat it ex-situ. Therefore, no ex-situ treatment techniques are being retained for further evaluation.

4.3.7 Removal with Off-Site Disposal

The removal with off-site disposal action involves the excavation of on-site soils and waste containing contamination exceeding the potential soil cleanup goals and disposal of the soils at an approved off-site facility. Although on-site disposal in contained systems is sometimes considered, it is typically not favorable for sites where redevelopment is planned. Depending upon the objective of the removal, either partial or total removal may be necessary to prevent further releases into the environment. There are many issues that must be considered if source removal and disposal are considered, including consideration of odors, fugitive dust emissions, depth and composition of the material being excavated, transportation methods, the transportation of the material through populated areas, pretreatment, waste characterization as dictated by land disposal restrictions (LDRs), temporary storage of the waste on-site, etc. Despite the anticipated difficulties with excavating at the Site, removal with off-site disposal as a remedial technology is being retained for further evaluation.

5.0 PROCESS AREA

For the purpose of the following evaluation and detailed analysis of alternatives, the Site has been divided into two separate remediation units. This section presents the analysis of the Process Area. Section 6.0 presents the analysis of the Fill Area.

5.1 Evaluation and Screening of Remedial Technologies

Preliminary screening was performed using engineering judgment to assess the implementability of each technology in the Process Area. Technologies that passed through the preliminary screening (Section 4.0) were then further qualitatively screened, based on feasibility. A feasible alternative is considered to be an alternative that is suitable to site conditions, and is capable of being successfully carried out with available technology, implementable and cost effective. The criteria used in the screening are defined below:

<u>Effectiveness:</u> Potential to achieve the RAOs with emphasis on feasible alternatives that would result in reduction of toxicity, mobility, or volume through treatment; reduce residual risks; afford long term protection; comply with RAOs; and reduce short term impacts over a reasonable amount of time. Technologies that provide significantly less effectiveness than other, more promising, technologies may be eliminated. Technologies that do not provide adequate protection of human health and the environment will be eliminated from further consideration.

<u>Implementability:</u> Applicability of the process option to the site with full consideration of topographic, geologic, and hydrogeologic constraints, as well as, legal and public constraints. These criteria focus on the technical feasibility and availability of the technologies that make up each alternative, as well as the administrative feasibility of implementing the alternative. Technologies that are technically or administratively infeasible, or that would require equipment, specialists, or facilities that are not available within a reasonable period of time will be eliminated from further consideration.

<u>Cost:</u> Process options are screened on the cost to implement the alternative and the benefits obtained. The alternative retained is determined based on the cost and benefit obtained. For example, an alternative that removes the last 2 to 3% of the contamination can have substantial cost with limited benefit and would not be

retained. Technologies providing effectiveness and implementability similar to that of another technology by employing a similar method of treatment or engineering control, but at a greater cost, will be eliminated. In addition to capital costs, long-term costs to operate and maintain the alternative needs to be considered.

A detailed screening of the technologies and associated process options that were retained during the initial screening was conducted for the Process Area. Table 14 presents the results of the detailed screening of the process options. Effectiveness, implementability, and cost were qualitatively evaluated for each process option and assigned a rank of low, moderate, or high for each criterion. The evaluation and assigned rankings for each process option are relative to other process options that achieve the same RAOs. Eliminated technologies and process options are shaded in the table and the rationale for elimination is presented in the rightmost column. As a result of the detailed screening, a concise list of technologies and process options is compiled in Section 5.2 that can be assembled into comprehensive remedial alternatives that achieve the RAOs. The retained technologies and process options are assembled into comprehensive remedial alternatives and evaluated in more detail in Section 5.3.

5.1.1 No Further Action

The National Contingency Plan (NCP) requires that No Action be included among the general response actions (GRAs) evaluated. Under the no action response, no additional measures would be taken to improve environmental condition with respect to the soils in the Process Area.

Effectiveness –As described in Section 2.8, the Process Area is presently being contained with the use of a groundwater collection and treatment system, which controls the potential migration of contaminated groundwater leaving the Site. The contaminated groundwater is removed through the use of four pumping wells and a collection trench and treated on-site. A groundwater monitoring program is currently in place to monitor the effectiveness of the containment system.

Future use of the Process Area would be restricted due to the continued presence of on-site contamination. Administrative controls and procedures such as perimeter fencing and site surveillance have already been implemented at the Site. The level of contamination in the groundwater would continue to decrease with time due to natural attenuation. The operation of the groundwater collection and treatment system would continue until natural attenuation has reduced the level of contamination to a point where the groundwater no longer represents a significant threat to the environment or public health. Since the sources of contamination are expected to remain for an extended period of time, it is anticipated that the groundwater collection and treatment system will continue to operate for at least 30 years.

Implementability - No Action is easily implemented from a technical and administrative perspective.

Costs - There are no short-term costs for No Action. Long-term costs are limited to continued operation of the GWCS, groundwater monitoring and Site maintenance.

Conclusion - The depth to impacted soils is relatively shallow in the Process Area and will likely be encountered and potentially displaced during excavation activities associated with potential redevelopment. Natural attenuation and operation of the GWCS will continue to reduce the level of contamination contained in the Process Area. Since this alternative does have some effectiveness in the short term and meets some of the RAOs, such as containment of the Site, taking no further action in the Process Area is being retained.

5.1.2 Institutional and Administrative Controls

Although numerous institutional and administrative controls are already in place for the Process Area, additional institutional controls (ICs) will be effective in further reducing potential human exposure and impacts to the environment when used in conjunction with other remedial actions.

ICs that may be used on the Site include restricting access, development of health and safety procedures to implement during construction activities, deed restrictions that restrict the Site for commercial or industrial use only, and restrictions on the use of the groundwater beneath the Site as a drinking water source. Implementation of these ICs will generally be feasible and costs are expected to be relatively low.

One method to control human exposure to Site contaminants which has already been implemented is restricting access to the Site. As previously discussed, the Site is currently secured with chain link fencing on all sides. There is a gate near the northeast corner of the Site restricting vehicular access to the Site near the intersection of Oak Street and Tenth Avenue. The current fencing around the Congress Street Facility will be useful during any active remedial work at the Site to limit human access. The existing fencing and gates could be supplemented with additional signage to warn potential trespassers to keep off the Site. However, restricting access to the Site is considered only a part of the permanent remedy for managing the Process Area.

Administrative controls have also been implemented at the Site concerning soil and storm water management. SI Group has also committed to completing a vapor intrusion evaluation if a building is constructed on Site in the future.

In addition, it is expected that covenants/deed restrictions may be required, depending on the remedial action selected, to limit future land use or prohibit activities that may compromise specific engineering remedies. For example, if the entire Process Area is capped, restrictions may be imposed concerning future excavations to limit potential human exposure and impacts to the environment.

Effectiveness - Site use restrictions may limit potential exposure to contaminants from a human health standpoint, but will not reduce or alleviate potential environmental impacts. Also, since some people may not comply with the controls, it is possible that some exposure to contamination may occur. However, the implementation of additional institutional and administrative controls will meet some RAOs in the short term and will help to meet the remaining RAOs over the long term.

Implementability - Institutional and administrative controls are easily implemented from a technical and administrative perspective. Many administrative controls are already in place, but land use restrictions may require zoning changes and legal consultation.

Costs – Costs of implementing institutional and administrative controls are expected to be low to moderate. Short-term costs include legal consultation. Long-term costs associated with this option include maintenance costs of Site access (fencing, etc.) and security.

Conclusion – This alternative does have some effectiveness in the short term and meets some of the RAOs, such as containment of the Site. Institutional Controls are potentially applicable to the Congress Street Site and will likely be implemented to some degree with all alternatives unless contaminant levels are reduced below RAOs.

5.1.3 Natural Attenuation

Analytical data that was obtained during the Updated RI indicate that natural attenuation is occurring in the Process Area. This is evident from the lower levels of soil contamination that were detected during the Updated RI compared to the levels detected during the investigations completed in the 1990s.

Given the present level of contaminated soil, natural attenuation mechanisms (e.g. biodegradation, dilution, dispersion, etc.) along with contaminant removal through operation of the GWCS, the amount and toxicity of the contamination will continue to reduce the potential threat posed to human health and the environment.

Various remedial alternatives that are developed for the Process Area will rely on natural attenuation and operation of the GWCS to reduce the residual contaminants that may not be addressed through active remediation. A plan will be developed during the remedial design that will outline the proposed monitoring program that would be used with the selected alternative.

The monitoring program will specify the location, frequency, and type of samples and measurements necessary to evaluate whether the remedy is performing as expected and is capable of attaining remediation objectives. The monitoring program will be designed to accomplish the following:

- Demonstrate that natural attenuation is occurring according to expectations;
- Detect changes in environmental conditions (e.g., hydrogeologic, geochemical, microbiological, or other changes) that may reduce the efficacy of the natural attenuation processes;
- Identify potentially toxic and/or mobile transformation products;
- Verify that the plume is not expanding (either downgradient, laterally, or vertically);
- Verify no unacceptable impact to downgradient receptors;
- Detect new releases of contaminants to the environment that could impact the effectiveness of the natural attenuation remedy;
- Demonstrate the efficacy of institutional controls that are put in place to protect potential receptors; and
- Verify attainment of remediation objectives.

The monitoring program will be implemented during design (baseline conditions) and during post-remediation phases of the program to document the efficacy of the natural attenuation process. A contingent remedy may be required if it appears that contaminant concentration trends are increasing rather than decreasing over time. Performance monitoring will continue until remediation objectives have been achieved, and longer if necessary to verify that the Process Area no longer poses a threat to human health or the environment.

Effectiveness - The effectiveness of natural attenuation depends on how well naturally occurring processes such as biodegradation reduce contaminant levels in the Process Area. The degree of degradation varies directly with the level of contamination and will require an extended time period to reach the RAOs. Extensive monitoring and analysis required as part of natural attenuation are effective in tracking trends in contaminants. Natural attenuation would be most effective if used in conjunction with another remedial technology that will initially remove a large portion of the contaminant mass.

Implementability – Natural attenuation is already occurring within the Process Area and is aided by the operation of the GWCS.

Costs - Short- and long-term costs for monitoring and data analysis are relatively low to moderate compared to active remedial alternatives.

Conclusion - Natural attenuation will reduce the level of contamination contained in the Process Area over an extended period of time. Although natural attenuation may be utilized to remediate residual contaminants, it will probably not be selected as the sole remedy for the Process Area. However, monitored natural attenuation can be implemented along with an active remedial technology or after a more active remediation is completed. This option is retained for further evaluation.

5.1.4 Physical Containment

Containment and/or hydraulic control measures are used to control the migration of contaminants in subsurface soils and groundwater. Containment techniques are typically utilized at sites where the contaminants are intended to be left in place at the site. For example, containment systems are often used at sites where the subsurface contamination is extensive and removal of the contaminants is precluded by the potential hazards associated with the removal and/or excessive costs. Extensive monitoring of containment systems is necessary to ensure the competency of the system and ensure that the system has been contained. Containment of the Congress Street Site was completed with implementation of the Remedial Action Plan specified for OU1. However, additional containment measures could be implemented and would provide limited further reduction in potential exposure to contaminants within the Process Area.

5.1.4.1 Soil

A variety of surface capping technologies are available to minimize the surface exposure of the contaminants present in soils in the Process Area. Although installation of a surface cap would not reduce the contaminant mass, caps are useful for controlling human exposure to the contaminants while certain types of remedies are being implemented.

If capping is implemented as a remedial action, a permeable soil cover is recommended for the Process Area. A permeable cap is recommended to allow infiltration of surface water, which should encourage natural biodegradation by introducing oxygen-rich water and air into the soil and aquifer and enhance the natural soil flushing. In addition, the migration of the surface water through the unsaturated soils will add in the migration of contaminants from the soils to the GWCS where they would then be removed. Material specifications, installation methods, and compaction specifications for the soil cover will be specified during the design phase.

Effectiveness – The effectiveness of installing a containment system in the Process Area over what has already been implemented is low, because the benefits obtained are limited. The containment system would reduce the potential risk of indirect exposure to the contaminants from a human health standpoint. In addition, a permeable cap would promote the infiltration of precipitation and surface water, enhancing natural soil flushing and thus removing contaminants at a higher rate. Capping will not achieve the RAOs in the short term, but will result in a reduction of the toxicity, mobility or volume of contamination in the Process Area.

Implementability – A cap or cover is easily implemented from a technical and administrative perspective.

Costs - Construction costs are expected to be low to moderate depending on the type of capping material, the thickness of the cap, and the method of construction. Long-term costs include periodic monitoring of the cap and cap maintenance, as required.

Conclusion - Based upon the results of the remedial investigation, it is likely that a permeable soil cover will be effective in the Process Area. This type of cover is protective of human health by reducing potential for human exposure to contaminants. In addition, the cover will allow for infiltration of surface water to encourage natural biodegradation, and flushing of contaminants from the soils to the GWCS. This option is retained for further evaluation.

5.1.4.2 Groundwater

The groundwater collection and treatment system, installed by SI Group in 2001 to control the off-site migration of contaminated groundwater from the Process Area, will remain in operation until groundwater contamination is reduced to levels below RAOs. The collection system has proven to be effective in reducing the mobility or migration of contaminants off-site and reduction in the concentration and volume of contaminants in the Process Area. This option will require continued long-term operation and maintenance of the GWCS.

5.1.5 In-Situ Treatment

5.1.5.1 Enhanced Bioremediation

Enhanced bioremediation is a technology that encourages growth and reproduction of indigenous microorganisms to enhance biodegradation of organic constituents in the saturated zone. Bioremediation techniques have been successfully used to remediate soils and groundwater contaminated with petroleum hydrocarbons, solvents, and other organic chemicals (Deuren et al., 2002). The contaminant groups treated most often are polynuclear aromatic hydrocarbons (PAHs), SVOCs, and BTEX compounds (benzene, toluene, ethylbenzene, and xylenes). Enhanced bioremediation is effective at treating both saturated and unsaturated zones (Deuren et al., 2002).

Bioremediation treatment does not require heating, but requires relatively inexpensive inputs, and usually does not generate residuals that may require additional treatment or disposal. Also, when conducted in-situ, it does not require excavation of contaminated media. Compared with other technologies, such as thermal desorption, thermally enhanced recovery, chemical treatment, and in-situ soil flushing, bioremediation may offer a cost advantage in the treatment of SVOCs.

Effectiveness - Enhanced bioremediation would result in a reduction of the toxicity, mobility and volume of contamination at the Site. The technology would reduce residual risks and afford long term protection. While bioremediation may be able to achieve the RAOs for SVOCs and VOCs, the timeframe to reach desired contaminant levels may be long-term due to current site conditions.

Enhanced bioremediation is not proven effective for grossly contaminated soils because high concentrations of organic chemical compounds can be toxic to the microorganisms.

Within the Process Area, contaminant concentrations of VOCs are too high for this option to be effective as an initial treatment technology.

Implementability – Enhanced bioremediation is technically and administratively implementable. Since the technology has been proven to be effective at a number of sites, the number of vendors offering this technology is high.

Costs – The relative costs of this technology can be classified as moderate compared to other technologies.

Conclusion – Since the technology is not expected to work effectively given the present high concentrations of VOCs, other options are preferable for initial treatment. However, enhanced bioremediation could be used to address SVOC contaminant levels after VOC concentrations have been reduced and thus is retained for further evaluation. As such, an alternative technology that is applicable to both VOCs and SVOCs may be preferred and bioremediation as a sole remedial technology will not be considered.

5.1.5.2 Conventional Soil Vapor Extraction

Soil vapor extraction (SVE) is an in-situ unsaturated zone soil remediation technology in which a vacuum is applied to the soil to induce the flow of air and remove volatile and some semi-volatile contaminants from the unsaturated zone. Conventional soil vapor extraction (SVE) should readily remove volatile compounds and simultaneously promote the in-situ biodegradation of less volatile organic compounds that are present. SVE systems are a medium-term technology and work best in high permeability soils. It would likely be necessary to pump groundwater from the target treatment zone in order to reduce ground water upwelling induced by the vacuum and to increase the depth of treatment in the vadose zone.

Effectiveness – The target contaminant groups for SVE are VOCs as well as some fuels. The technology is typically applicable only to more volatile compounds. Other factors, such as the moisture content, organic content, and permeability of the soil will also affect the effectiveness of SVE. Since conventional SVE systems work best in high permeability soils, it is anticipated that the low permeability soils observed in the Process Area during the Updated RI would reduce the effectiveness of the technology.

Furthermore, SVE will not readily remove heavier or less volatile compounds. However, because the process involves the continuous flow of air through the soil, it often promotes the in-situ biodegradation of low-volatility organic compounds that may be present.

Since extraction wells would already be in place, SVE could be followed by bioventing/biosparging to further promote natural biodegradation of SVOCs.

It is not anticipated that this technology would treat contamination contained within the relatively tight soils observed in the Process Area during the Updated RI as effectively as an enhanced SVE system as discussed in Section 5.1.5.7.

Implementability – Although SVE is readily implemented, it would likely require a dewatering system to create more unsaturated soils and increase the over-all effectiveness. Treatment of extracted vapor would be required prior to discharge. Existing slabs and foundations may present difficulties for implementing this technology and would likely need to be removed prior to implementation.

Costs – Costs are estimated to be in the moderate range.

Conclusion – Although conventional SVE is less expensive than enhanced SVE, it has limitations at sites that have low permeability soils. Furthermore, it is a longer-term technology than enhanced SVE. Although conventional SVE is both implementable and potentially applicable in combination with other technologies for treating VOCs and SVOCs, enhanced SVE is considered a more effective technology for the soil types present in the Process Area. As such, conventional SVE is not being retained for further consideration for the Process Area.

5.1.5.3 Soil Flushing

In situ soil flushing is the extraction of contaminants from the soil with water or other suitable aqueous solutions. Soil flushing is accomplished by passing the extraction fluid through in-place soils using an injection or infiltration process. Soil flushing is generally only effective at treating unsaturated soils. The target contaminant groups for soil flushing are VOCs and SVOCs.

Effectiveness – The technology can be used to treat VOCs and SVOCs, but may be less cost-effective than alternative technologies for these contaminant groups. Low permeability or heterogeneous soils are difficult to treat and may limit the applicability and effectiveness of the process. Soil flushing is a developing technology that has had limited use in the United States.

Ultimately, soil flushing would result in some reduction of the toxicity, mobility or volume of contamination at the Site. The technology would help to reduce short term impacts as well as afford long term protection. Soil flushing is currently being used in a limited degree by allowing the surface water to infiltrate the area and flow through the contaminated soils to the GWCS. As a result of this flushing, VOCs and SVOCs are being removed, collected by the GWCS, and treated.

Implementability – Soil washing is technically and administratively implementable. However, soil flushing is a developing technology that has been used at a limited number of sites. In addition, there are a limited number of vendors offering this technology.

Costs – The relative cost of this technology can be classified as moderate compared to other technologies. However, the depth to groundwater is a cost driver, with a deeper water table resulting in a higher cost to complete. Soils with lower permeability are less responsive to soil flushing, which increases both remediation time and costs.

Conclusion – Soil flushing is being used at this time to allow surface water to migrate through the soils to the GWCS. The low permeability and heterogeneous soils in the Process Area are expected to limit the effectiveness of soil flushing. Therefore, soil flushing will be retained in conjunction with other remedial alternatives as is presently being used but will not be retained for further evaluation as a sole alternative.

5.1.5.4 Bioventing/Biosparging

Bioventing provides oxygen to stimulate naturally occurring soil microorganisms to degrade compounds in unsaturated soil. Bioventing can be used to treat all aerobically biodegradable constituents; however, it is most effective in remediating sites with SVOC compounds. Compounds that tend to volatilize readily (VOCs) are more effectively removed using SVE. Similar to conventional SVE, initially high concentrations of volatile organics may be toxic to microorganisms, therefore hindering the effectiveness of the technology.

Effectiveness – If the current level of VOCs is reduced, bioventing would result in a reduction of the toxicity, mobility or volume of contamination at the Site. The technology would reduce residual risks and afford long term protection. However, while bioventing may be able to achieve the RAOs for SVOCs, the timeframe to reach desired contaminant levels may be mid- to long-term.

A major reduction in SVOC concentration is expected in the short-term. However, as contaminants concentrations are reduced, the microorganisms are less effective at treating the remaining concentration. The current levels of VOCs observed in the Process Area during the Updated RI are expected to limit the effectiveness of this technology and it would be necessary to first reduce VOC contamination prior to implementing a biosparging program.

Implementability – Bioventing/biosparging is readily implemented, especially if the technology is employed after SVE has been used to reduce VOC contamination and the bioventing network can utilize a previously installed SVE system. Existing slabs and foundations would present difficulties for implementing this technology and would likely need to be removed prior to implementation.

Costs – Costs are expected to be in the moderate range. However, if wells previously installed can be used for bioventing, costs can be decreased.

Conclusion – Since the technology is not expected to work effectively given the present high concentrations of VOCs, other options are preferable for initial treatment. However, bioventing could be used to address SVOC contaminant levels after VOC concentrations have been reduced and thus is retained for further evaluation. As such, an alternative technology that is applicable to both VOCs and SVOCs may be preferred; bioventing as a sole remedial technology will not be considered.

5.1.5.5 Chemical Oxidation

Chemical oxidation (CO) is based on the delivery of chemical oxidants to contaminated media in order to react with the contaminants and convert them to non-toxic compounds. Chemical oxidation is expected to address both VOCs and SVOCs present at the Site in the saturated zone. However, chemical oxidation is generally most effective when used concurrently with another treatment technique to target contaminants in the unsaturated zone (i.e. SVE). A benefit of many chemical oxidation techniques is that the chemical reactions provide residual dissolved oxygen that can then be used by aerobic microorganisms to biodegrade contaminants after active remediation is complete.

Effectiveness – Since chemical oxidation technologies have been predominantly and successfully used to address contaminants in the source area saturated zone and/or capillary fringe, the technology is expected to be successful in removing contaminants from the saturated zone within the Process Area but will not address the primary source area within the unsaturated soils. Treatment of the LNAPL present in the Process Area may be possible with chemical oxidation, which has been successfully employed at other sites to treat NAPLs. However, a bench-scale study would be needed prior to design to determine if Site conditions were favorable for the treatment of LNAPL in the Process Area.

Ultimately, chemical oxidation would result in a reduction of the toxicity, mobility and volume of contamination at the Site. The technology would reduce short term impacts as well as afford long term protection. The technology may be able to achieve the RAOs for groundwater, but will not address source-zone soils.

Implementability – This technology is readily implemented, requires no permanent structures and requires only minimally intrusive activities. Existing slabs and foundations would present difficulties for implementing this technology and would likely need to be removed prior to implementation.

Costs – Costs are expected to be in the moderate to high range when compared to other alternatives. Costs are ultimately based on the chemical reagent chosen, the need for the addition of a surfactant, how the application is performed, and the degree of contamination.

Conclusion – Chemical oxidation is a proven technology that would result in a reduction of the toxicity, mobility and volume of contamination in the saturated zone at the Site. The technology would reduce short term impacts as well as afford long term protection. However, chemical oxidation is not as effective at addressing contamination in the unsaturated zone. Based on the summary of contaminant mass provided in Section 3.3, the majority of contamination in the Process Area is present in the unsaturated zone. As such, chemical oxidation is not being retained as a possible remedial technology for the Process Area since it will not effectively address the majority of the contamination in the Process Area.

5.1.5.6 Multi-Phase Extraction

Multi-phase extraction (MPE) involves removal of contaminated groundwater, free-phase product contamination, and soil vapors from a common extraction well under vacuum conditions. MPE will readily remove volatile compounds and simultaneously promote the in-situ biodegradation of less volatile organic compounds that are present. Since it is effective in the removal of soil vapor as well as contaminated groundwater and free-phase product contamination, MPE is considered to be an effective means of in-situ remediation in the Process Area. Secondly, since MPE is best applied at sites with high VOC concentrations, free product, and sites which have moderate to low permeability, it is determined to be an appropriate remedial technology for the Process Area.

Effectiveness – MPE would result in a reduction of the toxicity, mobility and volume of contamination at the Site. While MPE directly removes VOCs from both soil and groundwater, the introduction of air or oxygen into the subsurface during the vapor extraction process stimulates biodegradation of SVOCs and results in natural bioremediation of soil contaminants that are not otherwise removed by an extraction system. The technology would reduce short term impacts as well as afford long term protection. The technology may be able to achieve the RAOs within a short time period compared to other alternatives.

Implementability – MPE is readily implemented, requires no permanent structures and requires only minimally intrusive activities. However, treatment of extracted product, water and vapor prior to discharge or disposal would be required. Existing slabs and foundations would present difficulties for implementing this technology and would likely need to be removed prior to implementation. The GWCS would also be required to operate during implementation to ensure that the site remains contained.

Costs – Costs are expected to be in the moderate range when compared to other alternatives. Costs are higher than conventional SVE because MPE is more energy-consumptive, but is ultimately more effective.

Conclusion – Although MPE is more expensive than conventional SVE, the technology has been shown to be effective at sites with soils that have low hydraulic conductivities and LNAPL. Based on this information, MPE is retained as a possible remedial technology for the Process Area.

5.1.5.7 Enhanced Soil Vapor Extraction

Thermally enhanced SVE is a full-scale technology that uses conduction or convection to transmit heat through soils to increase the volatilization rate of both volatiles and semi-volatiles and to facilitate extraction. Testing at SI Group's Rotterdam Junction facility has indicated that a combination of either convective or conductive heating of the soils and soil vapor extraction is effective in the remediation of VOC contaminants under similar site conditions, and further suggests that enhanced SVE is a remedial technology that should be considered as an initial remedial alternative for the Process Area.

Effectiveness - Enhanced SVE would result in a reduction of the toxicity, mobility and volume of contamination in the Process Area. The technology would reduce short term impacts as well as afford long term protection. Given the appropriate timeframe, the technology is expected to comply with RAOs. Since extraction wells would already be in place, SVE could be followed by bioventing/biosparging to further promote natural biodegradation of SVOCs. The lower permeability soils observed in the Process Area are expected to increase the effectiveness of the technology.

Implementability – An enhanced SVE system is readily implemented but will require an extensive dewatering system to create more unsaturated soils and increase the over-all effectiveness. Treatment of extracted vapor would be required prior to discharge. Existing slabs and foundations would present difficulties for implementing this technology and would likely need to be removed prior to implementation. It should be noted that one of the technologies demonstrated at SI Group's Rotterdam Junction facility was a proprietary technology. The GWCS would also be required to operate during implementation to ensure that the site remains contained.

Costs - Costs are estimated to be in the moderate range and are primarily driven by the energy-consumptive nature of the technology.

Conclusion – Although enhanced SVE is more expensive than conventional SVE, it has been determined to be a better alternative for sites with lower permeability soils. Based on this information, enhanced SVE is retained as a possible remedial technology for the Process Area.

5.1.5.8 In-Situ Thermal Desorption

In ISTD, soil is heated in-situ to higher temperatures than typically used for thermally-enhanced SVE. Volatile and semi-volatile contaminants are vaporized and rise to the unsaturated zone where they are removed by vacuum extraction and then treated. ISTD is used effectively to remediate both the saturated and unsaturated zones. The technology has a high removal efficiency because it does not rely on injection of fluids to mobilize target compounds. An additional benefit of ISTD is that it does not require that the groundwater be extracted and/or treated aboveground.

Effectiveness – ISTD would result in a reduction of the toxicity, mobility and volume of contamination in the Process Area in a relatively short timeframe. Since this technology works most effectively in tighter soils or in soils with heterogeneity in permeability or moisture content, it is anticipated to be effective in the Process Area. The target contaminant groups for low temperature ISTD systems are VOCs, but it can be used to treat some SVOCs depending on their volatility and temperature that the system is heated to.

Implementability – ISTD is readily implemented and is applicable to both soil and groundwater contamination across the Site. This treatment technology has been shown to be effective for the in-situ treatment of both soil and groundwater, thereby potentially decreasing the period of time required for operation of the GWCS. Because soil moisture greatly influences the effectiveness of the technology, control of groundwater recharge into the heated zone may be required. Treatment of extracted vapor would be required prior to discharge. Existing slabs and foundations would present difficulties for implementing this technology and would likely need to be removed prior to implementation.

Costs – There are substantial costs associated with the operation and maintenance (O&M) of ISTD, as well as the energy required to operate the system. However, since it is anticipated that this treatment technology may be able to achieve the RAOs within a short time-frame, long-term operation of the GWCS for the Process Area may not be necessary, thereby reducing long-term operating costs.

Conclusion – Although the costs associated with ISTD can be moderate to high due to energy and equipment costs, ISTD is retained as a viable technology because of the relatively short timeframe necessary to remediate the impacted soils and overall effectiveness.

5.1.5.9 Removal with Off-site Disposal

The removal and disposal response action involves the excavation of Process Area soils which contain contamination that exceeds potential soil cleanup goals, and disposing of the soils at an approved off-site facility. The feasibility study for OU-1 eliminated this option due to the inaccessibility of soils. However, the sources of contamination present in the soils are located under and adjacent to buildings that have since been removed from the Site. As such, this alternative is being reconsidered as a part of this Updated FS.

This process option would involve the greatest amount of Site disturbance and community impact. As such, the risks from dust and truck traffic would increase proportionally. Additional drawbacks associated with disposing of soils with contaminant levels present in excess of SCGs include the long-term liability associated with disposing waste at another location. Furthermore, CERCLA includes a statutory preference for treatment of contaminants, and excavation and off-site disposal is now less desirable than in the past.

In order to allow for informed decision making regarding the feasibility of excavation and/or other remedial activities, the stability of the soils across the Site was considered as part of the Updated RI and assessed by evaluating soil boring logs generated during this and previous investigations. It was determined that portions of the excavation, especially along the railroad and up-slope areas, would require extensive shoring to remain stable.

Effectiveness – Since no soil exceeding the cleanup standards would remain on-site, volume and toxicity would be reduced on-site but not at the disposal facility. This alternative represents a permanent solution for the Process Area. However, the contaminated soils disposed of off-site would have to be managed at the disposal facility over the long-term.

In order to fully remediate the Process Area, it is anticipated that soils would need to be removed to a depth of nearly 30 feet. If soils were not removed to this depth, residually contaminated soils and groundwater would remain on-site and would require additional treatment and/or monitored natural attenuation.

Implementability – Although removal and disposal of the contaminated soils from the Process Area is considered an effective approach for managing the impacts to the Site, implementation would be extremely difficult. Due to topography and soil characteristics, most of the contaminated soils present in the Process Area are difficult to access. The buildings once located on the Site were removed to ground level with the ground floors and selected walls left in place. The walls remaining in place function as retaining walls, maintaining the stability of the slope. In addition, the walls were re-enforced with placement of fill materials against the walls to ensure the integrity of the walls with the removal of the surrounding buildings.

As noted in the Updated RI Report, the soils on-site consist of inter-bedded sand, silt and clay layers. Regionally, many natural slopes in the area of the Site are often unstable and the disturbance of the slopes or unusual conditions such as heavy soaking rains that locally raise the water table can destabilize the slopes causing failure. Like this Site, these soils are often in the form of steeply sloped bluffs overlooking stream and river valleys. These bluffs, historically, are marginally stable in their natural condition, and become unstable in situations such as when excavations are made near the base of the slopes, which may occur if the area in question is removed. Major slope failures have occurred west of the Congress Street Site along Broadway that resulted in major property loss in recent years. The Process Area has similar topography and geology to the failure prone areas.

Instability of Site soils was previously demonstrated during the excavation of the "french drain". Shoring was installed on both sides of the excavation that was dug for installation of the "french drain". A small section of the excavation was not shored due to the fact the excavation was not very deep and shoring was not considered to be necessary. During excavation, difficulties were encountered due to the sloughing of soils into the excavation. This movement of the soils also resulted in the undermining of the loading dock located at a higher elevation near the excavation. The excavation would need to be extended two (2) to three (3) feet below the water table, requiring extensive dewatering.

While complete excavation of impacted soils does not appear to be easily implemented at this time, limiting the scale of excavation in the Process Area may be a reasonable option. With phased excavation and extensive sheeting, most stability issues could be addressed. The excavation would allow for the Site to be developed in the future with limited risk of potential human exposure associated with excavations for future building footprints. However, as noted above, some residual contamination will remain on-site.

Costs – This alternative represents the highest cost for remediation of the Process Area. It is anticipated at this time that a significant portion of excavated soils would need to be disposed off-site at a permitted disposal facility. Costs are driven primarily by the volume of soil disposed, dewatering and associated treatment, and engineering of the excavations.

Conclusion – Although no volume reduction would be attained by this process option since contamination would be transferred off-site rather than destroyed, it is the most permanent. Implementation of this option is considered the most difficult of those presented; however, since this option is the most permanent, it will be retained for further evaluation.

5.2 Representative Processes Selected for the Development of Alternatives

The technologies selected from the two-step screening process above include several process options. The physical treatment technology, for example, includes four process options (soil flushing, conventional SVE, enhanced SVE, MPE). Many of these process options are similar since they all reduce the volume of contamination. To include all combinations of process options in the development of alternatives would result in the evaluation of many of alternatives with little to no additional benefit.

In some cases, the various process options are sufficiently different in their performance that one would not adequately represent the other. In these cases, more than one process option was selected for a technology type. For example, under the physical treatment category, it was concluded that multi-phase extraction and enhanced SVE were sufficiently different in performance and cost for both to be included in the remedial alternative development. The following process options were selected as representative:

Technology	Representative Process Option(s)
No Action	▪ No Action
Access Restrictions	▪ Deed Restrictions ▪ Groundwater and Soil Management Plan
Natural Attenuation	▪ Natural Attenuation
Physical Containment	▪ Soil Cover
Excavation	▪ Conventional Equipment
Off-Site Disposal	▪ Off-Site Disposal
Biological Treatment	▪ Bioventing/Biosparging
Chemical Treatment	▪ None Selected
Physical Treatment	▪ In-Situ Thermally-Enhanced Soil Vapor Extraction ▪ In-Situ Multi-Phase Extraction
Thermal	▪ In-Situ Thermal Desorption
Ex-Situ Treatment	▪ None Selected

The actual process options to be used during the cleanup will be defined in the Remedial Action Plan. The technologies and representative process options identified in this section are combined into alternatives in Section 5.3 and evaluated in more detail in the remainder of this FS.

5.3 Development of Alternatives

Based upon the preliminary evaluation and screening of available remedial technologies, a number of options remain for managing the contaminants in the Process Area. As indicated in previous sections, a majority of the retained technologies will not be considered sufficient as the sole remedy. Instead, some remedial alternatives will combine a number of these technologies to provide an effective, implementable, and cost-effective approach to remediating the Process Area.

The following seven remedial alternatives for the Process Area have been assembled utilizing the general response actions, technologies, and process options retained from the initial screening and presented in Section 5.2:

Alternative P-1:

- No Further Action
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative P-2:

- Capping of Process Area
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Natural Attenuation
- Surface Water and Groundwater Monitoring

Alternative P-3:

- Excavation of Impacted Soils in Process Area, Off-site Disposal
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative P-4:

- Limited Excavation of Impacted Soils in Process Area, Off-site Disposal
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative P-5:

- In-Situ Treatment in Process Area Using Thermally-Enhanced SVE
- Bioventing/Biosparging
- Removal of Slabs, Surface Obstructions and Building Footings
- Institutional/Administrative Controls

- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative P-6:

- In-Situ Treatment in Process Area Using Multi-Phase Extraction
- Bioventing/Biosparging
- Removal of Slabs, Surface Obstructions and Building Footings
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative P-7:

- In-Situ Treatment Using ISTD
- Removal of Slabs, Surface Obstructions and Building Footings
- Institutional/Administrative Controls
- Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

A detailed analysis of these seven remedial alternatives for managing the subsurface contaminants present in the Process Area of the Congress Street Site is provided in the following section.

5.4 Detailed Analysis of Alternatives

The purpose of this section is to provide a detailed analysis of several remedial alternatives for managing the subsurface contaminants present in the Process Area of the Congress Street Site. The remedial alternatives for the Process Area were developed in Section 5.3 utilizing the general response actions, technologies and process options retained from the qualitative screening conducted in Section 5.1. The detailed analysis of alternatives consists of the refinement of remedial alternatives and evaluation of each alternative against seven evaluation criteria which encompass technical, cost, and institutional considerations; and compliance with statutory requirements. The detailed analysis presented in this section follows the outline presented in the USEPA RI/FS Guidance Document dated October 1988 and 6 NYCRR Section 375-2.8 (c). The criteria to be used for the detailed analysis of alternatives include the following:

- Protection of Human Health & the Environment
- Compliance with SCGs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

1. Overall Protection of Public Health and the Environment. This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, engineering controls or institutional controls. The remedy's ability to achieve each of the RAOs is evaluated.

2. Compliance with Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. All SCGs for the Site will be listed along with a discussion of whether or not the remedy will achieve compliance. For those SCGs that will not be met, provide a discussion and evaluation of the impacts of each, and whether waivers are necessary.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals

remain on-site after the selected remedy has been implemented, the following items are evaluated:

i. The magnitude of the remaining risks (i.e. will there be any significant threats, exposure pathways, or risks to the community and environment from the remaining wastes or treated residuals?),
ii. The adequacy of the engineering and institutional controls intended to limit the risk,
iii. The reliability of these controls, and;
iv. The ability of the remedy to continue to meet RAOs in the future.

4. Reduction of Toxicity, Mobility or Volume with Treatment. The remedy's ability to reduce the toxicity, mobility or volume of site contamination is evaluated. Preference should be given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site. Implementation of any of the alternatives, except No Action, will address the highest concentrations of constituents in the soil.

5. Short-term Effectiveness. The potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during the construction and/or implementation are evaluated. A discussion of how the identified adverse impacts and health risks to the community or workers at the Site will be controlled, and the effectiveness of the controls, should be presented. Provide a discussion of engineering controls that will be used to mitigate short term impacts (i.e. dust control measures). The length of time needed to achieve the remedial objectives is also estimated.

6. Implementability. The technical and administrative feasibility of implementing the remedy is evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

7. Cost. Capital, operation, maintenance and monitoring costs are estimated for the remedy and presented on a present worth basis.

Alternative P-1 represents the "No Further Action" alternative. In assembling the alternatives for the Process Area, Alternative P-2 (Physical Containment) was designed to eliminate the exposure pathway by preventing human exposure to contamination while also continuously removing contaminants through natural attenuation and operation of the GWCS. In addition, the alternative eliminates unacceptable construction/re-development/land use by placing controls on these activities.

Alternatives P-4 through P-7 were also designed to eliminate the exposure pathway, but also provide a more aggressive remediation process to reduce the contaminants contained in the soils. Alternative P-3 (Excavation) was designed to provide complete restoration of all media in the Process Area to RAOs. This alternative is the only one which returns the Process Area to “pre-disposal” conditions in the short term, but is met with significant impacts as well as extensive implementability issues.

In Section 3.3, an evaluation was performed to estimate the volume of impacted soil and groundwater within the Process Area. The evaluation indicated that remediation of soils above 100 mg/kg would remove a significant amount of the contamination within the Process Area, and be far less disruptive to the Site and adjacent community than required to return the Process Area to pre-disposal conditions (Alternative P-3 – Excavation). The volume of subsurface soil requiring remediation to achieve pre-disposal conditions is 91,500 yd^3 versus 11,670 yd^3 to remove approximately 96% of the contamination in the Process Area.

5.4.1 Alternative P-1 – No Further Action

Description of Alternative P-1 – Under “No Further Action” alternative no additional measures would be taken to improve the Process Area. The Process Area is presently contained with the use of the GWCS, which controls the potential migration of contaminated groundwater leaving the Site. Administrative controls and procedures such as perimeter fencing and site surveillance, which have already been implemented at the Site, will continue to be implemented. Natural processes, including degradation, dispersion, dilution, adsorption, volatilization, etc., are serving as a source of contaminant removal. Further active reduction in toxicity, mobility, or volume of the contaminants is being provided by operation of the GWCS.

This alternative, as noted above, includes the continued operation of the groundwater collection and treatment system. The objective of the GWCS is to minimize chemical migration from the Process Area by intercepting and collecting potentially impacted groundwater at the down gradient property boundary. The overall performance goal of the system, as outlined in the Operation and Maintenance Plan, will continue to be to maintain continuous operation of the groundwater extraction system. The system performance is to be evaluated on an annual basis. In addition, this requires continued compliance with the SPDES permit for the Site.

The current groundwater and surface water monitoring plan would continue as outlined in the standard operating procedure (SOP) for monitoring at the Site. The cost estimate includes the quarterly collection of 11 groundwater samples and 3 surface water samples. A summary report of the data would be prepared following each monitoring event. Monitoring, as described above, is included in all subsequent alternatives.

The cost estimate associated with this alternative includes operation and maintenance costs of the GWCS, maintenance of the Site (mowing, fencing, etc.), and annual monitoring. SI Group has estimated that it would cost approximately $9,400 a year to maintain the Site, $136,000 a year to operate and maintain the GWCS, and $48,600 a year for monitoring. Costs are assumed over the next 30 years, should remediation or re-development not proceed.

Assessment of Alternative P-1 – An analysis of the feasibility of the "No Action" alternative relative to the Process Area is presented in the following table:

Evaluation of Alternative P-1	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Existing institutional controls (e.g. signing, fencing) limits Site access. ▪ Potential for off-site impacts are being controlled with the elimination of aboveground contamination and operation of GWCS. ▪ RAOs for protection of human health and the environment are currently being met through containment of the site by the GWCS and administrative controls. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to contaminants
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in the short-term. Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.

Evaluation of Alternative P-1	
Criterion	**Discussion**
Long-Term Effectiveness & Permanence	*Advantages:* ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. ▪ Migration of contaminants from the Process Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Continued operation of the GWCS will be required to control potential contamination migration. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media (soils and groundwater) remains and limits potential redevelopment of the Process Area.
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates potential exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such as fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment remains but is limited by administrative controls and continued operation of the GWCS.
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Site will continue.
Cost	▪ Present Worth of Alternative P-1= $2.98 Million.

5.4.2 Alternative P-2 – Physical Containment

Description of Alternative P-2 – Alternative P-2 consists of the installation of a soil cover system across the entire impacted portion of the Process Area. In addition, Alternative P-2 includes the removal of slabs, surface obstructions and building footings; a monitoring program for groundwater and surface water; operation and maintenance of the GWCS; and ICs/ACs as described for Alternative P-1.

In order to facilitate the installation of the permeable cap, it will be necessary to first remove existing surface slabs, building footings, and other surface obstructions present in the Process Area. The portion of concrete is estimated to be on the order of 170 cubic yards of concrete. It is assumed that the concrete can be cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. Any soils that are excavated will be placed back into the excavation. Product or other man-made materials will be removed, tested and disposed of off-site. Furthermore, it is not anticipated that sheeting and/or shoring will be necessary during the slab/footing removal.

In order to backfill areas where concrete and associated soil is removed, 2,500 tons of clean soil would need to be imported to the Process Area. A lump sum cost for dust suppression during the removals due to the presence of VOC- and SVOC-impacted soils in the Process Area has been included. However, the costs associated with dust suppression are less significant for this alternative compared to Alternatives P-3 and P-4 because of the relatively minimal nature of the removals.

Given the type and concentration of contaminants found in the surface soils during the remedial investigation, long-term protection of human health and the environment could be provided by the placement of a soil cover over the Process Area. A permeable soil cover would be used as the capping system. The final design of the cover system would be determined in the design phase. The capping system would cover Areas A and B as presented on Figure 24. The cap will be installed to tie into existing Site features and topography to the extent possible.

Following the installation of the cover system, it will be necessary to extend 9 monitoring wells that are in the area to be covered. In addition, the railroad tracks located in the Process Area may need to be removed in order to facilitate the installation of a cap that would provide the maximum protection, but would be non-beneficial for potential future development.

Potential redevelopment of the Process Area would be limited with the installation of a cover system; additional deed restrictions would be required to prevent future users from excavating beneath the cover system.

Since there is no active removal or remediation of contaminants in the Process Area and all contaminants will remain after the cap is installed, it will be necessary to use the existing monitoring wells both on and off the Site to monitor the Process Area after the cap installation activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are not expected to reach RAOs for at least 30 years across the entire Process Area. Therefore, thirty years of post-action monitoring and GWCS operation have been included in the Alternative P-2 costs.

Assessment of Alternative P-2 – An analysis of the feasibility of the "Physical Containment" alternative relative to the Process Area is included in the following table:

Evaluation of Alternative P-2	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Permeable soil cover will allow for infiltration of oxygen-rich surface water, possibly enhancing natural biodegradation of contaminants ▪ Soil cover further limits potential for human exposure to contaminants ▪ Existing institutional controls (e.g. signing, fencing) limits Site access. ▪ Potential for off-site impacts are being controlled with the operation of GWCS. *Disadvantages:* ▪ Provides limited reduction in subsurface contaminants. ▪ Does not eliminate potential for human health and environmental exposure to contaminants.
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in the short-term. ▪ Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Soil cover would reduce potential for human exposure to subsurface contaminants over long-term. ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. *Disadvantages:* ▪ Continued operation of the GWCS will be required to control potential contamination migration. ▪ Some long-term maintenance may be required to maintain effectiveness. ▪ Significant institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants. ▪ Limited potential redevelopment of Process area.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation limits potential mobility and off-site contamination migration. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ No reduction in toxicity of contaminants beyond natural attenuation. Contaminated media (soils and groundwater) remains and limits potential redevelopment of the area.

Evaluation of Alternative P-2	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ Hazards associated with open excavations avoided, such as fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Process Area will continue. ▪ No other activities or development will be supported until cap installation activities are complete.
Cost	▪ Present Worth of Alternative P-2 = $4.83 Million.

5.4.3 Alternative P-3 – Excavation with Off-site Disposal

Description of Alternative P-3 – Alternative P-3 is the excavation and off-site disposal of all impacted soils in the Process Area. In addition, Alternative P-3 includes a monitoring program for groundwater and surface water, operation and maintenance of the groundwater collection system, and ICs/ACs as described for Alternative P-1. This alternative is expected to restore the Process Area to "pre-disposal conditions" as defined in Draft DER-10 "Technical Guidance for Site Investigation and Remediation".

Under Alternative P-3, contaminated soils in the Process Area would be excavated and disposed in a permitted off-site facility. However, an extensive stabilization system would need to be implemented to facilitate soil excavation, especially given the inherent slope stability issues discussed in Sections 2.5 and 5.1.7.

Based on results of the Updated RI, CHA has estimated that the soil removal excavation zone will be approximately 70,600 ft^2 in size (Areas A, and B as shown on Figure 24). Results from the Updated RI collected from both soil and groundwater samples were used to estimate the depth of contamination in the Process Area. Based on these data, it is assumed that removing and disposing of the top 35 feet of soil is necessary to remove all contamination from the Process Area. This depth will enable the excavation to extend below the groundwater table and into the deep groundwater interval.

With groundwater at an average depth of approximately 12 feet bgs, it would also be necessary to maintain an extensive dewatering system during the excavation. All groundwater extracted from the excavation area during the excavation activities would be assumed to be contaminated and would require treatment. Groundwater would be treated in the existing Treatment Facility under the assumption that the current facility has the capacity to manage the additional water.

An excavation of this magnitude would result in the generation of approximately 91,518 cubic yards (146,429 tons) of soil and debris to dispose of. However, a portion of the excavated material is assumed to be comprised of concrete, originating as either slab or footings. The portion of concrete is estimated to be on the order of 170 cubic yards. It is assumed that the concrete can be scraped or cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. The remainder of the soil would be transported off-site and, pending analyses, disposed of as either hazardous or non-hazardous waste at a permitted facility.

It is noted that the results from the Remedial Investigation were used to determine the amount of contaminated soil that would be removed under each alternative, as discussed in this and several other alternatives. The contaminated soil was grouped into two classifications based on the amount of potential contamination. The two classifications of soil were soils that had low levels of contamination that are referred to as non-hazardous soils and impacted soils that had high levels of contamination. The impacted soils could be either non-hazardous or hazardous based on testing of the soil for the RCRA characteristics and TCLP analysis. Final hazardous/non-hazardous determination will be made at the time of excavation.

In determining the percent of excavated soils removed from the Process Area that would be classified as impacted soils, the analytical data was compared to the results obtained from the MIP investigation. Soil samples with a combined VOC/SVOC concentration exceeding 100,000 ppb (Area A) typically showed elevated MIP response. For most of the MIP installations located within Area A, approximately 50% to 75% of the soils over the depth of the proposed excavation showed elevated MIP responses. Based on this information, a conservative estimate of 66% of the volume of Area A was used to estimate the amount of soil excavated that would be classified as impacted soils. All other soils excavated from the Process Area, including the remaining soils in “Area A” as well as all soils in "Area B", were classified as non-hazardous soils having lower levels of contamination.

In order to facilitate excavation across the entire Process Area, the railroad tracks located in the Process Area would need to be removed, preserved and stockpiled. In addition, a water management system would be maintained throughout the duration of all excavation activities to prevent rainwater contact with highly contaminated soils. All storm/surface water extracted from the excavation area during the remedial action would be assumed to be contaminated and would require treatment.

In order to backfill the Process Area excavation, 91,518 cubic yards (146,149 tons) of soil would need to be imported to the Site. A lump sum cost for dust suppression during the excavations due to the presence of VOC- and SVOC-impacted soils in the Process Area has been included. The costs for dust suppression are more significant with this alternative compared to others because of the magnitude of the excavation and the estimated time to complete the excavation.

To facilitate the excavations and ensure stability across the entire Process Area, it is estimated that approximately 47,250 square feet of sheeting (900 linear feet around portions of the Process Area by 52.5 feet deep) would be required. The exact depth of the excavation, the location of the sheeting, etc. would be determined during the design and implementation phases, should this alternative be selected as a remedy for the Process Area. Sheeting was installed along the southwestern boundary of the Site during the excavation of the "french drain" and remains in place; this alternative utilizes the previously installed sheeting along the southwestern property boundary as well as new sheeting along all other excavation walls.

Samples will be collected and analyzed to determine the exact limits of the excavation. It is assumed that the analysis of waste characterization samples would also be needed prior to a permitted disposal facility accepting the contaminated soils. It is anticipated that the excavation of all the impacted soils would require one year to complete. After confirmatory samples are collected to ensure removal of the contaminated media, the non-contaminated backfill would then be trucked to the Site and placed in the excavations.

As a final measure, it will be necessary to re-establish a monitoring plan that will be required to verify the success of the remedial program. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations could potentially reach the cleanup goals within five (5) years. Therefore, five (5) years of post-action monitoring and GWCS operation for the Process Area have been included in the Alternative P-3 costs.

Assessment of Alternative P-3 – The following table provides a summary of the detailed assessment for removing and disposing contaminated soil in the Process Area:

Evaluation of Alternative P-3	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Removal of contaminated soil will eliminate potential exposure risks to human health and the environment from this area. ▪ RAOs can be achieved within a relatively short time period. *Disadvantages:* ▪ Some contaminants will potentially remain in the groundwater.
Compliance with SCGs/RAOs	▪ Remedial objectives would be met following remediation because contaminated media will be removed and replaced with clean fill. ▪ Operation of GWCS will need to be maintained until the RAOs are met along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Effective. Potential impacts posed by impacted soil in Process Area are eliminated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the area because soils disposed off-site. ▪ Redevelopment would be viable within the Process Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants may remain in groundwater for a period of time.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants in Process Area significantly reduced in short-time frame. ▪ Removal of contamination will reduce the need for continued operation of the GWCS *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.

Evaluation of Alternative P-3	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants, and would require administrative and engineering controls. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities during the entire excavation and backfilling operations. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to depth and instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.
Cost	▪ Present Worth of Alternative P-3 = $56.3 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for extensive slope stabilization to allow for excavation. ▪ Significantly higher overall remediation costs than other active remediation methods.

5.4.4 Alternative P-4 – Limited Excavation with Off-site Disposal

Description of Alternative P-4 - Alternative P-4 is similar to Alternative P-3, but includes only limited excavation of source area soils, which would remove approximately 96% of the contamination in the Process Area. Alternative P-4 also includes a monitoring program for groundwater and surface water, operation and maintenance of the groundwater collection system, and ICs/ACs as described for Alternative P-1.

Under Alternative P-4, only the most contaminated soils in the Process Area would be excavated and disposed in a permitted off-site facility. As with Alternative P-3, however, a stabilization system would need to be implemented to facilitate soil excavation.

Based on results of the Updated RI Report and the estimates of contaminant mass (Section 4.3.1), it has been estimated that the source removal excavation zone will encompass "Area A" and will be approximately 26,260 ft^2 in size (Figure 24). It is assumed that removing and disposing of the top 15 feet of soil across this area will remove up to approximately 96% of the contamination in the Process Area. This depth will enable the excavation to extend approximately 2 to 3 feet below the groundwater table. An average depth of 15 feet has been used for the purpose of cost estimation. It is noted that the estimate for excavation depth may change slightly during the design phase of the project.

With groundwater at an average depth of approximately 12 feet bgs, it would also be necessary to maintain a dewatering system during the excavation. All groundwater extracted from the excavation area during the excavation activities would be assumed to be contaminated and would require treatment. Groundwater would be treated in the existing Treatment Facility under the assumption that the current facility has the capacity to manage the additional water.

An excavation of this magnitude would result in the generation of approximately 14,588 cubic yards (23,342 tons) of soil and debris to dispose of. However, a portion of the excavated material is assumed to be comprised of concrete, originating as either slab or footings. The portion of concrete is estimated to be on the order of 170 cubic yards of concrete. It is assumed that the concrete can be scraped or cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. The remainder of the soil would be transported off-site and, pending analyses, disposed of as either hazardous or non-hazardous waste at a permitted facility. For estimation purposes, it assumed that approximately two-thirds of the excavated soil would be classified as highly contaminated or impacted soils and the remaining one-third would be classified as non-hazardous.

Similar to Alternative P-3, the railroad tracks located in the Process Area would need to be removed, preserved and stockpiled. In addition, a water management system would be maintained throughout the duration of all excavation activities to prevent rainwater contact with highly contaminated soils. All storm/surface water extracted from the excavation area during the remedial action would be assumed to be contaminated and would require treatment.

In order to backfill the excavation, 14,588 cubic yards (23,342tons) of soil would need be imported to the Site. A lump sum cost for dust suppression during the excavations due to the presence of VOC- and SVOC-impacted soils in the Process Area has been included. The costs for dust suppression are more significant with this alternative compared to Alternative P-5 through P-7 because of the magnitude of the excavation and the estimated time to complete the excavation.

To facilitate the excavations and ensure stability across the entire Process Area, it is estimated that approximately 19,125 square feet of sheeting (850 linear feet around the source area by 22.5 feet deep) would be required. The exact depth of the excavation, the location of the sheeting, etc. would be determined during the design phase, should this alternative be selected as a remedy for the Process Area.

Samples will be collected and analyzed to determine the exact limits of the excavation. It is assumed that the analysis of waste characterization samples would also be needed prior to a permitted disposal facility accepting the contaminated soils. It is anticipated that the excavation of all the impacted soils would require two to four months to complete. After confirmatory samples are collected to ensure removal of the contaminated media, the non-contaminated backfill would then be trucked to the Site and placed in the excavations. As a final measure, it will be necessary to re-establish a monitoring plan that will be required to verify the success of the remedial program.

Assessment of Alternative P-4 – The following table provides a summary of the detailed assessment for removing and disposing contaminated soil in the Process Area:

Evaluation of Alternative P-4	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Removal of source-area soil will significantly reduce potential exposure risks to human health and the environment. ▪ Cleanup goals can be achieved within a relatively short time period. *Disadvantages:* ▪ Removal of source-area soil will not eliminate potential exposure risks to human health and the environment from this area. ▪ Technology does not address dissolved contaminants; residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.

Evaluation of Alternative P-4	
Criterion	**Discussion**
Compliance with SCGs/RAOs	▪ Remedial objectives would eventually be met following remediation because contaminated media will be removed and replaced with clean fill. Remaining contaminants would naturally attenuate after active remediation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Effective. Potential on-site impacts posed by impacted soil are reduced significantly. ▪ Process Area contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the Process Area because soils disposed off-site. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants will remain in groundwater for some time period. ▪ Residual contaminants in the soils outside the area of excavation will remain for some time period.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants significantly reduced in short-time frame. ▪ Removal of contamination with continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.
Short-Term Effectiveness	*Advantages:* ▪ Remediation would be effective within a relatively short time period. ▪ Redevelopment of the property would be viable within Process Area, with some restrictions. *Disadvantages:* ▪ Residual contamination would remain and would require an extended period to naturally attenuate and operation of the GWCS. ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants, and would require administrative and engineering controls. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities during the entire excavation and backfilling operations. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.

Evaluation of Alternative P-4	
Criterion	**Discussion**
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to potential instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.
Cost	▪ Present Worth of Alternative P-4 = $14.2 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for excavation engineering. ▪ Higher overall remediation costs than most other active remediation methods.

5.4.5 Alternative P-5 – In-Situ Treatment Using Thermally-Enhanced SVE

Description of Alternative P-5 – Alternative P-5 is the in-situ treatment of the Process Area using thermally-enhanced SVE followed by biosparging. This alternative incorporates the remedial components of Alternative P-1, which includes the following: a monitoring program for groundwater and surface water, operation and maintenance of the groundwater collection system, and ICs/ACs. In addition, Alternative P-5 includes the removal of slabs, surface obstructions and building footings. It is anticipated that, following thermally-enhanced SVE, biosparging would promote bioremediation by enabling the natural bio-organisms within the soil to become active and start to break down the VOCs and SVOCs remaining in the soils.

In order to facilitate in-situ treatment of impacted soils on the Site, it will be necessary to first remove existing surface slabs, building footings, and other surface obstructions present in the Process Area. The portion of concrete is estimated to be on the order of 170 cubic yards of concrete. It is assumed that the concrete can be cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. Any soils that are excavated will be placed back into the excavation. Product or other man-made materials will be removed, tested and disposed of off-site. Furthermore, it is not anticipated that sheeting and/or shoring will be necessary during the slab/footing removal.

In order to backfill areas where concrete and associated soil is removed, 2,500 tons of clean soil would need to be imported to the Process Area. A lump sum cost for dust suppression during the removals due to the presence of VOC- and SVOC-impacted soils in the Process Area has been included. However, the costs associated with dust suppression are less significant for this alternative compared to Alternatives P-3 and P-4 because of the relatively minimal nature of the removals.

Alternative P-5 would use one of two applicable in-situ remedial technologies:

a) a thermally-enhanced SVE system which uses conductive heating, similar to that which has been tested at SI Group's Rotterdam Junction facility (i.e. Heat Trodes/SVE), or
b) a thermally-enhanced SVE system which uses convective heating, similar to that which has also been tested at SI Groups Rotterdam Junction facility (hot air injection/SVE).

It is anticipated that the two systems would provide relatively similar results. The Building 10 Pilot Study conducted by SI Group at Rotterdam Junction between March 2004 and September 2006 demonstrated that by using thermally-enhanced soil vapor extraction, the volatile organic contamination contained in the unsaturated soils could be reduced to a level that allowed the natural bacteria contained in the soil to become active and bio-remediate the residual semi-volatile contamination. Two different methods of heating the soil were tested. One method utilized standard hot air injection and soil vapor extraction, which used convective heating as the heat transfer mechanism. The other method used a heated probe (HeatTrode technology) to conductively heat the soils. Each system was assigned a test area approximately 25 feet by 25 feet and extending to the top of the groundwater table, which was approximately 10 feet below grade. Soil samples were collected from both areas prior to starting the pilot study, during the study to monitor progress, and at completion. Details of the Pilot Study are provided in the report entitled "Pilot Test Report" (February 2007) and prepared by Earth Tech, Inc. on behalf of Donald J. Geisel and Assoc., Inc. The following table summarizes the results from each test area:

	Subsurface Soil Concentrations (ppm)	
	Prior to Testing March 2004	Completion of Pilot Test September 2006
Standard Hot Air Injection Technology		
Toluene	59.0 to 216.0	ND to 0.013
Ethylbenzene	847 to 1,775	ND to 0.014
Total Xylenes	3,251 to 6,325	ND to 0.095
Phenol	350 to 575	0.14 to 14.0
HeatTrode Technology		
Toluene	69 to 71.5	ND to 0.003
Ethylbenzene	2,650 to 3,500	ND to 0.023
Total Xylenes	7,850 to 8,675	ND to 0.15
Phenol	43 to 47	ND to 11.0

The type of contamination in the Process Area is similar to that tested in Building 10. The levels of contamination at Congress Street are lower then those remediated in Building 10. Based on the pilot study, it is estimated to take 2 to 3 years of in-situ treatment to obtain similar results as those obtain in Building 10 in the subsurface soils in the Process Area. Initial start-up of the in-situ treatment system will probably be in phases to control the amount of VOCs that are being removed.

The pilot study at Rotterdam Junction has indicated that in-situ remediation of VOCs and SVOCs may be accomplished using a combination of thermally-enhanced SVE followed by biosparging/bioventing. This technology would be used with the objective of reducing the levels of VOCs contained within the soils through enhanced SVE, thereby enabling the natural bio-organisms within the soil to become active and start to break down the SVOCs remaining in the soils. Thermal enhancement of the SVE system has indicated that the VOCs would be removed at a faster rate, reducing the time required to remediate the area. The bio-activity should also be enhanced at the higher temperatures that are naturally present within the soils after thermally enhancing the SVE system. Using this combined technology, the sources of contamination remaining in the soils should be mitigated to a level that no longer represents a significant threat to human health or the environment.

The method to be used to heat the soils would be either:

a.) the HeatTrode system or a comparable conductive technology, or
b.) a hot-air injection system or comparable convective technology.

The type of soils that are present will be one of the factors that will determine the type of heating that will be used. Soils that are more impermeable are heated more effectively using conductive heating while permeable soils are heated more effectively using convective heating. To complete the remedial design of the in-situ treatment system in the Process Area, pre-design testing will be completed to measure the porosity of the soil and measure the distance that a negative pressure can be applied to the soil from an extraction point. This testing will also be used to evaluate conductive verses convective soil heating methods.

Cost estimates for the treatment of two different areas have been prepared for the Process Area. Alternative P-5A treats only Area A (26,260 ft^2) and is expected to address approximately 96% of the contaminant mass in the Process Area. Alternative P-5B treats all 70,600 ft^2 (Areas A and B) of the designated Process Area and is expected to address approximately 98% of the contamination in the Process Area. These variations were prepared to enable the comparison with both Alternative 4, which treats a limited area, and Alternative 3, which addresses the entire Process Area. The relative costs to treat the additional area would also be applicable to Alternatives P-6 and P-7.

Similar to the Rotterdam Junction Pilot Study, HeatTrode/hot air injection units would be installed using Geoprobe™ drilling techniques. SVE units would be installed to a minimum depth of twelve (12) feet bgs and would likely be extended an additional two to three feet into the groundwater. A dewatering system would be required to lower the water level 2 to 3 feet to maximize the total column of unsaturated soil and allow treatment of the total area.

Following installation and baseline testing/sampling, it is anticipated that the system would operate continuously for up to two years with a target temperature goal of 90°F (±5°F). It is also anticipated that after an initial period of continuous heating and vacuum extraction, the system would be modified to cyclic pulsing of alternating extraction and injection (biosparging) to optimize for bioremediation of SVOCs.

A thermally-enhanced SVE system would require treatment of VOCs in the air/off-gases emitted from the SVE system. Carbon adsorption, in which pollutants are removed from the soil vapor extracted from the ground, has been used for estimating purposes and would require additional piping and treatment units on-site during remedial activities. In addition, an air permit for the off-gas system would be required.

The level of cleanup that can be obtained using the proposed remediation technology is considered to be sufficient to mitigate any significant threats to the environment and public health from Area A within the Process Area. The level of cleanup would be monitored and, based on the success of remediation, SI Group may be able to request termination of the groundwater collection in the Process Area. It has been estimated that the GWCS would remain in operation for approximately fifteen years following remediation.

Although it is likely that residual levels of contaminants will remain in the Process Area after remediation, it will be necessary to use the existing monitoring wells both on- and off-site to monitor the Process Area after the active remedial activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are expected to reach the cleanup goals in less than fifteen years. Therefore, fifteen years of post-action monitoring have been included in the Alternative P-5 costs.

Assessment of Alternative 5 – An analysis of the feasibility of Alternative P-5 relative to the Process Area is presented in the following table:

Evaluation of Alternative P-5	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Remediation of contaminated soil in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Technology does not address dissolved contaminants; residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.
Compliance with SCGs/RAOs	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.

Evaluation of Alternative P-5	
Criterion	**Discussion**
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in the groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. *Disadvantages:* ▪ Volume of contaminants is reduced but not eliminated.
Short-Term Effectiveness	*Advantages:* ▪ Remediation of the Process Area would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Energy consumption will be high due to thermal enhancement to volatilize contaminants.
Cost	▪ Present Worth of Alternative P-5 Alternative 5A = $5.84 Million. Alternative 5B = $9.10 Million

5.4.6 Alternative P-6 – In-Situ Treatment Using Multi-Phase Extraction

Description of Alternative P-6 – Alternative P-6 includes the removal of slabs, surface obstructions and building footings and remediation of soils via multi-phase extraction (MPE) in the Process Area. In addition, Alternative P-6 incorporates the remedial components of Alternative P-1, which includes the following: a monitoring program for groundwater and surface water, operation and maintenance of the groundwater collection system, and ICs/ACs.

This technology would be used with the objective of reducing the levels of VOCs contained within the soils through SVE while also effectively dewatering the treatment area. It is anticipated that MPE would be an effective method of lowering the water table and would eliminate or mitigate smear-zone contamination. It is further anticipated that MPE combined with biosparging/bioventing would promote bioremediation by enabling the natural bio-organisms within the soil to become active and start to break down the VOCs and SVOCs remaining in the soils.

In order to facilitate in-situ treatment of impacted soils on the Site, it will be necessary to first remove existing surface slabs, building footings, and other surface obstructions present in the Process Area. In order to backfill areas where concrete is removed, soil would need be imported to the Site. These activities will be performed as detailed in Alternative P-5.

Similar to Alternative P-5, cost estimates for the treatment of the two different areas within the Process Area has been prepared:

- Alternative 6A treats Area A
- Alternative 6B treats Areas A and B

The relative costs to treat the additional area would also be applicable to Alternatives P-5 and P-7.

A network of SVE/dewatering wells would be installed to a minimum depth of 12 feet bgs and would likely be extended an additional 2 to 3 feet below the groundwater. In order to effectively remove contaminant mass, the groundwater would be lowered 2 to 3 feet to allow remediation of entire area by SVE. It is anticipated that a dual-pump multi-phase extraction unit will be used. This method of remediation will allow for removal of the VOCs and an appreciable fraction of the SVOCs through extraction. The enhanced air flow through the subsurface will increase the volume and percentage of oxygen available in the subsurface to aid in biodegradation of the organics that are not removed. Lowering the groundwater elevation via electric submersible pumps will increase the area available for treatment and increase mass removal capabilities. However, since the vapor flow aspirates groundwater at the well screen for entrainment of groundwater, it is anticipated that only limited amount of groundwater would require treatment and would be offset by a reduction in volume contribution to the collection trench. As such, the estimates for Alternative P-6 assume that no additional water treatment capacity would be required at the Site.

The vapor phase will be handled by a positive displacement vacuum blower and will be treated prior to discharge to the atmosphere. Similar to Alternative P-5, an air permit for the off-gas system would be required. Following installation and baseline testing/sampling, it is anticipated that the system would operate continuously for up to two years. After the bulk of the contaminant mass is removed from the Site, vapor concentrations may decline to a level that post extraction treatment is not necessary. At that time, it is anticipated that the system would be modified to a cyclic pulsing of alternating air extraction and injection to optimize for bioremediation of SVOCs or to passive bioventing.

The level of cleanup that can be obtained using the proposed remediation technology is considered to be sufficient to mitigate any significant threats to the environment and public health from the Process Area. The level of cleanup would be monitored and, based on the success of remediation, SI Group may be able to request termination of groundwater collection in the Process Area. It is estimated that the GWCS would remain in operation for approximately fifteen years following remediation.

Although it is likely that only low, residual levels of contaminants will remain in the Process Area after remediation, it will be necessary to use the existing monitoring wells both on- and off-site to monitor the Process Area after the active remedial activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are expected to reach the cleanup goals in less than fifteen years. Therefore, fifteen years of post-action monitoring have been included in the Alternative P-6 costs.

Assessment of Alternative P-6 – An analysis of the feasibility of Alternative P-6 relative to the Process Area is presented in the following table:

Evaluation of Alternative P-6	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Remediation of contaminated soil in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.
Compliance with SCGs/RAOs	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to maintain a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Volume of contaminants is reduced but not eliminated.
Short-Term Effectiveness	*Advantages:* ▪ Remediation of the Process Area would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.

Evaluation of Alternative P-6	
Criterion	**Discussion**
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants.
Cost	▪ Present Worth of Alternative P-6 Alternative 6A = $5.53 Million. Alternative 6B = $8.80 Million

5.4.7 Alternative P-7– In-Situ Treatment Using ISTD

Description of Alternative P-7 – Alternative P-7 includes the removal of slabs, surface obstructions and building footings as well as treatment using in-situ thermal desorption (ISTD) across the Process Area. In addition, Alternative P-7 incorporates the remedial components of Alternative P-1, which includes the following: a monitoring program for groundwater and surface water, operation and maintenance of the groundwater collection system, and ICs/ACs.

In order to facilitate in-situ treatment of impacted soils on the Site, it will be necessary to first remove existing surface slabs, building footings, and other surface obstructions present in the Process Area. In order to backfill areas where concrete is removed, soil would need be imported to the Process Area. These activities will be performed as detailed in Alternative P-5.

Similar to Alternative P-5, cost estimates for the treatment of two different areas within the Process Area have been prepared:

- Alternative P-7A treats Area A
- Alternative P-7B treats Areas A and B

It is understood that a larger or smaller treatment area may be required based on a number of factors; the actual area to be treated will be determined during the Remedial Design Phase.

The most significant benefit of utilizing ISTD in the Process Area would be that, since ISTD depends partly on the presence of groundwater, a separate dewatering system would not be required as part of Alternative P-7. Preliminary design for Alternative P-7 includes installation of vertical ISTD heaters at approximately 12 ft spacing for a total of approximately 250 heater-only wells for Area A and 640 for Areas A and B. Vapors will be extracted from approximately 50 or 125 vertical multi-phase extraction wells, respectively. The heaters will extend to a minimum depth of twelve (12) feet bgs and would likely be extended an additional two to three feet into the groundwater. Off-gas treatment would include an un-heated vapor collection manifold, a condensing front end prior to vapor treatment, and liquid separation with granular-activated carbon (GAC) for condensate and groundwater treatment. The non-condensable vapors would be treated by a thermal oxidizer.

The level of cleanup that can be obtained using the proposed remediation technology is considered to be sufficient to mitigate any significant threats to the environment and public health from Area A within the Process Area. The level of cleanup would be monitored and, based on the success of remediation, SI Group may be able to request termination of the groundwater collection in the Process Area. It is estimated that the GWCS would remain in operation for approximately fifteen years following remediation.

Although it is likely that only low residual levels of contaminants will remain in the Process Area after remediation, it will be necessary to use the existing monitoring wells both on- and off-site to monitor the Process Area after the active remedial activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are not expected to reach the cleanup goals in less than fifteen years. Therefore, fifteen years of post-action monitoring have been included in the Alternative P-7 costs.

Assessment of Alternative P-7 – An analysis of the feasibility of Alternative P-7 relative to the Process Area is presented in the following table:

Evaluation of Alternative P-7	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Remediation of contaminated soil and groundwater in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Higher treatment temperature may hinder bioremediation of residual contaminants, potentially requiring bio-augmentation to complete remediation. ▪ Residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.
Compliance with SCGs/RAOs	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to maintain a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Volume of contaminants is reduced but not eliminated.
Short-Term Effectiveness	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within the Process Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.

Evaluation of Alternative P-7	
Criterion	**Discussion**
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Energy consumption will be high due to need for higher operating temperatures to volatilize all contaminants.
Cost	▪ Present Worth of Alternative P-7 Alternative 7A = $8.27 Million. Alternative 7B = $12.48 Million

5.5 Comparison of Remedial Alternatives

Table 15 provides a comparative summary of each remedial alternative relative to the seven criteria presented in Section 5.4 of this report. The following subsections provide a narrative comparison of the alternatives relative to the same seven criteria used to evaluate the alternatives individually. As previously identified in Section 5.4, the alternatives have been compared based upon the following seven criteria:

1. Overall protection of human health and the environment
2. Compliance with RAOs/SCGs
3. Long-term effectiveness and permanence
4. Reduction in toxicity, mobility, and volume
5. Short-term effectiveness
6. Implementability
7. Cost

An eighth criterion, Community Acceptance, will be evaluated by the NYSDEC after the public comment period is complete. More specifically, concerns of the community regarding the RI/FS reports and the proposed remedy will be evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

In order to quantitatively identify substantive differences among alternatives, each alternative was rated on a scale of 1 to 5 relative to each other for each criterion, with 1 being the highest (best) rating and a five being the lowest (least) rating. The results of the rating are included in Table 17. For each alternative, the ratings for each of the seven criteria were summed to provide an overall numerical rating of alternatives. Based on this scale, the alternative(s) with the lowest rating(s) provides the best overall remedial solution for the Site. The following sections present the strengths and weaknesses of each alternative relative to one another with respect to each criterion and provide the basis for the ratings.

5.5.1 Overall Protection of Public Health and the Environment

The remedial actions previously taken for the Congress Street Site under the existing ROD have contained the potential migration of contamination off-site, providing overall protection of public health and the environment. The following is an evaluation of how the different remedial alternatives will effect the protection already provided:

> P-3 (Excavation with Off-site Disposal) was assigned the highest rating of "1" for this criterion because it will essentially eliminate the contamination present in the Process Area, thereby eliminating the risk to public health and the environment that is present in the Process Area.
>
> P-4 (Limited Excavation with Off-site Disposal), P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) were assigned a rating of "2" because each alternative will essentially treat 96% of the contamination present in the Process Area, thereby substantially reducing the risk that is present in the Process Area to public health and the environment.
>
> P-2 (Physical Containment) was assigned a rating of "4" because it will enhance the overall protection already being provided with further containment of the Process Area and will provide further reduction in the amount of contamination present through natural attenuation, operation of the GWCS, and enhanced soil flushing.
>
> P-1 (No Further Action) will continue to offer the protection being provided under the existing ROD for public health and the environment. Reduction in the amount of contamination present will continue through natural attenuation and operation

of the GWCS. P-1 (No Further Action) was assigned a rating of "4" since it provides the least amount of active remediation.

5.5.2 Compliance with RAOs/SCGs

The following is an evaluation of how the different remedial alternatives will meet the RAOs/SCGs for the Process area:

P-3 (Excavation with Off-site Disposal) was assigned the highest rating of "1" for this criterion because the alternative will essentially eliminate the contamination present in the Process Area, thereby enabling the RAOs/SCGs to be met within a short time period following removal of the contamination.

P-4 (Limited Excavation with Off-site Disposal), P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) were all assigned the next highest rating of "2" since each will essentially treat 96% of the contamination present in the Process Area. The RAOs/SCGs should be met within a reasonable time period following removal of approximately 96% of the contamination.

P-1 (No Further Action) and P-2 (Physical Containment) will continue to contain the contamination present in the Process Area and will continue to actively reduce the amount of contamination present. Reduction of contaminant levels will be dependent on natural attenuation and operation of the GWCS. As such, RAOs/SCGs are not expected to be met for an extended period of time, which is considered to be in excess of 30 years. As result, both P-1 (No Further Action) and P-2 (Physical Containment) were assigned the lowest rating of "5".

5.5.3 Long-Term Effectiveness and Permanence

The following is an evaluation of how the different remedial alternatives will be effective in the long term.:

P-3 (Excavation with Off-site Disposal) will essentially eliminate the contamination present in the Process Area. This alternative provides the most permanent and effective solution for the Process Area and was thus assigned the highest rating of "1".

P-4 (Limited Excavation with Off-site Disposal), P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) will essentially treat 96% of the contamination present in the Process Area. These remedial alternatives will require the continued operation of the GWCS until the residual contamination remaining is attenuated and the RAOs are met. However, each of these alternatives will be effective in the long-term and the treatment will be permanent. Since P-5 has been demonstrated to be effective at the Rotterdam Junction site, where contaminants and site geology is similar, it was assigned a slightly higher rating of “2”, whereas P-4 and P-6 were assigned a ranking of “3”.

P-7 (In-Situ Treatment Using ISTD) will also treat 96% of the contamination present in the Process Area. However, due to the sterilization of soils, residual contamination may remain slightly longer than with P-4 (Limited Excavation with Off-site Disposal), P-5 (In-situ Treatment Using Thermally Enhanced SVE), or P-6 (In-Situ Treatment Using Multi –Phase Extraction). As such, P-7 has been assigned a slightly lesser ranking of “4”.

P-1 (No Further Action) and P-2 (Physical Containment) will continue to contain the contamination present in the Process Area and will continue to actively reduce the amount of contamination present. Reduction of contaminant levels will be dependent on the natural attenuation that will be occurring within the area and operation of the GWCS. As such, these remedial alternatives will require long-term operation of the GWCS to remain effective in the long term. Both P-1 (No Further Action) and P-2 (Physical Containment) were therefore assigned the lowest rating of “5”.

5.5.4 Reduction of Toxicity, Mobility, and Volume

The following is an evaluation of how the different remedial alternatives will reduce the toxicity, mobility, and volume:

P-3 (Excavation with Off-site Disposal) will essentially eliminate the contamination present in the Process Area. This alternative is the only one which will eliminate all contamination and was thus assigned the highest ranking of “1”.

P-4 (Limited Excavation with Off-site Disposal), P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) will essentially treat 96% of the contamination present in the Process Area. As such, these remedial alternatives will substantially reduce the toxicity, mobility and volume of contamination present in the Process Area. Since all four alternatives will provide the same reduction in toxicity, mobility, and volume and only offer slightly less reduction than P-3 (Excavation with Off-site Disposal), they were all assigned a rating of “2”.

P-1 (No Further Action) and P-2 (Physical Containment) will continue to contain the contamination present in the Process Area and will continue to actively reduce the amount of contamination present. Reduction of contaminant levels will be dependent on the natural attenuation that will be occurring within the area and operation of the GWCS. As such, the toxicity and volume of contaminants will be reduced as a result of the natural attenuation that occurs within the Process Area. Since P-1 (No Further Action) and P-2 (Physical Containment) will offer some reduction in the mobility of contaminants, they were both was assigned a ranking of “4”.

5.5.5 Short-term Impacts and Effectiveness

The following is an evaluation of the short-term impacts and effectiveness of the different remedial alternatives:

P-1 (No Further Action) will not have any short-term impacts on the community, workers or the environment. The current remedial action has been effective and should continue to be effective in the short-term; P-1 was thus assigned the highest rating of “1”.

P-2 (Physical Containment) will have some short-term impact has a result of the cap material that would be place on the Process Area. These impacts would potentially be dust generated from placement of the cap material, noise from the construction equipment and truck traffic. The cap should be effective in further containment of the Process Area following placement. Since impacts will be minimal, this alternative was assigned a rating of “2”.

P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) will potentially have some short-term impacts on the community, workers and environment. These impacts include the potential release of contaminants as they are removed and treated, the installation of well points in the contaminated area, noise from the well installation, and truck traffic. These technologies have been shown to be effective in the short term in reducing contaminant levels in similar site conditions. Since the technologies will be effective and the short-term impacts are low, these alternatives were assigned a ranking of “3”.

P-3 (Excavation with Off-site Disposal) and P-4 (Limited Excavation with Off-site Disposal) will potentially have substantial short-term impacts on the community, workers and environment. These impacts include the potential release of contaminants as they are excavated, movement of contaminated material through the community, noise from the excavation and shoring installation, and truck traffic. Although excavation is an effective method of removing the contamination in the short term, the short-term impacts significantly affect the rating when compared to other alternatives. As such, P-4 was assigned the ranking of “4”. P-3 will potentially have more short-term impacts from a larger and deeper excavation than P-4, and was thus assigned a ranking of “5”.

5.5.6 Implementability

The following is an evaluation of the implementability of the different remedial alternatives:

P-1 (No Further Action) does not require any further actions then what are being done at this time. As such, P-1 was assigned a ranking of “1” for implementability.

P-2 (Physical Containment) would employ standard soil placement technology that is widely used and is easily implemented. As such, it has also been assigned a ranking of “1”.

P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) would use standard technology that is used in the installation of wells and vapor recovery systems. Installation and operation of the systems may be limited in the winter months due potential freezing of equipment and piping. However, each technology is easily implemented and all alternatives were assigned the ranking of “2”.

P-4 (Limited Excavation with Off-site Disposal) would require an excavation that is located in close proximity of the railroad. Excavation in this area is difficult due to site conditions. Stabilization of the side walls would be required. Since the excavation is not as deep as P-3, standard shoring technology can be used but special care would have to be given to the side walls to prevent any movement of the rail line. As such, this alternative was assigned the second lowest ranking of “4”.

P-3 (Excavation with Off-site Disposal) would entail an excavation that is deep, requiring stabilization of the side walls. In addition, the presence of the railroad next to the excavation would add additional requirements on the stability of the excavation that may not be able to be satisfied with the shoring technology that is presently available. Implementability of P-3 is considered the most difficult and it has thus been assigned the lowest ranking of “5”.

5.5.7 Cost

The estimated capital costs, annual operating and maintenance cost, and present worth cost of the different alternatives are presented in the table on the following page. Below is rationalization for the assigned ratings based on cost:

P-1 (No Further Action) is the least expensive option and was assigned the highest ranking of “1” for cost.

P-2 (Physical Containment) is only slightly more expensive than alternative P-1 and has been assigned the next best ranking of “2”.

P-5 (In-situ Treatment Using Thermally Enhanced SVE), P-6 (In-Situ Treatment Using Multi –Phase Extraction), and P-7 (In-Situ Treatment Using ISTD) all have associated costs in a similar range. As such, each has been assigned the same ranking of “3”.

P-4 (Limited Excavation with Off-site Disposal) represents the second highest cost alternative and has been assigned a ranking of “4”.

P-3 (Excavation with Off-site Disposal) represents the highest cost option. This alternative has been assigned the lowest ranking of “5” for cost.

Cost estimates for the Process Area were made based on using one of the following cost factors:

1. Actual costs incurred by SI Group, Inc. or CHA for similar work,

2. Costs factors obtained from RS Means, Site Work & Landscape Cost Data, 2008 Edition, and adjusted for geographical conditions, or
3. Cost estimates provided by remedial contracting firms.

The following is a detailed description of how costs were generated and provides justification for the conceptual-level cost estimates.

Institutional Control Costs - The estimate is based on anticipated legal fees.

Site Preparation – RS Means cost factors were used to estimate the cost to clear and grub the site, construction of a containment pad, preparation/restoration of site road, removal of rail siding, demolition of the concrete, and replacement of clean soil. Quantities for these items were estimated based on conceptual plans for each alternative. For example, the estimated quantity of concrete required to be removed is based on a calculation of the volume of concrete present. The aerial extent of concrete present was estimated based on site drawings with the thickness of the slabs estimated to be 6" and the associated footings estimated to be 12" thick. The estimate of the quantity of product/manmade material associated with the concrete removal that would require disposal was estimated to be approximately 2" to 4" of material adjacent to the concrete. It is known from the investigation that product is present below the slabs. Disposal costs for the material are based on cost estimates received by SI Group. A slightly larger depth was used in the Fill Area based on the reported presence of man-made fill materials near the surface. The black-tar like material is the material that has been observed, and has cresylic and aromatic hydrocarbon levels of 5-10%. The cost of $300 per ton for excavation, transportation and disposal of the man-made material associated with removal of the concrete is estimated to be the same as the cost for contaminated soil having high levels of contamination. This cost is based on estimates received from three firms, and based on the material being classified as either non-hazardous or potentially hazardous due to the hazardous waste characteristics of the material.

Excavation – Results from the Remedial Investigation were used to determine the amount of contaminated soil that would be removed under each alternative. The contaminated soil was grouped into two classification based on the amount of potential contamination. The two classifications of soil were soils that had low levels of contamination that are referred to as non-hazardous soils and impacted soils that had high levels of contamination. The impacted soils could be either non-hazardous or hazardous based on testing of the soil for the RCRA characteristics and TCLP analysis.

The following table summarizes the amount of soil that would potentially be excavated from each area under the two alternatives involving excavation as well as the potential cost to excavate, transport and dispose of the contaminated soils.

	Process Area		Cost to Excavate, Transport and Dispose
	Alternative P-3 Excavation:	**Alternative P-4 Partial Excavation**	
Impacted Soil (Potentially hazardous and highly contaminated non-hazardous soils)	15,561 tons	15,561 tons	$300/ton
Non-hazardous Soils	130,868 tons	7,771 tons	$175/ton

Cost estimates from three firms for transportation and disposal of the contaminated soil were obtained. The costs obtained are only estimates with none of the soils approved by any of the facilities at this time. Full waste characterization and approval by the disposal facility would be required prior to disposal of any contamination. The cost for disposal of the contaminated soil would be finalized at that time if approved by the facility. The amount of contaminated soil to be disposed under each scenario is a fairly large quantity.

Permeable Cover System – RS Means cost factors were used to estimate the construction costs for the items under this category with the exception of the items "Extend Monitoring Wells", "Abandon Monitoring Wells", and "Replace Monitoring Wells and Pumping Wells". These costs were estimated based on actual costs incurred by CHA for similar type of work. The quantities used in preparing these costs were based on conceptual design presented in each alternative.

Engineered Cover System – RS Means cost factors were used to estimate the construction costs for the items under this category with the exception of the items "Extend Monitoring Wells", "Abandon Monitoring Wells", and "Replace Monitoring Wells and Pumping Wells". These costs were estimated based on actual costs incurred by CHA for similar type of work. The quantities used in preparing these costs were based on conceptual design presented in each alternative.

Enhanced SVE, In-Situ Thermal Desorption and **Multi-Phase Extraction** – Costs for the in-situ treatment system installation and operation were based on estimates received from remedial contractor firms. Estimates were based on preliminary information provided including the type and level of contamination, area and depth of contamination.

In some instances, these numbers were scaled to account for a slightly larger or smaller treatment area.

Annual Costs – All the "Annual Costs" (Operation and Maintenance of Groundwater Collection and Treatment System, Quarterly Groundwater Sampling w/ Letter Summary Report, and Site Maintenance) are based on actual costs incurred by SI Group.

Estimated Total Present Worth: Alternatives P-1 through P-7

Alternative	Description	Institutional Cost	Capital Cost	Annual Costs	Total Present Worth
1	No Further Action (Operation of GWCS)	$0	$0	$194,000	$2,980,000
2	Physical Containment via a Permeable Cap, Institutional Controls, Operation of GWCS	$30,000	$1,426,000	$219,000	$4,826,000
3	Excavation and Off-Site Disposal of Contaminated Media	$30,000	$55,420,000	$194,000	$56,290,000
4	Limited Excavation and Off-Site Disposal of Contaminated Media, Institutional Controls, and Operation of the GWCS	$30,000	$12,160,000	$194,000	$14,210,000
5	Enhanced Soil Vapor Extraction Treatment, Institutional Controls and Operation of the GWCS	$30,000	$3,790,000 to $7,050,000	$194,000	$5,840,000 to $9,100,000
6	Multi-Phase Extraction Treatment, Institutional Controls and Operation of the GWCS	$30,000	$3,480,000 to $6,750,000	$194,000	$5,530,000 to $8,800,000
7	In-Situ Thermal Desorption Treatment, Institutional Controls and Operation of the GWCS	$30,000	$6,220,000 to $10,430,000	$194,000	$8,270,000 to $12,480,000

6.0 FILL AREA

6.1 Evaluation and Screening of Remedial Technologies

A detailed screening of the technologies and associated process options that were retained during the initial screening was conducted for the Fill Area. Preliminary screening of each technology was performed using engineering judgment to assess the technical implementability and associated effectiveness in reducing potential risks in the Fill Area. Technologies and/or process options that passed through the preliminary screening (Section 4.0) were then further qualitatively screened based on effectiveness, implementability, and cost. Each of these criteria is defined in Section 6.1.

Table 17 presents the detailed screening of the process options. Effectiveness, implementability, and cost were qualitatively evaluated for each process option and assigned a rank of low, moderate, or high for each criterion. The evaluation and assigned rankings for each process option are relative to other process options that achieve the same RAOs. Eliminated technologies and process options are shaded in the table and the rationale for elimination is presented in the rightmost column. The retained technologies and process options are assembled into comprehensive remedial alternatives in Section 6.2 and evaluated in more detail in Section 6.3.

6.1.1 No Further Action

The National Contingency Plan (NCP) requires that No Action be included among the general response actions (GRAs) evaluated. Under the no action response, no additional measures would be taken to improve environmental control of the contamination contained in the Fill Area.

Effectiveness – As described in Section 2.8, the Fill Area is presently being contained with the use of a groundwater collection and treatment system (GWCS) which controls the potential migration of contaminated groundwater leaving the Site. The contaminated groundwater is removed through the use of four pumping wells and a collection trench and treated on-site. A groundwater monitoring program is currently in place to monitor the effectiveness of the containment system.

Future use of the Fill Area would be restricted due to the continued presence of on-site contamination. Administrative controls and procedures such as perimeter fencing and site surveillance have already been implemented at the Site. Operation of the groundwater collection and treatment system would continue until natural attenuation has reduced the level of contamination to a point where the groundwater no longer represents a significant threat to the environment or public health. The GWCS is currently removing and treating over 2 million gallons of water from the Fill Area annually. Since the sources of contamination are expected to remain for an extended period of time, it is anticipated that the groundwater collection and treatment system will continue to operate for at least 30 years.

Implementability - No Action is easily implemented from a technical and administrative perspective.

Costs - There are no short-term costs for No Action. Long-term costs are limited to continued operation of the GWCS, groundwater monitoring and Site maintenance.

Conclusion – The waste material contained in the Fill Area will remain in place, limiting any redevelopment of the area. Natural attenuation and operation of the GWCS will continue to reduce the level of contamination contained in the waste mass over an extended period of time. Since this alternative does have some effectiveness in the short term and meets some of the RAOs, such as containment of the Site, taking no further action in the Fill Area is being retained as a baseline for comparison to other alternatives.

6.1.2 Institutional and Administrative Controls

Although numerous institutional and administrative controls are already in place for the Fill Area, additional institutional controls (ICs) will be effective in further reducing potential human exposure and impacts to the environment when used in conjunction with other remedial actions.

ICs that may be used on the Site include restricting access, development of health and safety procedures to be implemented during any construction activities, deed restrictions that restrict the Fill Area for commercial or industrial use only, and restrictions on the use of the groundwater beneath the Fill Area as a drinking water source. It is determined that implementation of these ICs will generally be feasible and costs are expected to be relatively low.

One method to control human exposure to the contaminants which has already been implemented is restricting access to the Site. As previously discussed, the Site is currently secured with chain link fencing on all sides. There is a gate near the northeast corner of the Site restricting vehicular access to the Site near the intersection of Oak Street and Tenth Avenue. The current fencing around the Congress Street Facility will be useful during any active remedial work at the Site to limit human access. The existing fencing and gates could be supplemented with additional signage to warn potential trespassers to keep off the Site. However, restricting access to the Site is considered only a part of the permanent remedy for managing the Fill Area.

Administrative controls have also been implemented at the Site concerning soil and storm water management. SI Group has also committed to ensure that a vapor intrusion evaluation is completed if a building is constructed on Site in the future.

In addition, it is expected that covenants/deed restrictions may be required, depending on the remedial action selected, to limit future land use or prohibit activities that may compromise specific engineering remedies. For example, if the entire Fill Area is capped, restrictions may be imposed concerning future excavations to limit potential human exposure and impacts to the environment.

Effectiveness – Use restrictions may limit potential exposure to contaminants from a human health standpoint, but will not reduce or alleviate potential environmental impacts. Also, since some people may not comply with the controls, it is possible that some exposure to contamination may occur. However, the implementation of additional institutional and administrative controls will meet some RAOs in the short-term and will help to meet the remaining RAOs over the long-term.

Implementability - Institutional and administrative controls are easily implemented from a technical and administrative perspective. Many administrative controls are already in place, and the site is zoned as General Industrial. .

Costs – Costs of implementing institutional and administrative controls are expected to be low to moderate. Short-term costs include legal consultation. Long-term costs associated with this option include maintenance costs of Site access (fencing, etc.) and security.

Conclusion - This alternative does have some effectiveness in the short term and meets some of the RAOs, such as containment of the Site. Controls of this sort are potentially applicable to the Fill Area and will likely be implemented to some degree with all alternatives unless contaminant levels are reduced below RAOs.

6.1.3 Natural Attenuation

Natural attenuation represents the physical, chemical and biological processes that occur during the degradation of waste material. The effectiveness of natural attenuation is dependent on the material and level of contamination. For example, the effect of natural attenuation on a brick is limited while the wood contained in the waste mass will eventually decay. In a similar manner, the level of natural attenuation of the organic chemicals is dependent on the concentration of these materials, how they are contained and their toxicity to the natural biomass. Natural attenuation will continue to reduce the amount and toxicity of the organic chemicals contained in the waste mass as is presently occurring along with contaminant removal through the operation of the GWCS.

Therefore, natural attenuation can be utilized as an effective remediation technique to reduce the levels of contamination present in the waste mass and would thereby reduce the potential threat to public health and the environment.

Effectiveness - The effectiveness of natural attenuation depends on how well naturally occurring processes such as biodegradation reduce contaminant levels in the Fill Area. The degree of degradation varies directly with the level and type of contamination and will require an extended time period to reach the RAOs.

Implementability – Natural attenuation is already occurring within the Fill Area and is aided by the operation of the GWCS, which flushes nearly 2 million gallons of water through the Fill Area annually. Additional enhancement can be accomplished by removing the impermeable surfaces that cover parts of the Fill Area and installing a permeable cover over the area to encourage surface water to infiltrate and flow through the waste mass to the GWCS. The GWCS will have to operate for an extended time period in the Fill Area since this alternative leaves the waste mass in place and contaminants will continue to leach from the waste.

Costs - Short- and long-term costs for monitoring and data analysis are relatively low to moderate compared to active remedial actions.

Conclusion – Natural attenuation will reduce the level of contamination contained in the waste mass over an extended period of time. Since this alternative does have some effectiveness in the short term and would potentially meet some of the RAOs after an extended period of time, using natural attenuation in the Fill Area is being retained for further evaluation. If implemented, a limited natural attenuation monitoring program will be implemented.

6.1.4 Physical Containment

Containment and/or hydraulic control measures are typically used to contain a waste mass and control the migration of contaminants from the waste mass to the surrounding soils and groundwater. Containment techniques are typically utilized at landfills where the waste mass is intended to be left in place. For example, containment systems are often used at sites where the subsurface contamination is extensive and removal of the contaminants is precluded by the potential hazards associated with the removal and/or excessive costs. Monitoring of containment systems is necessary to ensure the competency of the system. Containment of the Congress Street Site was completed with implementation of the Remedial Action Plan specified for OU1. Physical containment of the Fill Area would focus on isolating the waste mass from the surrounding area and controlling the migration of residual contamination from the area.

6.1.4.1 Soil

A variety of surface capping technologies are available to minimize the exposure of the waste mass in the Fill Area. Although installation of a surface cap would not reduce the waste mass, a cap would provide additional control of potential human and environmental exposure to the contaminants contained in the Fill Area.

If physical containment is implemented as a remedial action, either a permeable or impermeable engineered cover system would be placed over the Fill Area. An impermeable cap would restrict the infiltration of precipitation and surface water reducing the amount of contaminants being flushed from the waste mass into the groundwater. A permeable cover system would promote the infiltration of precipitation and surface water, enhancing natural soil flushing and thus removing contaminants at a higher rate. Based on the known presence of landfill materials (construction/demolition debris, etc.) as well as the tar-like contamination identified during the Updated RI, it is anticipated that enhancing the infiltration of surface water will increase the leaching of contaminants into the groundwater, which would then be removed and treated by the GWCS.

The installation of either type of cover system, with continued operation of the GWCS, would reduce the current level of risk to human health and the environment associated with the Fill Area by further isolating the waste mass and associated contamination. The cover system would be placed on an adequate slope to promote gravity drainage and to ensure stability of the cover system. Material specifications, installation methods and compaction specifications would be specified during the design phase.

Effectiveness – Improving the containment of the Fill Area would be effective at further isolating the waste mass from the surrounding area, thereby reducing its potential impact on the environment and human health. An impermeable cap would reduce the infiltration of surface water into the waste mass, thereby reducing the leaching of contaminants into groundwater. A permeable cap would promote the infiltration of precipitation and surface water, enhancing natural soil flushing and thus removing contaminants at a higher rate.

Implementability – A cap or cover is easily implemented from both a technical and administrative perspective.

Costs - Construction costs are expected to be low to moderate depending on the type of capping material, the thickness of the cap, and the method of construction. Long-term costs include periodic monitoring of the cap and cap maintenance, as required. In addition, the GWCS will need to continue to operate to contain the Fill Area.

Conclusion - Based upon the results of the remedial investigation, both types of soil cover would be effective in isolating the waste mass in the Fill Area. This type of cover would be protective of human health by reducing potential for human exposure. While an impermeable cover would restrict the infiltration of precipitation and surface water and reduce the leaching of contaminants to the surrounding area, it would also reduce the amount of contaminants that are being removed and treated by the GWCS. While a permeable cover system is expected to remove more contamination from the Fill Area, it would enhance the rate of leaching of contaminants to the groundwater. Both options are potentially applicable within the Fill Area.

6.1.4.2 Groundwater

The groundwater collection and treatment system, installed by SI Group in 2001 to control the off-site migration of contaminated groundwater from the Site, will remain in operation until groundwater contamination is reduced to levels below RAOs. The GWCS has proven to be effective in reducing the mobility and migration of contaminants off-site and reducing the concentration and/or volume of contaminants at the Site. Continued long-term operation and maintenance of a groundwater collection system will be required with any alternative that leaves any portion of the waste mass in place.

6.1.5 In-Situ Treatment

6.1.5.1 Enhanced Bioremediation

Enhanced bioremediation is a technology that encourages growth and reproduction of indigenous microorganisms to enhance biodegradation of organic constituents. Bioremediation techniques have been successfully used to remediate soils and groundwater contaminated with petroleum hydrocarbons, solvents, and other organic chemicals (Deuren et al., 2002). The contaminant groups treated most often are polynuclear aromatic hydrocarbons (PAHs), SVOCs, and BTEX compounds (benzene, toluene, ethylbenzene, and xylenes).

Bioremediation treatment does not require heating but requires other inputs, such as an oxygen source and nutrients, to maintain the micro-organisms. The treatment does not generate residuals that may require additional treatment or disposal. However, bioremediation is affected by the type of material and the concentration of contaminants since at certain concentrations, the contaminants can be toxic to microorganisms. In addition, the matrix that a contaminant is contained in will affect the bioremediation of a material. For example, the black tar-like material that is found in the Fill Area does not provide the proper environment for microorganisms and offers little to no bioavailability of the contaminants contained within the material.

Effectiveness – Enhanced bioremediation may result in a reduction of the toxicity, mobility and volume of some contamination in the Fill Area. However, the technology would not be effective in treating the concentrated and/or solid process materials observed in the Fill Area, such as the black tar-like materials. In addition, the technology would not be effective in areas where the VOC concentrations are elevated and toxic to the microorganisms. Furthermore, while enhanced bioremediation is effective at reducing and/or eliminating some SVOCs, this technology does not effectively treat VOCs at high concentration levels. Enhanced bioremediation is not proven effective for grossly contaminated soils and materials (tar-like material) because high concentrations of VOCs can be toxic to the microorganisms. In addition, due to the limited solubility of the SVOCs contained in the black tar-like materials, the SVOCs would continue to leach from these materials requiring operation of the enhanced bioremediation system over an extended period of time.

Since this technology will only treat contaminants which are readily available to biodegrading microorganisms and since a significant portion of the contamination in the Fill Area is bound within the black tar-like material, enhanced bioremediation is not a highly effective treatment technology.

Implementability – Enhanced bioremediation is technically implementable in areas within the Fill Area where conditions are suitable to maintain the microorganisms. These areas are dispersed throughout the Fill Area due to the heterogeneity of the waste mass and are not well defined.

Costs – The relative costs of this technology can be classified as moderate if bioremediation was actively pursued compared to other technologies. Since the SVOCs will continue to be replenished due to leaching from the waste mass, the technology will be required to operate for an extended period of time. In addition, the groundwater collection system will need to operate to collect the contaminants that are not treated by the microorganisms.

Conclusion – Enhanced bioremediation will reduce the level of VOC and SVOC contamination contained in the waste mass over an extended period of time. The effect of enhanced bioremediation, which would probably occur mainly in the saturated zone, would be to reduce the amount of contaminants contained in the groundwater. The amount of reduction is limited since the saturated zone contains high levels of VOCs that are likely toxic to the microorganisms. The tar-like material that is observed in the Fill Area is not suitable for biological growth; contamination within this material is not considered to be bioavailable and thus would not be reduced with this technology. In addition, the GWCS is already removing contaminated groundwater from the area and treating both VOCs and SVOCs. The effectiveness of bioremediation would be random throughout the waste mass due to the heterogeneity of the waste mass and the unsuitable conditions that exist within the waste to maintain the microorganisms.

6.1.5.2 Conventional Soil Vapor Extraction

Conventional soil vapor extraction (SVE) should remove some of the volatile compounds and simultaneously promote some in-situ biodegradation of less volatile organic compounds that are present. SVE is highly dependent upon both the ability of the volatile contaminants to volatilize and the media in which the contamination exists. Based on the remedial investigation, the major portion of VOC contamination is present in the saturated zone. The effectiveness of SVE would be limited throughout the waste mass with a large portion of the waste mass remaining. Testing of the black tar-like material did not identify any VOCs contained in the material and, as such, this material would not be affected by conventional SVE.

Effectiveness – The target contaminant groups for SVE are VOCs. The technology is typically applicable only to volatile compounds. A number of factors that would affect SVE are the ability to move air through the waste mass, and the ability of the VOCs to volatilize, which can be affected by how these materials are contained within the waste mass. SVE will not readily remove heavier or less volatile compounds. However, because the process involves the continuous flow of air, it may promote some in-situ biodegradation of low-volatility organic compounds that may be present.

Based on treatability analyses performed on the black tar-like material, this technology would not effectively treat the contamination contained within the material. In addition, this remedial technology would leave construction and debris waste in the Fill Area, which would require long-term management and continued operation of the GWCS.

Implementability – Based on the remedial investigation, a large portion of the VOC contamination is contained in the saturated zone. To implement conventional SVE, a dewatering system would have to be implemented to depress the groundwater table to expose the area where the VOC contamination is present. The GWCS would also be required to operate to ensure that the site is contained. The SVE system would be difficult to operate since the fill material is very heterogeneous and preferential flow paths would occur reducing the effectiveness of the system. Treatment of extracted vapor would be required prior to discharge. Existing slabs and foundations would present difficulties for implementing this technology and would need to be removed prior to implementation.

Costs – Costs are estimated to be in the moderate range. Since this treatment technology will only treat the VOCs, leaving the SVOCs and solid waste mass in place, long-term operation of the groundwater collection system will be required to continue the collection and treatment of the SVOCs.

Conclusion – Conventional soil vapor extraction (SVE) should remove some of the volatile compounds and simultaneously promote some in-situ biodegradation of less volatile organic compounds that are present. However, this alternative will not treat the black tar-like material that is present in the waste mass and will require continued operation of the GWCS. The effect of conventional SVE would be to reduce the amount of VOCs contained in the groundwater, however, it is noted that the VOCs are already being removed and treated by the GWCS. In addition, the amount of SVOCs that are presently being removed by the GWCS will probably decrease during operation of the SVE system since the groundwater would not be exposed to the SVOCs contained in the Fill Area due to depression of the groundwater table. The effectiveness of SVE would be random throughout the waste mass due to the heterogeneity of the waste and the difficulty of controlling preferential flow paths. As a result, a large portion of the waste mass would remain, including the black tar-like material, requiring continuous operation of the GWCS as noted above.

6.1.5.3 Soil Flushing

In situ soil flushing is the extraction of contaminants from the soil with water or other suitable aqueous solutions. Soil flushing is accomplished by passing the extraction fluid through in-place soils using an injection or infiltration process. Soil flushing is generally only effective at treating unsaturated soils. The target contaminant groups for soil flushing are VOCs and SVOCs.

Effectiveness – The technology is used to treat VOCs and SVOCs, but is less cost-effective than alternative technologies for these contaminant groups. Low permeability or heterogeneous materials are difficult to treat and would limit the applicability and effectiveness of the process. Soil flushing is a developing technology and the effectiveness has not been thoroughly proven, especially, in waste materials.

Soil flushing would result in reduction of the toxicity, mobility and volume of contamination in the Fill Area. Characteristics of the Fill Area (heterogeneity of the waste mass, man-made materials, insolubility of the process materials, physical properties of the waste, etc.) would preclude soil flushing from working effectively in the short term. Soil flushing is currently being used in a limited degree by allowing the surface water to infiltrate the area and flow through the waste mass to the GWCS system. As a result of this flushing, VOCs and SVOCs are being removed from the waste mass, collected by the GWCS, and treated.

Implementability – Due to the heterogeneity of the waste mass, the insolubility of the process materials, and the permeability of the waste mass, the potential to substantially increase the amount of flushing that is occurring with beneficial results would be difficult. Pumping wells are already operating in the Fill Area and are removing contaminated ground water. The production rate that is obtained from these wells is low due to the low permeability of the waste mass. If a reagent is used, an investigation of the Fill Area would have to be completed to evaluate the suitability of the reagent and the potential of not causing additional problems due to the mixing of the chemicals within the waste mass. Treatability analyses have indicated that the black tar-like material is soluble only in solvents such as toluene and heptane, with no apparent solubility in methanol and acetone. Furthermore, this material rejects water suggesting it is completely insoluble in water.

Soil flushing is a developing technology that has been used at a limited number of sites. In addition, there are a limited number of vendors offering this technology. Even if a suitable reagent was identified, a large portion of the waste mass would still remain resulting in the need for continued operation of the GWCS.

Costs – The relative cost of this technology can be classified as moderate to high compared to other technologies due to the information that needs to be obtained to determine its feasibility. Since this treatment technology will leave a portion of the waste mass in place, long-term operation of a groundwater collection system and maintenance of the area would be necessary.

Conclusion – Soil flushing is being used at this time to allow the surface water to migrate through the waste mass to the GWCS. The potential to increase soil flushing by identifying a suitable reagent that could be used to remove the contamination, which would include the black tar-like materials, is considered to be very low. These materials are not readily soluble in water and the reagents that these materials are soluble in are not suitable for soil flushing. Furthermore, this technology does not address groundwater contamination and will leave a portion of the waste mass in place, including the black tar-like material. Soil flushing will be retained in conjunction with other remedial alternatives as is presently being used but will not be retained for further evaluation as a sole alternative.

6.1.5.4 Bioventing/Biosparging

Bioventing provides oxygen to stimulate naturally occurring microorganisms to degrade compounds in unsaturated areas. Bioventing can be used to treat aerobically biodegradable constituents; however, it is most effective in remediating sites with SVOC compounds. Compounds that tend to volatilize readily (VOCs) are more effectively removed using SVE. Similar to bioremediation, highly contaminated soils and materials may not be biodegraded because the concentrations of certain contaminants are too high and toxic to the microorganisms, and conditions may not be suitable for the microorganisms.

Effectiveness – Bioventing would result in some reduction of the toxicity, mobility and volume of contamination in the Fill Area. However, bioventing would not be effective at treating contaminated solid waste materials and construction and debris since this technology is highly dependent on homogeneity to effectively distribute oxygen to the subsurface media. As a result, the majority of contamination would remain for an extended period.

The current level of VOCs observed in the Fill Area during the Updated RI will further limit the effectiveness of this technology and it would be necessary to first reduce VOC contamination prior to implementing a biosparging program.

Similar to other in-situ technologies, the effectiveness would be very limited throughout the waste mass due to the heterogeneity of the waste mass and the unsuitable conditions that exist within the waste to maintain the microorganisms. Furthermore, as discussed in Section 6.1.5.1, the black tar-like material that is observed in the Fill Area is not suitable for biological remediation; contamination within this material is not considered to be bioavailable and thus would not be reduced with this technology. As a result, a large portion of the waste mass would remain.

Implementability – Bioventing could be implemented but would only be effective in those areas where the proper conditions exist for the microorganisms. The effective area could be increased if the technology is employed after SVE, which also has its limitations in reducing VOC contamination. Existing slabs, the loading dock, and the Treatment Building may present difficulties for implementing this technology and would need to be removed or relocated prior to implementation.

Costs – Costs are expected to be in the moderate range. Since this treatment technology will leave the solid waste mass in place, long-term operation of a groundwater collection system would be necessary.

Conclusion – The technology would be effective only in those limited areas where the conditions may be suitable for both the distribution of oxygen and for microorganisms. The effectiveness would be very limited throughout the waste mass due to the heterogeneity of the waste mass and the unsuitable conditions that exist within the waste to maintain the microorganisms. As a result, a large portion of the waste mass, including the black tar-like material, would remain with varying levels of treatment. In the short term, biosparging would have a limited impact on reducing the level of contamination contained within the Fill Area.

6.1.5.5 Chemical Oxidation

Chemical oxidation (CO) is based on the delivery of chemical oxidants to contaminated media in order to react with the site contaminants and convert them to non-toxic compounds. Chemical oxidation could address both the VOCs and SVOCs present at the Site. However, chemical oxidation is generally most effective when used concurrently with another treatment technique to target contaminants in the unsaturated zone (i.e. SVE). A benefit of many chemical oxidation techniques is that the chemical reactions provide residual dissolved oxygen that can then be used by aerobic microorganisms to biodegrade contaminants after active remediation is complete.

Effectiveness – Since chemical oxidation technologies have been predominantly and successfully used to address contaminants in the source area saturated zone and/or capillary fringe, the technology would be expected to remove some contaminants from the saturated zone within the Fill Area but will not address the unsaturated waste mass. This remedial technology would leave a large portion of the waste mass in place, including the black tar-like material, which would require long-term management and continued operation of the GWCS.

The effectiveness of chemical oxidation in the Fill Area is also dependent on the materials in the waste mass, the reactions that would result from the oxidation of those materials and the rate at which those reactions would occur. Due to the wide variety of materials contained in the waste mass, a single reagent would not be effective for all the different types of materials contained in the Fill Area. In addition, the black tar-like material consists of contaminants surrounded by large polymeric materials, which makes the material not suitable for chemical oxidation.

Implementability – Due to the heterogeneity of the waste mass, the type of process material contained in the waste mass, and the solubility of waste; the potential to effectively implement chemical oxidation is low.

Costs – Costs are expected to be in the moderate to high range when compared to other alternatives. Costs are ultimately based on the chemical chosen, the need for the addition of a surfactant, how the application is performed, and the degree of contamination. Since this treatment technology will leave the solid waste mass in place, including the black tar-like material, long-term operation of a groundwater collection system would be necessary.

Conclusion – Chemical oxidation is a technology that could potentially result in some reduction of the toxicity, mobility and volume of contamination in certain situations. However, chemical oxidation is not as effective at addressing contamination in unsaturated zones. In addition, the technology will not effectively treat the black tar-like material and other waste materials that are present within the waste mass. Based on the summary of contaminant mass provided in Section 3.3, the majority of contamination in the Fill Area is present in the waste mass, which would not be treated. As such, chemical oxidation is not being retained as a possible remedial technology since it will not effectively address the majority of the contamination in the Fill Area.

6.1.5.7 Multi-Phase Extraction

Multi-phase extraction (MPE) involves removal of contaminated groundwater, free-phase product contamination, and soil vapors from a common extraction well under vacuum conditions. In the right soil conditions, MPE will readily remove volatile compounds and simultaneously promote the in-situ biodegradation of less volatile organic compounds that are present. Since it is effective in the removal of soil vapor as well as contaminated groundwater and free-phase product contamination, MPE may be a partially effective means of in-situ remediation in the Fill Area.

Effectiveness – MPE would result in some reduction of the toxicity, mobility and volume of contamination in a limited portion of the Fill Area. While MPE directly removes VOCs, the introduction of air or oxygen into the subsurface during the vapor extraction process stimulates biodegradation and results in natural bioremediation of contaminants that are not otherwise removed by an extraction system. Similar to Conventional Soil Vapor Extraction and Bioremediation, MPE relies on homogenous subsurface conditions to effectively distribute oxygen to the subsurface media. The nature of the contamination will significantly limit the effectiveness of this technology in the Fill Area. Based on treatability analyses performed on the black tar-like material, this technology would not effectively treat the contamination contained within this material.

Implementability – Based on the remedial investigation, a large portion of the VOC contamination is contained in the saturated zone. To implement an effective MPE system, the MPE system would have to depress the groundwater table to expose the area where the VOC contamination is present. The GWCS would also be required to operate during implementation to ensure that the site remains contained. The MPE system would be difficult to operate since the fill material is heterogeneous and preferential flow paths would occur, thereby reducing the overall effectiveness of the system. Treatment of extracted product, water and vapor prior to discharge or disposal would be required. Existing slabs, the loading dock, and the Treatment Building would present difficulties for implementing this technology and would possibly need to be removed or relocated prior to implementation.

Costs – Costs are expected to be in the moderate range when compared to other alternatives. Costs are higher than conventional SVE because MPE is more energy-consumptive. Since this treatment technology will leave the solid waste mass in place, long-term operation of the GWCS would be necessary.

Conclusion – MPE would remove some of the volatile compounds and promote some in-situ biodegradation of less volatile organic compounds that are present. However, this alternative will not treat the black tar-like material that is present in the waste mass and thus will require long-term (30+ years) operation of the GWCS. The effect of MPE would be to reduce the amount of contamination contained in what is currently the saturated zone. However, it is noted that contamination in this zone is already being removed and treated by the GWCS. The effectiveness would be random throughout the waste mass due to the heterogeneity of the waste and the difficulty of controlling preferential flow paths with a large portion of the waste mass remaining. As a result, a large portion of the waste mass would remain including the black tar-like material, requiring continuous operation of the GWCS as noted above. However, since some contamination will be removed from the Fill Area using this technology, MPE will be retained for consideration.

6.1.5.8 Enhanced Soil Vapor Extraction

Thermally-enhanced SVE is a full-scale technology that uses conduction or convection to transmit heat through soils to increase the volatilization rate of both volatiles and semi-volatiles and to facilitate extraction. This technology is used with the objective of first reducing the levels of VOCs contained in the soils through SVE. Thermal enhancement of the SVE system has indicated that the VOCs would be removed at a faster rate, reducing the time required to remediate the area. In areas where the VOCs are no longer toxic to the natural bio-organisms, the natural bio-organisms may become active and start to break down any bioavailable VOCs and SVOCs. The bio-activity should also be enhanced at the higher temperatures that are naturally present within the soils after thermally enhancing the SVE system.

Testing at SI Group's Rotterdam Junction facility has indicated that a combination of either convective or conductive heating of the soils and soil vapor extraction is effective in the remediation of VOC contaminants. However, the lithology of the Fill Area and the waste materials contained in the Fill Area are considerably different than that of the materials tested at the Rotterdam Junction facility.

Effectiveness – Thermally-enhanced SVE would result in some reduction of the toxicity, mobility or volume of contamination in the Fill Area similar to conventional soil vapor extraction. Since extraction wells would already be in place, thermally-enhanced SVE could be followed by bioventing/biosparging to further promote natural biodegradation of some SVOCs. However, the technology would only be marginally effective in treating the Fill Area.

Since thermally-enhanced SVE systems work best in homogeneous media such as soils, the heterogeneity of the waste would reduce the effectiveness of the thermally-enhanced SVE system due to the potential of preferential flow paths within the waste. Furthermore, treatability analyses of the black tar-like material showed that heating of the material to 95ºF over an extended time period would have no effect on the black tar-like material observed in the Fill Area, as described in Section 2. This remedial technology would leave a large portion of the waste in the Fill Area, which would require long-term (30+ years) of the GWCS.

Implementability – Based on the remedial investigation, a large portion of the VOC contamination is contained in the saturated zone. To implement thermally-enhanced SVE, an extensive dewatering system would have to be implemented to depress the groundwater table to expose the area where the VOC contamination is present. The GWCS would also be required to operate during implementation to ensure that the site remains contained. The thermally-enhanced SVE system would be difficult to operate since the fill material is heterogeneous and preferential flow paths would occur, thereby reducing the overall effectiveness of the system.

Costs – Costs are estimated to be in the moderate to high range and are primarily driven by the energy-consumptive nature of the technology. Since this treatment technology will leave the solid waste mass in place, long-term operation of the GWCS would be necessary.

Conclusion – Similar to conventional SVE, thermally-enhanced SVE should remove some of the volatile compounds and simultaneously promote some in-situ biodegradation of less volatile organic compounds that are present. However, this alternative will not treat the black tar-like material that is present in the waste mass and will require long-term (30+ years) operation of the GWCS. The effect of the thermally-enhanced SVE system would be to reduce the amount of contamination contained in what is currently the saturated zone. However, it is noted that contamination in this zone is already being removed and treated by the GWCS. The effectiveness of thermally-enhanced SVE would be random throughout the waste mass due to the heterogeneity of the waste and the difficulty of controlling preferential flow paths. As a result, a large portion of the waste mass would remain including the black tar-like material, requiring continuous operation of the GWCS as noted above. However, since some contamination will be removed from the Fill Area using this technology, thermally-enhanced SVE will be retained for consideration.

6.1.5.9 In-Situ Thermal Desorption

Using ISTD, soil is heated in-situ to higher temperatures than typically used for thermally-enhanced SVE. Volatile and semi-volatile contaminants are vaporized and are removed by vacuum extraction and then treated. ISTD is used to remediate both the saturated and unsaturated zones. The technology has a high removal efficiency in soils because it does not rely on injection of fluids to mobilize target compounds. An additional benefit of ISTD is that it does not require that the groundwater be extracted and treated aboveground since the groundwater is also vaporized within the targeted treatment area.

Effectiveness – The technology has a high removal efficiency in homogeneous media because it heats the soils to elevated temperatures. Similar to thermally-enhanced SVE, this technology works most effectively in homogeneous, low-permeability soils where the heat is transferred through the soils. ISTD has not been widely applied to waste and debris, and no tests have been conducted on the use of ISTD in landfill-type conditions (Shaw et al., 1999). The elevated temperatures used during treatment present a safety concern. The temperatures that are used would exceed the flash points of the VOC contaminants present in the waste mass and particularly the cresylic acid that is contained in the black tar-like material. In addition, the Fill Area contains combustible materials, such as the wood that was identified during the investigation, which could potentially support a fire if an ignition did occur within the waste material.

The composition analysis of the black tar-like material shows that the material contains 5-10% cresylic acid, which is a flammable solid having a flash point of 178 ºF and a boiling point of 392 ºF. The treatability analyses of the black tar-like material indicate that the material would have to be heated above the flash point of the cresylic acid before contaminants within the material vaporize. Even if heated to the high temperatures reached using ISTD, a significant portion of the solid waste mass would be left in place requiring long-term management.

Implementability – Due to the heterogeneity of the waste mass, the characteristics of the waste, and the safety concerns, the implementation of ISTD would be extremely difficult without creating a potential safety concern.

Costs – Costs are expected to be in the moderate to high range when compared to other alternatives. Costs would be ultimately based on the amount of heat that would be required to volatilize the materials of concern, collect the chemical vapors emitted, and operate the system in a safe manner to prevent any ignition within the waste mass that could cause a fire. In addition, this treatment technology will leave the solid waste mass in place requiring long-term (30+ years) operation of the GWCS.

Conclusion – ISTD is a new technology that has been effective in treating contaminated soils, but has not been shown to be a viable option in treating waste material contained in a landfill situation. As such, ISTD is not being retained as a possible remedial technology since it has not been demonstrated to be effective in a landfill situation. In addition, the black tar-like material would not be effected by this technology until it is heated well above its flash point and, thereby, creating a potential safety concern within the Fill Area.

6.1.6 Removal with Off-site Disposal

The removal and disposal response action involves the excavation of the waste mass and contaminated soils that exceed the cleanup goals in the Fill Area, and disposal of the waste mass and contaminated soils at an approved off-site facility.

This process option would involve the greatest amount of disturbance and community impact. As such, the risks from dust and truck traffic would increase proportionally. Additional drawbacks associated with disposing of the waste mass and contaminated soils include temporary increased truck traffic through area communities and the long-term liability associated with disposing the waste at another location. Furthermore, CERCLA includes a statutory preference for treatment of contaminants, and excavation and off-site disposal is now less acceptable than in the past.

In order to allow for informed decision making regarding the feasibility of excavation and/or other remedial activities, the stability of the soils across the Fill Area was considered as part of the Updated RI and assessed by evaluating soil boring logs generated during this and previous investigations. It was determined that, while the excavation side wall could be sloped back to provide adequate stability and remain within the confines of the property in a limited number of areas, such as to the south/southeast, other portions of the excavation would require extensive shoring to remain stable. It is further anticipated that excavation in the Fill Area could pose a significant safety risk to both persons and adjacent property, including properties located up slope from the excavation on 10th Avenue, the Congress Street bridge and the CSX railroad tracks down slope from the Fill Area, which serve as the main rail line between Albany and Buffalo.

Effectiveness – Since no soil exceeding the cleanup standards would remain on-site, the volume and toxicity of contamination would be reduced on-site but not at the disposal facility. This alternative represents a permanent solution for the Fill Area. However, the waste mass contaminated soils disposed of off-site would have to be managed at the disposal facility over the long-term.

In order to fully remediate the Fill Area, it is anticipated that soils would need to be removed to a depth of nearly 50 feet. If soils were not removed to this depth, residually contaminated soils and groundwater would remain on-site and would require additional treatment and/or monitored natural attenuation. This excavation would occur next to the CSX railroad tracks within their right-of-way. Standard shoring technology would not be suitable for this deep of an excavation. Special stabilization technology would have to be investigated to determine if an excavation could be completed to the depth required without disturbing the railroad tracks and other significant structural features within the area that include a bridge.

Implementability – Although removal and disposal of the contaminated soils in the Fill Area is considered an effective approach for managing the impacts to the Fill Area, implementation would be extremely difficult and potentially infeasible. Due to topography and soil characteristics, most of the contaminated soils present in the Fill Area are difficult to access.

As noted in the Updated RI Report, the soils on-site consist of inter-bedded sand, silt and clay layers. Regionally, many natural slopes in the area of the Site are often unstable and the disturbance of the slopes or unusual conditions such as heavy soaking rains that locally raise the water table can destabilize the slopes causing failure. Like this Site, these soils are often in the form of steeply sloped bluffs overlooking stream and river valleys. These bluffs, historically, are marginally stable in their natural condition, and become unstable in situations such as when excavations are made near the base of the slopes, which may occur if the area in question is removed. Major slope failures have occurred west of the Congress Street Site along Broadway that resulted in major property loss in recent years. The Fill Area has similar topography and geology to the failure prone areas. This geology is further destabilized in the Fill Area by the presence of fill materials, which have low cohesion and are more susceptible to failure.

Instability of soils and the fill material in the Fill Area was previously demonstrated during the excavation of the “french drain”. Shoring was installed on both sides of the excavation that was dug for installation of the “french drain”. A small section of the excavation was not shored due to the fact the excavation was not very deep and shoring was not considered to be necessary. During excavation, difficulties were encountered due to the sloughing of soils into the excavation. This movement of the soils also resulted in the undermining of the loading dock, located at a higher elevation near the excavation on top of fill materials.

While complete excavation of the waste mass and impacted soils does not appear to be easily implemented at this time, partial excavation in the Fill Area may be an option. The excavation would remove some of the waste mass and contaminated soil contained in the Fill Area, thereby reducing the amount of waste material.

Costs – This alternative represents the highest cost for remediation of the Fill Area. It is anticipated at this time that a significant portion of the excavated waste mass would need to be disposed off-site at a permitted disposal facility. Costs are driven primarily by the volume of waste disposed, dewatering and associated treatment, and stabilization of the slopes during excavation. The costs may even be substantially higher due to the stabilization technology that would have to be implemented to insure that the area surrounding the excavation does not move.

Conclusion – Although no volume reduction would be attained by this process option, it is the most permanent. Implementation of this option is considered the most difficult of those presented and potentially infeasible; however, since this option is the most permanent, it will be retained for further evaluation.

6.2 Representative Processes Selected for the Development of Alternatives

The technologies selected from the two-step screening process above include several process options. The "cover" technology, for example, includes four process options (clean soil cover, synthetic membrane cap, asphalt/concrete cap, and multimedia cap). Many of these process options are similar since they reduce potential exposure. To include all combinations of process options in the development of alternatives would result in the evaluation of hundreds of alternatives with little to no additional benefit.

In some cases, the various process options are sufficiently different in their performance that one would not adequately represent the other. In these cases, more than one process option was selected for a technology type. For example, under the physical treatment category, it was concluded that multi-phase extraction and enhanced SVE were sufficiently different in performance and cost for both to be included in the remedial alternative development. The following process options were selected as representative:

Technology	Representative Process Option(s)
No Action	▪ No Action
Access Restrictions	▪ Deed Restrictions ▪ Groundwater and Soil Management Plan
Natural Attenuation	▪ Natural Attenuation
Containment	▪ Impermeable Engineered Cap ▪ Permeable Cap
Excavation	▪ Conventional Excavation w/ Off-Site Disposal
Biological Treatment	▪ Bioventing/Biosparging
Chemical Treatment	▪ None Selected
Physical Treatment	▪ Soil Vapor Extraction ▪ Enhanced Soil Vapor Extraction ▪ Multi-Phase Extraction
Thermal	▪ None Selected
Ex-Situ Treatment	▪ None Selected

The actual process options to be used during the cleanup will be defined in the Remedial Action Plan. The technologies and representative process options identified in this section are combined into alternatives in Section 6.3 and evaluated in more detail in the remainder of this FS.

6.3 Development of Alternatives

Based upon the preliminary evaluation and screening of available remedial technologies, a number of options remain for managing the contaminants in the Fill Area. As indicated in previous sections, a majority of the retained technologies will not be considered sufficient as the sole remedy for the Fill Area of the Congress Street Site. Instead, some remedial alternatives will combine a number of these technologies to provide potentially more effective, implementable, and cost-effective approach to remediating the Fill Area.

The following eight remedial alternatives for the Fill Area have been assembled utilizing the general response actions, technologies, and process options retained from the initial screening and presented in Section 6.2:

Alternative F-1:
- No Further Action
- Institutional/Administrative Controls
- Long-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-2:
- Containment of Fill Area
- Institutional/Administrative Controls
- Long-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-3:
- Natural Attenuation
- Institutional/Administrative Controls
- Installation of a Permeable Cap
- Long-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-4:
- Excavation of Impacted Soils in Fill Area, Off-site Disposal
- Relocation of Treatment Facility
- Institutional/Administrative Controls
- Short-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-5:
- Limited Excavation of Impacted Soils in Fill Area, Off-site Disposal
- Containment of Fill Area
- Institutional/Administrative Controls
- Long-Term Groundwater Hydraulic Containment, On-site Treatment

- Surface Water and Groundwater Monitoring

Alternative F-6:

- In-Situ Treatment in Fill Area Using Conventional SVE
- Bioventing/Biosparging
- Capping of Fill Area
- Removal of Slabs, Surface Obstructions and Building Footings (excepting Treatment Facility)
- Institutional/Administrative Controls
- Moderate-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-7:

- In-Situ Treatment in Fill Area Using Thermally-Enhanced SVE
- Bioventing/Biosparging
- Capping of Fill Area
- Removal of Slabs, Surface Obstructions and Building Footings (excepting Treatment Facility)
- Institutional/Administrative Controls
- Moderate-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

Alternative F-8:

- In-Situ Treatment in Fill Area Using Multi-Phase Extraction
- Bioventing/Biosparging
- Capping of Fill Area
- Removal of Slabs, Surface Obstructions and Building Footings (excepting Treatment Facility)
- Institutional/Administrative Controls
- Long-Term Groundwater Hydraulic Containment, On-site Treatment
- Surface Water and Groundwater Monitoring

A detailed analysis of these remedial alternatives for managing the subsurface contaminants present in the Fill Area of the Congress Street Site is provided in the following section.

6.4 Detailed Analysis of Alternatives

The purpose of this section is to provide a detailed analysis of several remedial alternatives for managing the subsurface contaminants present in the Fill Area of the Congress Street Site. The remedial alternatives for this remediation unit were developed in Section 6.3 utilizing the general response actions, technologies and process options retained from the qualitative screening conducted in Section 6.1. The detailed analysis of alternatives consists of the refinement of remedial alternatives and evaluation of each alternative against seven evaluation criteria which encompass technical, cost, and institutional considerations; and compliance with statutory requirements. The detailed analysis presented in this section follows the outline presented in the USEPA RI/FS Guidance Document dated October 1988, and 6 NYCRR Section 375-2.8 (c). The criteria to be used for the detailed analysis of alternatives include the following:

- Protection of Human Health & the Environment
- Compliance with SCGs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

These criteria are described in detail in Section 5.1.

Alternative F-1 represents the “No Further Action” alternative. In assembling the alternatives for the Fill Area, Alternative F-2 (Physical Containment) was designed to further contain the Fill Area and controlling the potential release of contaminants from the waste mass. In addition, the alternative eliminates unacceptable construction/redevelopment/land use by placing controls on these activities.

Alternatives F-3 through F-8 were designed to reduce the level of contamination within the Fill Area as opposed to simply restricting contact with contamination. Alternative F-4 (Excavation) was designed to provide complete restoration of the Fill Area. This alternative is the only one which returns the Fill Area to “pre-disposal” conditions, but is met with significant short-term impacts as well as extensive implementability issues.

In Section 3.3, an evaluation was performed to estimate the volume of waste and impacted soil and groundwater within the Fill Area. The evaluation indicated that remediation of soils to a limited depth would be far less disruptive to the Fill Area and adjacent community than what would be required to return the Fill Area to pre-disposal conditions (Alternative F-4). However, treatment or excavation and disposal of a limited portion of the Fill Area would remove only approximately 35% of Fill Area contamination.

6.4.1 Alternative F-1 – No Further Action

Description of Alternative F-1 - Under the "No Further Action" alternative, no additional measures would be taken to improve Fill Area conditions. However, the Fill Area is presently being contained with the use of the GWCS which controls the potential migration of contaminated groundwater leaving the Site. Administrative controls and procedures such as perimeter fencing and site surveillance which have already been implemented at the Site will continue to be implemented. Natural processes, including degradation, dispersion, dilution, adsorption, volatilization, etc., are serving as a source of contaminant removal. Further active reduction in toxicity, mobility, and volume of the contaminants is being provided by operation of the GWCS, which removes and treats approximately 2 million gallons of contaminated groundwater from the Fill Area annually.

This alternative, as noted above, includes the continued operation of the groundwater collection and treatment system. The objective of the GWCS is to control chemical migration from the Fill Area by intercepting and collecting potentially impacted groundwater at the down gradient property boundary. An additional benefit of the GWCS is that it is actively removing dissolved contamination from the Fill Area and, through natural soil flushing, is promoting the dissolution of additional contamination contained within the waste mass and/or adsorbed to soil particles. The overall performance goal of the system, as outlined in the Operation and Maintenance Plan, will continue to be to maintain continuous operation of the groundwater extraction system. The system performance is to be evaluated on an annual basis. In addition, this requires continued compliance with the SPDES permit for the Site.

The current groundwater and surface water monitoring plan would continue as outlined in the standard operating procedure (SOP) for monitoring at the Site. The cost estimate includes the quarterly collection of 11 groundwater samples and 3 surface water samples. A summary report of the data would be prepared following each monitoring event. Monitoring, as described above, is included in all subsequent alternatives.

The cost estimate associated with this alternative includes operation and maintenance costs of the GWCS, maintenance of the Site (mowing, fencing, etc.), and annual monitoring. SI Group has estimated that it would cost approximately $9,400 a year for Site maintenance, $136,000 a year to operate and maintain the GWCS, and $48,600 a year for monitoring. Costs are assumed over the next 30 years.

Despite the fact that no additional measures would be taken in the Fill Area, the No Action alternative currently meets many of the remedial action objectives, including:

- Operation of the GWCS is removing dissolved contaminants from the Fill Area, thereby working towards restoration of groundwater quality to levels which meet state and federal groundwater standards;
- Current site controls such as fencing along with operation of the GWCS are preventing human contact with contaminated soils, waste, and groundwater; and
- Through natural soil flushing, operation of the GWCS is promoting the dissolution of additional contamination contained within the waste mass and/or adsorbed to soil particles, thereby working towards restoring subsurface soil quality to levels which meet state and federal requirements for redevelopment of the Site.

Analysis of Alternative F-1 – An analysis of Alternative F-1 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-1	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Existing institutional controls (e.g. signing, fencing) limit Fill Area access. ▪ Potential for off-site impacts are being controlled with the elimination of aboveground contamination and operation of GWCS. ▪ RAOs for protection of human health and the environment are currently being met through containment of site by the GWCS and administrative controls. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants.
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in the short-term ▪ Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.

Evaluation of Alternative F-1	
Criterion	**Discussion**
Long-Term Effectiveness & Permanence	*Advantages:* ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Potential exists for continued contamination migration, although unlikely with continued operation of the GWCS. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media remains on site and limits potential redevelopment of Fill Area.
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates potential exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment remains but is limited by administrative controls and continued operation of the GWCS.
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Fill Area will continue.
Cost	▪ Present Worth of Alternative F-1= $2.98 Million.

6.4.2 Alternative F-2 – Physical Containment

Description of Alternative F-2 – Alternative F-2 is the installation of an impermeable cover system over the Fill Area to further contain the contamination present in the waste mass. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area. The GWCS will continue to be operated in the long-term to control groundwater migration from the area. A long-term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area.

The installation of an impermeable cap, with continued operation of the GWCS, would reduce the current level of risk to human health and the environment associated with the Fill Area by further isolating the waste mass and associated contamination. The cap would restrict the infiltration of precipitation and surface water and would be installed over most existing concrete slabs and asphalt. Based on the known presence of landfill materials (construction/demolition debris, etc.) as well as the tar-like contamination identified during the Updated RI, it is anticipated that restricting the infiltration of surface water will reduce the leaching of contaminants into the groundwater.

The final design of the cover system would be determined in the design phase. The extent of the capping system is presented on Figure 24 (Fill Area). The cap will be installed to tie into existing Fill Area features (i.e. the Treatment Facility) and topography to the extent possible. Following the installation of the cover system, it will be necessary to extend 7 monitoring/pumping wells that are in the area to be capped.

Potential redevelopment of the Fill Area would be limited with the installation of a cover system; additional deed restrictions would be required to prevent future Fill Area users to comply with a Soil Management Plan when excavating beneath the cover system.

Since the majority of contamination as well as the solid waste materials will still remain in the Fill Area after installation of the engineered cover system, it will be necessary to use the existing monitoring wells both on- and off-Site to monitor the Fill Area after the cap installation activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are not expected to reach the cleanup goals for a minimum of 30 years across the entire Fill Area. Therefore, thirty years of post-action monitoring and GWCS operation have been included in the Alternative F-2 costs.

Analysis of Alternative F-2 – An analysis of Alternative F-2 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-2	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Engineered cover would reduce potential emissions of volatile contaminants from soils to the atmosphere. ▪ Engineered cover further limits potential for human exposure to Fill Area contaminants and reduce surface water infiltration and leachate generation. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with control of infiltration into the Fill Area, reducing the amount of leachate generation, and isolation of the area. *Disadvantages:* ▪ Provides limited reduction in subsurface contaminants. ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants.
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in the short-term ▪ Concentrations in groundwater and soil will decrease with time due to natural attenuation, operation of the GWCS, and isolation of Fill Area, but SCOs would not be achieved within a reasonable period of time. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Engineered cover would reduce potential for human exposure subsurface contaminants. ▪ Engineered cover would reduce leachate generation. ▪ Fill Area contamination will be reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ Groundwater/leachate collection system will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media and waste mass remains on-site and limits potential redevelopment of Fill Area.

Evaluation of Alternative F-2	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment during construction of soil cover.
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of Fill Area will continue. ▪ No other activities or development will be supported until cap installation activities are complete.
Cost	▪ Present Worth of Alternative F-2 = $3.29 Million.

6.4.3 Alternative F-3 – Natural Attenuation

Description of Alternative F-3 – Alternative F-3 will use natural attenuation along with operation of the GWCS to reduce contaminant levels. A permeable cover system will be installed over the Fill Area to further contain the contamination present in the waste mass while also encouraging the maximum amount of surface water to flow through the waste mass to the GWCS. Alternative F-3 includes the removal of surface slabs, the loading dock, and other surface obstructions to further promote surface water infiltration. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area. The GWCS will continue to be operated in the long-term to control groundwater migration from the area. A long-term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area.

In order to facilitate in-situ treatment of impacted soils in the Fill Area, it will be necessary to first remove existing surface slabs, the loading dock, and other surface obstructions present in the Fill Area. At this time, it is not anticipated that the Treatment Facility would need to be relocated. The portion of concrete to be removed is estimated to be on the order of 50 yd^3 of concrete. It is assumed that the concrete can be cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. Any soils that are excavated will be placed back into the excavation. Product or other manmade materials will be removed, tested and disposed of off-site. Furthermore, it is not anticipated that sheeting and/or shoring will be necessary during the slab/concrete removal.

In order to backfill areas where concrete is removed, the same 50 yd^3 of soil would need be imported to the Fill Area. A lump sum cost for dust suppression during the removals due to the presence of VOC- and SVOC-impacted soils in the Fill Area has been included.

The installation of a permeable cap, with continued operation of the GWCS, would reduce the current level of risk to human health and the environment associated with the Fill Area by further isolating the waste mass and associated contamination. The permeable cap would promote the infiltration of precipitation and surface water, enhancing natural soil flushing and thus removing contaminants at a higher rate. Based on the known presence of landfill materials (construction/demolition debris, etc.) as well as the black tar-like contamination identified during the Updated RI, it is anticipated that enhancing the infiltration of surface water will increase the leaching of contaminants into the groundwater, which would then be removed and treated by the GWCS.

The final design of the cover system would be determined in the design phase. The extent of the capping system is presented on Figure 24 (Fill Area). The cap will be installed to tie into existing Fill Area features (i.e. the Treatment Facility) and topography to the extent possible. Following the installation of the cover system, it will be necessary to extend 7 monitoring/pumping wells that are in the area to be capped.

Potential redevelopment of the Fill Area would be limited with the installation of a cover system; additional deed restrictions would be required to prevent future Fill Area users to comply with a Soil Management Plan when excavating beneath the cover system.

Since the majority of contamination as well as the solid waste materials will remain in the Fill Area, it will be necessary to use the existing monitoring wells both on- and off-Site to monitor the Fill Area after the cap installation activities are complete. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are not expected to reach the cleanup goals for a minimum of 30 years across the entire Fill Area. Therefore, 30 years of post-action monitoring and GWCS operation have been included in the Alternative F-3 costs.

Analysis of Alternative F-3 – An analysis of Alternative F-3 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-3	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Reduces but does not eliminate potential for human health and environmental exposure to Fill Area contaminants.
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in the short-term. ▪ Concentrations in groundwater and soil will decrease with time due to natural attenuation and removal via the GWCS, but SCOs would be achieved over a long period of time. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Permeable cover would reduce potential for human exposure subsurface contaminants. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Fill Area contamination will be reduced with continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ Groundwater/leachate collection system will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media and waste mass remains on-site and limits potential redevelopment of Fill Area.

Evaluation of Alternative F-3	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment during construction of soil cover.
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of Fill Area will continue.
Cost	▪ Present Worth of Alternative F-3 = $3.51 Million.

6.4.4 Alternative F-4 – Excavation with Off-Site Disposal

Description of Alternative F-4 – Alternative F-4 is the complete excavation and removal of the waste mass and contaminated soil in the Fill Area with the intent of returning the area to "pre-disposal conditions". Administrative controls and institutional controls will be used during remediation of the Fill Area. The GWCS will continue to be operated until the groundwater meets the RAOs. This alternative is expected to restore the Fill Area to "pre-disposal conditions" as defined in Draft DER-10 "Technical Guidance for Site Investigation and Remediation".

Under Alternative F-4, contaminated soils in the Fill Area would be excavated and disposed of in a permitted off-site facility. However, an extensive stabilization system would need to be implemented to facilitate waste and soil excavation, especially given the inherent slope stability issues discussed in Sections 2.5 and 6.1.6.

Based on results of the Updated RI, it has been estimated that the Fill Area covers an area approximately 27,275 ft^2 in size (Figure 24). Results from the Updated RI collected from both soil and groundwater samples were used to estimate the depth of contamination in the Fill Area. Based on this data, it has been estimated that removing and disposing of up to 50 feet in the deepest part of the Fill Area (near monitoring well MW-19A/B) is necessary to remove all contamination. However, contamination in some portions of the

Fill Area extends to a lesser depth of 30 feet (near boring location GP-17). As such, an average depth of 40 feet has been used for cost estimation purposes. This depth will enable the excavation to extend below the groundwater table and into the deep groundwater interval. It is noted that the estimate for excavation depth may change during the implementation phase of the project.

With groundwater at an average depth of approximately 16 feet bgs in the Fill Area, it would also be necessary to maintain an extensive dewatering system during the excavation. All groundwater extracted from the excavation would be assumed to be contaminated and would require treatment. The groundwater would be treated in the on-site Treatment Facility. A portion (~150 ft) of the trench, two pumping wells, and the wet well, which are part of the groundwater collection system, would have to be removed during the excavation. Due to the depth and location of the excavation, the Groundwater Treatment Facility would have to be relocated to another portion of the Site prior to excavation. Costs for removal/relocation of these components have been included. It is anticipated that the remaining two pumping wells in place in the Fill Area could maintain containment of the Fill Area during implementation of this alternative.

Based on the assumed depth of the excavation and slope stability issues discussed in previous sections, it is anticipated that extensive stabilization would be required, particularly along the southwest portion of the excavation where the CSX railroad tracks are present. Coordination with CSX, along with monitoring and permits, would be required. As an example, the rail lines were closely monitored during the installation of the groundwater collection trench by surveying the tracks multiple times per week during excavation activities due to a requirement from CSX allowing no track movement. It is assumed that similar activities would be required if the Fill Area were to be excavated.

An excavation of this magnitude would result in the generation of approximately 40,400 cubic yards (64,480 tons) of soil and waste to dispose of. A portion of the excavated material is assumed to be comprised of concrete, originating as either slab or footings. The portion of concrete is estimated to be on the order of 50 cubic yards of concrete. It is assumed that the concrete can be scraped or cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. The remainder of the soil would be transported off-site and, pending analyses, disposed of as either hazardous or non-hazardous waste at a permitted facility. For estimation purposes, it has been assumed that approximately two-thirds of the excavated waste would be classified as highly contaminated or impacted soils and the remaining one-third of the waste, as well as all excavated natural soils, would be classified as non-hazardous.

In order to facilitate excavation across the entire Fill Area, a water management system would be maintained throughout the duration of all excavation activities to prevent rainwater contact with highly contaminated materials. All storm/surface water extracted from the excavation area during the remedial action would be assumed to be contaminated and would require treatment.

In order to backfill the Fill Area excavation, the same 40,400 cubic yards (64,480 tons) of soil would need be imported to the Fill Area. A lump sum cost for dust suppression during the excavations due to the presence of VOC- and SVOC-impacted soils in the Fill Area has been included. The costs for dust suppression are more significant with this alternative compared to others because of the magnitude of the excavation and the estimated time to complete the excavation.

To facilitate the excavations and ensure stability across the entire Fill Area, it has been estimated that approximately 54,560 square feet of sheeting (680 linear feet around the Fill Area by 80 feet deep) would be required. The location of the sheeting, etc. would be determined during the design phase, should this alternative be selected as a remedy for the Fill Area.

In addition, confirmatory samples from the exterior walls of the excavation will be collected to ensure removal of all contaminated material. Analysis of waste characterization samples would also be completed to allow disposal of the waste and contaminated soils at a permitted disposal facility. It is anticipated that the excavation of all waste and impacted soils would require six to eight months to complete. After confirmatory samples are collected to ensure removal of the contaminated media, the non-contaminated backfill would then be trucked to the Fill Area and placed in the excavations.

As a final measure, it will be necessary to re-establish a monitoring plan that will be required to verify the success of the remedial program. It is expected that monitoring wells will be used to monitor the attenuation of the residual contamination; however, the contaminant concentrations are expected to reach the cleanup goals within five (5) years. Therefore, five (5) years of post-action monitoring and GWCS operation have been included in the Alternative F-4 costs.

Analysis of Alternative F-4 – An analysis of Alternative F-4 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-4	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Removal of contaminated soil and waste mass will eliminate potential exposure risks to human health and the environment from this area. ▪ RAOs can be achieved within a relatively short time period. *Disadvantages:* ▪ Remedial activities would result in an increased short-term human exposure risk. ▪ Dissolved contaminants and some residual contaminants will remain in surrounding soil and groundwater.
Compliance with SCGs/RAOs	▪ Remedial objectives would be met following remediation because contaminated media will be removed and replaced with clean fill. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Effective. Potential impacts posed by impacted soil in Fill Area are eliminated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the Fill Area because soils are disposed off-site. ▪ Redevelopment of the property would be viable within Fill Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants may remain in groundwater for a period of time.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Volume of contaminants in Fill Area significantly reduced in short-time frame. ▪ Removal of contamination with continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.

Evaluation of Alternative F-4	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within Fill Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Significant engineering controls required to limit human and environmental exposures during excavation activities. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to depth and instabilities of the soils. Required excavation may be Infeasible due to depth and control requirements. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will likely result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete. ▪ Removal of a portion of the existing GWCS system and relocation of the existing treatment facility required.
Cost	▪ Present Worth of Alternative F-4 = $29.8 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for extensive slope stabilization to allow for excavation. ▪ Significantly higher overall remediation costs than other active remediation methods.

6.4.5 Alternative F-5 – Limited Excavation with Off-site Disposal/Capping

Description of Alternative F-5 – Alternative F-5 is the partial excavation and removal of the waste mass and contaminated soil in the Fill Area. The excavation would use conventional benching and shoring techniques. Upon completion of the excavation, a permeable cap would be placed over the waste mass remaining in place. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area. The GWCS will continue to be operated in the long-term to control groundwater migration from the area. A long-term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area. Alternative F-5 is similar to Alternative F-4, but would remove only 35% of fill materials in the Fill Area.

Based on results of the Updated RI and an evaluation of a cross section of the Fill Area, it has been estimated that a volume of approximately 9,780 yd^3 could be excavated from the Fill Area using only conventional benching, shoring and excavation techniques (using a three on one ratio). An excavation of this type would remove up to fourteen feet of soil and waste along the center line of the excavation and would be benched both upslope and down slope to achieve the maximum excavated volume. Based on contaminant mass estimates presented in Section 3.3.2, this alternative is not expected to remove a significant portion of contamination in the Fill Area, which is generally present at depths greater than 14 feet. However, approximately 35% of the fill material in the Fill Area is expected to be removed. It is noted that the estimate for excavation depth may change slightly during the design and implementation phase of the project.

With groundwater at an average depth of approximately 16 feet bgs, only a minimal dewatering system is anticipated to be necessary during the excavation. All groundwater extracted from the excavation area during the excavation activities would be assumed to be contaminated and would require treatment. Groundwater would be treated in the existing Treatment Facility under the assumption that the current facility has the capacity to manage the additional water. However, two pumping wells and the Groundwater Treatment Facility will need to be relocated to another portion of the Site prior to excavation. Costs for removal/relocation of the building have been included. It is anticipated that the remaining two pumping wells and the wet well left in place could maintain containment of the Fill Area during implementation of this alternative.

An excavation of this magnitude would result in the generation of approximately 9,780 cubic yards (15,645 tons) of soil and waste to dispose of. However, a portion of the excavated material is assumed to be comprised of concrete, originating as either slab or footings. The portion of concrete is estimated to be on the order of 50 cubic yards of concrete. It is assumed that the concrete can be scraped or cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. The remainder of the soil and waste material would be transported off-site and, pending analyses, disposed of as either hazardous or non-hazardous waste at a permitted facility. For estimation purposes, it has been assumed that approximately half of the excavated soil would be classified as highly contaminated or impacted soils and half would be classified as non-hazardous.

A water management system would be maintained throughout the duration of all excavation activities to prevent rainwater contact with highly contaminated materials. All storm/surface water extracted from the excavation area during the remedial action would be assumed to be contaminated and would require treatment.

In order to backfill the Fill Area excavation, the same 9,780 cubic yards (15,645 tons) of clean soil would need be imported to the Fill Area. A lump sum cost for dust suppression during the excavations due to the presence of VOC- and SVOC-impacted soils within the Fill Area has been included. The costs for dust suppression are more significant with this alternative compared to others because of the magnitude of the excavation and the estimated time to complete the excavation.

To facilitate the excavations and ensure stability across the entire Fill Area, it has been estimated that limited sheeting, if any, would be required. A cost for 2,000 square feet (100 linear feet by 20 feet deep) of sheeting has been included as a provisionary measure. The exact depth of the excavation, the location of the sheeting, etc. would be determined during the design and implementation phase, should this alternative be selected as a remedy for the Fill Area.

This remedial technology would leave approximately 65% of the fill materials and almost all of the contamination currently present in the Fill Area. The alternative only removes non-impacted fill materials such as construction and demolition debris. The continued presence of significant contamination would require long-term management. Given the type and concentration of contaminants that would remain in the subsurface after the limited excavation, a permeable cap would be placed over the waste material remaining in place (Figure 24). It has been assumed that the area would require grading prior to the installation of a cover system. The cover system will be installed to the specifications outlined in Section 6.4.3.

Redevelopment of the Fill Area would be limited with the installation of a cover system; additional deed restrictions would be required to prevent future Fill Area users from excavating beneath the cover system.

Since significant contamination will remain in the Fill Area after the cap is installed, it will also be necessary to use the existing monitoring wells both on- and off-site to monitor the Fill Area after the active remedial activities are complete. It is expected that monitoring wells will be used to monitor the natural attenuation of the waste; however, the contaminant concentrations are not expected to reach the cleanup goals for at least 30 years in the fill area. Therefore, thirty years of post-action monitoring and GWCS operation have been included in the Alternative F-5 costs. Due to the fact that most of the contamination would remain and the GWCS would need to operate for at least 30 years, there would be no significant reduction in risk to human health and the environment, with the exception of the additional containment afforded by the permeable cap.

Analysis of Alternative F-5 – An analysis of Alternative F-5 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-5	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Cover in Fill Area will reduce potential human exposure to the waste mass remaining in the Fill Area. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through operation of the GWCS and natural attenuation. *Disadvantages:* ▪ Excavation does not reduce potential exposure risk to human health and the environment from this area.
Compliance with SCGs/RAOs	▪ RAOs would not be met in the short-term. ▪ Will not meet RAOs for groundwater due to residual contaminants in the groundwater. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Permanently removes 35% of non-impacted fill materials from the Fill Area. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. *Disadvantages:* ▪ Most of the chemical contamination remains in place leaving, requiring long-term control and management.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ Removal of fill materials with continued operation of a groundwater/leachate collection system and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced in the short-term.

Evaluation of Alternative F-5	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ Cover in fill area would reduce potential for human exposure to the residual subsurface contaminants. ▪ Redevelopment of the property may be viable within Fill Area with proper land use/deed restrictions. *Disadvantages:* ▪ Most of the waste mass would remain and would require an extended period to naturally attenuate. ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Significant engineering controls required to limit human and environmental exposures during excavation activities. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require engineering controls to complete the work due to potential instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will likely result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.
Cost	▪ Present Worth of Alternative F-5 = $9.7 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for slope stabilization to allow to excavation. ▪ Higher overall remediation costs than other remediation methods with no significant reduction in risk or in contaminant mass.

6.4.6 Alternative F-6 – In-Situ Treatment Using Conventional Soil Vapor Extraction

Description of Alternative F-6 – Alternative F-6 is the in-situ treatment of the Fill Area using conventional soil vapor extraction (SVE) technology. Following removal of the

VOCs, the system would be converted to biosparging to promote bioremediation of the waste mass. A permeable cap would be placed over the Fill Area since the SVE system will only remove a small component of the waste mass. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area since contamination and solid waste materials would remain. The GWCS will continue to be operated in the long term to control groundwater migration from the area and to remove contaminated groundwater from the Fill Area. A long term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area. In addition, Alternative F-6 includes the removal of surface slabs, the loading dock, and other surface obstructions as well as in-situ treatment using conventional SVE and biosparging.

In order to facilitate in-situ treatment of impacted soils in the Fill Area, it will be necessary to first remove existing surface slabs, the loading dock, and other surface obstructions present in the Fill Area. At this time, it is not anticipated that the Treatment Facility would need to be relocated. The portion of concrete to be removed is estimated to be on the order of 50 yd^3 of concrete. It is assumed that the concrete can be cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. Any soils that are excavated will be placed back into the excavation. Product or other man-made materials will be removed, tested and disposed of off-site. Furthermore, it is not anticipated that sheeting and/or shoring will be necessary during the slab/concrete removal.

In order to backfill areas where concrete is removed, the same 50 yd^3 of soil would need be imported to the Fill Area. A lump sum cost for dust suppression during the removals due to the presence of VOC- and SVOC-impacted soils in the Fill Area has been included. However, the costs associated with dust suppression are less significant for this alternative compared to Alternatives F-4 and F-5 because of the relatively minimal nature of the removals.

Alternative F-6 would use a conventional SVE system. This technology would be used with the objective of reducing the levels of VOCs contained within the waste mass and soils through SVE. In areas where the VOCs are no longer toxic to the natural bio-organisms, the natural bio-organisms may become active and start to break down any bioavailable VOCs and SVOCs. The effectiveness of the technology would be random throughout the Fill Area due to the heterogeneity of the waste mass and would be limited by the presence of suitable conditions to remove the VOCs and allow biodegradation.

A cost estimate has been prepared for the treatment of the entire Fill Area to a depth of 28 feet, which would address the interval with evidence for the highest levels of contamination. It is understood that a larger or smaller treatment area may be required based on a number of factors; the actual area to be treated will be determined during the Remedial Design Phase.

Extraction wells would be installed to a depth of 28 feet bgs on a 25-foot grid to maximize efficiency of the system. Extraction wells would be plumbed together and connected to a vacuum extraction system. A dewatering system would be required to lower the water level in the treatment area to maximize the total column of unsaturated soil and waste within the treatment area to be remediated.

Following installation and baseline testing/sampling, it is anticipated that the system would operate continuously for up to two years. It is also anticipated that after an initial period of continuous vacuum extraction, the system would be modified to cyclic pulsing of alternating air extraction and injection (biosparging) to optimize for bioremediation of SVOCs.

A SVE system would require treatment of VOCs in the air/off-gases emitted from the SVE system. Carbon adsorption, in which pollutants are removed from air by physical adsorption onto carbon grains, would likely be used for treatment and would require additional piping and treatment units on-site during remedial activities. In addition, an air permit of the off-gas system would be required.

This technology will not address contamination present within the black tar-like material observed in the Fill Area, as demonstrated during the treatability analyses conducted by SI Group (see Section 2.7.3.1), nor will it address solid waste materials. Therefore, while the technology will remove some additional contamination in the short term, the GWCS will continue to operate, removing and treating contaminated groundwater. The majority of contamination, as well as the solid waste materials, will still remain in the Fill Area and will thus require that a permeable cover system be installed as part of Alternative F-6. Details of the construction and installation of the cover system are provided in Section 6.4.3. It is anticipated that, after cover installation, the Fill Area would require limited monitoring. It is expected that the monitoring program will continue to monitor the reduction in contaminant levels in the Fill Area. However, the contaminant concentrations are not expected to reach the cleanup goals for at least 30 years in the Fill Area. Therefore, 30 years of post-action monitoring and GWCS operation have been included in the Alternative F-6 costs. .

Analysis of Alternative F-6 – An analysis of Alternative F-6 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-6	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of SVE system provides little additional protection of human health and the environment
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in short term. ▪ Operation of SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.

Evaluation of Alternative F-6	
Criterion	**Discussion**
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via SVE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.
Short-Term Effectiveness	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.
Cost	▪ Present Worth of Alternative F-6 = $9.05 Million.

6.4.7 Alternative F-7 – In-Situ Treatment Using Thermally-Enhanced Soil Vapor Extraction

Description of Alternative F-7 – Alternative F-7 is the in-situ treatment of some contamination in the Fill Area using thermally-enhanced SVE followed by biosparging. Following removal of the VOCs, the system would be converted to biosparging to promote bioremediation of the waste mass. A permeable cap would be placed over the Fill Area since the SVE system will only remove a small component of the waste mass. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area since contamination and solid waste materials would remain. The GWCS will continue to be operated in the long term to control groundwater migration from the area and to remove contaminated groundwater from the Fill Area. A long term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area. In addition, Alternative F-7 includes the removal of surface slabs, the loading dock, and other surface obstructions as well as in-situ treatment using thermally-enhanced SVE and biosparging.

In order to facilitate in-situ treatment of impacted soils in the Fill Area, it will be necessary to first remove existing surface slabs, the loading dock, and other surface obstructions present in the Fill Area. At this time, it is not anticipated that the Treatment Facility would need to be relocated. The portion of concrete to be removed is estimated to be on the order of 50 yd^3 of concrete. It is assumed that the concrete can be cleaned of any soil and/or contamination and disposed of at a non-hazardous off-site facility. Any soils that are excavated will be placed back into the excavation. Product or other man-made materials will be removed, tested and disposed of off-site. Furthermore, it is not anticipated that sheeting and/or shoring will be necessary during the slab/concrete removal.

In order to backfill areas where concrete is removed, the same 50 yd^3 of soil would need be imported to the Fill Area. A lump sum cost for dust suppression during the removals due to the presence of VOC- and SVOC-impacted soils in the Fill Area has been included. However, the costs associated with dust suppression are less significant for this alternative compared to Alternatives F-4 and F-5 because of the relatively minimal nature of the removals.

Alternative F-7 would use one of two applicable in-situ remedial technologies:

a) a thermally-enhanced SVE system which uses conductive heating, similar to that which has been tested at SI Group's Rotterdam Junction facility (i.e. Heat Trodes/SVE), or
b) a thermally-enhanced SVE system which uses convective heating, similar to that which has also been tested at SI Groups Rotterdam Junction facility (hot air injection/SVE).

It is anticipated that the two systems would provide relatively similar results. The type of soils that are present in the Fill Area will be one of the factors that will determine the type of heating that will be used. Soils that are more impermeable are heated more effectively using conductive heating while permeable soils are heated more effectively using convective heating. The type of heating used is influenced by the amount of void spaces contained in the soils.

The soils in Building 10 consisted primarily of silt with discontinuous lenses of silty sand underlain by a semi-confining layer. Some discontinuous layers of sand and gravel were also present. The soils at Congress Street are primarily fine sand with some inter-bedded silt layers. To complete the remedial design, testing would be completed to determine if conductive or convective soil heating methods should be used.

This technology would be used with the objective of reducing the levels of VOCs contained within the waste mass and soils through SVE. Thermal enhancement of the SVE system has indicated that the VOCs would be removed at a faster rate, reducing the time required to remediate the area. In areas where the VOCs are no longer toxic to the natural bio-organisms, the natural bio-organisms may become active and start to break down any bioavailable VOCs and SVOCs. The bio-activity should also be enhanced at the higher temperatures that are naturally present within the soils after thermally enhancing the SVE system. However, it is noted that the effectiveness of the technology would be random throughout the Fill Area due to the heterogeneity of the waste mass and would be limited by the presence of suitable conditions to remove the VOCs and allow biodegradation.

A cost estimate has been prepared for the treatment of the entire Fill Area to a depth of 28 feet, which would address the interval with evidence for the highest levels of contamination. It is understood that a larger or smaller treatment area may be required based on a number of factors; the actual area to be treated will be determined during the Remedial Design Phase.

Extraction wells would be installed to a depth of 28 feet bgs on a 25-foot grid to maximize efficiency of the system. Extraction wells would be plumbed together and connected to a vacuum extraction system. A dewatering system would be required to lower the water level in the treatment area to maximize the total column of unsaturated soil and waste within the treatment area to be remediated.

Following installation and baseline testing/sampling, it is anticipated that the system would operate continuously for up to two years. It is also anticipated that after an initial period of continuous vacuum extraction, the system would be modified to cyclic pulsing of alternating air extraction and injection (biosparging) to optimize for bioremediation of SVOCs.

A SVE system would require treatment of VOCs in the air/off-gases emitted from the SVE system. Carbon adsorption, in which pollutants are removed from air by physical adsorption onto carbon grains, would likely be used for treatment and would require additional piping and treatment units on-site during remedial activities. In addition, an air permit of the off-gas system would be required.

This technology will not address contamination present within the black tar-like material observed in the Fill Area, as demonstrated during the treatability analyses conducted by SI Group (see Section 2.7.3.1), nor will it address solid waste materials. Therefore, while the technology will remove some additional contamination in the short-term, the GWCS will continue to operate, removing and treating contaminated groundwater. The majority of contamination, as well as the solid waste materials, will still remain in the Fill Area and will thus require that a permeable cover system be installed as part of Alternative F-7. Details of the construction and installation of the cover system are provided in Section 6.4.3. It is anticipated that, after cover installation, the Fill Area would require limited monitoring. It is expected that the monitoring program will continue to monitor the reduction in contaminant levels in the Fill Area. However, the contaminant concentrations are not expected to reach the cleanup goals for at least 30 years in the Fill Area. Therefore, 30 years of post-action monitoring and GWCS operation have been included in the Alternative F-7 costs.

Analysis of Alternative F-7 – An analysis of Alternative F-7 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-7

Criterion	Discussion
Protection of Human Health & the Environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of enhanced SVE system provides little additional protection of human health and the environment

Evaluation of Alternative F-7	
Criterion	**Discussion**
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in short term. ▪ Operation of enhanced SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via enhanced SVE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.

Evaluation of Alternative F-7	
Criterion	**Discussion**
Short-Term Effectiveness	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of enhanced SVE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.
Cost	▪ Present Worth of Alternative F-7 = $9.61 Million. ▪ Cost is moderate to high and does not significantly reduce the risk to human health and the environment when compared to one or more other lower cost alternatives.

6.4.8 Alternative F-8 – In-Situ Treatment Using Multi-Phase Extraction

Description of Alternative F-8 – Alternative F-8 includes the in-situ treatment of some contamination in the Fill Area using multi-phase extraction technology. Following removal of the VOCs, the system would be converted to biosparging to promote bioremediation of the waste mass. A permeable cap would be placed over the Fill Area since the MPE system will only remove a small component of the contamination in the waste mass. Administrative controls and institutional controls will be used to restrict disturbance of the Fill Area since contamination and solid waste materials would remain. The GWCS will continue to be operated in the long term to control groundwater migration from the area and to remove contaminated groundwater from the Fill Area. A long term groundwater and surface water monitoring program will be maintained to ensure containment of the Fill Area. In addition, Alternative F-8 includes the removal of surface slabs, the loading dock, and other surface obstructions as well as in-situ treatment using thermally-enhanced SVE and biosparging.

This technology would be used with the objective of reducing the levels of VOCs contained within the waste mass and soils through SVE while also dewatering to expand the treatment area. It is anticipated that MPE would be an effective method of lowering the water table. It is further anticipated that MPE, combined with biosparging/ bioventing, would promote some bioremediation. In areas where the VOCs are no longer toxic to the natural bio-organisms, the natural bio-organisms may become active and start to break down any bioavailable VOCs and SVOCs. However, the effectiveness of the technology would be random throughout the Fill Area due to the heterogeneity of the waste mass and would be limited by the presence of suitable conditions to remove the VOCs and allow biodegradation.

In order to facilitate in-situ treatment of the waste mass and contaminated soils in the Fill Area, it will be necessary to first remove existing surface slabs, loading docks, and other surface obstructions present in the Fill Area. In order to backfill areas where concrete is removed, soil would need be imported to the Fill Area. These activities will be performed as detailed in Alternative F-6.

The area to be treated is the same as Alternative F-6 and F-7 (Figure 24); however, it is understood that a larger or smaller treatment area may be required based on a number of factors. The actual area to be treated will be determined during the Remedial Design Phase.

A network of SVE/dewatering wells would be installed to depths ranging from 15 to 28 feet bgs depending on location within the Fill Area. Wells would be installed on a 25-foot grid to maximize efficiency of the system. It is anticipated that a dual-pump multi-phase extraction unit will be used. This method of remediation will allow for removal of the volatile organic compounds. The enhanced air flow through the subsurface will increase the volume and percentage of oxygen available in the subsurface to aid in biodegradation of the waste. Lowering the groundwater will increase the area available for treatment. Since the vapor flow aspirates groundwater at the well screen for entrainment of groundwater, it is anticipated that only limited amount of groundwater would require treatment. As such, the estimate for Alternative F-8 assumes that no additional water treatment capacity would be required.

The vapor phase will be handled by a positive displacement vacuum blower and will be treated prior to discharge to the atmosphere. Similar to Alternative F-6, an air permit for the off-gas system would be required. Following installation and baseline testing/sampling, it is anticipated that the system would operate continuously for up to two years. At that time, it is anticipated that the system would be modified to a cyclic pulsing of alternating air extraction and injection to optimize for bioremediation of SVOCs or to passive bioventing.

This technology will not address contamination present within the black tar-like material observed in the Fill Area, as demonstrated during the treatability analyses conducted by SI Group (see Section 2.7.3.1), nor will it address solid waste materials. Therefore, while the technology will remove some additional contamination in the short-term, the GWCS will continue to operate, removing and treating contaminated groundwater. The majority of contamination, as well as the solid waste materials, will still remain in the Fill Area and will thus require that a permeable cover system be installed as part of Alternative F-8. Details of the construction and installation of the cover system are provided in Section 6.4.3. It is anticipated that, after cover installation, the Fill Area would require limited monitoring. It is expected that the monitoring program will continue to monitor the reduction in contaminant levels in the Fill Area. However, the contaminant concentrations are not expected to reach the cleanup goals for at least 30 years in the Fill Area. Therefore, 30 years of post-action monitoring and GWCS operation have been included in the Alternative F-8 costs.

Analysis of Alternative F-8 – An analysis of Alternative F-8 relative to the Fill Area is presented in the following table:

Evaluation of Alternative F-8	
Criterion	**Discussion**
Protection of Human Health & the Environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of MPE system provides little additional protection of human health and the environment
Compliance with SCGs/RAOs	▪ Only some RAOs would be met in short term. ▪ Operation of SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.

Evaluation of Alternative F-8	
Criterion	**Discussion**
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility, & Volume	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via MPE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.
Short-Term Effectiveness	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of MPE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.

Evaluation of Alternative F-8	
Criterion	**Discussion**
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.
Cost	▪ Present Worth of Alternative F-6 = $9.08 Million.

6.5 Comparison of Remedial Alternatives

Table 20 provides a comparative summary of each remedial alternative relative to the seven criteria presented in Section 6.4 of this report. The following subsections provide a narrative comparison of the alternatives relative to the same seven criteria used to evaluate the alternatives individually. As previously identified in Section 6.4, the alternatives have been compared based upon the following seven criteria:

1. Overall protection of human health and the environment
2. Compliance with RAOs/SCGs
3. Long-term effectiveness and permanence
4. Reduction in toxicity, mobility, and volume
5. Short-term effectiveness
6. Implementability
7. Cost

An eighth criterion, Community Acceptance, will be evaluated by the NYSDEC after the public comment period is complete. More specifically, concerns of the community regarding the RI/FS reports and the proposed remedy will be evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

In order to quantitatively identify substantive differences among alternatives, each alternative was rated on a scale of 1 to 5 relative to each other for each criterion, with 1 being the highest (best) rating and a five being the lowest (least) rating. The results of the rating are included in Table 21. For each alternative, the ratings for each of the seven criteria were summed to provide an overall numerical rating of alternatives. Based on this scale, the alternative(s) with the lowest rating(s) provides the best overall remedial solution for the Site. The following sections present the strengths and weaknesses of each alternative relative to one another with respect to each criterion and provide the basis for the ratings.

6.5.1 Overall Protection of Public Health and the Environment

The remedial actions previously taken for the Congress Street Site under the existing ROD have contained the potential migration of contamination off-site, providing overall protection of public health and the environment. The following is an evaluation of how the different remedial alternatives will effect the protection already provided:

> F-4 (Excavation with Off-site Disposal) was assigned the highest rating of "1" for this criterion because it will essentially eliminate the contamination present in the Fill Area, thereby eliminating the risk to public health and the environment that is present in the Fill Area.

> F-2 (Physical Containment), F-3 (Natural Attenuation), F-5 (Limited Excavation with Off-site Disposal), F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi – Phase Extraction) were assigned a rating of "3" because, although each alternative leaves a substantial portion of the waste materials in place, they provide equal protection of public health and the environment with the use of a cover system and continued operation of the GWCS. .

> F-1 (No Further Action) will continue to offer the protection being provided under the existing ROD for public health and the environment with all surface contamination having been previously removed and with operation of the GWCS. The main difference between F-1 and F-2, F-3, and F-5 through F-8 is additional improvement of the cap since it provides some additional protection for human health and the environment, F-1 (No Further Action) was assigned a rating of "4".

6.5.2 Compliance with RAOs/SCGs

The following is an evaluation of how the different remedial alternatives will meet the RAOs/SCGs for the Fill area:

F-4 (Excavation with Off-site Disposal) was assigned the highest rating of "1" for this criterion because the alternative will essentially eliminate the contamination present in the Fill Area, thereby enabling the RAOs/SCGs to be met within a short time period following removal of the contamination.

F-2 (Physical Containment), F-3 (Natural Attenuation), F-5 (Limited Excavation with Off-site Disposal), F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi – Phase Extraction) were all assigned a rating of "4" since each will leave a major portion of the contamination present in the Fill Area in place. The main differences between F-2 and F-3 versus F-5 through F-8 are the volume of contaminants removed in the short-term. However, reduction of contaminant levels below groundwater and soil standards will ultimately be dependent on natural attenuation and operation of the GWCS. For all 6 alternatives, RAOs/SCGs are not expected to be met for an extended period of time, which is considered to be in excess of 30 years. These alternatives were assigned a slightly higher rating than F-1 (No Further Action) because each alternative provides some reduction in contamination.

F-1 (No Further Action) will continue to contain the contamination present in the Fill Area. Fill materials will be left in place and will continue to leach contaminants into groundwater, which will then be removed and treated by the GWCS. Similar to alternatives F-2, F-3, F-6, F-7 and F-8, RAOs/SCGs are not expected to be met for an extended period of time, which is considered to be in excess of 30 years. However, this alternative is the only alternative for which no additional measures would be taken to enhance natural soil flushing of the Fill Area or to promote biodegradation. As result, F-1 (No Further Action) was assigned the lowest rating of "5".

6.5.3 Long-Term Effectiveness and Permanence

The following is an evaluation of how the different remedial alternatives will be effective in the long term.:

F-4 (Excavation with Off-site Disposal) will essentially eliminate the contamination present in the Fill Area. This alternative provides the most permanent and effective solution for the Fill Area and was thus assigned the highest rating of "1".

F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi–Phase Extraction) will treat an undetermined amount of the contamination present in the Fill Area. These remedial alternatives will require the continued operation of a groundwater/leachate collection system until the RAOs are met, which would not occur for an extended period of time (30+ years). The overall effectiveness of technologies would be limited throughout the waste mass. Although the treatment of contamination may be permanent, there is the potential that remediated areas could be recontaminated by contaminants that are not effectively treated in-situ. Based on this information, F-6, F-7 and F-8 were assigned a slightly lesser ranking of “3” than alternative F-5.

F-5 (Limited Excavation with Off-site Disposal) will remove 35% of the fill materials in the Fill Area, but removes little to no chemical contamination. This remedial alternative will require the continued operation of a groundwater/leachate collection system until the RAOs are met, which would not occur for an extended period of time. The only benefit of this alternative over Alternatives F-1 through F-3 is that it removes approximately 35% of the fill materials present in the Fill Area. Since most of the waste mass will be left in place, F-5 has been assigned a lower ranking of “4”.

Alternative F-2 (Physical Containment) will limit infiltration and reduce leachate generation in the long-term. Alternative F-3 (Natural Attenuation) will enhance natural attenuation already occurring at the site by promoting the infiltration of precipitation and surface water, enhancing natural soil flushing and thus removing contaminants at a higher rate. The caps to be installed for both F-2 and F-3 are also considered a permanent remedy. These alternatives are expected to provide similar long-term effectiveness and permanence as the in-situ treatments outlined in Alternatives F-6 through F-8. As a result, Alternatives F-2 and F-3 have also been assigned an equal ranking of “4”. If Alternatives F-6, F-7 and F-8 did not already include a cap, Alternatives F-2 and F-3 would have been assigned an even higher ranking due to the long-term protection provided by the cap.

F-1 (No Further Action) will continue to contain the contamination present in the Fill Area. Reduction of contaminant levels will be dependent on the natural attenuation and removal of contaminants via the GWCS. However, this alternative offers no additional measure such as the cover systems outlined in Alternatives F-

2 and F-3. As such, F-1 (No Further Action) was assigned the lowest rating of "5".

6.5.4 Reduction of Toxicity, Mobility, and Volume

The following is an evaluation of how the different remedial alternatives will reduce the toxicity, mobility, and volume:

F-4 (Excavation with Off-site Disposal) will essentially eliminate the contamination present in the Fill Area. This alternative is the only one which will eliminate all contamination and was thus assigned the highest ranking of "1".

F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi –Phase Extraction) will all treat some of the contamination present in the Fill Area. As such, these remedial alternatives will reduce the toxicity, mobility and volume of contamination present in the Fill Area. As noted above, however, the overall effectiveness of the technologies is expected to be limited in certain areas within the waste mass and will not address the black tar-like material. Since all three alternatives will provide a similar reduction in toxicity, mobility, and volume which is significantly less than Alternative F-4 (Excavation with Off-site Disposal) they were all assigned a rating of "3".

F-5 (Limited Excavation with Off-site Disposal) removes some fill materials from the Fill Area, but leaves the majority of chemical contamination in place. Reduction of volume will occur via natural attenuation and operation of the GWCS. Contamination will remain in the Fill Area, but will be restricted to the deep interval (>14 feet bgs). Since the alternative will provide some similar reduction in toxicity, mobility, and volume which is less than Alternatives F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi –Phase Extraction), it was assigned a rating of "3".

F-3 (Natural Attenuation) will also reduce toxicity, mobility and volume of contaminants. Reduction of volume will occur via natural attenuation and operation of the GWCS. Contamination will remain in the Fill Area, but will be restricted to the area beneath the cap. Although there is less reduction in toxicity and volume in the short-term than F-5, F-6, F-7 and F-8, alternative F-3 is expected to have similar long-term reduction in toxicity and volume as alternatives F-5, F-6, F-7 and F-8. All five alternatives are expected to offer similar reduction in mobility via operation of the GWCS and the cover system. As such, F-3 (Natural Attenuation) was assigned an equal ranking of “3”.

F-2 (Physical Containment) will offer some reduction in the toxicity, mobility and volume of contaminants. Contamination will remain in the Fill Area, but will be restricted to the area beneath the cap. F-2 (Physical Containment) will have similar results for Alternative F-3 (Natural Attenuation) but is not expected to enhance natural attenuation as in F-3. Therefore, Alternative F-2 (Physical Containment) has been assigned a slightly lesser ranking of “4”.

F-1 (No Further Action) will continue to contain the contamination present in the Fill Area. Reduction of contaminant levels will occur via natural attenuation and with continued operation of the GWCS. As such, the toxicity and volume of contaminants will be reduced as a result of the natural attenuation and operation of the GWCS. However, the alternative will not provide any additional reduction in mobility because the alternative does not include any additional short-term measures such as enhanced soil flushing provided by a permeable cover system. As such, F-1 (No Further Action) was assigned a rating of “4”.

6.5.5 Short-Term Impacts and Effectiveness

The following is an evaluation of the short-term impacts and effectiveness of the different remedial alternatives:

F-1 (No Further Action) will not have any short-term impacts on the community, workers or the environment since the measures are already in place. The current remedial action has been effective and should continue to be effective in the short-term with operation of the GWCS. F-1 was thus assigned the highest rating of “1”.

F-2 (Physical Containment) and F-3 (Natural Attenuation) will have minimal, if any, short-term impacts on the community, workers or the environment. The current remedial action has been effective and should continue to be effective in the short-term. Furthermore, the cover systems to be installed as a part of F-2 (Physical Containment) and F-3 (Natural Attenuation) should be effective in further containment of the Fill Area following placement. F-2 and F-3 were thus assigned the next highest rating of "2".

F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi –Phase Extraction) will potentially have some short-term impacts on the community, workers and environment. These impacts include the potential release of contaminants as they are removed and treated, the installation of well points in the contaminated area, noise from the well installation, and truck traffic. These technologies have been shown to be effective in the short term in reducing contaminant levels in similar site conditions. However, due to additional short-term impacts, these alternatives were assigned a ranking of "3".

F-4 (Excavation with Off-site Disposal) and F-5 (Limited Excavation with Off-site Disposal) will potentially have substantial short-term impacts on the community, workers and environment. These impacts include the potential release of contaminants as they are excavated, movement of contaminated material through the community, noise from the excavation and shoring installation, and truck traffic. Although excavation is an effective method of removing the contamination in the short term, the short-term impacts significantly affect the rating when compared to other alternatives. As such, F-5 was assigned the ranking of "5". F-4 will potentially have more short-term impacts from a larger and deeper excavation than F-5. However, since Alternative F-5 provides greater short-term effectiveness, this alternative was also assigned a ranking of "5".

6.5.6 Implementability

The following is an evaluation of the implementability of the different remedial alternatives:

F-1 (No Further Action) does not require any further actions than what are being done at this time. As such, F-1 was assigned a ranking of "1" for implementability.

F-2 (Physical Containment) and F-3 (Natural Attenuation) would employ standard soil placement technology that is widely used and is easily implemented. Since they are slightly more difficult to implement than F-1, they have been assigned a ranking of "2".

F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi–Phase Extraction) would use standard technology that is used in the installation of wells and vapor recovery systems. Installation and operation of the systems may be limited in the winter months due potential freezing of equipment and piping. However, each technology can be readily implemented and so were assigned the ranking of “3”.

F-5 (Limited Excavation with Off-site Disposal) would require an excavation that is located in close proximity of the railroad and would require relocation of the current Groundwater Treatment Facility. Excavation in this area is difficult due to Site conditions. Stabilization of the side walls would be required. Since the excavation is not as deep as F-4, standard shoring technology can be used but special care would have to be given to the side walls to prevent any movement of the rail line. As such, this alternative was assigned the second lowest ranking of “4”.

F-4 (Excavation with Off-site Disposal) would entail an excavation that is deep, requiring extensive stabilization of the side walls and significant dewatering. In addition, the presence of the railroad next to the excavation would add additional requirements on the stability of the excavation that may not be able to be satisfied. Implementability of F-4 is considered the most difficult and potentially infeasible. It has thus been assigned the lowest ranking of “5”. The “+” after the rating of “5” in Table 21 indicates the difficulty of implementing this alternative and potential infeasibility of it.

6.5.7 Cost

The estimated capital costs, annual operating and maintenance cost, and present worth cost of the different alternatives are presented in the following table:

F-1 (No Further Action), F-2 (Physical Containment) and F-3 (Natural Attenuation) are the least expensive options and were each assigned the highest ranking of “1” for cost.

F-6 (In-situ Treatment Using Conventional SVE), F-7 (In-situ Treatment Using Thermally Enhanced SVE) and F-8 (In-Situ Treatment Using Multi –Phase

Extraction) have associated costs in a similar range. As such, each has been assigned the same ranking of “3”.

F-5 (Limited Excavation with Off-site Disposal) represents the second highest cost alternative and has been assigned a ranking of “4”.

F-4 (Excavation with Off-site Disposal) represents the highest cost option. This alternative has been assigned the lowest ranking of “5” for cost. The “+” after the rating of “5” in Table 21 indicates that the costs are significantly higher than all other alternatives.

Cost estimates for the Fill Area were made based on using one of the following cost factors:

1. Actual costs incurred by SI Group, Inc. or CHA for similar work;
2. Costs factors obtained from RS Means, Site Work & Landscape Cost Data, 2008 Edition, and adjusted for geographical conditions; or,
3. Cost estimates provided by remedial contracting firms.

The following is a detailed description of how costs were generated and provides justification for the conceptual-level cost estimates.

<u>Institutional Control Costs</u> - The estimate is based on anticipated legal fees.

<u>Site Preparation</u> – RS Means cost factors were used to estimate the cost to clear and grub the site, construction of a containment pad, preparation/restoration of site road, removal of rail siding, demolition of the concrete, and replacement of clean soil. Quantities for these items were estimated based on conceptual plans for each alternative as discussed in detail in Section 5.5.7.

<u>Excavation</u> – Results from the Remedial Investigation were used to determine the amount of contaminated soil that would be removed under each alternative. The contaminated soil was grouped into two classification based on the amount of potential contamination. The two classifications of soil were soils that had low levels of contamination that are referred to as non-hazardous soils and impacted soils that had high levels of contamination. The impacted soils could be either non-hazardous or hazardous based on testing of the soil for the RCRA characteristics and TCLP analysis.

The following table summarizes the amount of soil that would potentially be excavated from each area under the two alternatives involving excavation as well as the potential cost to excavate, transport and dispose of the contaminated soils.

	Fill Area		**Cost to Excavate, Transport and Dispose**
	Alternative F-3 Excavation:	**Alternative F-4 Partial Excavation**	
Impacted Soil (Potentially hazardous and highly contaminated non-hazardous soils)	21,215 tons	0 tons	$300/ton
Non-hazardous Soils	43,265 tons	15,645 tons	$175/ton

As discussed in Section 5.5.7, CHA solicited cost estimates from three firms for transportation and disposal of the contaminated soil. Based on an analysis of these estimates, a cost of $300/ton is being used for the excavation, transportation and disposal of the Impacted Soils and $175/ton for the non-hazardous soils.

Permeable Cover System – RS Means cost factors were used to estimate the construction costs for the items under this category with the exception of the items "Extend Monitoring Wells", "Abandon Monitoring Wells", and "Replace Monitoring Wells and Pumping Wells". These costs were estimated based on actual costs incurred by CHA for similar type of work. The quantities used in preparing these costs were based on conceptual design presented in each alternative.

Engineered Cover System – RS Means cost factors were used to estimate the construction costs for the items under this category with the exception of the items "Extend Monitoring Wells", "Abandon Monitoring Wells", and "Replace Monitoring Wells and Pumping Wells". These costs were estimated based on actual costs incurred by CHA for similar type of work. The quantities used in preparing these costs were based on conceptual design presented in each alternative.

Enhanced SVE and **Multi-Phase Extraction** – Costs for the in-situ treatment system installation and operation were based on estimates received from remedial contractor firms. Estimates were based on preliminary information provided including the type and level of contamination, area and depth of contamination. In some instances, these numbers were scaled to account for a slightly larger or smaller treatment area.

<u>**Annual Costs**</u> – All the “Annual Costs” (Operation and Maintenance of Groundwater Collection and Treatment System, Quarterly Groundwater Sampling w/ Letter Summary Report, and Site Maintenance) are based on actual costs incurred by SI Group.

Estimated Total Present Worth: Alternatives F-1 through F-8

Alternative	Description	Institutional Cost	Capital Cost	Annual Costs	Total Present Worth
1	No Further Action (Operation of GWCS)	$0	$0	$194,000	$2,980,000
2	Physical Containment via an Impermeable Cap, Institutional Controls, Operation of GWCS	$30,000	$280,000	$194,000	$3,290,000
3	Natural Attenuation, Physical Containment via a Permeable Cap, Institutional Controls, Operation of GWCS	$30,000	$500,000	$194,000	$3,510,000
4	Excavation and Off-Site Disposal of Contaminated Media	$30,000	$28,940,000	$194,000	$29,810,000
5	Limited Excavation and Off-Site Disposal of Contaminated Media, Permeable Cap, Institutional Controls, and Operation of the GWCS	$30,000	$6,690,000	$194,000	$9,700,000
6	Conventional Soil Vapor Extraction Treatment, Permeable Cap, Institutional Controls and Operation of the GWCS	$30,000	$6,040,000	$194,000	$9,050,000
7	Thermally-Enhanced Soil Vapor Extraction Treatment, Permeable Cap, Institutional Controls and Operation of the GWCS	$30,000	$6,600,000	$194,000	$9,610,000
8	Multi-Phase Extraction Treatment, Permeable Cap, Institutional Controls and Operation of the GWCS	$30,000	$6,070,000	$194,000	$9,080,000

7.0 RECOMMENDATION OF A REMEDIAL ALTERNATIVE

The Feasibility Study has evaluated the remedial alternatives that are available, the implementation of these technologies, and the resources required. The proposed remedial program that has been recommended for the Congress Street Site will substantially reduce and control the contamination remaining at the Site. The RAOs for a majority of the Site will be met within a reasonable time period. Further reduction in the amount of contamination remaining on-site would require a substantial commitment of additional resources with a limited reduction in the amount of contamination remaining.

The evaluation of the proposed alternatives for remediation of the Fill and Process Areas of the Congress Street Site was completed in general accordance with the procedures outlined in 6 NYCRR Section 375-2.8(c), as well as USEPA's document "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", and guidance provided by the NCP.

7.1 Process Area

Based on the comparative analysis for the Process Area, Alternative P-5 consisting of the in-situ treatment of the Process Area using thermally enhanced soil vapor extraction technology followed by bioremediation using biosparging technology has been selected as the preferred remediation alterative. The significant strengths of this alternative, as demonstrated in the comparative analysis, are:

- Elimination of unacceptable exposure risk to human health and the environment;
- Protection of Site workers, the community and the environment during remediation activities;
- Elimination of approximately 96% of the contamination in the Process Area within a short time period;
- Long-term permanence of the remedial action;
- Natural attenuation would eliminate remaining contamination requiring only moderate long-term operation of the GWCS;
- Technology has been proven effective with similar contaminants and soil lithology;
- The alternative has a high degree of reliability in meeting the specified performance goals;
- The alternative is consistent with the current Site zoning and the surrounding area land use; and

- The technologies are commercially available with several vendors qualified to complete the remedial tasks.

7.2 Fill Area

Due to the nature of the Fill Area, there are substantially fewer applicable technologies from which to choose when selecting remedial alternatives. With the exception of Alternative F-4 (Excavation and Off-Site Disposal), which is considered extremely difficult to implement and cost-prohibitive, there are no other known technologies which could be employed to treat the waste mass and associated contamination in the Fill Area at this time. As a result, all other alternatives will leave a large portion of the waste, including any contaminants contained with the waste, which would require long-term control. Therefore, the main objectives for any selected alternative is that it offers continued containment of the Site to prevent residual contamination from migrating off-site, provides permanent protection of human health and the environment, and progresses towards the ultimate goal of complying with RAOs/SCGs for the Site. Although other technologies could be used to reduce a limited amount of contamination contained within the waste mass in the short term, the majority of the contamination will remain at the completion of these remedial technologies.

In the Fill Area of the Congress Street Facility, one of the challenges is the black tar-like material and the overall depth of contamination. Because there are no known technologies which can currently treat the material, it will remain indefinitely in the Fill Area, acting as a source as contaminants continue to leach from the material over a long time-frame. While it may be feasible to attempt to remove some Fill Area contamination in the short term using a more active remedial method such as SVE or MPE, these technologies offer no additional benefit to reduce the length of time required for long-term management of the Site or the length of time that the GWCS will be required to operate. All alternatives, except for total excavation, require long-term (30+ years) operation of the GWCS and will ultimately rely on natural attenuation and the GWCS to reach cleanup levels. Therefore, the results of this feasibility study do not support currently available remedial technologies, beyond the technologies currently being employed, due to their ineffectiveness in treating the solid waste materials and the contaminants contained within these materials.

Based on the comparative analysis for the Fill Area, Alternative F-3, consisting of natural attenuation, continued operation of the GWCS and the installation of a permeable cap over the Fill Area has been selected as the preferred remediation alternative. The significant strengths of this alternative, as demonstrated in the comparative analysis, are:

- Long term control of an unacceptable exposure risk to human health and the environment;
- Long-term permanence of the remedial action;
- Protection of Site workers, the community and the environment during remediation activities;
- Continued progression towards cleanup goals via natural attenuation and removal of contaminants via the GWCS;
- Installation of the permeable cover system will promote infiltration of surface water and precipitation, enhancing the natural soil flushing effects in the Fill Area;
- Continued operation of a groundwater/leachate collection system will prevent residual contamination from migrating off-site;
- Containment techniques have already been proven successful at this Site and other similar sites;
- The alternative has a high degree of reliability in meeting the specified performance goals;
- The alternative is consistent with the current Site zoning and the surrounding area use; and
- The technologies are commercially available and easily implemented.

7.3 Process Components of Selected Alternative

An overview of the process components of Alternatives P-5 and F-3 are described below:

<u>Removal of Concrete Footings and Slabs</u>

The purpose of this process component is two-fold. First, the removal of the slabs and footings will serve to improve overall Site conditions and aesthetic value. Secondly, the removal will facilitate the installation of the in-situ enhanced soil vapor extraction/biosparging system in the Process Area by reducing potential negative impacts caused by the presence of the footings/slabs. Removal of the concrete footing and slabs will eliminate most potential pathways for the migration of soil vapor contamination (if present) and will ensure that uniform heat distribution and soil vapor removal occurs. In the Fill Area, the removal will facilitate the installation of the soil cover and increase the infiltration of surface water/precipitation.

In-Situ Treatment of "Area A" Using Enhanced Soil Vapor Extraction and Biosparging

Approximately 96% of the contamination in the Process Area would be removed using enhanced SVE and biosparging. This process option provides source control by permanently reducing soil contaminant concentrations in the Process Area to a level well within current and planned use and zoning for the Site.

By performing active remediation of the source area (Area A), all soils with total contaminant concentrations greater than 100 mg/kg will be effectively remediated. This goal is consistent with NYSDEC guidance values for cleanup of sites containing VOC and SVOC contamination. The enhanced SVE process option is anticipated to reduce VOC concentrations well below 100 mg/kg. By applying biosparging as a process option following enhanced SVE, additional reduction in SVOC concentrations are also expected as a result of natural biodegradation processes. The short-term objective of the active remediation is to reduce contaminant levels such that they are consistent with commercial or industrial re-development of the Process Area. The long-term objective of this alternative is to reduce contaminant levels such that they are consistent with the RAOs proposed.

This component is protective of human health and the environment and offers a permanent remedy. It is anticipated that, following active remediation, Process Area soil contamination will continue to decrease as a result of natural attenuation and will eventually allow the GWCS to be decommissioned. However, operation of a GWCS will continue in the Fill Area due to the continued presence of the waste mass.

Permeable Cap in Fill Area

An area approximately 27,275 ft^2 in size will be covered with a permeable cap in the Fill Area. The permeable cap would be installed above all soil and waste materials and will provide substantial containment of the waste mass. It is anticipated that an approximately 2 foot soil cover would be put in place, which would promote the infiltration of precipitation and surface water.

This process option will substantially reduce potential exposure risks to humans and the environment. In order to maintain the effectiveness of the remedy, an inspection and monitoring program will be developed which will ensure the integrity of the cover system and containment of the Fill Area over the long-term.

Operation of Groundwater Collection System and Natural Attenuation of Groundwater

An active groundwater/leachate collection and treatment system will be maintained at the Site to control the migration of groundwater and leachate off-site. As remediation progresses in the Process Area, the amount of contamination in the groundwater should decrease and within a reasonable time period meet NYS Ambient Water Quality Standards. As the groundwater meets these standards, the collection system will be reduced with the ultimate goal of only collecting the leachate that is generated within the Fill Area. The reduction in groundwater contamination is expected to occur as a result of natural attenuation that will result from the removal of the source contamination in the Process Area and containment of the waste mass in the Fill Area.

Institutional and Administrative Controls

Institutional controls would be included as part of this alternative since some soil and groundwater contamination will remain in the Process Area, and since the waste mass will remain in the Fill Area. The institutional controls proposed include deed restrictions which will:

- Control excavation into the subsurface in the Fill Area indefinitely and in the Process Area until RAOs are met;
- Restrict the use of groundwater until RAOs are met; and,
- Restrict development within the Fill Area indefinitely and in the Process Area until RAOs are met.

In addition, administrative controls will include maintaining existing access restrictions such as fencing and signs. Regular inspections of the fencing and signs would be conducted and repairs would be made, as required.

8.0 REFERENCES

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FIGURES

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SITE LOCATION

UPDATED FEASIBILITY STUDY

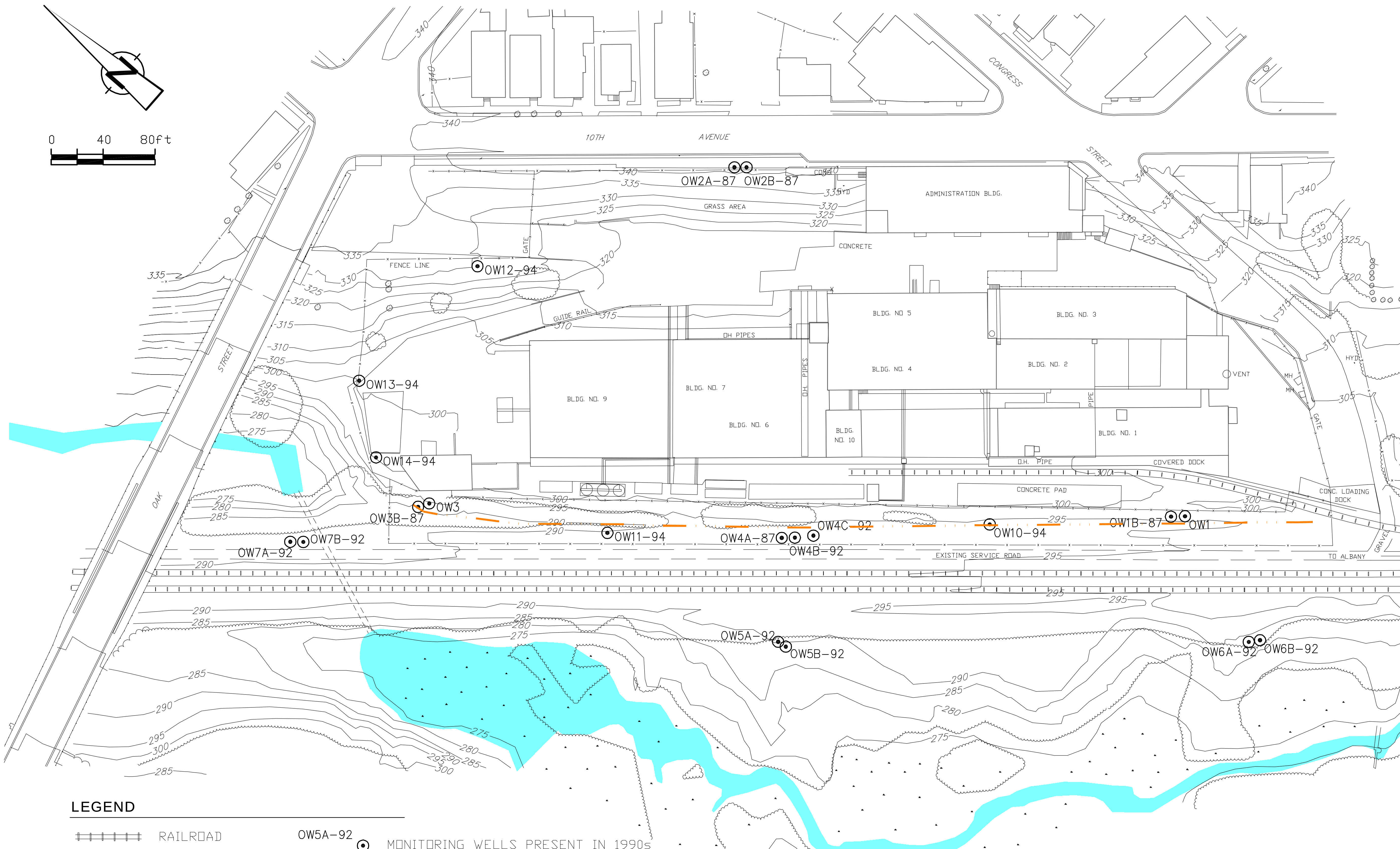
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO.
15091.2010.1102

DATE: 02/25/09

FIGURE 1

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 1.DWG Saved: 4/15/2009 3:23:59 PM Plotted: 4/15/2009 3:25:59 PM User: Weatherby Jr., Bill



LEGEND

- RAILROAD
- FENCE
- CULVERT
- SWALE
- 300 — CONTOUR WITH ELEVATION
- OW5A-92 ⊙ MONITORING WELLS PRESENT IN 1990s

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SITE PLAN (LATE 1990's)

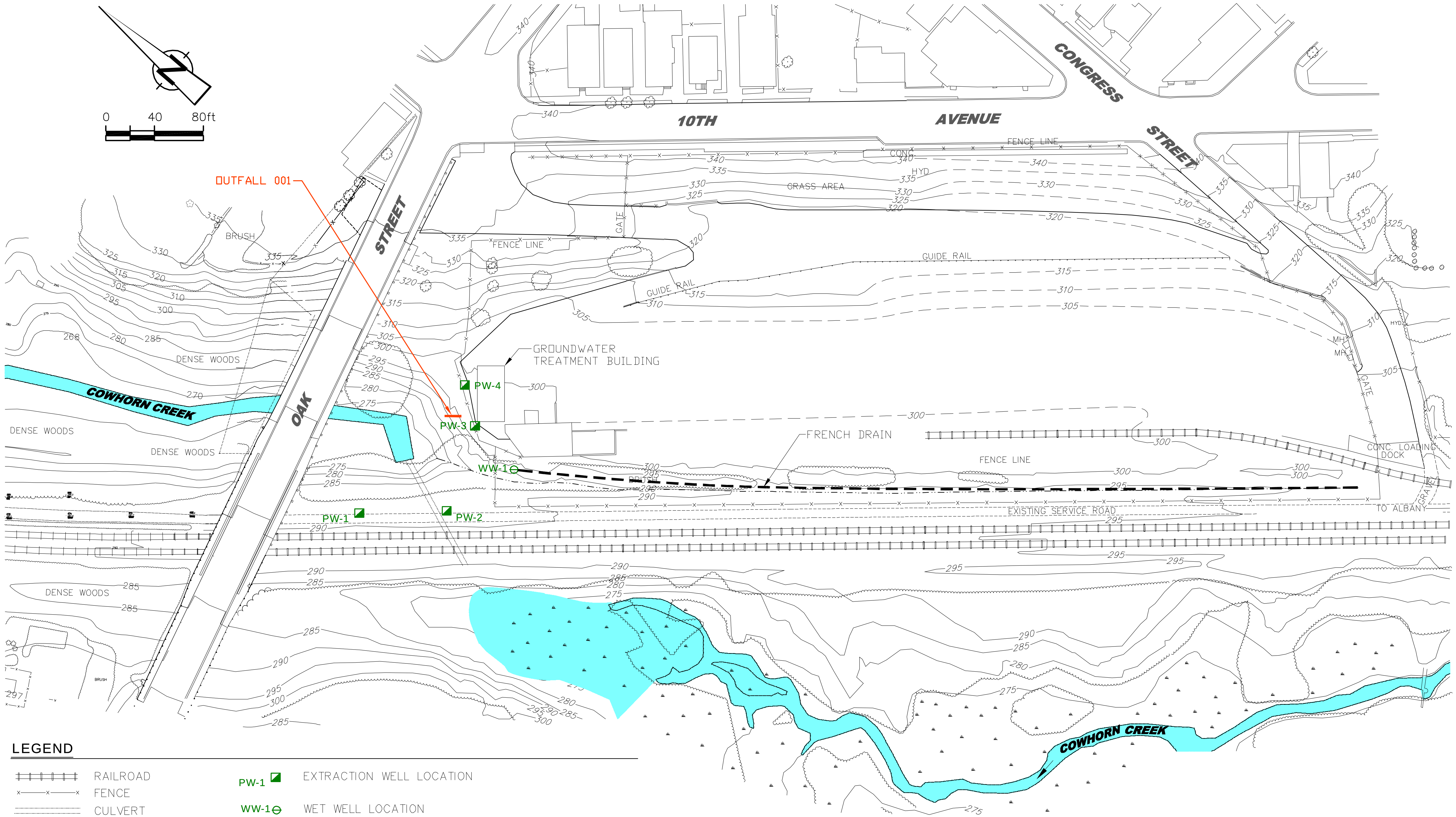
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 2

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 2.DWG Saved: 4/15/2009 3:27:49 PM Plotted: 4/15/2009 3:37:18 PM User: Weatherby Jr., Bill



LEGEND

RAILROAD	
FENCE	
CULVERT	
SWALE	
300	CONTOUR WITH ELEVATION
300	INFERRED CONTOUR WITH ELEVATION
PW-1	EXTRACTION WELL LOCATION
WW-1	WET WELL LOCATION
	GROUNDWATER COLLECTION DRAIN

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SITE PLAN (2007)

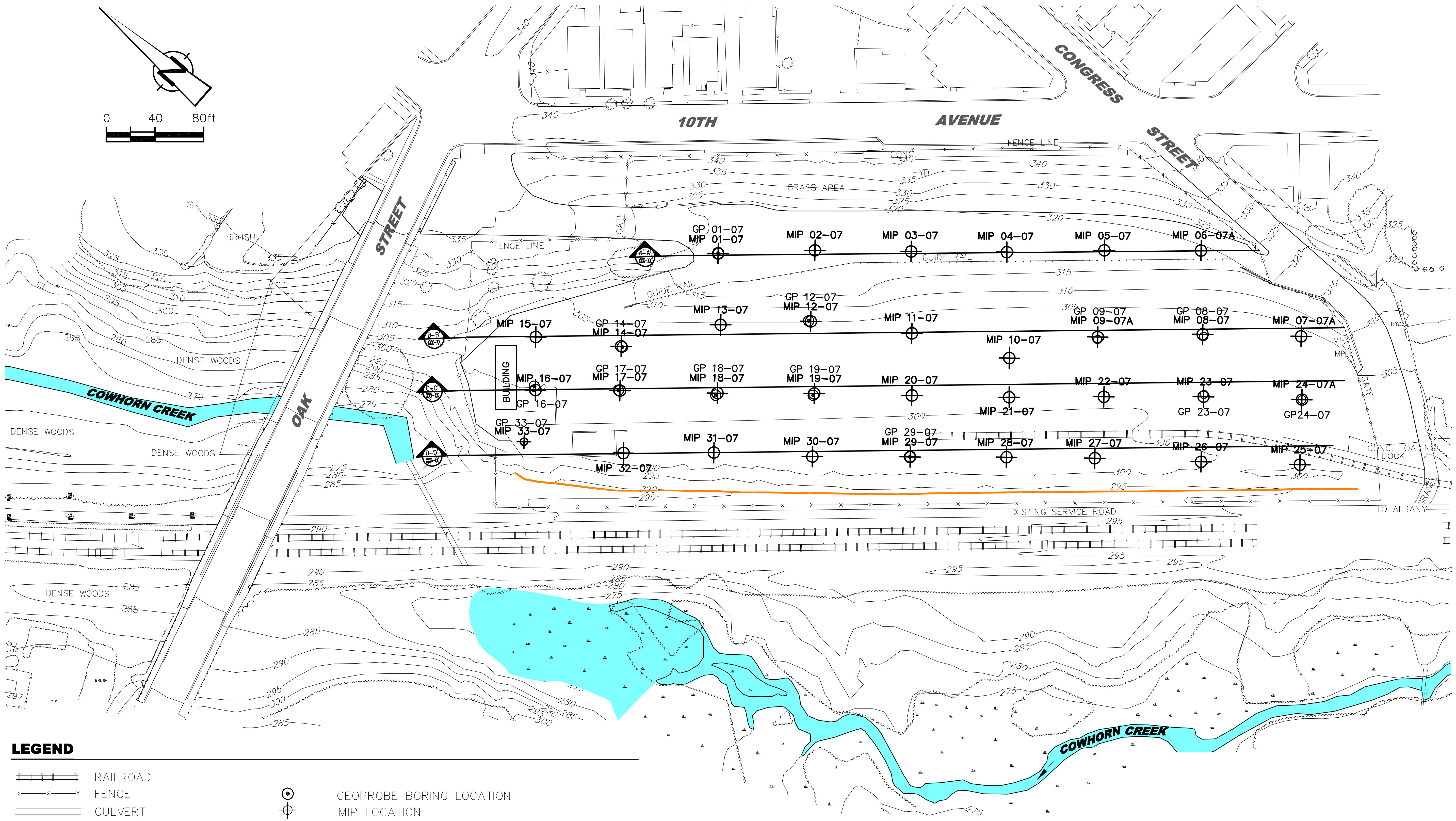
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 3

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 3.DWG Saved: 4/15/2009 3:42:56 PM Plotted: 4/15/2009 3:43:39 PM User: Weatherby Jr., Bill



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 CONTOUR WITH ELEVATION
- 300 GROUNDWATER ELEVATION CONTOUR
- GEOPROBE BORING LOCATION
- MIP LOCATION
- APPROXIMATE LOCATION OF MIP CROSS-SECTIONS (FIGURES 14a-14d)

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MIP AND GEOPROBE LOCATIONS
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SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

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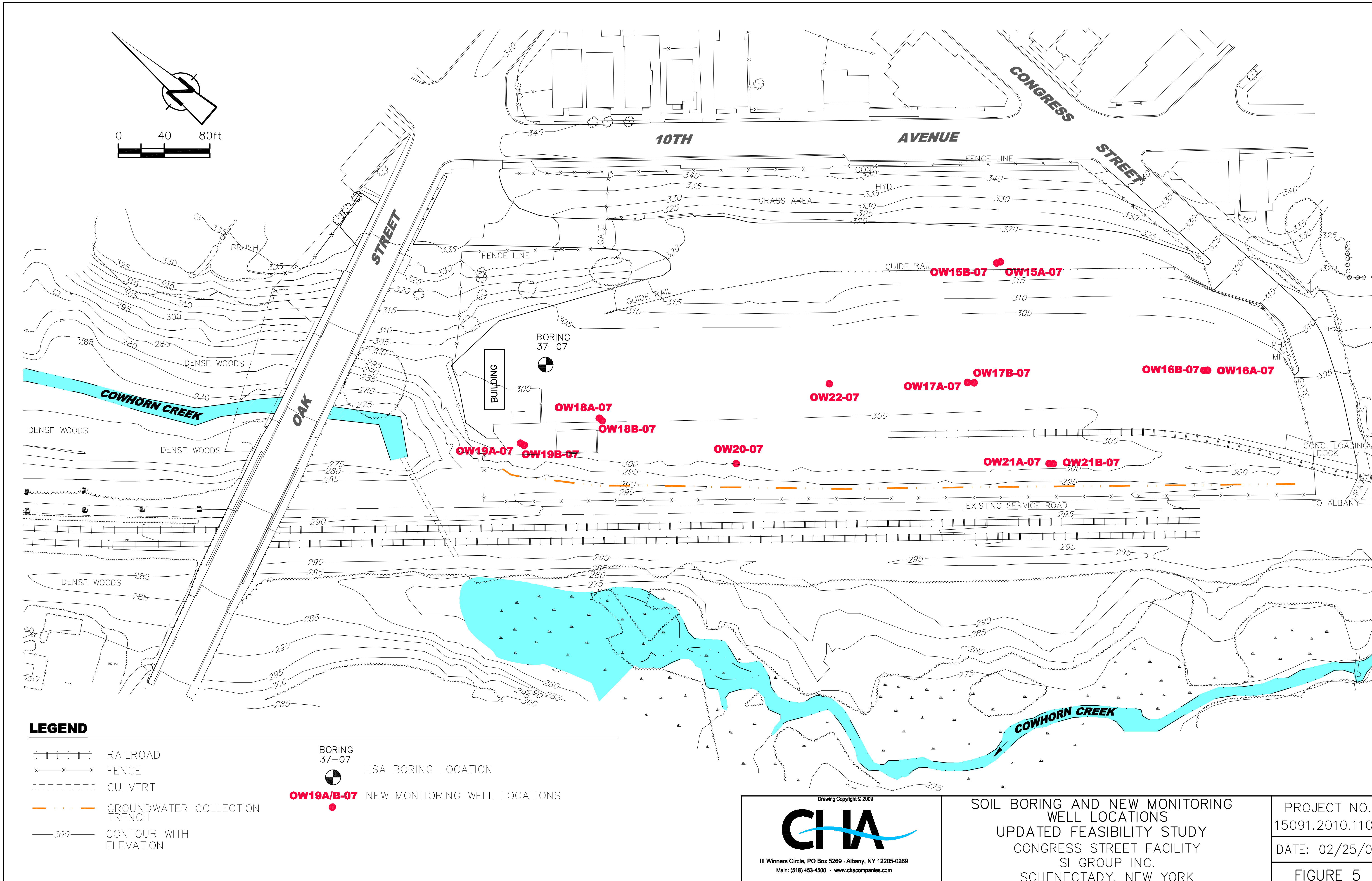
FIGURE 4

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 4_MIP AND GP LOCATIONS.DWG Saved: 4/15/2009 3:45:10 PM Plotted: 4/15/2009 3:48:34 PM User: Weatherby Jr., Bill



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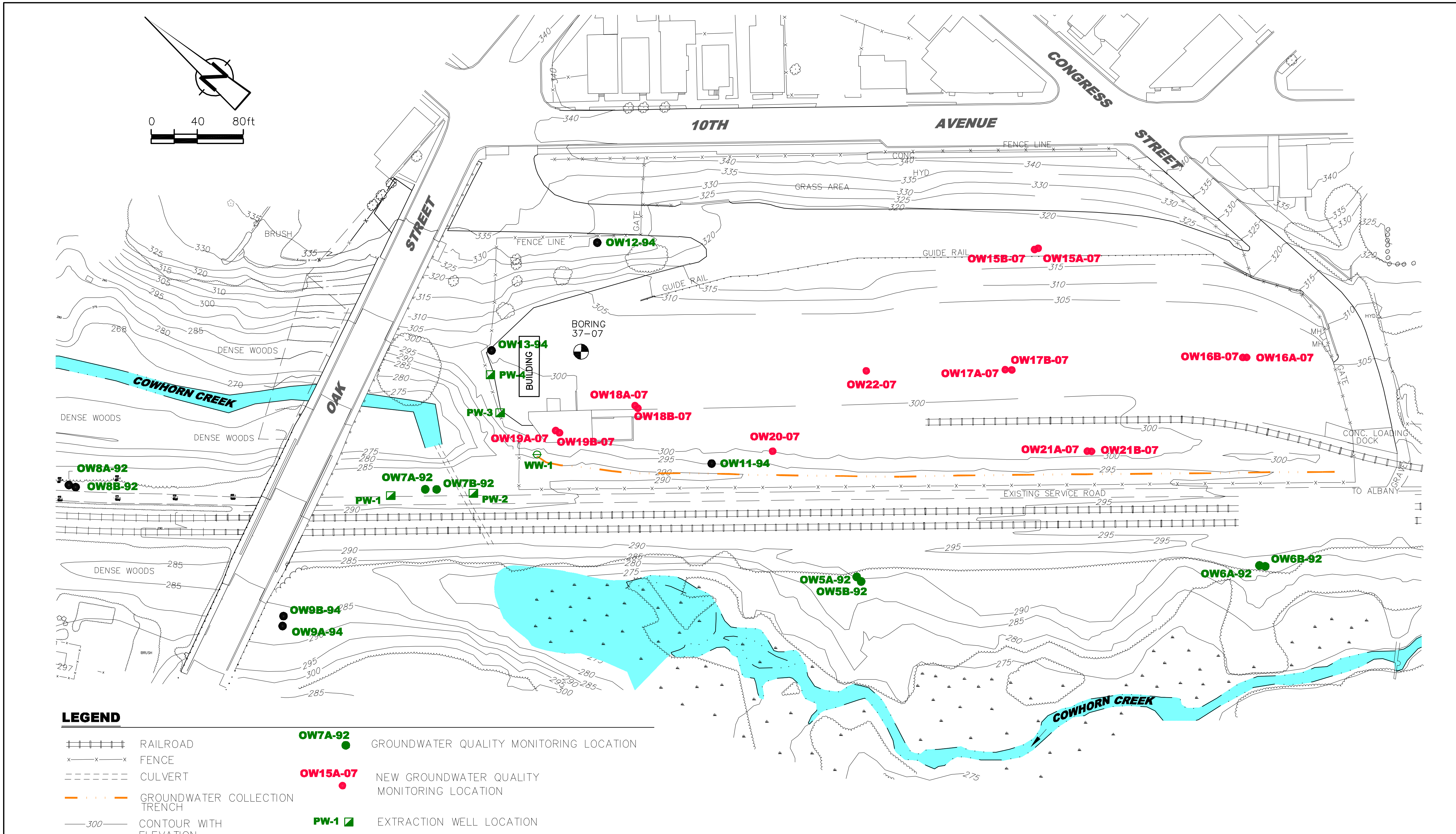

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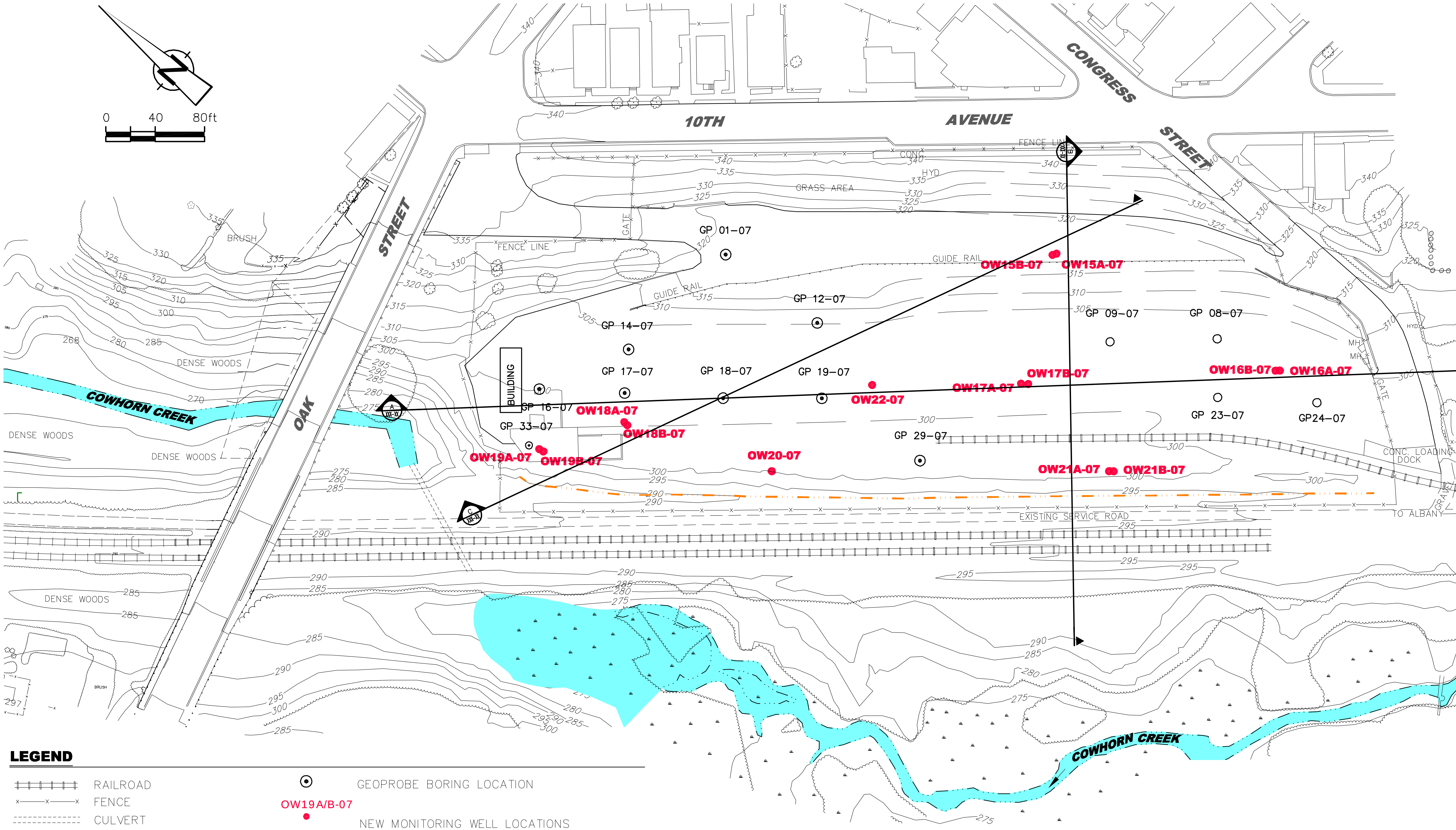
FIGURE 6

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 6_ MW LOCATIONS.DWG Saved: 4/15/2009 3:52:11 PM Plotted: 4/15/2009 3:52:54 PM User: Weatherby Jr., Bill



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CROSS SECTION LOCATION MAP
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CONGRESS STREET FACILITY
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SCHENECTADY, NEW YORK

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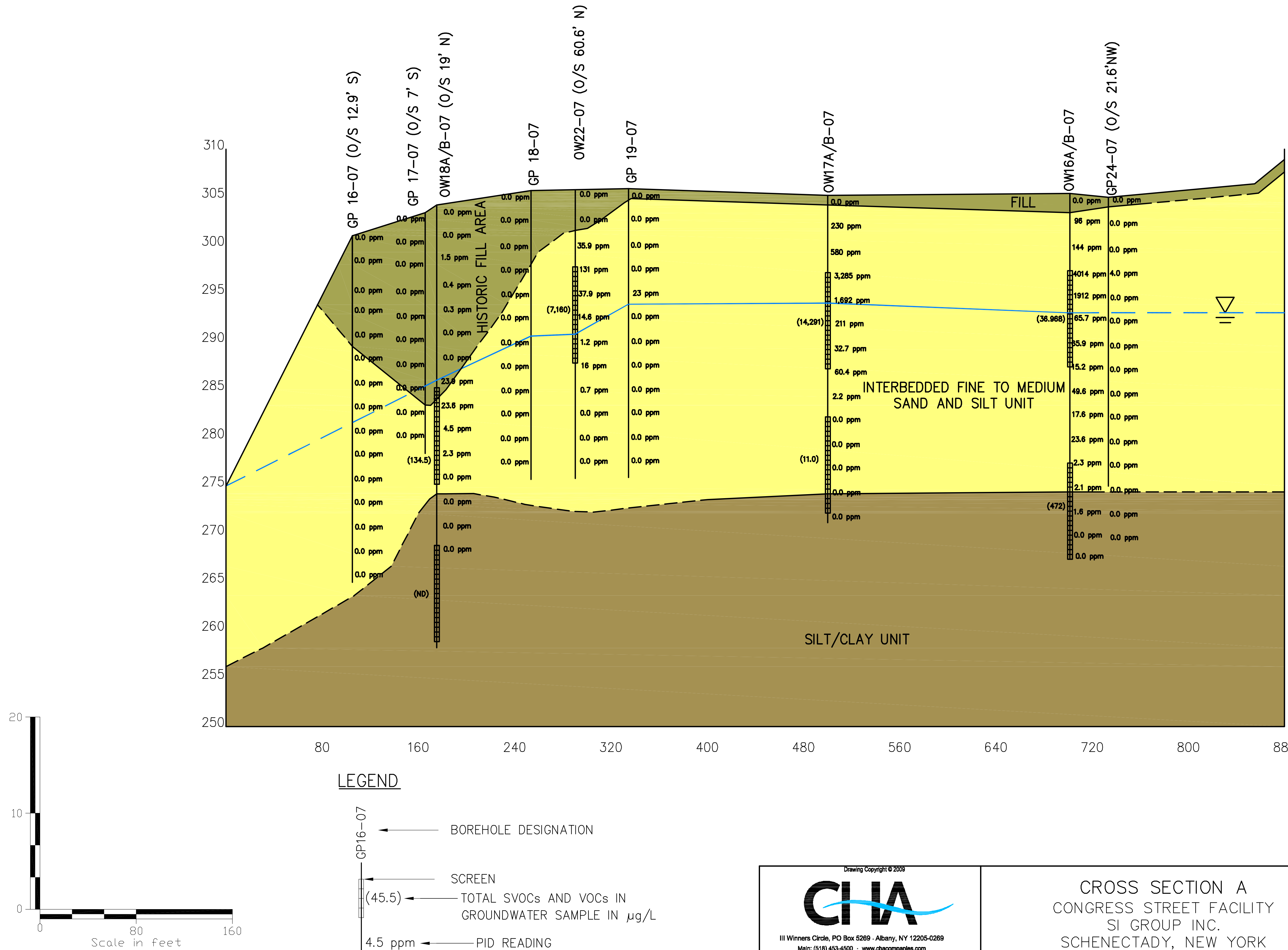
FIGURE 7

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\15091_XSEC LOCATIONS.DWG Saved: 4/15/2009 2:52:22 PM PLotted: 4/15/2009 3:14:19 PM User: Weatherby Jr., Bill



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CROSS SECTION A
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FIGURE 8

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\15091_XSEC LOCATIONS.DWG Saved: 4/15/2009 2:52:22 PM Plotted: 4/15/2009 3:11:44 PM User: Weatherby Jr., Bill

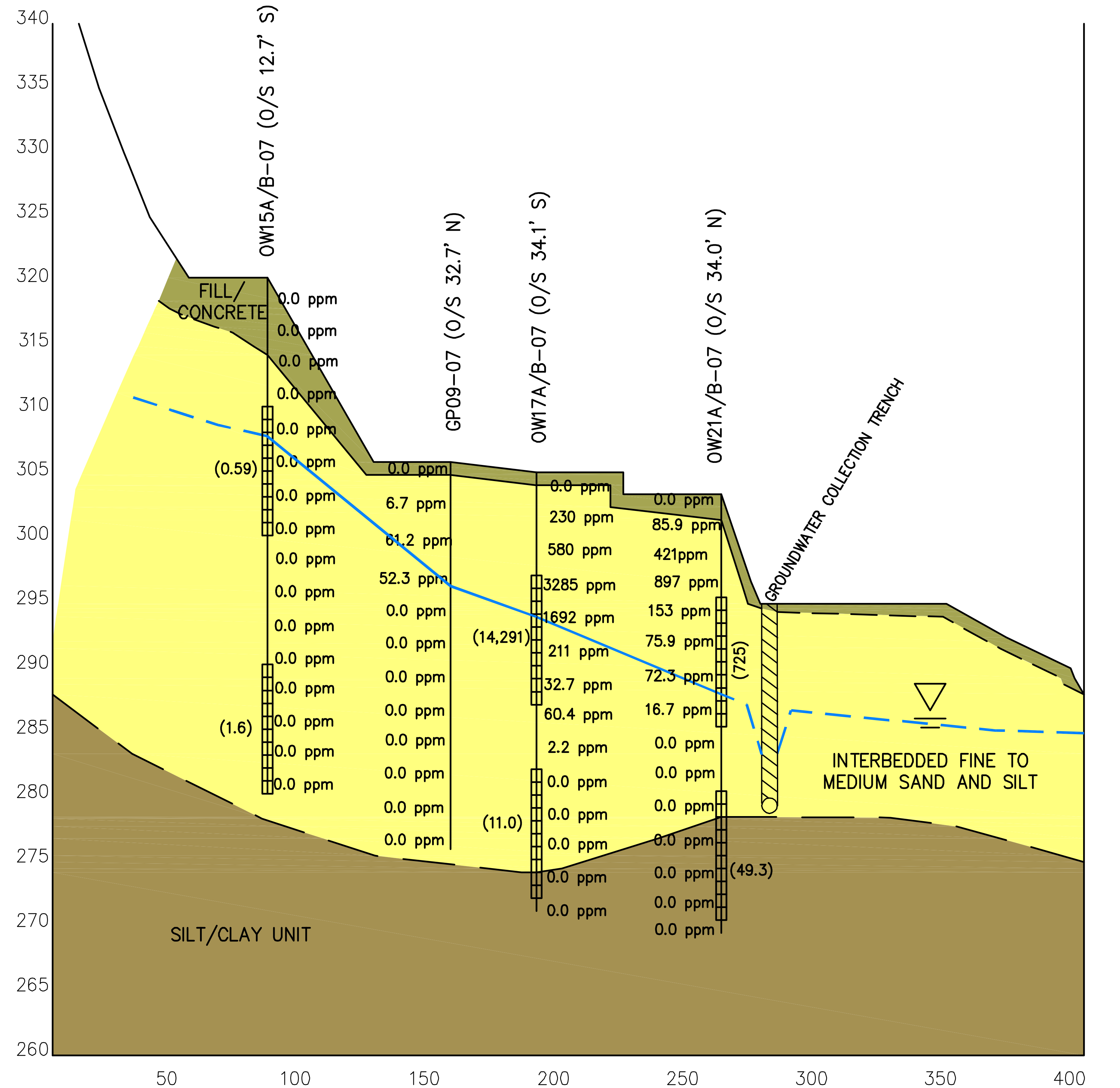
LEGEND

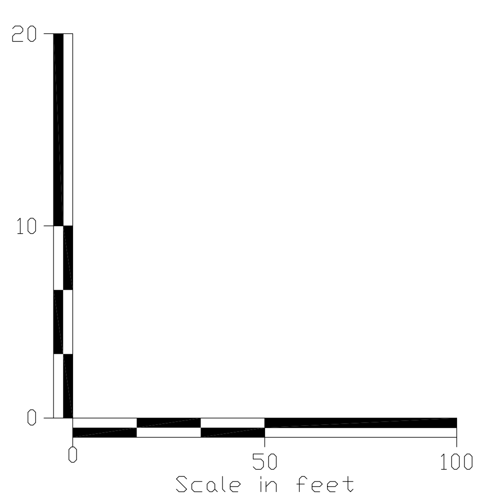
GP16-07 — BOREHOLE DESIGNATION

SCREEN

(45.5) — TOTAL SVOCs AND VOCs IN GROUNDWATER SAMPLE IN µg/L

4.5 ppm — PID READING





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CROSS SECTION B
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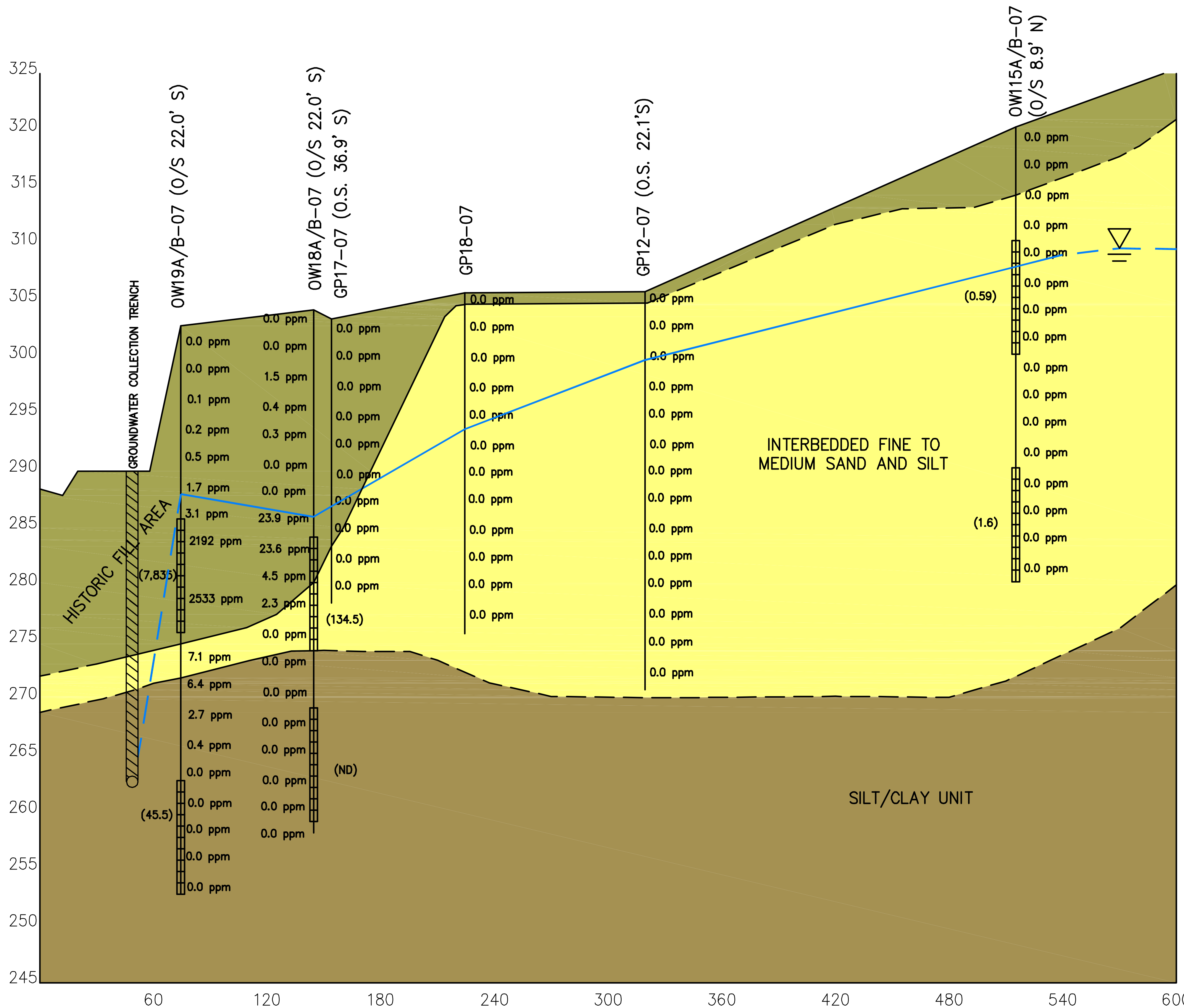
FIGURE 9

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\15091_XSEC LOCATIONS.DWG Saved: 4/15/2009 2:52:22 PM Plotted: 4/15/2009 3:15:55 PM User: Weatherby Jr., Bill



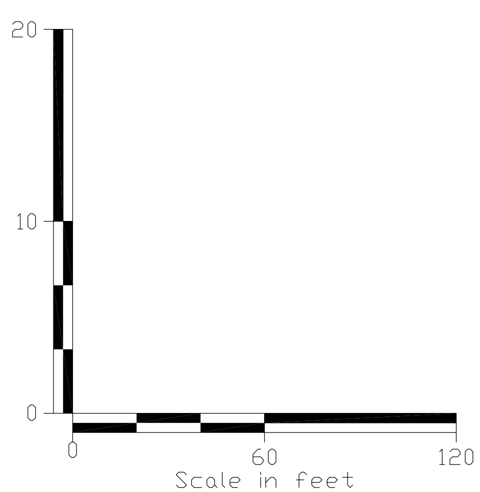
LEGEND

GP16-07 ← BOREHOLE DESIGNATION

4.5 ppm ← PID READING

← SCREEN

(45.5) ← TOTAL SVOCs AND VOCs IN GROUNDWATER SAMPLE IN µg/L



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CROSS SECTION C
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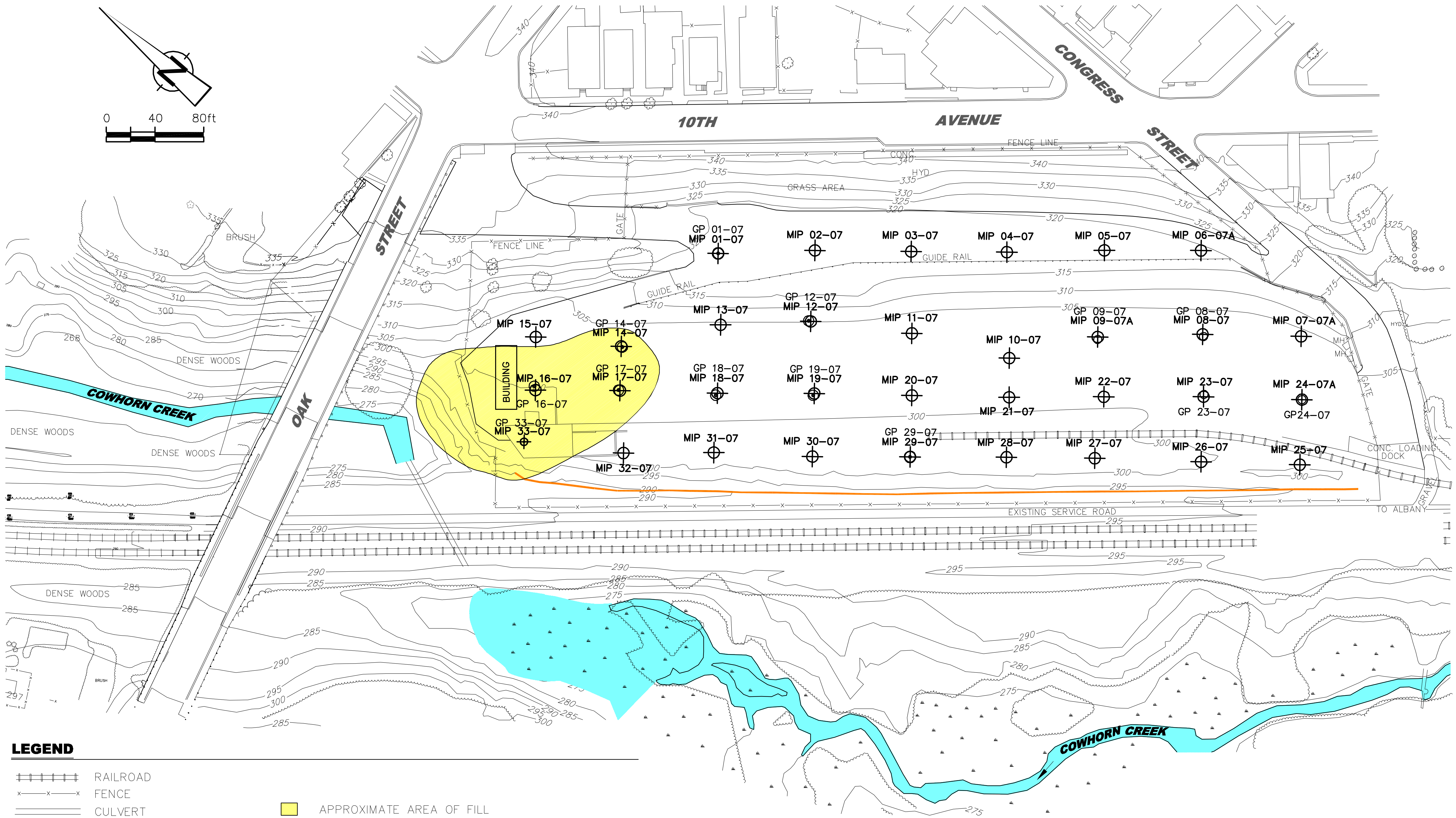
FIGURE 10

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\15091_XSEC LOCATIONS.DWG Saved: 4/15/2009 2:52:22 PM PLotted: 4/15/2009 3:17:10 PM User: Weatherby Jr., Bill



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 CONTOUR WITH ELEVATION
- 300 GROUNDWATER ELEVATION CONTOUR
- APPROXIMATE AREA OF FILL

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APPROXIMATE EXTENT OF FILL AREA

UPDATED FEASIBILITY STUDY
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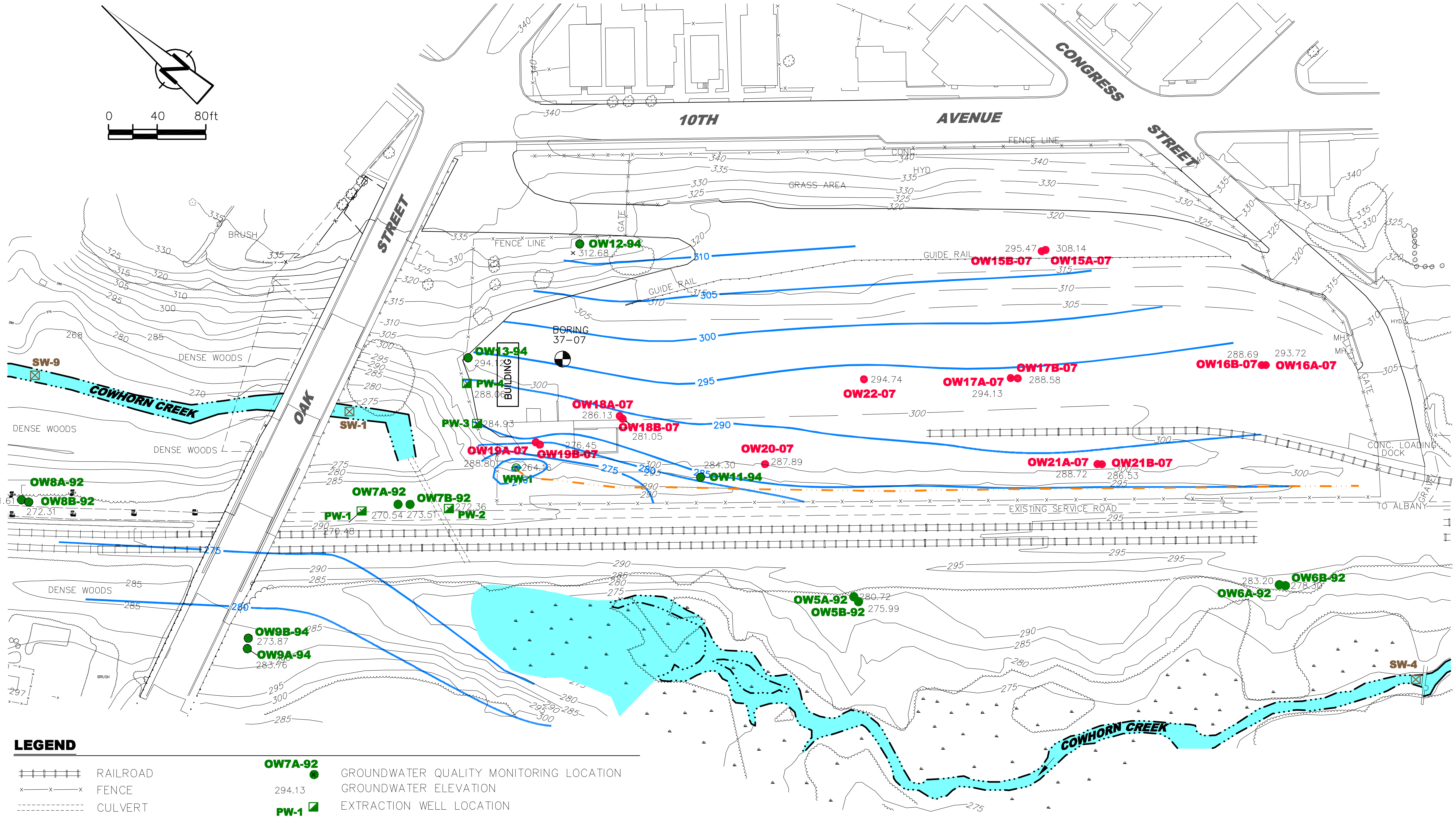
FIGURE 11

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 11_FILL AREA.DWG Saved: 4/15/2009 3:54:06 PM Plotted: 4/15/2009 3:57:59 PM User: Weatherby Jr., Bill



LEGEND

RAILROAD	
FENCE	
CULVERT	
GROUNDWATER COLLECTION TRENCH	
300 CONTOUR WITH ELEVATION	
300 GROUNDWATER ELEVATION CONTOUR	
OW7A-92 294.13	GROUNDWATER QUALITY MONITORING LOCATION GROUNDWATER ELEVATION
PW-1	EXTRACTION WELL LOCATION
WW-1	WET WELL LOCATION
SW-1	SURFACE WATER QUALITY MONITORING LOCATION (CRA, 1992,1994)
OW15A-07 294.13	NEW GROUNDWATER QUALITY MONITORING LOCATION GROUNDWATER ELEVATION

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GROUNDWATER ELEVATION CONTOURS
(MARCH 10, 2008)

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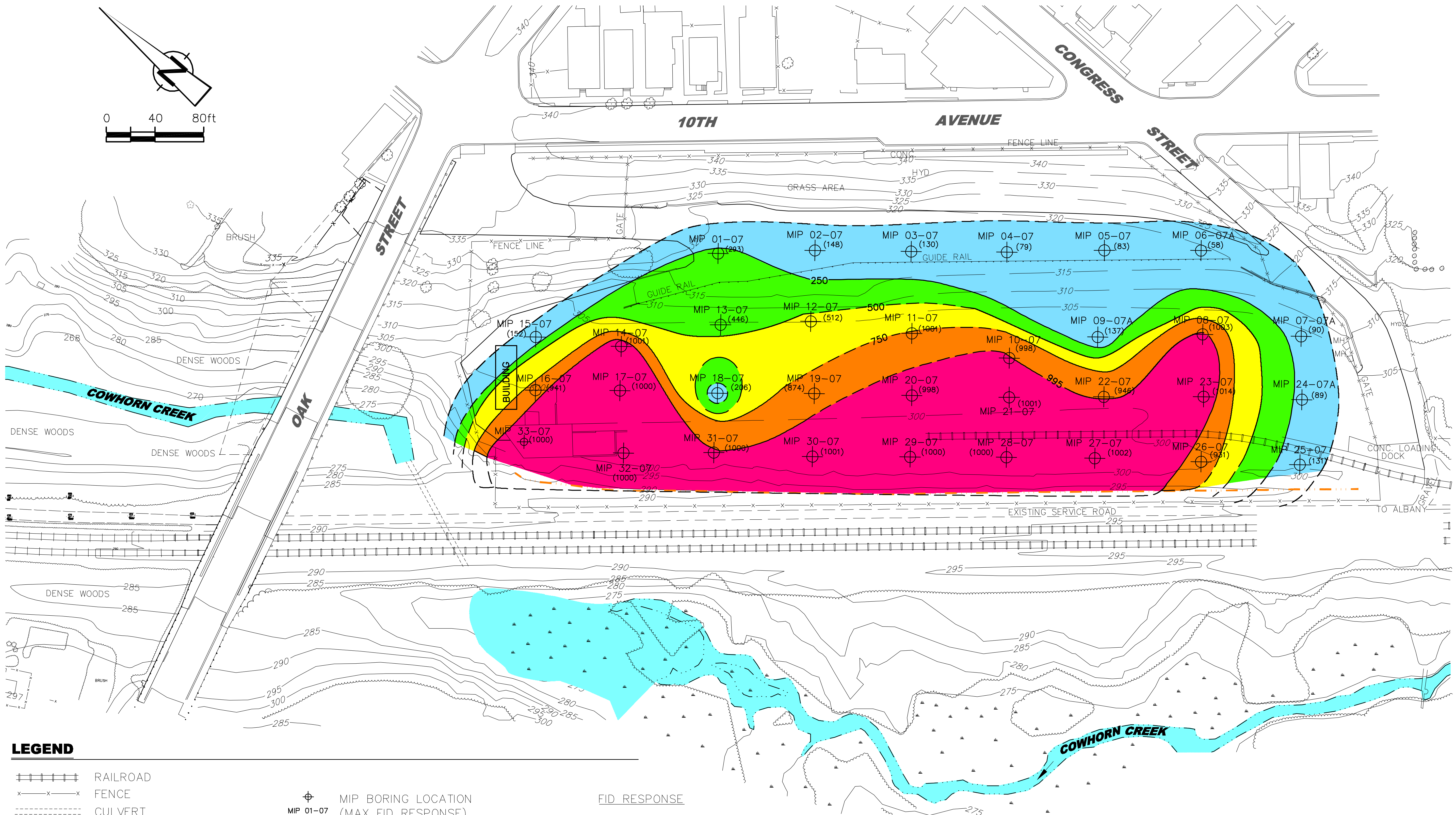
FIGURE 12



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 CONTOUR WITH ELEVATION
- 300 MIP RESPONSE CONTOUR
- MIP 01-07 (293) MIP BORING LOCATION (MAX FID RESPONSE)

FID RESPONSE

- ≥ 995
- ≥ 750, < 995
- ≥ 500, <750
- ≥ 250, <500
- ≤ 250

NOTE: MIP-11-07 EXCLUDED DUE TO EQUIPMENT NOT OPERATING PROPERLY.

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MIP RESPONSE
UPDATED FEASIBILITY STUDY
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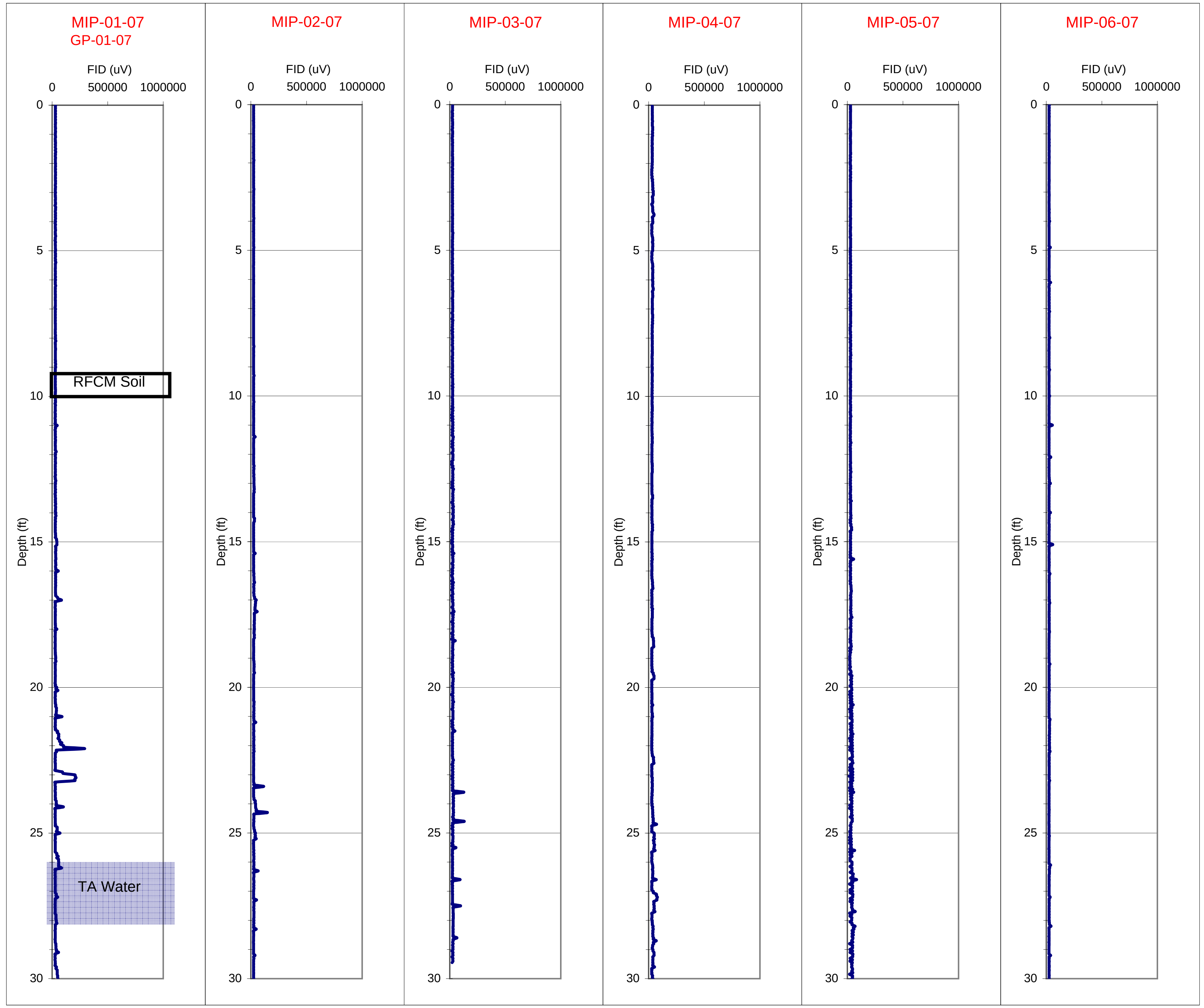
FIGURE 13

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURE 13_MIP RESPONSE.DWG Saved: 4/15/2009 4:01:46 PM Plotted: 4/15/2009 4:03:28 PM User: Weatherby Jr., Bill

Figure 14a
MIP CROSS SECTION "A"
Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY



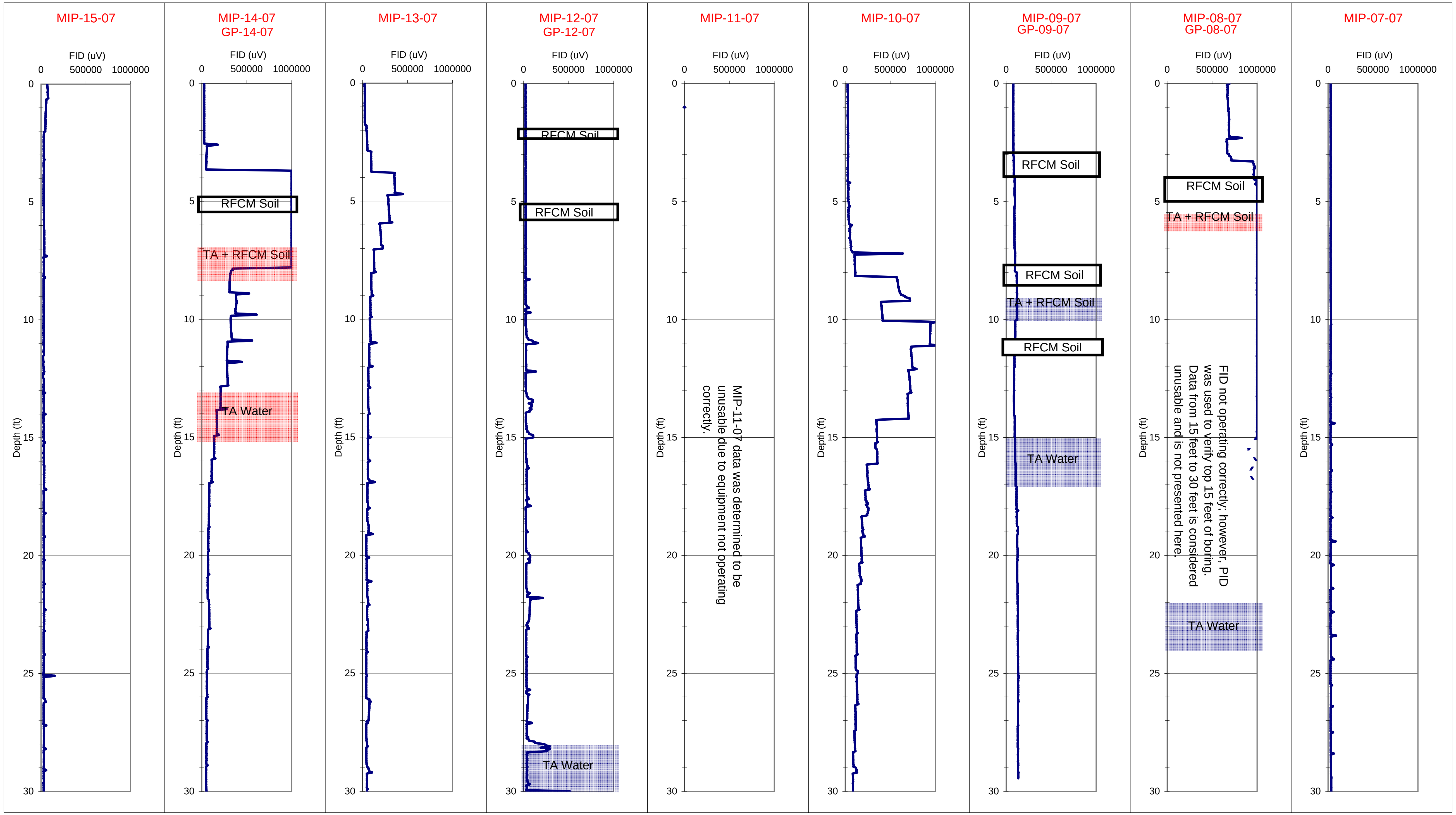
Interval from which a TestAmerica sample was collected. Blue color indicates that no parameters in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard valu

Interval from which a TestAmerica sample was collected. Red color indicates that one or more parameter in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) stan

RFCM Soil Interval from which a Rapid Field Characterization Method soil sample was collected

Notes:
TA : TestAmerica
RFCM: Rapid Field Charactization Method

Figure 14b
MIP CROSS SECTION "B"
Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY



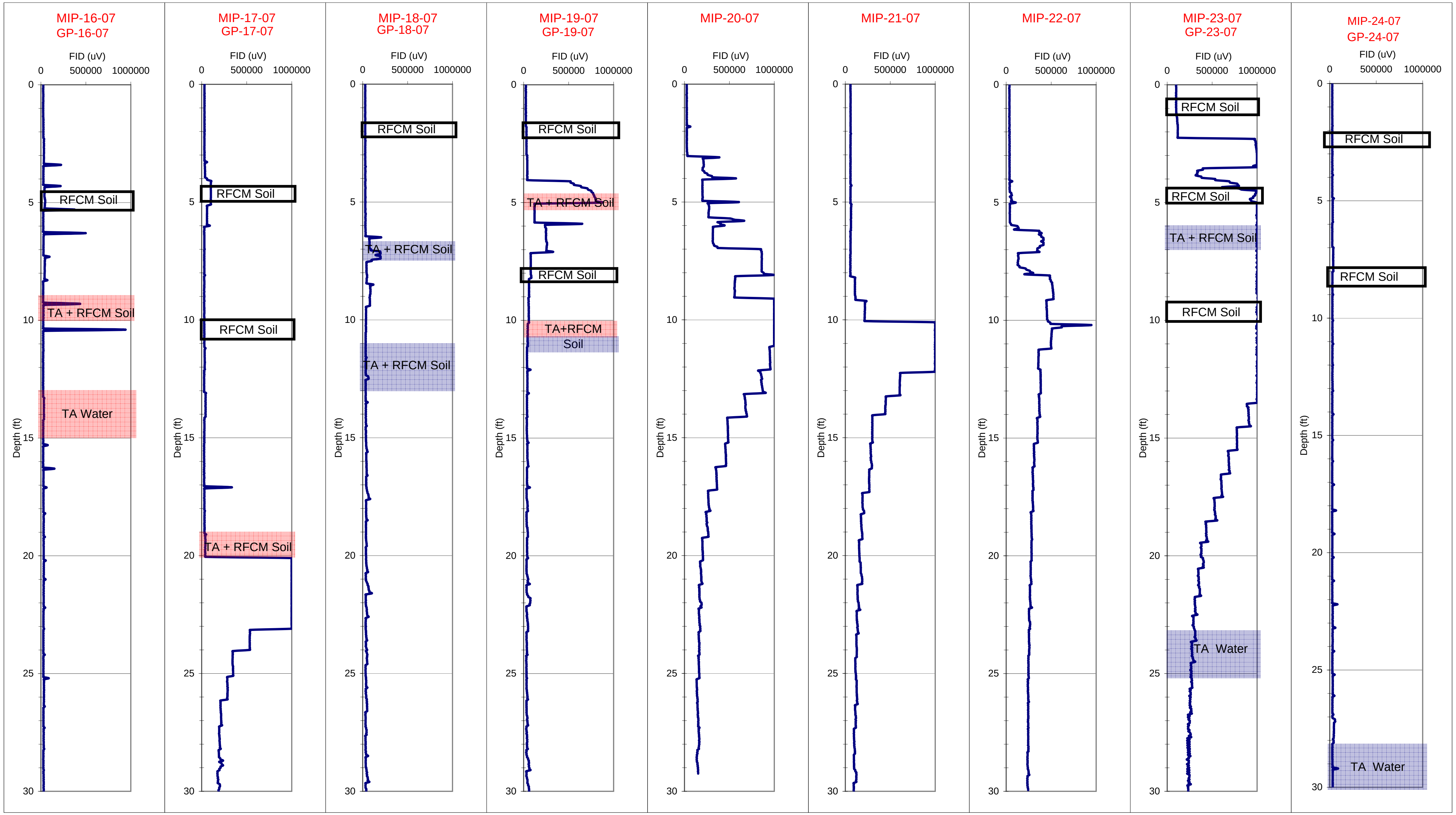
Interval from which a TestAmerica sample was collected. Blue color indicates that no parameters in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.

Interval from which a TestAmerica sample was collected. Red color indicates that one or more parameter in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.

RFCM Soil — Interval from which a Rapid Field Characterization Method soil sample was collected

Notes:
TA : TestAmerica
RFCM: Rapid Field Charactization Method

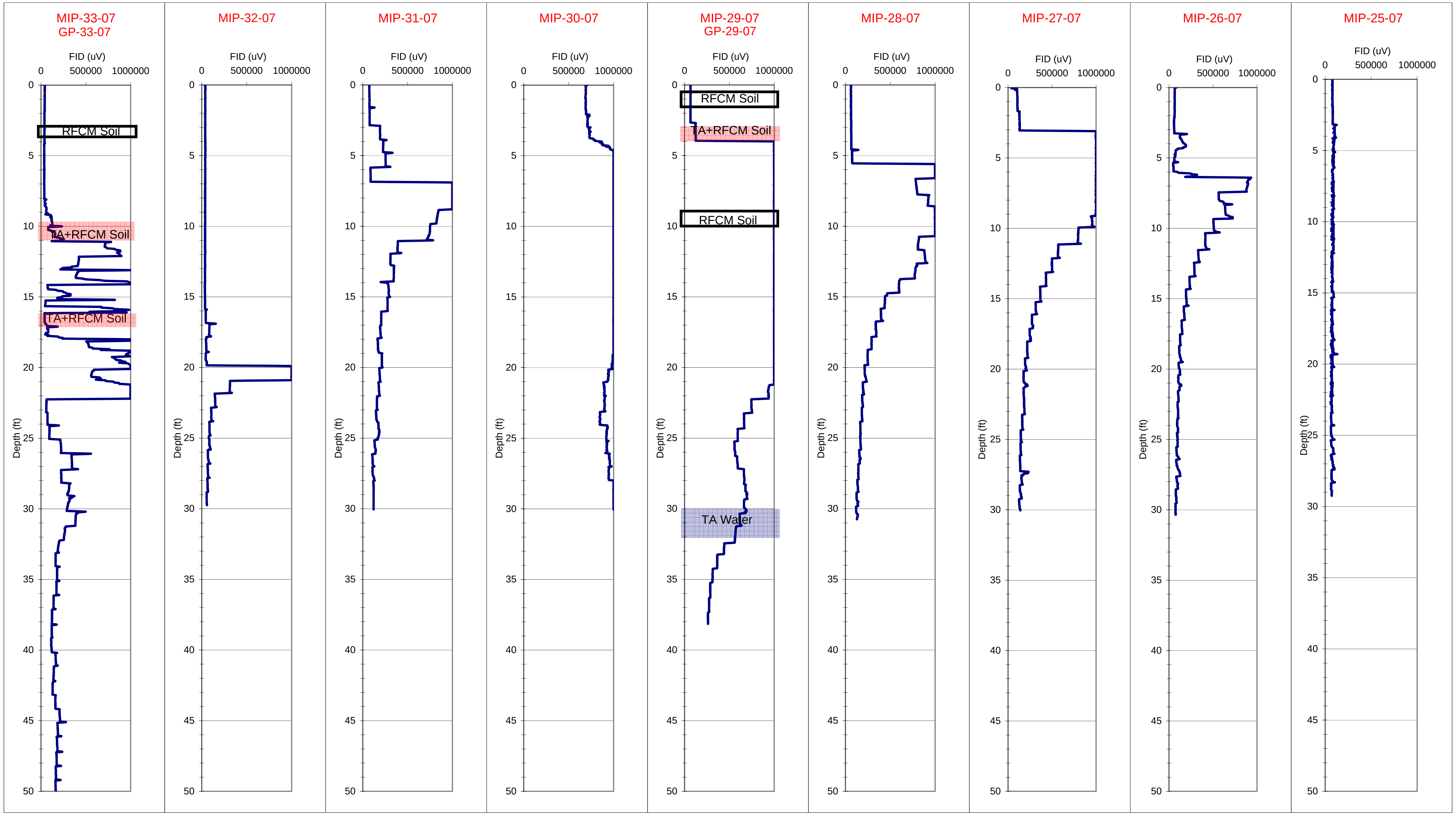
Figure 14c
MIP CROSS SECTION "C"
Updated Feasibility Study
SI Group, INC.
Congress Street Facility
Schenectady, NY



Interval from which a TestAmerica sample was collected. Blue color indicates that no parameters in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.
Interval from which a TestAmerica sample was collected. Red color indicates that one or more parameter in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.
RFCM Soil Interval from which a Rapid Field Characterization Method soil sample was collected

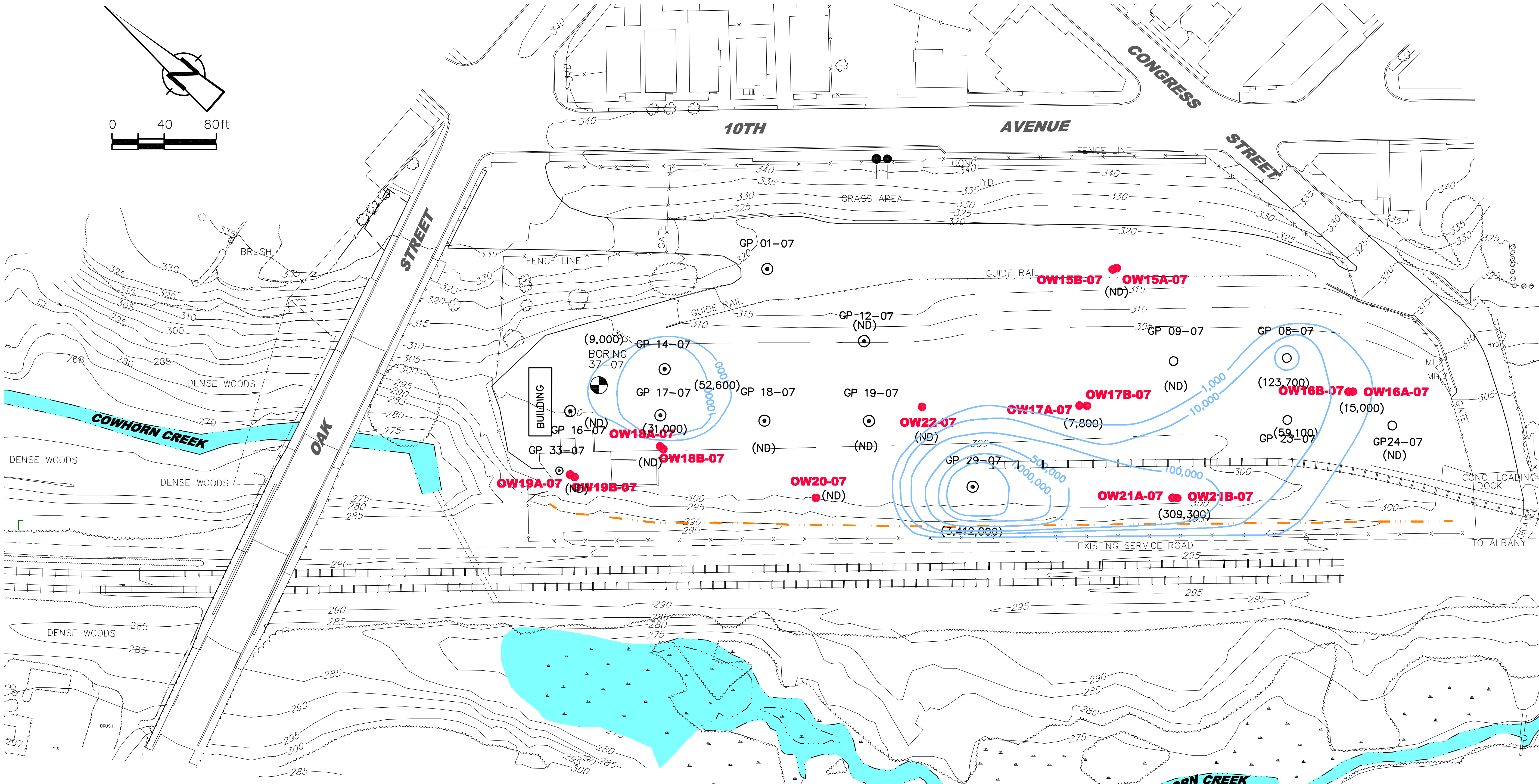
Notes:
TA : TestAmerica
RFCM: Rapid Field Charactization Method

Figure 14d
MIP CROSS SECTION "D"
Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY



Interval from which a TestAmerica sample was collected. Blue color indicates that no parameters in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.
Interval from which a TestAmerica sample was collected. Red color indicates that one or more parameter in the sample exceeded Part 375 Soil Cleanup Objectives for Unrestricted Use (soil) or TOGS 1.1.1 (water) standard values.
RFCM Soil Interval from which a Rapid Field Characterization Method soil sample was collected

Notes:
TA : TestAmerica
RFCM: Rapid Field Charactization Method



LEGEND

RAILROAD	
FENCE	
CULVERT	
GROUNDWATER COLLECTION TRENCH	
—300— CONTOUR WITH ELEVATION	
OW22-07 (1,187,900)	HSA BORING LOCATION (TOTAL RFCM ANALYTES)
GP 01-07 (13,500)	GEOPROBE BORING LOCATION (TOTAL RFCM ANALYTES)
—2,000,000—	ISOCONCENTRATION CONTOUR (PPB)

ALL UNITS ARE IN µg/Kg

NOTE: TOTAL ANALYTES DATA IS FROM RAPID FIELD CHARACTERIZATINO METHOD (RFCM) (SEE SEC. 4.2.4 OF TEXT FOR DETAILS). TOTAL ANALYTES IS A SUM OF BENZENE, TOLUENE, CHLOROBENZENE, ETHYLBENZENE, XYLENE, PHENOL AND CRESOL.

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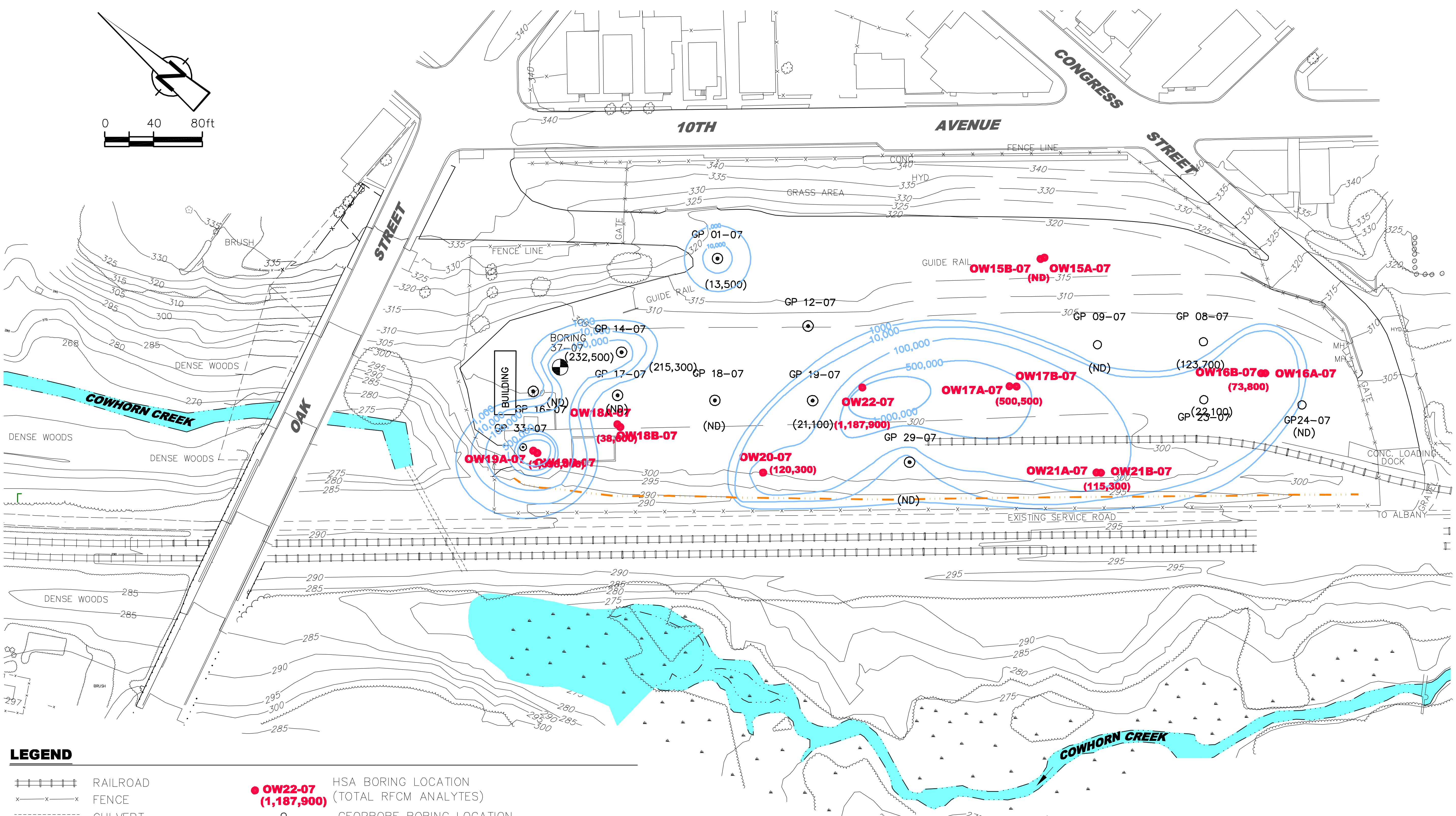
ISOCONCENTRATION CONTOURS FOR TOTAL CONCENTRATIONS OF RFCM ANALYTES IN SHALLOW SOIL SAMPLES (0' – 6')
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 15



LEGEND

RAILROAD	
FENCE	
CULVERT	
GROUNDWATER COLLECTION TRENCH	
300 CONTOUR WITH ELEVATION	
OW22-07 (1,187,900)	HSA BORING LOCATION (TOTAL RFCM ANALYTES)
GP 01-07 (13,500)	GEOPROBE BORING LOCATION (TOTAL RFCM ANALYTES)
2,000,000	ISOCONCENTRATION CONTOUR (PPB)

ALL UNITS ARE IN μg/Kg

NOTE: TOTAL ANALYTES DATA IS FROM RAPID FIELD CHARACTERIZATINO METHOD (RFCM) (SEE SEC. 4.2.4 OF TEXT FOR DETAILS). TOTAL ANALYTES IS A SUM OF BENZENE, TOLUENE, CHLOROBENZENE, ETHYLBENZENE, XYLENE, PHENOL AND CRESOL.

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ISOCONCENTRATION CONTOURS FOR TOTAL CONCENTRATIONS OF RFCM ANALYTES IN DEEP SOIL SAMPLES (6' TO SATURATED ZONE)
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
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SCHENECTADY, NEW YORK

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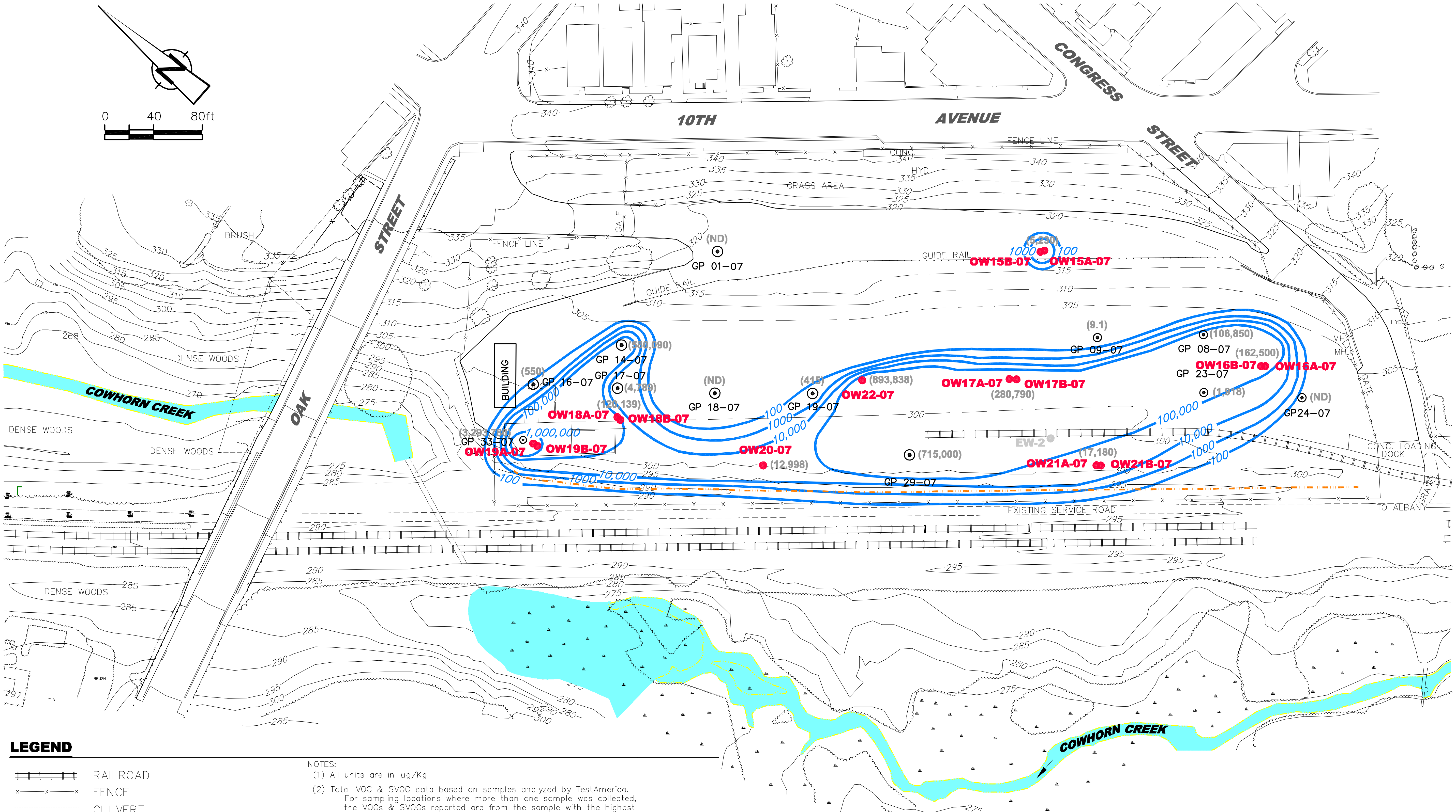
DATE: 02/25/09

FIGURE 16



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 — CONTOUR WITH ELEVATION
- 100,000 — ISOCONCENTRATION CONTOUR
- GP 14-07 (580,090) — GEOPROBE SOIL SAMPLE LOCATION (TOTAL VOCs AND SVOCs)
- OW22A-07 (593,838) — HSA SOIL SAMPLE LOCATION (TOTAL VOCs AND SVOCs)

NOTES:
(1) All units are in µg/Kg
(2) Total VOC & SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCs & SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 1 & 3.

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ISOCONCENTRATION CONTOURS FOR TOTAL VOCs AND SVOCs IN SOIL
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

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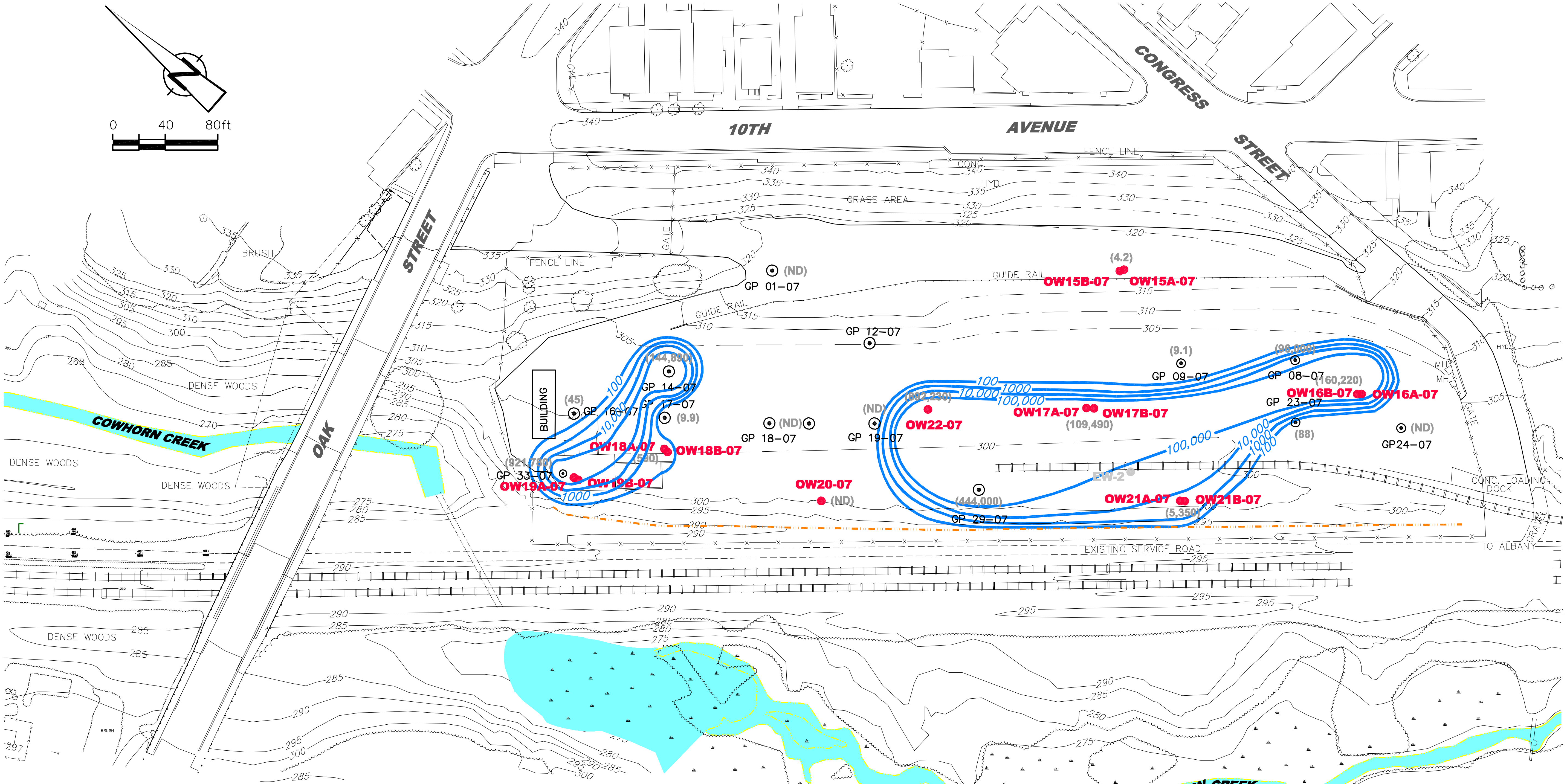
FIGURE 17

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURES\15091_FIG17.DWG Saved: 4/15/2009 5:07:38 PM Plotted: 4/15/2009 5:08:36 PM User: Weatherby Jr., Bill



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 — CONTOUR WITH ELEVATION
- 100,000 — ISOCONCENTRATION CONTOUR
- GP 14–07 (580,090) — GEOPROBE SOIL SAMPLE LOCATION (TOTAL VOCs)
- OW20–07 (ND) — HSA SOIL SAMPLE LOCATION (TOTAL VOCs)

NOTES:

(1) All units are in µg/Kg

(2) Total VOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 1 & 3.

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ISOCONCENTRATION CONTOURS FOR TOTAL VOCs IN SOIL
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
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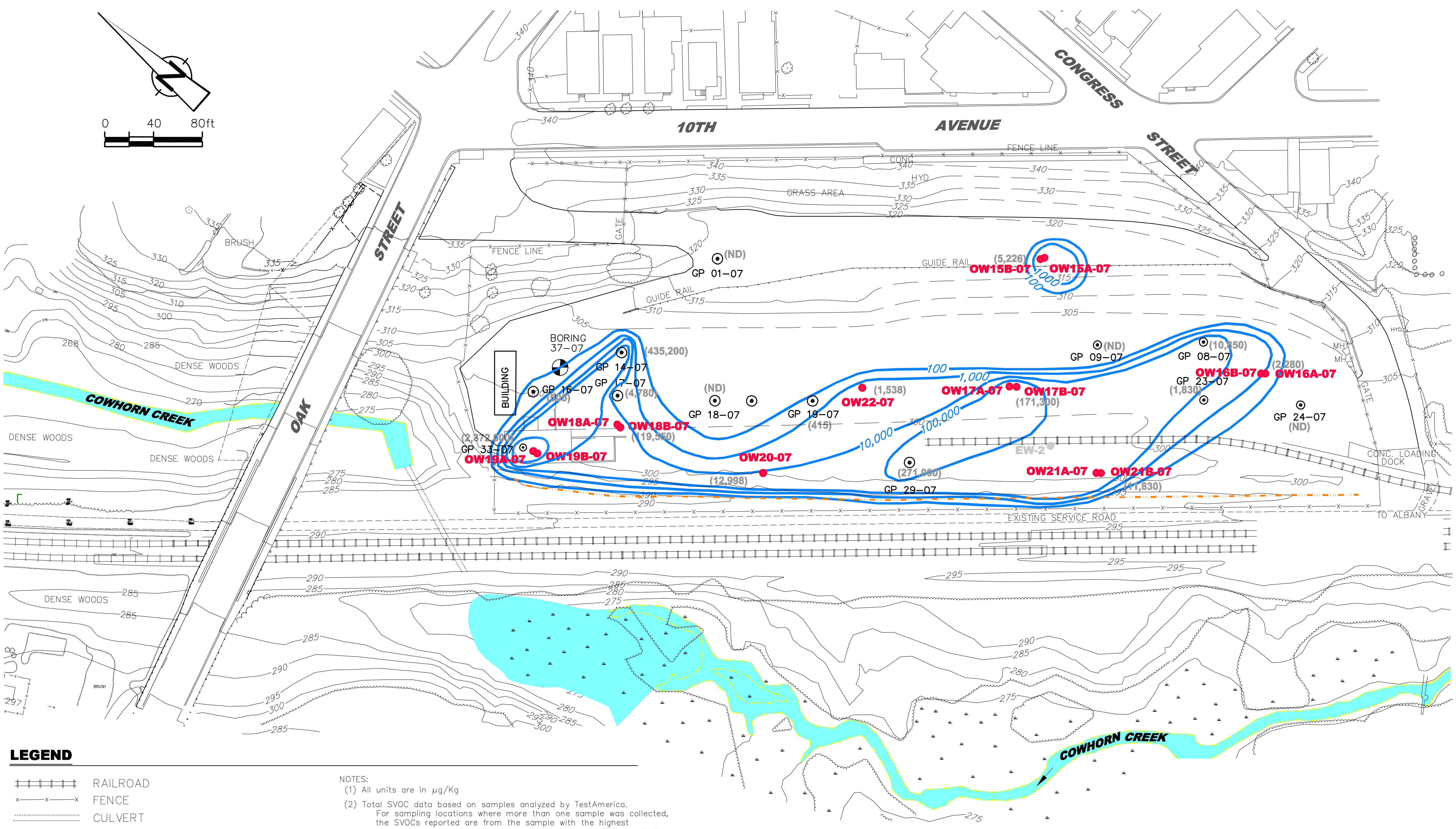
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 18



LEGEND

RAILROAD

FENCE

CULVERT

GROUNDWATER COLLECTION TRENCH

300 — CONTOUR WITH ELEVATION

100,000 — ISOCONCENTRATION CONTOUR

GP 14-07 (580,090) — GEOPROBE SOIL SAMPLE LOCATION (TOTAL SVOCs)

OW20-07 (ND) — HSA SOIL SAMPLE LOCATION (TOTAL SVOCs)

NOTES:
(1) All units are in µg/Kg
(2) Total SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 1 & 3.

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ISOCONCENTRATION CONTOURS FOR TOTAL SVOCs IN SOIL
UPDATED FEASIBILITY STUDY
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PROJECT NO. 15091.2010.1102

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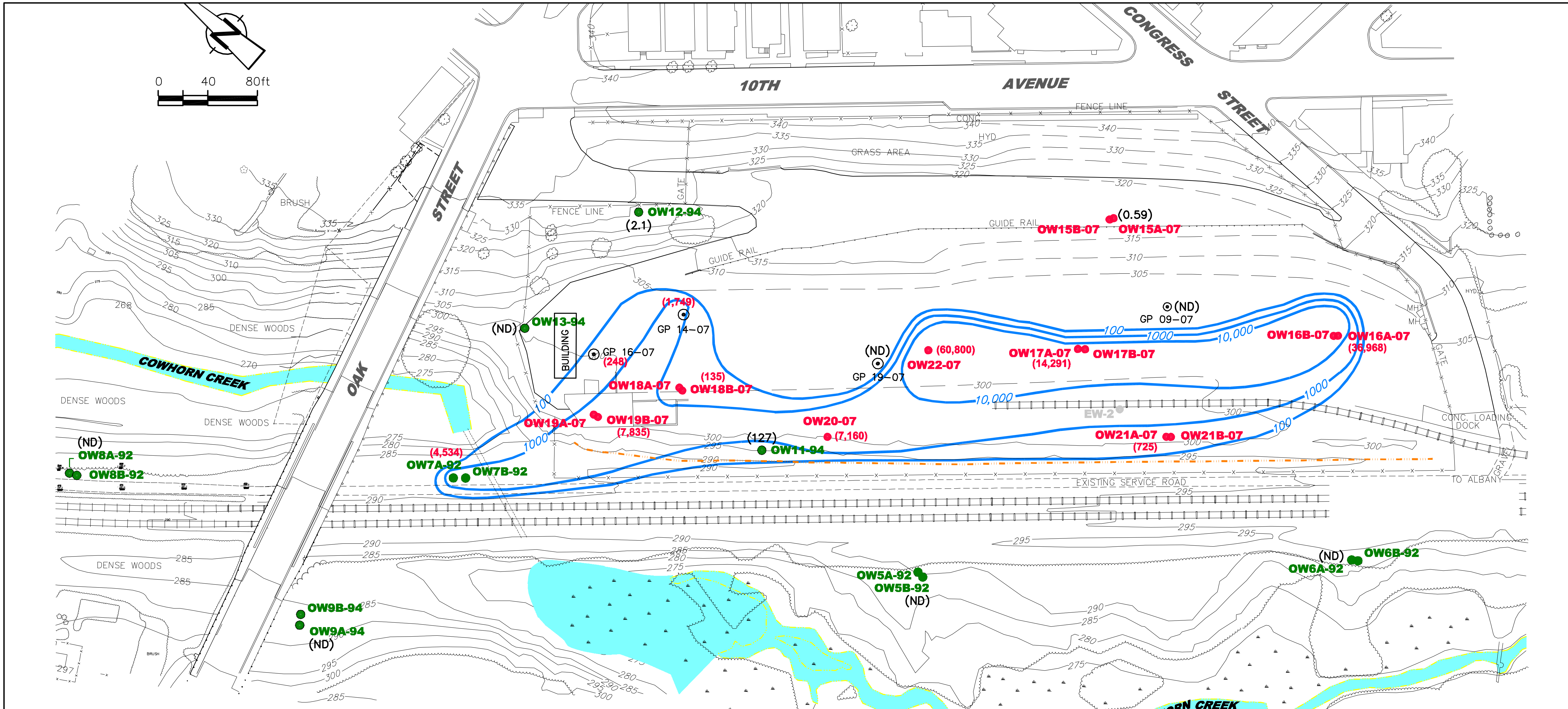
FIGURE 19

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURES\15091_FIG19.DWG Saved: 4/15/2009 5:10:38 PM Plotted: 4/15/2009 5:11:16 PM User: Weatherby Jr., Bill



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 — CONTOUR WITH ELEVATION
- 300 — GROUNDWATER ELEVATION CONTOUR
- OW7A-92 (4,534) — GROUNDWATER QUALITY MONITORING LOCATION (TOTAL VOCs AND SVOCs)
- OW15A-07 (0.59) — NEW GROUNDWATER QUALITY MONITORING LOCATION (TOTAL VOCs AND SVOCs)
- GP 14-07 (1,749) — WATER QUALITY SAMPLE LOCATION (TOTAL VOCs AND SVOCs)

NOTES:
(1) All units are in µg/L
(2) Total VOC & SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCs & SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 2 & 4.
(3) A red total VOCs and SVOCs value indicates one or more parameters exceeded a TOGS 1.1.1 standard.

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ISOCONCENTRATION CONTOURS FOR TOTAL VOCs AND SVOCs IN SHALLOW GROUNDWATER
UPDATED FEASIBILITY STUDY
CONGRESS STREET FACILITY
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SCHENECTADY, NEW YORK

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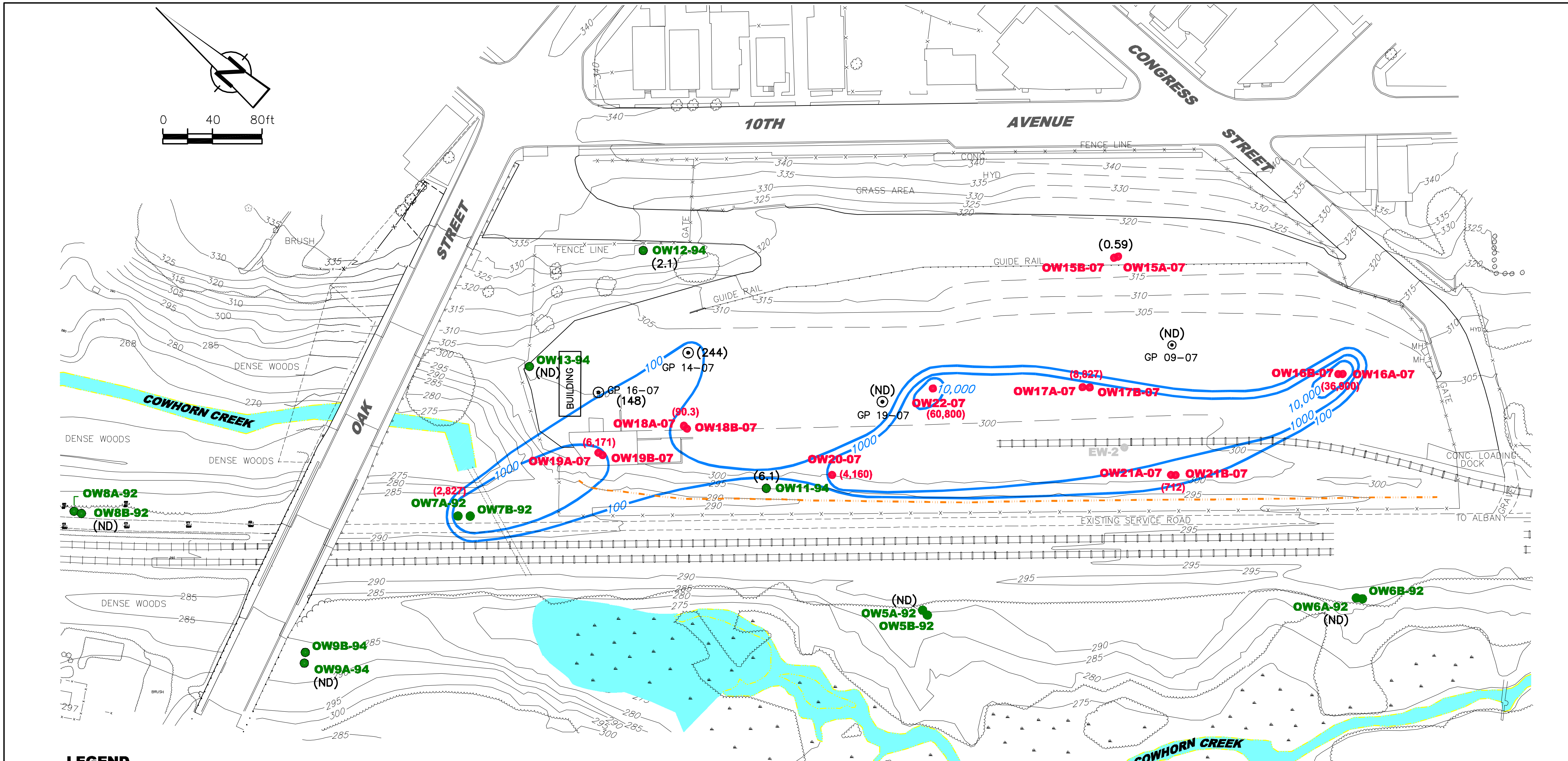
DATE: 02/25/09
FIGURE 20

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURES\15091_FIG20.DWG Saved: 4/15/2009 5:15:43 PM Plotted: 4/15/2009 5:16:28 PM User: Weatherby Jr., Bill



LEGEND

RAILROAD

FENCE

CULVERT

GROUNDWATER COLLECTION TRENCH

300 CONTOUR WITH ELEVATION

300 GROUNDWATER ELEVATION CONTOUR

OW7A-92 (2,827) GROUNDWATER QUALITY MONITORING LOCATION (TOTAL VOCs)

OW15A-07 (ND) NEW GROUNDWATER QUALITY MONITORING LOCATION

GP 14-07 (244) WATER QUALITY SAMPLE LOCATION (TOTAL VOCs*)

NOTES:
(1) All units are in µg/L
(2) Total VOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCsreported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 2 & 4.
(3) A red total VOCs value indicates one or more parameters exceeded a TOGS 1.1.1 standard.

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ISOCONCENTRATION CONTOURS FOR TOTAL VOCs IN SHALLOW GROUNDWATER
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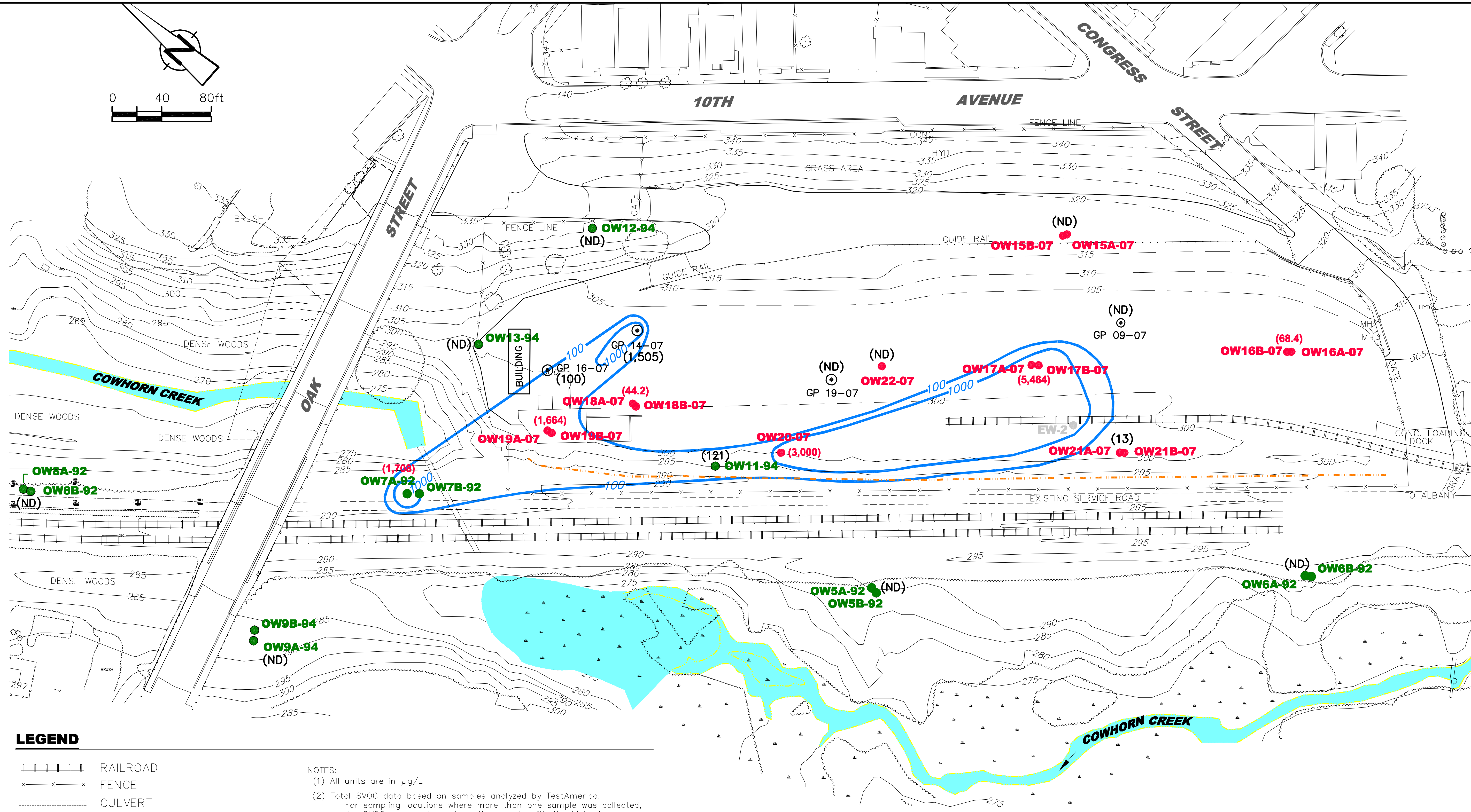
FIGURE 21



LEGEND

- RAILROAD
- FENCE
- CULVERT
- GROUNDWATER COLLECTION TRENCH
- 300 — CONTOUR WITH ELEVATION
- 300 — GROUNDWATER ELEVATION CONTOUR
- OW7A-92 (1,708) — GROUNDWATER QUALITY MONITORING LOCATION (TOTAL SVOCs)
- OW15A-07 (ND) — NEW GROUNDWATER QUALITY MONITORING LOCATION (TOTAL SVOCs)
- GP 14-07 (1,505) — WATER QUALITY SAMPLE LOCATION (TOTAL SVOCs)

NOTES:
(1) All units are in $\mu g/L$
(2) Total SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 2 & 4.
(3) A red total SVOCs value indicates one or more parameters exceeded a TOGS 1.1.1 standard.

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ISOCONCENTRATION CONTOURS FOR TOTAL SVOCs IN SHALLOW GROUNDWATER
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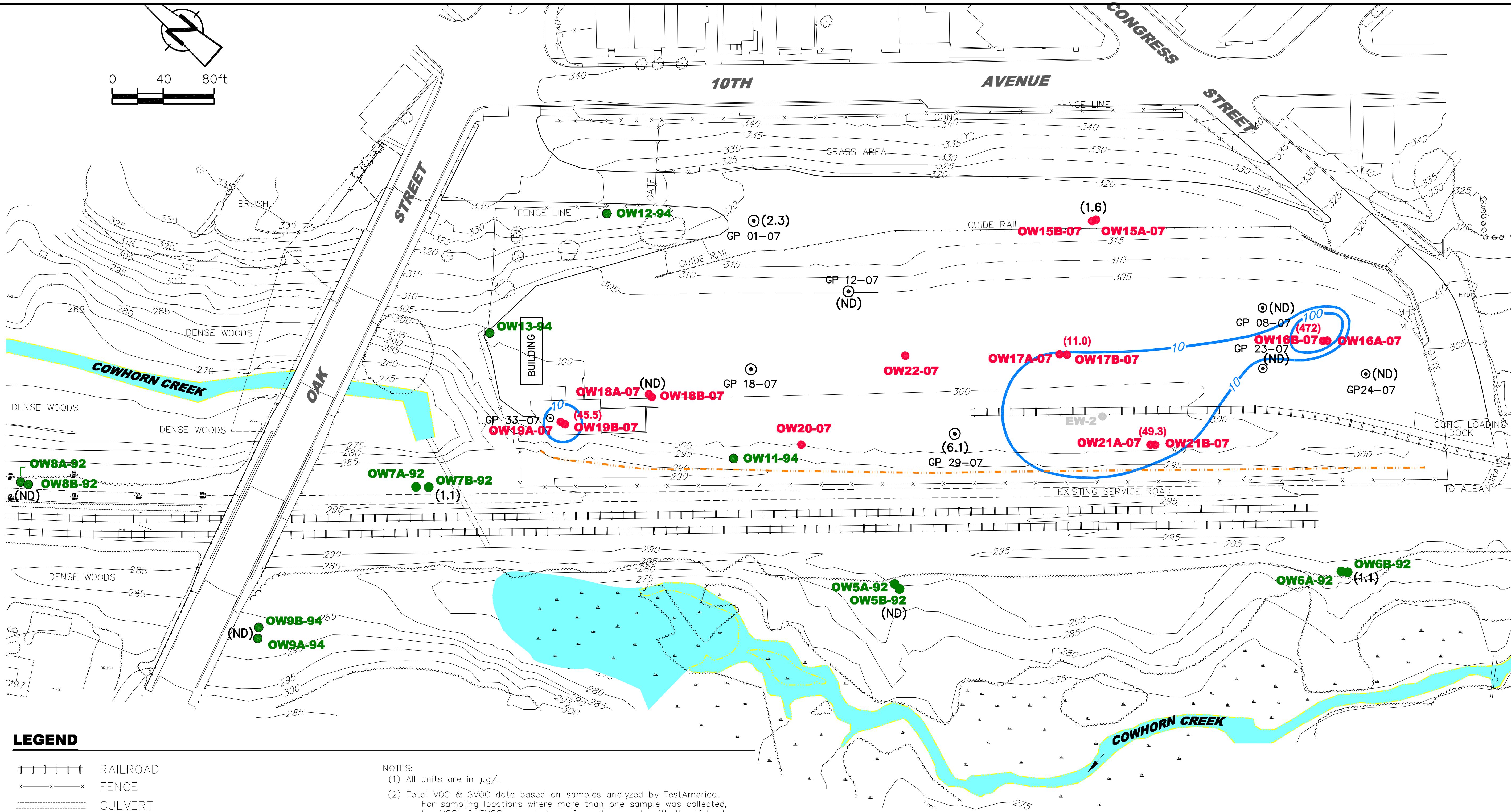
FIGURE 22

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURES\15091_FIG22.DWG Saved: 4/15/2009 5:12:16 PM Plotted: 4/15/2009 5:12:46 PM User: Weatherby Jr., Bill



LEGEND

RAILROAD

FENCE

CULVERT

GROUNDWATER COLLECTION TRENCH

300 CONTOUR WITH ELEVATION

300 GROUNDWATER ELEVATION CONTOUR

OW7A-92 (1,708) GROUNDWATER QUALITY MONITORING LOCATION (TOTAL VOCs AND SVOCs)

OW15A-07 (ND) NEW GROUNDWATER QUALITY MONITORING LOCATION (TOTAL VOCs AND SVOCs)

GP 14-07 (1,505) WATER QUALITY SAMPLE LOCATION (TOTAL VOCs AND SVOCs)

NOTES:

(1) All units are in µg/L

(2) Total VOC & SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCs & SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 2 & 4.

(3) A red total VOCs and SVOCs value indicates one or more parameters exceeded a TOGS 1.1.1 standard.

CHA

III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
Main: (518) 453-4500 · www.chacompanies.com

ISOCONCENTRATION CONTOURS FOR TOTAL VOCs AND SVOCs IN DEEP GROUNDWATER

UPDATED FEASIBILITY STUDY

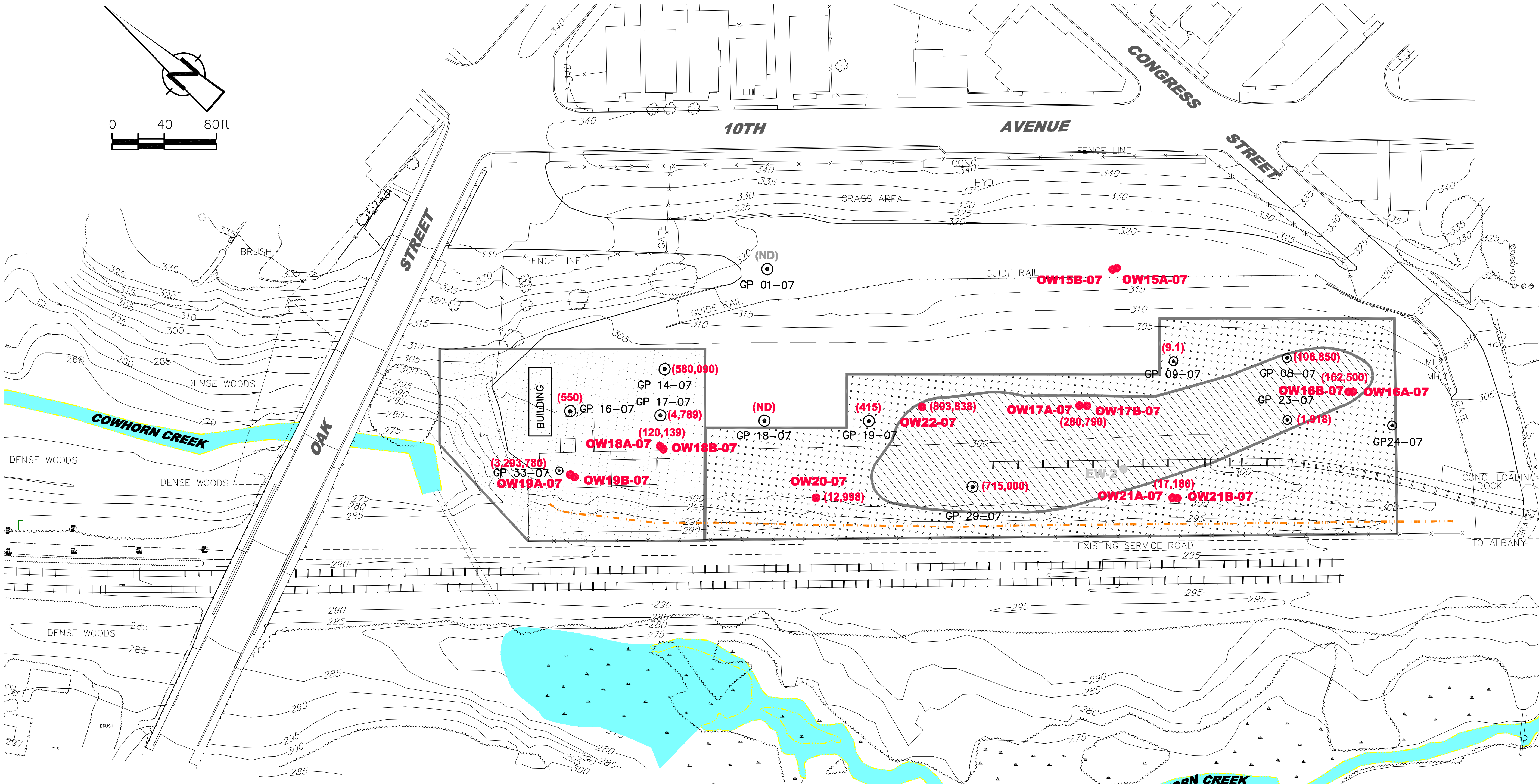
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 23

File: M:\15091\CS\FEASIBILITY STUDY\ACAD\ACAD\FIGURES\15091_FIG23.DWG Saved: 4/15/2009 5:17:06 PM Plotted: 4/15/2009 5:18:05 PM User: Weatherby Jr., Bill



LEGEND

RAILROAD

FENCE

CULVERT

GROUNDWATER COLLECTION TRENCH

300 CONTOUR WITH ELEVATION

100,000 ISOCONCENTRATION CONTOUR

GP 14-07 (580,090) GEOPROBE SOIL SAMPLE LOCATION (TOTAL VOCs AND SVOCs)

OW22A-07 (593.838) HSA SOIL SAMPLE LOCATION (TOTAL VOCs AND SVOCs)

NOTES:
(1) All units are in µg/Kg
(2) Total VOC & SVOC data based on samples analyzed by TestAmerica. For sampling locations where more than one sample was collected, the VOCs & SVOCs reported are from the sample with the highest totals. For a complete sampling summary, refer to Tables 1 & 3.

Fill Area

Area A

Area B

CHA

III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
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POTENTIAL TREATMENT AREAS
UPDATED SUPPLEMENTAL FEASIBILITY STUDY
CONGRESS STREET FACILITY
SI GROUP INC.
SCHENECTADY, NEW YORK

PROJECT NO. 15091.2010.1102

DATE: 02/25/09

FIGURE 24

TABLES

TABLE 1
GEOPROBE SOIL SAMPLING SUMMARY

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Sampling Location	CHA/TestAmerica Sampling ID[1]	RFCM[2] Sample ID	Sample Collection		Depth Interval (ft. bgs)	QA/QC	Volume	Analyses
			Date	Time				
GP-01-07	S-101007-SDN-001	000089	10/10/2007	0810	22 -23		(A), (B)	(D), (E)
GP-01-07		000138	10/10/2007	0800	9.5-10		(B)	(E)
GP-08-07		000099	10/11/2007	0755	4 to 5.5		(B)	(E)
GP-08-07	S-101107-SDN-003	000119	10/11/2007	0800	5 to 6		(A), (B)	(D), (E)
GP-09-07		000129	10/15/2007	0735	3 to 3.7		(B)	(E)
GP-09-07		000126	10/15/2007	0745	7.7 to 8.3		(B)	(E)
GP-09-07	S-101207-SDN-017	000134	10/15/2007	0750	9 to 10	MS/MSD	(A), (C)	(D), (E)
GP-09-07		000143	10/15/2007	0800	11		(B)	(E)
GP-12-07		000174	10/15/2007	0925	2		(B)	(E)
GP-12-07		000164	10/15/2007	0930	5 to 5.5		(B)	(E)
GP-14-07		000114	10/12/2007	1115	5		(B)	(E)
GP-14-07	S-101207-SDN-015	000160	10/12/2007	1120	6.9 to 7.3		(A), (B)	(D), (E)
GP-16-07		000135	10/12/2007	1340	5		(B)	(E)
GP-16-07	S-101207-SDN-018	000147	10/12/2007	1345	9 to 10		(A), (B)	(D), (E)
GP-17-07		000133	10/12/2007	0935	4 to 5.5		(B)	(E)
GP-17-07		000087	10/12/2007	0950	10 to 10.7		(B)	(E)
GP-17-07	S-101207-SDN-014	000091	10/12/2007	1000	19 to 20		(A), (B)	(D), (E)
GP-18-07		000142	10/12/2007	0740	2		(B)	(E)
GP-18-07	S-1012-07-SDN-011	000090	10/12/2007	0745	7		(A), (B)	(D), (E)
GP-18-07	S-1012-07-SDN-012	000130	10/12/2007	0800	11 to 13		(A), (B)	(D), (E)
GP-18-07	S-1012-07-SDN-013	000130	10/12/2007	0900	11 to 13	Duplicate	(A), (B)	(D), (E)
GP-19-07		000085	10/11/2007	1445	2		(B)	(E)
GP-19-07	S-101107-SDN-008	000132	10/11/2007	1455	5		(A), (B)	(D), (E)
GP-19-07		000120	10/11/2007	1500	8		(B)	(E)
GP-19-07	S-101107-SDN-010	000139	10/11/2007	1515	10 to 11		(A), (B)	(D), (E)
GP-23-07		000144	10/11/2007	0955	0.8 to 1.3		(B)	(E)
GP-23-07		000137	10/11/2007	1000	4.5 to 5		(B)	(E)
GP-23-07	S-101107-SDN-005	000145	10/11/2007	1005	6 to 7		(A), (B)	(D), (E)
GP-23-07		000141	10/11/2007	1010	9.3 to 10		(B)	(E)
GP-24-07		000140	10/11/2007	1235	2		(B)	(E)
GP-24-07		000163	10/11/2007	1245	8		(B)	(E)
GP-29-07		000092	10/15/2007	1255	0.7 to 1.5		(B)	(E)
GP-29-07	S-101507-SDN-023	000051	10/15/2007	1300	3 to 4		(A), (B)	(D), (E)
GP-29-07		000095	10/15/2007	1320	9 to 10		(B)	(E)
GP-33-07		000074	10/15/2007	1520	3 to 3.4		(B)	(E)
GP-33-07	S-101507-SDN-026	000075	10/15/2007	1530	10 to 11		(A), (B)	(D), (E)
GP-33-07	S-101507-SDN-027	000038	10/15/2007	1540	16.5 to 17		(A), (B)	(D), (E)

Notes:

(1) Only samples sent to TestAmerica Analytical Laboratory have CHA sample IDs. RFCM sample ID numbers were used for all other samples.
(2) RFCM = Rapid Field Characterization Method; see Section 4.2.4 of report for description
(A) = Volume: One 2-oz. glass jar w/ no preservatives, one 8-oz. glass jar w/ no preservatives.
(B) = Volume: One 10mL sample preserved in methanol.
(C) = Volume: Two 2-oz. glass jars w/ no preservatives, two 8-oz. glass jars w/ no preservatives.
(D) = Analyses: VOCs, SVOCs
(E) = Analyses: RFCM (Benzene, Toluene, Chlorobenzene, Ethylbenzene, Total Xylenes, Phenol, Cresol)
QA/QC = Quality Assurance/Quality Control

TABLE 2
GEOPROBE GROUNDWATER SAMPLING SUMMARY

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Sampling Location	Sampling ID	Sample Collection Date	Sample Collection Time	Depth Interval	QA/QC	Volume	Analyses
GP-01-07	GW-101007-SDN-002	10/10/2007	0830	26 to 28		(B)	(D)
GP-08-07	GW-101107-SDN-004	10/11/2007	0830	22 to 24		(B)	(D)
GP-09-07	GW-101207-SDN-020	10/15/2007	0800	15 to 17		(A)	(D)
GP-12-07	GW-101507-SDN-021	10/15/2007	0955	28 to 30		(A)	(D)
GP-12-07	GW-101507-SDN-022	10/15/2007	1040	33 to 35		(A)	(D)
GP-14-07	GW-101207-SDN-016	10/12/2007	1130	13 to 15		(A)	(D)
GP-16-07	GW-101207-SDN-019	10/12/2007	1400	13 to 15	MS/MSD	(C)	(D)
GP-19-07	GW-101107-SDN-009	10/11/2007	1510	10 to 11		(B)	(D)
GP-23-07	GW-101107-SDN-006	10/11/2007	1020	23 to 25		(B)	(D)
GP-24-07	GW-101107-SDN-007	10/11/2007	1310	28 to 30		(B)	(D)
GP-29-07	GW-101507-SDN-024	10/15/2007	1340	30 to 32		(A)	(D)
GP-29-07	GW-101507-SDN-025	10/15/2007	1400	30 to 32	Duplicate	(A)	(D)

Notes:

(A) = Volume: Two 40 mL w/ preservative HCL, two 1 L amber w/no preservatives
(B) = Volume: Two 40 mL w/ preservative HCL, one 1 L amber w/no preservatives
(C) = Volume: Four 40 mL w/preservative HCL, Four 1 L amber w/ no preservatives
(D) = Analyses: VOCs, SVOCs
QA/QC = Quality Assurance/Quality Control

TABLE 3
HOLLOW STEM AUGER SOIL SAMPLING SUMMARY

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Sampling Location	CHA/TestAmerica Sampling ID[1]	RFCM[2] Sample ID	Sample Collection		Depth Interval (ft. bgs)	QA/QC	Volume	Analyses
			Date	Time				
OW15A/B-04		000096	10/22/2007	1200	2 to 4		(B)	(E)
OW15A/B-05		000048	10/22/2007	1210	6 to 8		(B)	(E)
OW15A/B-06	S-102207-SDN-028	000097	10/22/2007	1220	10 to 12		(A), (B)	(D), (E)
OW16A/B-07		000066	10/23/2007	1345	6 to 8		(B)	(E)
OW16A/B-07		000042	10/23/2007	1355	8 to 10		(B)	(E)
OW16A/B-07	S-102307-SDN-029	000071	10/23/2007	1405	10 to 12		(A), (B)	(D), (E)
OW17A/B-07		000094	10/24/2007	950	2 to 4		(B)	(E)
OW17A/B-07		000110	10/24/2007	955	6 to 8		(B)	(E)
OW17A/B-07		000072	10/24/2007	1000	8 to 10		(B)	(E)
OW17A/B-07	S-102407-SDN-030	000069	10/24/2007	1010	10 to 12		(A), (B)	(D), (E)
OW18A/B-07		000041	10/25/2007	1300	4 to 6		(B)	(E)
OW18A/B-07		000047	10/25/2007	1320	10 to 12		(B)	(E)
OW18A/B-07		000084	10/25/2007	1340	16 to 18		(B)	(E)
OW18A/B-07	S-102507-SDN-032	000064	10/25/2007	1350	20 to 22		(A), (B)	(D), (E)
OW19A/B-07	S-103007-SDN-036	001653	10/30/2007	0900	6 to 8		(A), (B)	(D), (E)
OW19A/B-07		001134	10/30/2007	0920	10 to 12		(B)	(E)
OW19A/B-07		001139	10/30/2007	0940	14 to 16		(B)	(E)
OW19A/B-07		001140	10/30/2007	1000	18 to 20		(B)	(E)
OW19A/B-07		001138	10/30/2007	1100	20 to 22		(B)	(E)
OW20-07	S-102907-SDN-035	001208	10/29/2007	1115	2 to 4		(A), (B)	(D), (E)
OW20-07		001213	10/29/2007	1120	4 to 6		(B)	(E)
OW20-07		001185	10/29/2007	1130	6 to 8		(B)	(E)
OW20-07		001184	10/29/2007	1140	8 to 10		(B)	(E)
OW21A/B-07	S-102907-SDN-033	001135	10/29/2007	0910	2 to 5		(A), (B)	(D), (E)
OW21A/B-07	S-102907-SDN-034	001135	10/29/2007	0920	2 to 5	Duplicate	(A), (B)	(D), (E)
OW21A/B-07		001141	10/29/2007	0930	4 to 6		(B)	(E)
OW21A/B-07		001230	10/29/2007	0940	6 to 8		(B)	(E)
OW21A/B-07		001225	10/29/2007	0950	8 to 10		(B)	(E)
OW22-07		000088	10/24/2007	1350	4 to 6		(B)	(E)
OW22-07		000076	10/24/2007	1405	10 to 12		(B)	(E)
OW22-07	S-102407-SDN-031	000086	10/24/2007	1400	8 to 10	MS/MSD	(A), (C)	(D), (E)
B-37-07		000039	10/26/2007	0830	2 to 4		(B)	(E)
B-37-07		001136	10/26/2007	0840	8 to 10		(B)	(E)
B-37-07		001175	10/26/2007	0850	10 to 12		(B)	(E)

Notes:

(1) Only samples sent to TestAmerica Analytical Laboratory have CHA sample IDs. RFCM sample ID numbers were used for all other samples.
(2) RFCM = Rapid Field Characterization Method; see Section 4.2.4 of report for description
(A) = Volume: One 2-oz. glass jar w/ no preservatives, one 8-oz. glass jar w/ no preservatives.
(B) = Volume: One 10mL sample preserved in methanol.
(C) = Volume: Two 2-oz. glass jars w/ no preservatives, two 8-oz. glass jars w/ no preservatives.
(D) = Analyses: VOCs, SVOCs
(E) = Analyses: Rapid Field Characterization Method (Benzene, Toluene, Chlorobenzene, Ethylbenzene, Total Xylenes, Phenol, Cresol)
QA/QC = Quality Assurance/Quality Control

TABLE 4
MONITORING WELL GROUNDWATER SAMPLING SUMMARY

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Sample I.D.	Well I.D.	Sample Collection Date	Sample Collection Time	Sample Ship Date	QA/QC	Volume	Analysis
OW5A	OW5A	29-Nov-07	12:50	30-Nov-07		(A)	(C)
OW5B	OW5B	29-Nov-07	13:00	30-Nov-07		(A)	(C)
OW6A	OW6A	29-Nov-07	12:30	30-Nov-07	MS/MSD	(B)	(C)
OW6B	OW6B	29-Nov-07	12:40	30-Nov-07		(A)	(C)
OW7A	OW7A	29-Nov-07	13:10	30-Nov-07		(A)	(C)
OW7B	OW7B	29-Nov-07	13:20	30-Nov-07		(A)	(C)
OW8A	OW8A	28-Nov-07	14:40	28-Nov-07		(A)	(C)
OW8B	OW8B	28-Nov-07	14:50	28-Nov-07		(A)	(C)
OW9A	OW9A	28-Nov-07	15:00	28-Nov-07		(A)	(C)
OW9B	OW9B	28-Nov-07	15:10	28-Nov-07		(A)	(C)
OW11	OW11	28-Nov-07	15:20	28-Nov-07		(A)	(C)
OW12	OW12	28-Nov-07	14:30	28-Nov-07		(A)	(C)
OW13	OW13	28-Nov-07	14:20	28-Nov-07		(A)	(C)
OW15A	OW15A	27-Nov-07	14:30	28-Nov-07		(A)	(C)
OW15B	OW15B	27-Nov-07	14:40	28-Nov-07	MS/MSD	(B)	(C)
OW16A	OW16A	27-Nov-07	14:50	28-Nov-07		(A)	(C)
OW16B	OW16B	27-Nov-07	15:00	28-Nov-07		(A)	(C)
OW17A	OW17A	27-Nov-07	15:10	28-Nov-07		(A)	(C)
OW17B	OW17B	27-Nov-07	15:20	28-Nov-07		(A)	(C)
OW18A	OW18A	27-Nov-07	15:30	28-Nov-07		(A)	(C)
OW18B	OW18B	27-Nov-07	15:40	28-Nov-07		(A)	(C)
OW19A	OW19A	27-Nov-07	15:50	28-Nov-07		(A)	(C)
OW19B	OW19B	27-Nov-07	16:00	28-Nov-07		(A)	(C)
OW20	OW20	27-Nov-07	16:10	28-Nov-07		(A)	(C)
OW21A	OW21A	27-Nov-07	16:20	28-Nov-07		(A)	(C)
OW21B	OW21B	27-Nov-07	16:30	28-Nov-07		(A)	(C)
OW22	OW22	27-Nov-07	16:40	28-Nov-07		(A)	(C)
WW1	WW1	30-Nov-07	12:15	30-Nov-07		(A)	(C)
PW1	PW1	30-Nov-07	NS				
PW2	PW2	30-Nov-07	12:35	30-Nov-07		(A)	(C)
PW3	PW3	30-Nov-07	12:45	30-Nov-07		(A)	(C)
PW4	PW4	30-Nov-07	12:55	30-Nov-07		(A)	(C)
CHA-3	OW7A	29-Nov-07	13:30	30-Nov-07	Duplicate	(A)	(C)
CHA-4	OW19A	27-Nov-07	16:50	28-Nov-07	Duplicate	(A)	(C)

Notes:

(A) = Volume: Two 40 mL w/ preservative HCL, two 1 L amber w/no preservatives
(B) =Volume: Six 40 mL w/preservative HCL, six 1 L amber w/ no preservatives
(C) = Analyses: VOCs, SVOCs
QA/QC = Quality Assurance/Quality Control
NS: No sample due to pump not operating

TABLE 5
WELL DETAIL SUMMARY

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Well Location	Date Completed (D/M/Y)	Ground Elevation (ft. AMSL)	Total Depth (ft bgs)	Screened Interval ft bgs	Hydraulic Conductivity (cm/sec)
OW15A	10/23/2007	320.35	20.0	10.0 - 20.0	2.23E-05
OW15B	10/22/2007	320.26	40.0	30.0 - 40.0	3.28E-04
OW16A	10/23/2007	305.43	18.0	8.0 - 18.0	2.54E-04
OW16B	10/31/2007	305.43	38.0	28.0 - 38.0	3.39E-04
OW17A	10/31/2007	305.32	18.0	8.0 - 18.0	NM
OW17B	11/1/2007	305.19	33.0	23.0 - 33.0	4.31E-04
OW18A	10/25/2007	304.18	30.0	20.0 - 30.0	9.05E-05
OW18B	11/6/2007	304.43	45.0	35.0 - 45.0	6.85E-05
OW19A	10/30/2007	302.76	27.0	17.0 - 27.0	2.21E-04
OW19B	11/6/2007	302.76	50.0	40.0 - 50.0	1.25E-04
OW20	10/30/2007	305.74	18.0	8.0 - 18.0	2.58E-04
OW21A	10/29/2007	303.53	18.0	8.0 - 18.0	1.58E-04
OW21B	11/2/2007	303.67	33.0	23.0 - 33.0	1.46E-04
OW22	10/25/2007	302.62	18.5	8.5 - 18.5	1.26E-04

Notes:
NM = Not measured

TABLE 6
SUMMARY OF GROUNDWATER ELEVATION DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Well / Location ID	*Reference Elevation TOC (ft)*	*Groundwater Elevation 11/26/2007*
WW1	292.96	264.16
PW1	290.68	270.48
PW2	290.66	272.36
PW3	302.83	284.93
PW4	303.73	288.06
OW5A-92	293.48	280.72
OW5B-92	292.08	275.99
OW6A-92	297.48	283.20
OW6B-92	298.01	278.30
OW7A-92	292.09	270.54
OW7B-92	291.61	273.51
OW8A-92	288.73	271.61
OW8B-92	289.11	272.31
OW9A-94	288.90	283.76
OW9B-94	288.30	273.87
OW11-94	293.90	284.30
OW12-94	332.10	312.68
OW13-94	303.50	294.12
EW2	303.37	293.92
OW15A-07*	323.34	308.14
OW15B-07*	323.37	295.47
OW16A-07*	307.37	293.72
OW16B-07*	307.17	288.69
OW17A-07*	307.33	294.13
OW17B-07*	307.97	288.58
OW18A-07*	307.03	286.13
OW18B-07*	307.65	281.05
OW19A-07*	305.8	288.80
OW19B-07*	305.65	276.45
OW20-07*	304.59	287.09
OW21A-07*	305.37	288.72
OW21B-07*	306.28	286.53
OW22-07*	307.59	294.74

Notes:

*Elevations based on record mapping provided by CRA.

TABLE 7
RAPID FIELD CHARACTERIZATION METHOD ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

			Parameter	***Benzene***	***Toluene***	***Chlorobenzene***	***Ethylbenzene***	***Total Xylene***	***Phenol***	***Total Cresol [3]***
			Part 375 Unrestricted Use SCOs [2]	60	700	1,100	1,000	260	330	330
Sampling Location:	***Sample Identification:***	***Sampling Date:***	***Depth Interval (ft. bgs):***							
B-37-07	000039	10/26/07	2 to 4	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	**9,000**
B-37-07	001136	10/26/07	8 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
B-37-07	001175	10/26/07	10 to 12	**2,800**	2900 U	3300 U	2300 U	4200 U	**28,300**	**201,400**
GP-01-07	000089	10/10/07	22 to 23	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-01-07	000138	10/10/07	9.5 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	**13,500**	3400 U
GP-08-07	000099	10/11/07	4 to 5.5	1600 U	2900 U	3300 U	**8,200**	4200 U	4700 U	3400 U
GP-08-07	000119	10/11/07	5 to 6	1600 U	2900 U	**6,000**	**17,800**	**83,100**	**8,200**	**8,600**
GP-09-07	000129	10/15/07	3 to 3.7	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-09-07	000126	10/15/07	7.7 to 8.3	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-09-07	000134	10/15/07	9 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-09-07	000143	10/15/07	11	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-12-07	000174	10/15/07	2	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-12-07	000164	10/15/07	5 to 5.5	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-14-07	000114	10/12/07	5	1600 U	2900 U	3300 U	**6,700**	**34,700**	**5,300**	**5,900**
GP-14-07	000160	10/12/07	6.9 to 7.3	1600 U	**8,400**	**5,800**	**16,600**	**100,500**	**20,600**	**63,400**
GP-16-07	000135	10/12/07	5	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-16-07	000147	10/12/07	9 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-17-07	000133	10/12/07	4 to 5.5	1600 U	2900 U	3300 U	2300 U	**31,100**	4700 U	3400 U
GP-17-07	000087	10/12/07	10 to 10.7	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-17-07	000091	10/12/07	19 to 20	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-18-07	000142	10/12/07	2	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-18-07	000090	10/12/07	7	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-18-07	000130	10/12/07	11 to 13	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-19-07	000085	10/11/07	2	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-19-07	000132	10/11/07	5	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-19-07	000120	10/11/07	8	1600 U	2900 U	**15,900**	2300 U	**5,200**	4700 U	3400 U
GP-19-07	000139	10/11/07	10 to 11	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-23-07	000144	10/11/07	0.8 to 1.3	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-23-07	000137	10/11/07	4.5 to 5	1600 U	2900 U	**8,800**	**5,200**	**2,800 J**	**8,100**	**37,000**
GP-23-07	000145	10/11/07	6 to 7	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	**3,200 J**
GP-23-07	000141	10/11/07	9.3 to 10	1600 U	**2,800 J**	3300 U	**3,900**	4200 U	**4,500 J**	**10,900**
GP-24-07	000163	10/11/07	8	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-29-07	000092	10/15/07	0.7 to 1.5	1600 U	**1,277,400**	3300 U	**371,000**	**1,315,900**	**88,500**	**359,200**
GP-29-07	000051	10/15/07	3 to 4	1600 U	**207,100**	**207,100**	**68,800**	**182,600**	**26,600**	**140,800**
GP-29-07	000095	10/15/07	9 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-33-07	000074	10/15/07	3 to 3.4	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-33-07	000075	10/15/07	10 to 11	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
GP-33-07	000038	10/15/07	16.5 to 17	1600 U	**22,100**	**7,900**	57,900	419,700	58,800	33,700
OW15A/B-04	000096	10/22/07	2 to 4	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW15A/B-05	000048	10/22/07	6 to 8	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW15A/B-06	000097	10/22/07	10 to 12	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW16A/B-07	000066	10/23/07	6 to 8	1600 U	2900 U	3300 U	2300 U	4200 U	**8,100**	**6,900**
OW16A/B-07	000042	10/23/07	8 to 10	1600 U	2900 U	3300 U	**35,700**	**13,600**	**6,800**	**17,700**
OW16A/B-07	000071	10/23/07	10 to 12	1600 U	**19,800**	3300 U	**24,700**	**27,900**	4700 U	3400 U
OW17A/B-07	000094	10/24/07	2 to 4	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW17A/B-07	000110	10/24/07	6 to 8	1600 U	**7,800**	3300 U	2300 U	4200 U	4700 U	3400 U
OW17A/B-07	000072	10/24/07	8 to 10	1600 U	**214,900**	**21,700**	**174,500**	**22,000**	**42,700**	**24,700**
OW17A/B-07	000069	10/24/07	10 to 12	1600 U	**2,100**	**6,900**	**15,300**	**39,400**	**4400 J**	**7,600**
OW18A/B-07	000041	10/25/07	4 to 6	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW18A/B-07	000047	10/25/07	10 to 12	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	**1,300 J**
OW18A/B-07	000084	10/25/07	16 to 18	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW18A/B-07	000064	10/25/07	20 to 22	1600 U	**3,700**	**7,300**	**4,500**	4200 U	**5,400**	**17,700**
OW19A/B-07	001653	10/30/07	6 to 8	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW19A/B-07	001134	10/30/07	10 to 12	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW19A/B-07	001139	10/30/07	14 to 16	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW19A/B-07	001140	10/30/07	18 to 20	**13,600**	**105,300**	**23,000**	**85,700**	**712,800**	**257,000**	**181,900**
OW19A/B-07	001138	10/30/07	20 to 22	**66,300**	**185,500**	**16,900**	**246,500**	**2,340,000**	**143,000**	**57,900**
OW20-07	001208	10/29/07	2 to 4	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW20-07	001213	10/29/07	4 to 6	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW20-07	001185	10/29/07	6 to 8	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW20-07	001184	10/29/07	8 to 10	1600 U	**9,700**	3300 U	**14,000**	**85,900**	4700 U	**10,700**
OW21A/B-07	001135	10/29/07	2 to 5	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW21A/B-07	001135	10/29/07	2 to 5	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW21A/B-07	001141	10/29/07	4 to 6	1600 U	2900 U	3300 U	2300 U	**17,000**	**47,600**	**244,700**
OW21A/B-07	001230	10/29/07	6 to 8	1600 U	**3,400**	3300 U	2300 U	**19,200**	**51,800**	**40,900**
OW21A/B-07	001225	10/29/07	8 to 10	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	**15,500**
OW22-07	000088	10/24/07	4 to 6	1600 U	2900 U	3300 U	2300 U	4200 U	4700 U	3400 U
OW22-07	000076	10/24/07	10 to 12	1600 U	**7,200**	3300 U	**259,800**	**917,100**	**3,800 J**	3400 U
OW22-07	000086	10/24/07	8 to 10	1600 U	**5,900**	**3,200 J**	**198,000**	**698,400**	**2,700**	3400 U

NOTES:
1. Units are shown as µg/Kg
2. 6 NYCRR Part 375 (Table 375--6.8[a]) for Unrestricted Use Soil Cleanup Objectives
3. Guidance value based on Part 375 Unrestricted Use SCO for 2-Methylphenol and 4-Methylphenol.
U - The compound was not detected at the indicated concentration.
J - Associated value is estimated.
Values in **BOLD** are compounds detected at concentrations exceeding Part 375 Soil Cleanup Objectives for Unrestricted Use.

TABLE 8
SOIL ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

PARAMETER	***UNITS***	***Part 375 Unrestricted Use SCOs***	GP-01-07	GP-08-07	GP-09-07	GP-14-07	GP-16-07	GP-17-07	GP-18-07	GP-18-07	GP-18-07	GP-19-07	GP-19-07	GP-23-07	GP-29-07
		Sampling Location	GP-01-07	GP-08-07	GP-09-07	GP-14-07	GP-16-07	GP-17-07	GP-18-07	GP-18-07	GP-18-07	GP-19-07	GP-19-07	GP-23-07	GP-29-07
		Sample Identification	S-101007-SDN-001	S-101107-SDN-003	S-101507-SDN-017	S-101207-SDN-015	S-101207-SDN-018	S-101207-SDN-014	S-101207-SDN-011	S-101207-SDN-012	S-101207-SDN-013	S-101107-SDN-008	S-101107-SDN-010	S-101107-SDN-005	S-101507-SDN-023
		Sample Date	10/10/2007	10/11/2007	10/15/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/11/2007	10/11/2007	10/11/2007	10/15/2007
		Sample Start Depth	22	5	9	6.9	9	19	7	11	11	5	10	6	3
		Sample End Depth	23	6	10	7.3	10	20	7	13	13	5	11	7	4
VOCs															
1,1,1-Trichloroethane	ug/kg	680	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,1,2,2-Tetrachloroethane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,1,2-Trichloroethane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,1-Dichloroethane	ug/kg	270	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,1-Dichloroethene	ug/kg	330	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,2-Dichloroethane	ug/kg	20	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
1,2-Dichloropropane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
2-Butanone	ug/kg	120	12 U	1300 U	14 U	2500 U	12 U	9.9 J	12 U	13 U	14 U	13 U	13 U	13 U	13000 U
2-Hexanone	ug/kg	NA	12 U	1300 U	14 U	2500 U	12 U	13 U	12 U	13 U	14 U	13 U	13 U	13 U	13000 U
4-Methyl-2-Pentanone	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Acetone	ug/kg	50	22 U	3300 U	9.1 J	**28000 J**	28 J	95 U	25 U	37 U	30 U	22 U	30 U	35 U	32000 U
Benzene	ug/kg	60	6.1 U	1300 U	6.8 U	**890 J**	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Bromodichloromethane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Bromoform	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Bromomethane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 UR	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 UR	13000 U
Carbon Disulfide	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	1.5 J	6.4 U	13000 U
Carbon Tetrachloride	ug/kg	760	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Chlorobenzene	ug/kg	1100	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Chlorodibromomethane	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Chloroethane	ug/kg	370	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Chloroform	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Chloromethane	ug/kg	250	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Cis-1,2-Dichloroethene	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Cis-1,3-Dichloropropene	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Ethylbenzene	ug/kg	1000	6.1 U	**13000**	6.8 U	**14000**	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	64	76	**54000**
Methylene Chloride	ug/kg	50	8.1 U	1300 U	2.6 U	2500 U	3.3 U	20 U	11 U	11 U	14 U	5.9 U	7 U	6.5 U	13000 U
Styrene	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Tetrachloroethene	ug/kg	1300	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Toluene	ug/kg	700	6.1 U	1300 U	6.8 U	**2000 J**	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	**240000**
Total Xylenes	ug/kg	260	6.1 U	**83000**	6.8 U	**100000**	17	6.6 U	6 U	6.6 U	6.8 U	6.4 U	210	12	**150000**
Trans-1,2-Dichloroethene	ug/kg	190	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Trans-1,3-Dichloropropene	ug/kg	NA	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Trichloroethylene	ug/kg	470	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
Vinyl Chloride	ug/kg	20	6.1 U	1300 U	6.8 U	2500 U	5.9 U	6.6 U	6 U	6.6 U	6.8 U	6.4 U	6.7 U	6.4 U	13000 U
SVOCs															
1,2,4-Trichlorobenzene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
1,2-Dichlorobenzene	ug/kg	1100	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
1,3-Dichlorobenzene	ug/kg	2400	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
1,4-Dichlorobenzene	ug/kg	1800	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2,2'-oxybis[1-chloropropane]	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2,4- Dichlorophenol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2,4,5-Trichlorophenol	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
2,4,6-Trichlorophenol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2,4-Dimethylphenol	ug/kg	NA	390 U	430 U	450 U	200000	120 J	580 J	390 U	430 U	440 U	400 U	440 U	420 U	28000
2,4-Dinitrophenol	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
2,4-Dinitrotoluene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2,6-Dinitrotoluene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2-Chloronaphthalene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2-Chlorophenol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
2-Methylnaphthalene	ug/kg	NA	390 U	4400	450 U	17000 J	73 J	750 J	390 U	430 U	440 U	400 U	440 U	130 J	63000
2-Methylphenol	ug/kg	330	390 U	430 U	450 U	**18000 J**	370 U	1700 U	390 U	430 U	440 U	110 J	440 U	420 U	20000 U
2-Nitroaniline	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
2-Nitrophenol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
3,3`-Dichlorobenzidine	ug/kg	NA	780 U	850 U	890 U	82000 U	750 U	3400 U	780 U	870 U	870 U	800 U	880 U	850 U	41000 U
3-Nitroaniline	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
4,6-Dinitro-2-Methylphenol	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
4-Bromophenyl Phenyl Ether	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
4-Chloro-3-Methylphenol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
		0													

TABLE 8
SOIL ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	GP-01-07	GP-08-07	GP-09-07	GP-14-07	GP-16-07	GP-17-07	GP-18-07	GP-18-07	GP-18-07	GP-19-07	GP-19-07	GP-23-07	GP-29-07
		Sample Identification	S-101007-SDN-001	S-101107-SDN-003	S-101507-SDN-017	S-101207-SDN-015	S-101207-SDN-018	S-101207-SDN-014	S-101207-SDN-011	S-101207-SDN-012	S-101207-SDN-013	S-101107-SDN-008	S-101107-SDN-010	S-101107-SDN-005	S-101507-SDN-023
		Sample Date	10/10/2007	10/11/2007	10/15/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/12/2007	10/11/2007	10/11/2007	10/11/2007	10/15/2007
		Sample Start Depth	22	5	9	6.9	9	19	7	11	11	5	10	6	3
		Sample End Depth	23	6	10	7.3	10	20	7	13	13	5	11	7	4
PARAMETER	***UNITS***	***Part 375 Unrestricted Use SCOs***													
SVOCs, con't		0													
4-Chloroaniline	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
4-Chlorophenyl Phenylether	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
4-Methylphenol	ug/kg	330	390 U	430 U	450 U	**130000**	57 J	**1900**	390 U	430 U	440 U	250 J	440 U	420 U	20000 U
4-Nitroaniline	ug/kg	NA	780 U	850 U	890 U	82000 U	750 U	3400 U	780 U	870 U	870 U	800 U	880 U	850 U	41000 U
4-Nitrophenol	ug/kg	NA	1900 U	2100 U	2200 U	200000 U	1800 U	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
Acenaphthene	ug/kg	20000	390 U	270 J	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	410 J	20000 U
Acenaphthylene	ug/kg	100000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Anthracene	ug/kg	100000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzo(A)Anthracene	ug/kg	1000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzo(A)Pyrene	ug/kg	1000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzo(B)Fluoranthene	ug/kg	1000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzo(G,H,I)Perylene	ug/kg	100000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzo(K)Fluoranthene	ug/kg	800	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Benzyl Alcohol	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Bis(2-Chloroethoxy) Methane	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Bis(2-Chloroethyl) Ether	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Bis(2-Ethylhexyl) Phthalate	ug/kg	NA	390 U	130 J	450 U	41000 U	190 U	1700 U	390 U	430 U	440 U	55 J	440 U	420 U	20000 U
Butyl Benzyl Phthalate	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Carbazole	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Chrysene	ug/kg	1000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Dibenzo(A,H)Anthracene	ug/kg	330	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Dibenzofuran	ug/kg	7000	390 U	370 J	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	330 J	20000 U
Diethylphthalate	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Dimethylphthalate	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Di-N-Butylphthalate	ug/kg	NA	390 U	430 U	450 U	11000 J	370 U	350 J	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Di-N-Octyl Phthalate	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Fluoranthene	ug/kg	100000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Fluorene	ug/kg	30000	390 U	250 J	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	340 J	20000 U
Hexachlorobenzene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Hexachlorobutadiene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Hexachlorocyclopentadiene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Hexachloroethane	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Indeno(1,2,3-Cd)Pyrene	ug/kg	500	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Isophorone	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Naphthalene	ug/kg	12000	390 U	5300	450 U	**53000**	93 J	730 J	390 U	430 U	440 U	400 U	440 U	340 J	**180000**
Nitrobenzene	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
N-Nitroso-Di-N-Propylamine	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
N-Nitrosodiphenylamine	ug/kg	NA	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Pentachlorophenol	ug/kg	800	1900 U	2100 U	2200 U	200000 U	42 J	8300 U	1900 U	2100 U	2100 U	1900 U	2100 U	2000 U	99000 U
Phenanthrene	ug/kg	100000	390 U	130 J	450 U	41000 U	370 U	470 J	390 U	430 U	440 U	400 U	440 U	280 J	20000 U
Phenol	ug/kg	330	390 U	430 U	450 U	**6200 J**	120 J	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U
Pyrene	ug/kg	100000	390 U	430 U	450 U	41000 U	370 U	1700 U	390 U	430 U	440 U	400 U	440 U	420 U	20000 U

NOTES:
1. Units are shown as µg/Kg
2. 6 NYCRR Part 375 (Table 375--6.8(a)) for Unrestricted Use Soil Cleanup Objectives

U - The compound was not detected at the indicated concentration.
J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.
R - Data qualified as unusable based on validation guidance criteria. The rejected data may be determined to be usable to the user based on additional information that is not contained in the data validation criteria.
M - Manually integrated compound.
NA - Guidance value not available
NR - Not analyzed
BOLD values exceed Part 375 SCO for Unrestricted Use

TABLE 8
SOIL ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	GP-33-07	GP-33-07	OW15A/B-06	OW16A/B-07	OW17A/B-07	OW18A/B-07	OW19A/B-07	OW20-07	OW21A/B-07	OW21A/B-07_D	OW22-07
		Sample Identification	S-101507-SDN-026	S-101507-SDN-027	S-102207-SDN-028	S-102307-SDN-029	S-102407-SDN-030	S-102507-SDN-032	S-103007-SDN-036	S-102907-SDN-035	S-102907-SDN-033	S-102907-SDN-034	S-102407-SDN-031
		Sample Date	10/15/2007	10/15/2007	10/22/2007	10/23/2007	10/24/2007	10/25/2007	10/30/2007	10/29/2007	10/29/2007	10/29/2007	10/24/2007
		Sample Start Depth	10	16.5	10	10	10	20	6	2	2	2	8
		Sample End Depth	11	17	12	12	12	22	8	4	5	5	10
PARAMETER	***UNITS***	***Part 375 Unrestricted Use SCOs***											
VOCs													
1,1,1-Trichloroethane	ug/kg	680	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,1,2,2-Tetrachloroethane	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,1,2-Trichloroethane	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,1-Dichloroethane	ug/kg	270	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,1-Dichloroethene	ug/kg	330	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,2-Dichloroethane	ug/kg	20	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
1,2-Dichloropropane	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
2-Butanone	ug/kg	120	7.9 J	6500 U	13 U	1500 U	1300 U	27	12 U	12 U	620 U	610 U	12000 U
2-Hexanone	ug/kg	NA	12 U	6500 U	13 U	1500 U	1300 U	13 U	12 U	12 U	620 U	610 U	12000 U
4-Methyl-2-Pentanone	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Acetone	ug/kg	50	**62 J**	**8400 J**	26 U	3600 U	3300 U	**61**	**75**	24 U	1500 U	1500 U	30000 U
Benzene	ug/kg	60	6 U	**780 J**	6.4 U	1500 U	1300 U	3.1 J	6.2 U	6.1 U	620 U	610 U	12000 U
Bromodichloromethane	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Bromoform	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Bromomethane	ug/kg	NA	6 U	6500 UR	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Carbon Disulfide	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	1 J	6.2 U	6.1 U	620 U	610 U	12000 U
Carbon Tetrachloride	ug/kg	760	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Chlorobenzene	ug/kg	1100	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Chlorodibromomethane	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Chloroethane	ug/kg	370	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Chloroform	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Chloromethane	ug/kg	250	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Cis-1,2-Dichloroethene	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Cis-1,3-Dichloropropene	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Ethylbenzene	ug/kg	1000	6 U	**81000**	6.4 U	**28000**	**25000**	160	2.3 J	6.1 U	250 J	310 J	**190000**
Methylene Chloride	ug/kg	50	8.3 U	6500 U	4.2 J	**220 J**	1300 U	7.7 J	9.7 U	4.8 U	620 U	610 U	12000 U
Styrene	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Tetrachloroethene	ug/kg	1300	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Toluene	ug/kg	700	6 U	**130000**	6.4 U	**12000**	1300 U	3.1 U	6.2 U	6.1 U	620 U	610 U	**2300 J**
Total Xylenes	ug/kg	260	6 U	**710000**	6.4 U	**120000**	**84000**	**330**	20	6.1 U	**5100**	**5700**	**700000**
Trans-1,2-Dichloroethene	ug/kg	190	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Trans-1,3-Dichloropropene	ug/kg	NA	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Trichloroethylene	ug/kg	470	6 U	6500 U	6.4 U	1500 U	**490 J**	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
Vinyl Chloride	ug/kg	20	6 U	6500 U	6.4 U	1500 U	1300 U	6.4 U	6.2 U	6.1 U	620 U	610 U	12000 U
SVOCs													
1,2,4-Trichlorobenzene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
1,2-Dichlorobenzene	ug/kg	1100	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
1,3-Dichlorobenzene	ug/kg	2400	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
1,4-Dichlorobenzene	ug/kg	1800	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2,2'-oxybis[1-chloropropane]	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2,4- Dichlorophenol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2,4,5-Trichlorophenol	ug/kg	NA	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
2,4,6-Trichlorophenol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2,4-Dimethylphenol	ug/kg	NA	390 U	1300000	400 U	200 J	8600 U	2100 U	410 U	220 J	810 U	3900 U	400
2,4-Dinitrophenol	ug/kg	NA	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
2,4-Dinitrotoluene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2,6-Dinitrotoluene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2-Chloronaphthalene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2-Chlorophenol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
2-Methylnaphthalene	ug/kg	NA	390 U	83000 U	400 U	780	22000	10000	78 J	2800	1400 J	4000 J	98 J
2-Methylphenol	ug/kg	330	390 U	**100000**	400 U	480 U	8600 U	2100 U	410 U	250 J	810 U	3900 U	400 U
2-Nitroaniline	ug/kg	NA	1900 U	130000 J	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
2-Nitrophenol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
3,3`-Dichlorobenzidine	ug/kg	NA	790 U	170000 U	800 U	960 U	17000 U	4200 U	820 U	790 U	1600 U	7700 U	800 U
3-Nitroaniline	ug/kg	NA	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
4,6-Dinitro-2-Methylphenol	ug/kg	NA	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
4-Bromophenyl Phenyl Ether	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
4-Chloro-3-Methylphenol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
		0											

TABLE 8
SOIL ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

PARAMETER	***UNITS***	***Part 375 Unrestricted Use SCOs***	GP-33-07	GP-33-07	OW15A/B-06	OW16A/B-07	OW17A/B-07	OW18A/B-07	OW19A/B-07	OW20-07	OW21A/B-07	OW21A/B-07_D	OW22-07
		Sample Identification	S-101507-SDN-026	S-101507-SDN-027	S-102207-SDN-028	S-102307-SDN-029	S-102407-SDN-030	S-102507-SDN-032	S-103007-SDN-036	S-102907-SDN-035	S-102907-SDN-033	S-102907-SDN-034	S-102407-SDN-031
		Sample Date	10/15/2007	10/15/2007	10/22/2007	10/23/2007	10/24/2007	10/25/2007	10/30/2007	10/29/2007	10/29/2007	10/29/2007	10/24/2007
		Sample Start Depth	10	16.5	10	10	10	20	6	2	2	2	8
		Sample End Depth	11	17	12	12	12	22	8	4	5	5	10
SVOCs, con't		0											
4-Chloroaniline	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
4-Chlorophenyl Phenylether	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
4-Methylphenol	ug/kg	330	390 U	**580000**	400 U	480 U	8600 U	2100 U	70 J	**1300**	810 U	3900 U	400 U
4-Nitroaniline	ug/kg	NA	790 U	170000 U	800 U	960 U	17000 U	5900	820 U	790 U	1600 U	7700 U	800 U
4-Nitrophenol	ug/kg	NA	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
Acenaphthene	ug/kg	20000	390 U	83000 U	400 U	480 U	1900 J	3700	410 U	920	810 U	3900 U	400 U
Acenaphthylene	ug/kg	100000	390 U	83000 U	400 U	480 U	8600 U	1400 J	410 U	180 J	810 U	3900 U	400 U
Anthracene	ug/kg	100000	390 UM	83000 U	160 J	480 U	8600 UM	2000 J	410 UM	110 J	810 U	3900 U	400 U
Benzo(A)Anthracene	ug/kg	1000	120 J	83000 U	450	480 U	8600 U	**6100**	150 J	190 J	810 U	3900 U	400 U
Benzo(A)Pyrene	ug/kg	1000	96 J	83000 U	320 J	480 U	8600 U	**4100**	140 J	150 J	120 J	3900 U	400 U
Benzo(B)Fluoranthene	ug/kg	1000	130 J	83000 U	390 J	480 U	8600 U	**7100**	180 J	270 J	230 J	3900 U	400 U
Benzo(G,H,I)Perylene	ug/kg	100000	79 J	83000 U	280 J	480 U	8600 U	5600	110 J	180 J	180 J	3900 U	400 U
Benzo(K)Fluoranthene	ug/kg	800	390 U	83000 U	150 J	480 U	8600 U	**2800**	410 UM	78 J	810 UM	3900 U	400 U
Benzyl Alcohol	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Bis(2-Chloroethoxy) Methane	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Bis(2-Chloroethyl) Ether	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Bis(2-Ethylhexyl) Phthalate	ug/kg	NA	82 J	33000 JB	99 U	480 U	8600 U	940 J	190 U	220 U	340 U	3900 U	200 J
Butyl Benzyl Phthalate	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Carbazole	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	720 J	410 U	400 U	810 U	3900 U	400 U
Chrysene	ug/kg	1000	130 J	83000 U	400 J	480 U	8600 U	**6600**	190 J	300 J	810 U	3900 U	400 U
Dibenzo(A,H)Anthracene	ug/kg	330	390 U	83000 U	72 J	480 U	8600 U	**2300**	210 J	220 J	810 U	3900 U	400 U
Dibenzofuran	ug/kg	7000	390 U	83000 U	400 U	480 U	1900 J	4100	410 U	1000	810 U	3900 U	400 U
Diethylphthalate	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Dimethylphthalate	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Di-N-Butylphthalate	ug/kg	NA	390 U	83000 U	400 U	480 U	120000	2100 U	410 U	920	810 U	3900 U	400 U
Di-N-Octyl Phthalate	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Fluoranthene	ug/kg	100000	250 J	83000 U	870	480 U	8600 U	15000	240 U	360 U	140 U	3900 U	400 U
Fluorene	ug/kg	30000	390 U	83000 U	84 J	480 U	1700 J	3300	410 U	140 J	810 U	3900 U	400 U
Hexachlorobenzene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Hexachlorobutadiene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Hexachlorocyclopentadiene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Hexachloroethane	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Indeno(1,2,3-Cd)Pyrene	ug/kg	500	74 J	83000 U	290 J	480 U	8600 U	**7000**	330 U	370 U	590 U	3900 U	400 U
Isophorone	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Naphthalene	ug/kg	12000	390 U	**19000 J**	400 U	1300	**21000**	9500	86 J	2400	9900 J	**25000 J**	220 J
Nitrobenzene	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
N-Nitroso-Di-N-Propylamine	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
N-Nitrosodiphenylamine	ug/kg	NA	390 U	83000 U	400 U	480 U	8600 U	2100 U	410 U	400 U	810 U	3900 U	400 U
Pentachlorophenol	ug/kg	800	1900 U	400000 U	2000 U	2300 U	42000 U	10000 U	2000 U	1900 U	3900 U	19000 U	1900 U
Phenanthrene	ug/kg	100000	170 J	83000 U	830	480 U	2800 J	8200	210 J	500	810 U	3900 U	400 U
Phenol	ug/kg	330	390 U	**210000**	400 U	480 U	8600 U	**910 J**	410 U	**510**	810 U	3900 U	**620**
Pyrene	ug/kg	100000	240 J	83000 U	930	480 U	8600 U	13000	270 U	360 JB	120 U	3900 U	400 U

NOTES:
1. Units are shown as µg/Kg
2. 6 NYCRR Part 375 (Table 375--6.8(a)) for Unrestricted Use Soil Cleanup Objectives
U - The compound was not detected at the indicated concentration.
J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.
R - Data qualified as unusable based on validation guidance criteria. The rejected data may be determined to be usable to the user based on additional information that is not contained in the data validation criteria.
M - Manually integrated compound.
NA - Guidance value not available
NR - Not analyzed
BOLD values exceed Part 375 SCO for Unrestricted Use

TABLE 9
GEOPROBE WATER SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	**GP-01-07**	**GP-08-07**	**GP-09-07**	**GP-12-07**	**GP-12-07**	**GP-14-07**	**GP-16-07**	**GP-19-07**	**GP-23-07**	**GP-24-07**	**GP-29-07**	**GP-29-07**
		Sample Identification	**GW-101007-SDN-002**	**GW-101107-SDN-004**	**GW-101507-SDN-020**	**GW-101507-SDN-021**	**GW-101507-SDN-022**	**GW-101207-SDN-016**	**GW-101207-SDN-019**	**GW-101107-SDN-009**	**GW-101107-SDN-006**	**GW-101107-SDN-007**	**GW-101507-SDN-024**	**GW-101507-SDN-025**
		Sample Date	**10/10/2007**	**10/11/2007**	**10/15/2007**	**10/15/2007**	**10/15/2007**	**10/12/2007**	**10/12/2007**	**10/11/2007**	**10/11/2007**	**10/11/2007**	**10/15/2007**	**10/15/2007**
		Sample Start Depth	**26**	**22**	**15**	**28**	**33**	**19**	**13**	**10**	**23**	**28**	**30**	**30**
		Sample End Depth	**28**	**24**	**17**	**30**	**35**	**20**	**15**	**11**	**25**	**30**	**32**	**32**
PARAMETER	***Units***	***TOGS 1.1.1 Guidance Value***												
Volatiles														
1,1,1-Trichloroethane	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	1	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	0.6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	1	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	µg/L	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	7.6 J	10 U	10 U	10 U	4.1 U	3.3 U	3.2 U
Benzene	µg/L	1	5 U	5 U	5 U	5 U	5 U	**7.2**	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	50[2]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	50[2]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 UR	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	µg/L	NA	5 U	5 U	5 U	5 U	5 U	5 U	0.97 JM	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorodibromomethane	µg/L	50[2]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	µg/L	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	µg/L	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cis-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cis-1,3-Dichloropropene	µg/L	0.4	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5	5 U	5 U	5 U	5 U	5 U	**23**	**26**	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 UM	0.33 U	5 U	5 U
Styrene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5	5 U	5 U	5 U	5 U	5 U	**6.3**	0.77 J	5 U	5 U	5 U	0.87 J	2.4 J
Total Xylenes	µg/L	5	5 U	5 U	5 U	5 U	5 U	**200**	**120**	5 U	5 U	5 U	5 U	5 U
Trans-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trans-1,3-Dichloropropene	µg/L	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethylene	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	2	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SVOCs														
1,2,4-Trichlorobenzene	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
1,2-Dichlorobenzene	µg/L	3	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
1,3-Dichlorobenzene	µg/L	3	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
1,4-Dichlorobenzene	µg/L	3	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2,2'-oxybis[1-chloropropane]	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2,4- Dichlorophenol	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2,4,5-Trichlorophenol	µg/L	1	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
2,4,6-Trichlorophenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2,4-Dimethylphenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	**610**	**34**	13 U	14 U	15 U	11 U	11 U
2,4-Dinitrophenol	µg/L	1[3]	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
2,4-Dinitrotoluene	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2,6-Dinitrotoluene	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2-Chloronaphthalene	µg/L	10[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2-Chlorophenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
2-Methylnaphthalene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	**2.2 J**	13 U	14 U	15 U	11 U	11 U
2-Methylphenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	**88 J**	**9.5 J**	13 U	14 U	15 U	11 U	11 U
2-Nitroaniline	µg/L	5	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
2-Nitrophenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
3,3`-Dichlorobenzidine	µg/L	5	12 U	17 U	10 UJ	10 UJ	10 UJ	100 U	11 U	13 U	14 U	15 U	11 UJ	11 UJ
3-Nitroaniline	µg/L	5	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
4,6-Dinitro-2-Methylphenol	µg/L	1[3]	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
4-Bromophenyl Phenyl Ether	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
4-Chloro-3-Methylphenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U

TABLE 9
GEOPROBE WATER SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	**GP-01-07**	**GP-08-07**	**GP-09-07**	**GP-12-07**	**GP-12-07**	**GP-14-07**	**GP-16-07**	**GP-19-07**	**GP-23-07**	**GP-24-07**	**GP-29-07**	**GP-29-07**
		Sample Identification	**GW-101007-SDN-002**	**GW-101107-SDN-004**	**GW-101507-SDN-020**	**GW-101507-SDN-021**	**GW-101507-SDN-022**	**GW-101207-SDN-016**	**GW-101207-SDN-019**	**GW-101107-SDN-009**	**GW-101107-SDN-006**	**GW-101107-SDN-007**	**GW-101507-SDN-024**	**GW-101507-SDN-025**
		Sample Date	**10/10/2007**	**10/11/2007**	**10/15/2007**	**10/15/2007**	**10/15/2007**	**10/12/2007**	**10/12/2007**	**10/11/2007**	**10/11/2007**	**10/11/2007**	**10/15/2007**	**10/15/2007**
		Sample Start Depth	**26**	**22**	**15**	**28**	**33**	**19**	**13**	**10**	**23**	**28**	**30**	**30**
		Sample End Depth	**28**	**24**	**17**	**30**	**35**	**20**	**15**	**11**	**25**	**30**	**32**	**32**
PARAMETER	***Units***	***TOGS 1.1.1 Guidance Value***												
SVOCs, con't														
4-Chloroaniline	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
4-Chlorophenyl Phenylether	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
4-Methylphenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	**730**	**44**	13 U	14 U	15 U	11 U	0.46 J
4-Nitroaniline	µg/L	5	24 U	34 U	20 U	20 U	20 U	210 U	22 U	25 U	29 U	31 U	22 U	22 U
4-Nitrophenol	µg/L	1[3]	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
Acenaphthene	µg/L	20[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Acenaphthylene	µg/L	20	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Anthracene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzo(A)Anthracene	µg/L	0.002[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzo(A)Pyrene	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzo(B)Fluoranthene	µg/L	0.002[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzo(G,H,I)Perylene	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzo(K)Fluoranthene	µg/L	0.002[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Benzyl Alcohol	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Bis(2-Chloroethoxy) Methane	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Bis(2-Chloroethyl) Ether	µg/L	1	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Bis(2-Ethylhexyl) Phthalate	µg/L	5	2.3 J	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Butyl Benzyl Phthalate	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Carbazole	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Chrysene	µg/L	0.002[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Dibenzo(A,H)Anthracene	µg/L	50	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Dibenzofuran	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Diethylphthalate	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Dimethylphthalate	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Di-N-Butylphthalate	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	38 J	11 U	13 U	14 U	15 U	11 U	11 U
Di-N-Octyl Phthalate	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Fluoranthene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Fluorene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Hexachlorobenzene	µg/L	0.04	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Hexachlorobutadiene	µg/L	0.5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Hexachlorocyclopentadiene	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Hexachloroethane	µg/L	5	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Indeno(1,2,3-Cd)Pyrene	µg/L	0.002[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Isophorone	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Naphthalene	µg/L	10	12 U	17 U	10 U	10 U	10 U	**10 J**	2.7 J	13 U	14 U	15 U	11 U	11 U
Nitrobenzene	µg/L	0.4	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
N-Nitroso-Di-N-Propylamine	µg/L	NA	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
N-Nitrosodiphenylamine	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Pentachlorophenol	µg/L	1[3]	61 U	85 U	50 U	50 U	50 U	520 U	56 U	63 U	71 U	77 U	56 U	56 U
Phenanthrene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U
Phenol	µg/L	1[3]	12 U	17 U	10 U	10 U	10 U	**29 J**	**7.6 J**	13 U	14 U	15 U	11 U	11 U
Pyrene	µg/L	50[2]	12 U	17 U	10 U	10 U	10 U	100 U	11 U	13 U	14 U	15 U	11 U	11 U

NOTES:
1. New York State Department of Environmental Conservation, Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1, October 1993 "Ambient Water Quality Standards and Guidance Values")
2. Indicates value is a guidance value rather than a standard.
3. Applies to sum of all phenolic compounds.
U - The compound was not detected at the indicated concentration.
J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value
M - Manually integrated compound.
NA - Guidance value not available
BOLD values are concentrations which exceed TOGS 1.1.1 Standard or Guidance Value for Class GA Groundwater.

TABLE 10
GROUNDWATER WELL SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	OW5A-92	OW5B-92	OW6A-92	OW6B-92	OW7A-92	OW7A-92	OW7B-92	OW8A-92	OW8B-92	OW9A-94	OW9B-94	WW1	PW1	PW2	PW3	PW4	OW11-94	OW12-94
		Sample Identification	OW5A	OW5B	OW6A	OW6B	OW7A	CHA-3	OW7B	OW-8A	OW-8B	OW-9A	OW-9B	WW1	PW1	PW2	PW3	PW4	OW-11	OW-12
		Sample Date	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/28/07	11/28/07	11/28/07	11/28/07	11/30/07	11/30/07	11/30/07	11/30/07	11/30/07	11/28/07	11/28/07
PARAMETER	***Units***	***TOGS 1.1.1 Guidance Value***																		
Volatiles																				
1,1,1-Trichloroethane	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	1	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	0.6	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	1	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
2-Butanone	µg/L	NA	10 U	10 U	10 U	10 U	100 U	100 U	10 U	10 U	10 U	10 U	10 U	20 U	NM	200 U	10 U	10 U	10 U	10 U
2-Hexanone	µg/L	50[2]	10 U	10 U	10 U	10 U	100 U	100 U	10 U	10 U	10 U	10 U	10 U	20 U	NM	200 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	µg/L	NA	10 U	10 U	10 U	10 U	100 U	100 U	10 U	10 U	10 U	10 U	10 U	20 U	NM	200 U	10 U	10 U	10 U	10 U
Acetone	µg/L	50[2]	10 U	10 U	10 U	10 U	100 U	100 U	10 U	10 U	10 U	10 U	10 U	20 U	NM	200 U	10 U	10 U	10 U	10 U
Benzene	µg/L	1	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	**2.2 J**	NM	**7.2 J**	**0.35 J**	**0.56 J**	**0.6 J**	5 U
Bromodichloromethane	µg/L	50[2]	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	50[2]	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Carbon Disulfide	µg/L	NA	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 UJ	5 UJ	5 U	5 U	5 U
Carbon Tetrachloride	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	**1.7 J**	5 U	5 U	5 U
Chlorodibromomethane	µg/L	50[2]	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Chloroform	µg/L	7	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	**2.1 J**
Chloromethane	µg/L	NA	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Cis-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Cis-1,3-Dichloropropene	µg/L	0.4	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5	5 U	5 U	5 U	5 UM	**1000**	**1000**	5 U	5 U	5 U	5 U	5 U	**350**	NM	**1100**	5 U	**22**	**3.8 J**	5 U
Methylene Chloride	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	**140**	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5	5 U	5 U	5 U	5 U	**27 J**	**30 J**	5 U	5 U	5 U	5 U	5 U	**72**	NM	**7.6 J**	5 U	**2.8 J**	5 U	5 U
Total Xylenes	µg/L	5	5 U	5 U	5 U	**1.1 J**	**1800**	**1700**	5 U	5 U	5 U	5 U	5 U	**850**	NM	**4700**	**0.66 J**	**54**	**1.7 J**	5 U
Trans-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Trans-1,3-Dichloropropene	µg/L	NA	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Trichloroethylene	µg/L	5	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	2	5 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	10 U	NM	100 U	5 U	5 U	5 U	5 U
Semi-Volatiles																				
1,2,4-Trichlorobenzene	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
1,2-Dichlorobenzene	µg/L	3	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
1,3-Dichlorobenzene	µg/L	3	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
1,4-Dichlorobenzene	µg/L	3	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2,2'-oxybis[1-chloropropane]	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2,4- Dichlorophenol	µg/L	5	50 U	53 U	55 U	50 U	1100 U	500 UJ	53 U	10 U	10 U	10 UHJ	10 U	570 U	NM	2700 U	52 U	56 U	20 U	10 U
2,4,5-Trichlorophenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	52 U	50 U	50 UHJ	50 U	110 U	NM	540 U	10 U	11 U	100 U	50 U
2,4,6-Trichlorophenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2,4-Dimethylphenol	µg/L	1[3]	10 U	11 U	11 U	10 U	**45 JM**	**26 J**	11 U	10 U	10 U	10 UHJ	10 U	**340 M**	NM	540 U	10 U	**9.9 J**	**120**	10 U
2,4-Dinitrophenol	µg/L	1[3]	50 U	53 U	55 U	50 U	1100 U	500 UJ	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
2,4-Dinitrotoluene	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2,6-Dinitrotoluene	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2-Chloronaphthalene	µg/L	10[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2-Chlorophenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
2-Methylnaphthalene	µg/L	50[2]	10 U	11 U	11 U	10 U	**180 J**	**110**	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	**390 J**	10 U	11 U	20 U	10 U
2-Methylphenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	**51 J**	NM	540 U	10 U	11 U	20 U	10 U
2-Nitroaniline	µg/L	5	50 U	53 U	55 U	50 U	1100 U	500 U	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
2-Nitrophenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
3,3`-Dichlorobenzidine	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
3-Nitroaniline	µg/L	5	50 U	53 U	55 U	50 U	1100 U	500 U	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
4,6-Dinitro-2-Methylphenol	µg/L	1[3]	50 U	53 U	55 U	50 U	1100 U	500 UJ	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
4-Bromophenyl Phenyl Ether	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
4-Chloro-3-Methylphenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U

TABLE 10
GROUNDWATER WELL SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	OW5A-92	OW5B-92	OW6A-92	OW6B-92	OW7A-92	OW7A-92	OW7B-92	OW8A-92	OW8B-92	OW9A-94	OW9B-94	WW1	PW1	PW2	PW3	PW4	OW11-94	OW12-94
		Sample Identification	OW5A	OW5B	OW6A	OW6B	OW7A	CHA-3	OW7B	OW-8A	OW-8B	OW-9A	OW-9B	WW1	PW1	PW2	PW3	PW4	OW-11	OW-12
		Sample Date	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/29/07	11/28/07	11/28/07	11/28/07	11/28/07	11/30/07	11/30/07	11/30/07	11/30/07	11/30/07	11/28/07	11/28/07
PARAMETER	***Units***	***TOGS 1.1.1 Guidance Value***																		
SVOCs, con't																				
4-Chloroaniline	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
4-Chlorophenyl Phenylether	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
4-Methylphenol	µg/L	1[3]	10 U	11 U	11 U	10 U	**15 J**	**7.9 J**	11 U	10 U	10 U	10 UHJ	10 U	**94 J**	NM	540 U	10 U	11 U	20 U	10 U
4-Nitroaniline	µg/L	5	20 U	21 U	22 U	20 U	430 U	200 U	21 U	21 U	20 U	20 UHJ	20 U	230 U	NM	1100 U	21 U	22 U	40 U	20 U
4-Nitrophenol	µg/L	1[3]	50 U	53 U	55 U	50 U	1100 U	500 UJ	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
Acenaphthene	µg/L	20[2]	10 U	11 U	11 U	10 U	**100 J**	**68 J**	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	**44 J**	**0.73 J**	**0.67 J**	**0.96 J**	10 U
Acenaphthylene	µg/L	20	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Anthracene	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzo(A)Anthracene	µg/L	0.002[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzo(A)Pyrene	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzo(B)Fluoranthene	µg/L	0.002[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzo(G,H,I)Perylene	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzo(K)Fluoranthene	µg/L	0.002[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Benzyl Alcohol	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Bis(2-Chloroethoxy) Methane	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	**11 J**	NM	540 U	10 U	11 U	20 U	10 U
Bis(2-Chloroethyl) Ether	µg/L	1	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Bis(2-Ethylhexyl) Phthalate	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Butyl Benzyl Phthalate	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Carbazole	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Chrysene	µg/L	0.002[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Dibenzo(A,H)Anthracene	µg/L	50	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Dibenzofuran	µg/L	NA	10 U	11 U	11 U	10 U	**58 J**	**41 J**	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Diethylphthalate	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Dimethylphthalate	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Di-N-Butylphthalate	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Di-N-Octyl Phthalate	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Fluoranthene	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Fluorene	µg/L	50[2]	10 U	11 U	11 U	10 U	**9.8 J**	**7.4 J**	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Hexachlorobenzene	µg/L	0.04	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Hexachlorobutadiene	µg/L	0.5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Hexachlorocyclopentadiene	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Hexachloroethane	µg/L	5	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Indeno(1,2,3-Cd)Pyrene	µg/L	0.002[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Isophorone	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Naphthalene	µg/L	10	10 U	11 U	11 U	10 U	**1300 J**	**700 J**	**1.1 J**	10 U	10 U	10 UHJ	10 U	**50 J**	NM	**3100**	10 U	**24**	20 U	10 U
Nitrobenzene	µg/L	0.4	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
N-Nitroso-Di-N-Propylamine	µg/L	NA	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
N-Nitrosodiphenylamine	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Pentachlorophenol	µg/L	1[3]	50 U	53 U	55 U	50 U	1100 U	500 UJ	53 U	52 U	50 U	50 UHJ	50 U	570 U	NM	2700 U	52 U	56 U	100 U	50 U
Phenanthrene	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U
Phenol	µg/L	1[3]	10 U	11 U	11 U	10 U	210 U	100 UJ	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	**0.89 J**	11 U	20 U	10 U
Pyrene	µg/L	50[2]	10 U	11 U	11 U	10 U	210 U	100 U	11 U	10 U	10 U	10 UHJ	10 U	110 U	NM	540 U	10 U	11 U	20 U	10 U

NOTES:
1. New York State Department of Environmental Conservation, Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1, October 1993 "Ambient Water Quality Standards and Guidance Values'
2. Indicates value is a guidance value rather than a standard.
3. Applies to sum of all phenolic compounds
U - The compound was not detected at the indicated concentration.
J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero
M - Manual integrated compound.
NA - Guidance value not available
[shaded box] Indicates associated value exceeds TOGS 1.1.1 Standard or Guidance Value for Class GA Groundwater

TABLE 10
GROUNDWATER WELL SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		Sampling Location	**OW13-94**	**OW15A-07**	**OW15B-07**	**OW16A-07**	**OW16B-07**	**OW17A-07**	**OW17B-07**	**OW18A-07**	**OW18B-07**	**OW19A-07**	**OW19A-07**	**OW19B-07**	**OW20-07**	**OW21A-07**	**OW21B-07**	**OW22-07**
		Sample Identification	**OW-13**	**OW-15A**	**OW-15B**	**OW-16A**	**OW-16B**	**OW-17A**	**OW-17B**	**OW-18A**	**OW-18B**	**OW-19A**	**CHA-4**	**OW-19B**	**OW-20**	**OW-21A**	**OW-21B**	**OW-22**
		Sample Date	**11/28/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/2007**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**
PARAMETER	***Units***	***TOGS 1.1.1 Guidance Value***																
Volatiles																		
1,1,1-Trichloroethane	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,1,2,2-Tetrachloroethane	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,1,2-Trichloroethane	µg/L	1	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,1-Dichloroethane	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,1-Dichloroethene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,2-Dichloroethane	µg/L	0.6	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
1,2-Dichloropropane	µg/L	1	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
2-Butanone	µg/L	NA	10 U	10 U	10 U	800 U	10 U	200 U	10 U	10 U	10 U	200 U	100 U	10 U	80 U	20 U	10 U	1000 U
2-Hexanone	µg/L	50[2]	10 U	10 U	10 U	800 U	10 U	200 U	10 U	10 U	10 U	200 U	100 U	10 U	80 U	20 U	10 U	1000 U
4-Methyl-2-Pentanone	µg/L	NA	10 U	10 U	10 U	800 U	10 U	200 U	10 U	10 U	10 U	200 U	100 U	10 U	80 U	20 U	10 U	1000 U
Acetone	µg/L	50[2]	10 U	10 U	10 U	800 U	10 U	200 U	10 U	9 J	10 U	200 U	100 U	10 U	80 U	20 U	10 U	1000 U
Benzene	µg/L	1	5 U	5 U	5 U	400 U	5 U	**6 J**	5 U	**1.3 J**	5 U	**31 J**	**31 J**	5 U	40 U	**6.7 J**	5 U	500 U
Bromodichloromethane	µg/L	50[2]	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Bromoform	µg/L	50[2]	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Bromomethane	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Carbon Disulfide	µg/L	NA	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Carbon Tetrachloride	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Chlorobenzene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Chlorodibromomethane	µg/L	50[2]	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Chloroethane	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Chloroform	µg/L	7	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Chloromethane	µg/L	NA	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Cis-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Cis-1,3-Dichloropropene	µg/L	0.4	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Ethylbenzene	µg/L	5	5 U	5 U	5 U	**4900**	**82**	**2100**	1.1 J	**7.7**	5 U	**460**	**460**	2.3 J	**440**	**110**	**8.3**	**14000**
Methylene Chloride	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Styrene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Tetrachloroethene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Toluene	µg/L	5	5 U	5 U	5 U	**10000**	**47**	**21 J**	5 U	**4.3 J**	5 U	**380**	**390**	1 J	**120**	**5.3 J**	5 U	**1800**
Total Xylenes	µg/L	5	5 U	0.59 J	1.6 J	**22000**	**340**	**6700**	**7.3**	**68**	5 U	**5300**	**5000**	**35**	**3600**	**590**	**41**	**45000**
Trans-1,2-Dichloroethene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Trans-1,3-Dichloropropene	µg/L	NA	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Trichloroethylene	µg/L	5	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Vinyl Chloride	µg/L	2	5 U	5 U	5 U	400 U	5 U	100 U	5 U	5 U	5 U	100 U	50 U	5 U	40 U	10 U	5 U	500 U
Semi-Volatiles																		
1,2,4-Trichlorobenzene	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
1,2-Dichlorobenzene	µg/L	3	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
1,3-Dichlorobenzene	µg/L	3	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
1,4-Dichlorobenzene	µg/L	3	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
2,2'-oxybis[1-chloropropane]	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
2,4- Dichlorophenol	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 UJ
2,4,5-Trichlorophenol	µg/L	1[3]	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 UJ
2,4,6-Trichlorophenol	µg/L	1[3]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 UJ
2,4-Dimethylphenol	µg/L	1[3]	10 U	10 U	10 U	**14**	10 U	500 U	10 U	**1.8 J**	10 U	**760**	**790**	**6.5 J**	**530 M**	**990 M**	10 U	**110 J**
2,4-Dinitrophenol	µg/L	1[3]	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 UJ
2,4-Dinitrotoluene	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
2,6-Dinitrotoluene	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
2-Chloronaphthalene	µg/L	10[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
2-Chlorophenol	µg/L	1[3]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 UJ
2-Methylnaphthalene	µg/L	50[2]	10 U	10 U	10 U	1.4 J	10 U	**1700**	0.78 J	4.2 J	10 U	34 J	36 J	10 U	500 U	200 U	13	2.7 J
2-Methylphenol	µg/L	1[3]	10 U	10 U	10 U	**14**	10 U	500 U	10 U	**1.9 J**	10 U	**180**	**190**	10 U	**420 J**	200 U	10 U	**20 J**
2-Nitroaniline	µg/L	5	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 U
2-Nitrophenol	µg/L	1[3]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 UJ
3,3`-Dichlorobenzidine	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
3-Nitroaniline	µg/L	5	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 U
4,6-Dinitro-2-Methylphenol	µg/L	1[3]	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 UJ
4-Bromophenyl Phenyl Ether	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
4-Chloro-3-Methylphenol	µg/L	1[3]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 UJ

TABLE 10
GROUNDWATER WELL SAMPLE ANALYTICAL DATA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

PARAMETER	Units	TOGS 1.1.1 Guidance Value	OW13-94	OW15A-07	OW15B-07	OW16A-07	OW16B-07	OW17A-07	OW17B-07	OW18A-07	OW18B-07	OW19A-07	OW19A-07	OW19B-07	OW20-07	OW21A-07	OW21B-07	OW22-07
Sample Identification			OW-13	OW-15A	OW-15B	OW-16A	OW-16B	OW-17A	OW-17B	OW-18A	OW-18B	OW-19A	CHA-4	OW-19B	OW-20	OW-21A	OW-21B	OW-22
Sample Date			11/28/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07	11/27/2007	11/27/07	11/27/07	11/27/07	11/27/07	11/27/07
SVOCs, con't																		
4-Chloroaniline	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
4-Chlorophenyl Phenylether	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
4-Methylphenol	µg/L	1[3]	10 U	10 U	10 U	**14**	10 U	500 U	10 U	**4.2 J**	10 U	**420**	**430**	10 U	**2500**	**13 J**	10 U	**24 J**
4-Nitroaniline	µg/L	5	20 U	20 U	20 U	20 U	20 U	1000 U	20 U	20 U	20 U	200 U	200 U	20 U	1000 U	400 U	20 U	40 U
4-Nitrophenol	µg/L	1[3]	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 UJ
Acenaphthene	µg/L	20[2]	10 U	10 U	10 U	10 U	10 U	**190 J**	10 U	0.63 J	10 U	100 U	100 U	10 U	500 U	200 U	1.1 J	20 U
Acenaphthylene	µg/L	20	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Anthracene	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**46 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzo(A)Anthracene	µg/L	0.002[2]	10 U	10 U	10 U	10 U	10 U	**36 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzo(A)Pyrene	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzo(B)Fluoranthene	µg/L	0.002[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzo(G,H,I)Perylene	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzo(K)Fluoranthene	µg/L	0.002[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Benzyl Alcohol	µg/L	NA	10 U	10 U	10 U	10 U	2.5 J	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Bis(2-Chloroethoxy) Methane	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Bis(2-Chloroethyl) Ether	µg/L	1	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Bis(2-Ethylhexyl) Phthalate	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Butyl Benzyl Phthalate	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Carbazole	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Chrysene	µg/L	0.002[2]	10 U	10 U	10 U	10 U	10 U	500 UM	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Dibenzo(A,H)Anthracene	µg/L	50	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Dibenzofuran	µg/L	NA	10 U	10 U	10 U	10 U	10 U	220 J	10 U	0.47 J	10 U	100 U	100 U	10 U	500 U	200 U	0.62 J	20 U
Diethylphthalate	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	1.2 J	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Dimethylphthalate	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Di-N-Butylphthalate	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**1000**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Di-N-Octyl Phthalate	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**37 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Fluoranthene	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**52 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Fluorene	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**120 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	1.2 J	20 U
Hexachlorobenzene	µg/L	0.04	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Hexachlorobutadiene	µg/L	0.5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Hexachlorocyclopentadiene	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Hexachloroethane	µg/L	5	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Indeno(1,2,3-Cd)Pyrene	µg/L	0.002[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Isophorone	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Naphthalene	µg/L	10	10 U	10 U	10 U	**25**	0.73 J	**1800**	0.65 J	**28**	10 U	**130**	**130**	0.71 J	**80 J**	200 U	10 U	9.6 J
Nitrobenzene	µg/L	0.4	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
N-Nitroso-Di-N-Propylamine	µg/L	NA	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
N-Nitrosodiphenylamine	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	500 U	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U
Pentachlorophenol	µg/L	1[3]	50 U	50 U	50 U	50 U	50 U	2500 U	50 U	50 U	50 U	500 U	500 U	50 U	2500 U	1000 U	50 U	100 UJ
Phenanthrene	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**200 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	1.9 J	20 U
Phenol	µg/L	1[3]	10 U	10 U	10 U	10 U	10 U	500 U	**1.2 J**	**1.8 J**	10 U	**140**	**160**	10 U	500 U	200 U	10 U	**20 J**
Pyrene	µg/L	50[2]	10 U	10 U	10 U	10 U	10 U	**63 J**	10 U	10 U	10 U	100 U	100 U	10 U	500 U	200 U	10 U	20 U

NOTES:
1. New York State Department of Environmental Conservation, Division of Water Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1, October 1993 "Ambient Water Quality Standards and Guidance Values'
2. Indicates value is a guidance value rather than a standard.
3. Applies to sum of all phenolic compounds
U - The compound was not detected at the indicated concentration.
J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero
M - Manual integrated compound.
NA - Guidance value not available
[shaded box] Indicates associated value exceeds TOGS 1.1.1 Standard or Guidance Value for Class GA Groundwater

TABLE 11
SOIL VAPOR ANALYTICAL RESULTS

Updated Feasibility Study
Congress Street Facility
SI Group
Schenectady, NY

VOCs	Units	**Sample ID:** / **Collection Date:** / **Sample Location:** / **EPA Generic Screening Levels†**	**SV-1** / **10/17/2008** / **SV-1**	**SV-2** / **10/17/2008** / **SV-2**	**SV-3** / **10/17/2008** / **SV-3**	**SV-4** / **10/17/2008** / **SV-4**	**SV-5** / **10/17/2008** / **SV-5**	**CHA-1** / **10/17/2008** / **SV-5**	**Trip Blank** / **--** / **N/A**
1,1,1-Trichloroethane	$\mu g/m^3$	220,000	**0.48**	<0.43	<0.41	<0.46	<0.42	< 0.44	0.27
1,1,2,2-Tetrachloroethane	$\mu g/m^3$	420	<0.50	<0.54	<0.52	<0.58	<0.53	<0.55	<0.34
1,1,2-Trichloroethane	$\mu g/m^3$	1,500	<0.40	<0.43	<0.41	<0.46	<0.42	< 0.44	<0.27
1,1-Dichloroethane	$\mu g/m^3$	50,000	<0.59	<0.64	<0.62	<0.68	<0.63	<0.65	<0.4
1,1-Dichloroethene	$\mu g/m^3$	20,000	<0.58	<0.63	<0.60	<0.67	<0.61	<0.64	<0.4
1,2,4-Trichlorobenzene	$\mu g/m^3$	20,000	<5.4	<5.9	<5.6	<6.2	<5.8	<6.0	<3.7
1,2,4-Trimethylbenzene	$\mu g/m^3$	600	**4.4**	**3.1**	**5.0**	**5.1**	**2.3**	**1.8**	<0.49
1,2-Dibromoethane (EDB)	$\mu g/m^3$	20	<0.56	<0.61	<0.58	<0.64	<0.60	<0.62	<0.38
1,2-Dichlorobenzene	$\mu g/m^3$	20,000	<0.44	<0.47	<0.46	<0.50	<0.46	<0.48	<0.3
1,2-Dichloroethane	$\mu g/m^3$	940	<0.59	<0.64	<0.62	<0.68	<0.63	<0.65	<0.4
1,2-Dichloropropane	$\mu g/m^3$	400	<0.67	<0.73	<0.70	<0.78	<0.72	<0.74	<0.46
1,3,5-Trimethylbenzene	$\mu g/m^3$	600	**2.1**	**1.1**	**2.1**	**1.8**	**0.76**	<0.79	<0.49
1,3-Dichlorobenzene	$\mu g/m^3$	11,000	<0.44	<0.48	<0.46	**0.57**	**0.61**	**0.5**	<0.3
1,4-Dichlorobenzene	$\mu g/m^3$	80,000	<0.44	<0.48	<0.46	<0.50	<0.46	<0.48	<0.3
1,4-Dioxane	$\mu g/m^3$	--	<0.53	<0.57	<0.55	<0.60	0.66	<0.58	<0.36
2,2,4-Trimethylpentane	$\mu g/m^3$	--	<0.68	<0.74	<0.71	<0.78	<0.72	<0.75	<0.47
2-Butanone (Methyl Ethyl Ketone)	$\mu g/m^3$	100,000	**4.1**	**7.2**	**2.8**	**2.6**	**1.7**	**2.2**	<0.29
4-Methyl-2-pentanone (MIBK)	$\mu g/m^3$	8,000	**0.69**	<0.65	**0.65**	<0.69	<0.63	<0.66	<0.41
alpha-Chlorotoluene (Benzylchloride)	$\mu g/m^3$	500	<0.76	<0.82	<0.79	<0.87	<0.80	<0.83	<0.52
Benzene	$\mu g/m^3$	3,100	**0.48**	<0.50	<0.48	<0.54	<0.50	<0.51	<0.32
Bromodichloromethane	$\mu g/m^3$	1,400	<0.49	<0.53	<0.51	<0.56	<0.52	<0.54	<0.34
Bromoform	$\mu g/m^3$	22,000	<0.75	<0.82	<0.78	<0.87	<0.80	<0.83	<0.52
Bromomethane	$\mu g/m^3$	--	**1.1**	<0.61	**0.8**	<0.65	<0.60	<0.62	<0.39
Carbon Tetrachloride	$\mu g/m^3$	1,600	**0.53**	**1.0**	<0.48	<0.53	**0.53**	**0.56**	0.31
Chlorobenzene	$\mu g/m^3$	6,000	<0.67	<0.73	<0.70	<0.77	<0.71	<0.74	<0.46
Chloroethane	$\mu g/m^3$	1,000,000	<0.38	<0.42	<0.40	<0.44	<0.41	<0.42	<0.26
Chloroform	$\mu g/m^3$	1,100	<0.71	<0.77	<0.74	**5.6**	<0.76	<0.79	<0.49
Chloromethane (methyl chloride)	$\mu g/m^3$	9,000	**0.58**	<0.33	**0.61**	<0.35	<0.32	<0.33	<0.21
cis-1,2-Dichloroethene	$\mu g/m^3$	3,500	<0.58	<0.63	<0.60	<0.67	<0.61	<0.64	<0.4
cis-1,3-Dichloropropene	$\mu g/m^3$	2,000	<0.66	<0.72	<0.69	<0.76	<0.70	<0.73	<0.45
Cyclohexane	$\mu g/m^3$	--	**1.6**	<0.54	<0.52	<0.58	<0.53	<0.55	<0.34
Dibromochloromethane	$\mu g/m^3$	1,000	<0.62	<0.67	<0.65	<0.72	<0.66	<0.68	<0.42
Ethanol	$\mu g/m^3$	--	**8.6**	**12**	**12**	**24**	**20**	**19**	<0.94
Ethyl Benzene	$\mu g/m^3$	22,000	**2.7**	**2.2**	**1.6**	**1.5**	<0.67	<0.70	<0.43
Freon 11 (trichloroflouromethane)	$\mu g/m^3$	70,000	**1.6**	**1.5**	**1.1**	**2.4**	**5.9**	**5.6**	<0.28
Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	$\mu g/m^3$	3,000,000	<0.56	<0.60	<0.58	<0.64	0.64	<0.62	<0.38
Freon 114	$\mu g/m^3$	--	<0.51	<0.55	<0.53	<0.59	<0.54	<0.56	<0.35
Freon 12 (Dichlorodifluoromethane)	$\mu g/m^3$	20,000	**0.96**	**0.94**	**1.5**	**1.6**	**1.3**	**1.2**	<0.25
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	$\mu g/m^3$	1,100	<7.8	<8.4	<8.1	<9.0	<8.3	<8.6	<5.3
Hexane	$\mu g/m^3$	20,000	**1.3**	**0.61**	<0.54	<0.59	<0.55	<0.57	<0.35
m,p-Xylene	$\mu g/m^3$	700,000	**12**	**8.3**	**6.5**	**5.9**	**2.1**	**2.0**	<0.43
Methyl tert-butyl ether	$\mu g/m^3$	300,000	<0.53	<0.57	<0.55	<0.60	<0.56	<0.58	<0.36
Methylene Chloride	$\mu g/m^3$	52,000	<2.5	<2.7	<2.6	<2.9	<2.7	<2.8	<1.7
o-Xylene	$\mu g/m^3$	700,000	**4.6**	**3.4**	**3.0**	**3.0**	**1.0**	**0.94**	<0.43
Styrene	$\mu g/m^3$	100,000	<0.62	<0.67	<0.65	<0.72	<0.66	<0.68	<0.42
tert-Butyl alcohol	$\mu g/m^3$	--	<2.2	<2.4 UJ	<2.3 UJ	**3.7 J**	<2.3 UJ	<2.4 UJ	<1.5
Tetrachloroethene	$\mu g/m^3$	8,100	**1.6**	**2.0**	**4.4**	**5.4**	**2.5**	**2.6**	<0.34
Toluene	$\mu g/m^3$	40,000	**5.1**	**3.1**	**2.5**	**1.9**	**1.1**	**0.96**	<0.38
trans-1,2-Dichloroethene	$\mu g/m^3$	7,000	<0.58	<0.63	<0.60	<0.67	<0.61	<0.64	<0.4
trans-1,3-Dichloropropene	$\mu g/m^3$	--	<0.66	<0.72	<0.69	<0.76	<0.70	<0.73	<0.45
Trichloroethene	$\mu g/m^3$	220	<0.39	<0.42	<0.41	<0.45	<0.42	<0.43	<0.27
Vinyl Chloride	$\mu g/m^3$	2,800	<0.37	<0.40	<0.39	<0.43	<0.40	<0.41	<0.26
Leak Detection									
Helium	%	10	<0.073	<0.079	<0.076	<0.084	<0.078	<0.08	N/A

Notes:
† = Screening Levels identified in EPA's "OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)" (November, 2002). Target Deep Soil Gas Concentration corresponding to target indoor air concentration where the soil gas to indoor air attentuation factor = 0.01
BOLD values are compounds detected above the reporting limit.
-- = Standard or guidance value does not exist or is not applicable.
µg/m3 = micrograms per cubic meter
% = percent
N/A = Not applicable
< 0.00 = Compound not detected above the noted reporting limit

TABLE 12
SUMMARY OF AREAS, VOLUMES, and CONTAMINANT MASS FOR REMEDIATION

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

PROCESS AREA				
	Area "A"[1]	***Area "B"***[1]	***Shallow Groundwater***[2]	***Deep Groundwater***[3]
Volume	393,900 ft^3	665,100 ft^3	1,795,600 gal	3,693873 gal
VOCs	Chemical Mass (lb)			
Acetone	--	0.39	--	--
Benzene	--	--	0.10	--
Carbon Disulfide	--	0.06	--	--
Ethylbenzene	2,198	7.0	65	0.94
Methylene Chloride	7.8	--	--	--
Toluene	3,005	--	36	0.74
Total Xylenes	8,062	95	233	4.0
Trichloroethylene	17	--	--	--
SVOCs				
2,4-Dimethylphenol	338	3.7	6.2	--
2-Methylnaphthalene	640	36	8.3	0.21
2-Methylphenol	--	9.0	2.3	--
4-Methylphenol	--	33	9.6	--
Acenaphthene	38	16	2.8	0.03
Acenaphthylene	--	3.0	--	--
Anthracene	--	1.9	0.7	--
Benzo(A)Anthracene	--	3.2	0.5	--
Benzo(A)Pyrene	--	2.3	--	--
Benzo(B)Fluoranthene	--	4.2	--	--
Benzo(G,H,I)Perylene	--	3.0	--	--
Benzo(K)Fluoranthene	--	1.3	--	--
Benzyl Alcohol		--	--	0.08
Bis(2-Ethylhexyl) Phthalate	5.9	2.4	--	--
Chrysene	--	5.1	--	--
Dibenzo(A,H)Anthracene	--	3.7	--	--
Dibenzofuran	40	17	3.3	0.02
Di-N-Butylphthalate	4,254	16	15.0	
Di-N-Octyl Phthalate	--	--	0.6	--
Fluoranthene	--	--	0.8	--
Fluorene	35	2.4	1.8	0.04
Naphthalene	1,474	104	7.2	0.02
Phenanthrene	52	8.5	3.0	0.06
Phenol	22.0	8.6	0.3	0.04
Pyrene	--	6.1	0.9	--
Process Area Chemical Mass Totals (lbs):	**20,189**	**392**	**397**	**6**
Percent Chemical Mass in Process Area:	**96%**	**1.9%**	**1.9%**	**0.03%**

NOTES:
-- = Compound Not Detected
1. Depth of soils is assumed to be 0 feet bgs to 15 feet bgs.
2. Depth of shallow groundwater is assumed to be 12 feet bgs to 20.5 feet bgs.
3. Depth of deep groundwater is assumed to be 20.5 feet bgs to 38 feet bgs.
bgs = below ground surface

TABLE 12
SUMMARY OF AREAS, VOLUMES, and CONTAMINANT MASS FOR REMEDIATION

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

FILL AREA

	Soils[4]	*Groundwater*[5]
Volume	381,850 ft^3	1,795,500 gal
VOCs	Chemical Mass (lb)	
2-Butanone	0.63	--
Acetone	145	0.12
Benzene	13	0.20
Carbon Disulfide	0.03	0.01
Ethylbenzene	1,395	1.30
Methylene Chloride	0.26	--
Toluene	4,468	0.98
Total Xylenes	12,206	14.29
SVOCs		
2,4-Dimethylphenol	22,348	3.53
2-Methylnaphthalene	185	0.20
2-Methylphenol	3,437	1.05
2-Nitroaniline	4,468	--
4-Methylphenol	9,999	4.49
4-Nitroaniline	203	--
Acenaphthene	127	0.01
Acenaphthylene	48	--
Anthracene	69	--
Benzo(A)Anthracene	210	--
Benzo(A)Pyrene	141	--
Benzo(B)Fluoranthene	244	--
Benzo(G,H,I)Perylene	192	--
Benzo(K)Fluoranthene	96	--
Bis(2-Ethylhexyl) Phthalate	583	--
Carbazole	25	--
Chrysene	227	--
Dibenzo(A,H)Anthracene	79	--
Dibenzofuran	141	0.01
Diethylphthalate	--	0.02
Di-N-Butylphthalate	12	0.57
Fluoranthene	516	--
Fluorene	113	--
Indeno(1,2,3-Cd)Pyrene	241	--
Naphthalene	335	0.43
Phenanthrene	149	--
Phenol	3,624	0.67
Pyrene	447	--
Fill Area Chemical Mass Totals (lbs):	**66,486**	**27.9**
Percent Chemical Mass in Fill Area:	**99.96%**	**0.04%**

NOTES:
-- = Compound Not Detected
4. Depth of soil assumed to be from 14 to 28 feet bgs based on known depth of contaminated fill.
5. Groundwater is assumed to be 28 feet bgs to 50 feet bgs, the maximum depth of contamination.
bgs = below ground surface

TABLE 13
IDENTIFICATION OF POTENTIAL REMEDIAL TECHNOLOGIES

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
No Action	Site Containment and Monitoring	Site Containment and Monitoring	Continued operations of the GWCS and continued detection monitoring program	Required for consideration by NCP; containment and monitoring in place presently
Institutional/Administrative Controls	Access Restrictions	Deed Restrictions	Site use restrictions, groundwater use restrictions, etc.	Applicable during cleanup
		Groundwater and Soil Management Plan	Develop plan for managing groundwater and/or soil should the site be redeveloped	Applicable during cleanup
		Site Security	Fencing, signage, security system, etc.	Restrictions in place
		Health and Safety Measures	Personal Protective Equipment, administrative rules	Applicable during cleanup
Monitored Natural Attenuation	Monitoring	Groundwater Monitoring	Monitoring program for on-site wells to ensure that contaminant concentrations are decreasing	Applicable during cleanup
		Soil Monitoring	Monitoring program for on-site soils to ensure that contaminant concentrations are decreasing	Applicable during cleanup
		Air Monitoring	Monitoring program for on-site soil vapor and/or on-site buildings to ensure that soil vapor is not intruding indoor air space	Applicable during cleanup
Containment	Cover	Soil Cover	Permeable soil cover that will allow for infiltration of surface water and reduce potential for human exposure to site contaminants	Applicable during cleanup
	Cap	Synthetic Membrane	Non-permeable membrane that will reduce surface water infiltration and reduce potential for human exposure to site contaminants	Potentially applicable
		Asphalt/Concrete Cap	Non-permeable asphalt pavement that will reduce surface water infiltration and reduce potential for human exposure to site contaminants	Potentially applicable
		Multimedia Cap	Non-permeable cover consisting of two of the above covers that will reduce surface water infiltration and reduce potential for human exposure to site contaminants	Potentially applicable
Removal	Excavation and Off-Site Disposal	Excavation and Off-Site Disposal	Excavation of all impacted soils, groundwater management, and off-site disposal of contaminated media	Potentially applicable
In-Situ Treatment	Biological Treatment	Enhanced Bioremediation	Uses microorganisms to degrade organic contaminants in various soil, sediment, and groundwater. Breaks down contaminants by using them as a food source or co-metabolizing them with a food source.	Potentially applicable
		Phytoremediation	Process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, and groundwater.	Depth and concentrations of contamimants not suitable for this technology
		Bioventing/Biosparging	Uses extraction wells to circulate air through the ground, sometimes pumping air into the ground, which stimulates the natural biodegradation of any aerobically degradable compounds in soil by providing oxygen to existing soil microorganisms	Applicable during cleanup
	Chemical Treatment	Chemical Oxidation	Uses reduction/oxidation (redox) reactions to chemically convert hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, or inert.	Applicable during cleanup
	Physical Treatment	Soil Flushing	Water, or water containing an additive to enhance contaminant solubility, is applied to the soil or injected into the ground water to raise the water table into the contaminated soil zone. Contaminants are leached into the ground water, which is then extracted and treated.	Potentially applicable
		Airsparging	Air is injected into saturated matrices to remove contaminants through volatilization.	Not applicable based on low permeabilities and inability to treat SVOCs
		Conventional Soil Vapor Extraction	Vacuum is applied through extraction wells to create a pressure/concentration gradient that induces gas-phase volatiles to be removed from soil through extraction wells.	Potentially applicable
		Multi-Phase Extraction	A high vacuum system is applied to simultaneously remove various combinations of contaminated ground water, separate-phase petroleum product, and hydrocarbon vapor from the subsurface.	Applicable during cleanup
		Enhanced Soil Vapor Extraction	Steam/hot air injection is used to increase the volatilization rate of semi-volatiles and facilitate extraction of soil vapor.	Applicable during cleanup
	Thermal Treatment	Thermal Desorption	Contaminated media is heated to high temperatures (+100°C) to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to the gas treatment system.	Applicable during cleanup
Ex-Situ Treatment	Biological Treatment	Bioremediation	Uses microorganisms to degrade organic contaminants in various media. Breaks down contaminants by using them as a food source or co-metabolizing them with a food source.	Not applicable because in-situ alternatives are more easily implemented
	Physical Treatment	Soil Flushing	Water, or water containing an additive to enhance contaminant solubility, is applied to the soil or injected into the ground water to raise the water table into the contaminated soil zone. Contaminants are leached into the ground water, which is then extracted and treated.	Not applicable because in-situ alternatives are more easily implemented
	Chemical Treatment	Chemical Oxidation	Uses reduction/oxidation (redox) reactions to chemically convert hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, or inert.	Not applicable because in-situ alternatives are more easily implemented
	Thermal Treatment	Thermal Desorption	Contaminated media is heated to high temperatures (+100°C) to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to the gas treatment system.	Not applicable because in-situ alternatives are more easily implemented

Eliminated from further consideration

TABLE 14
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
No Action	No Further Action (Site Containment and Monitoring)	Public health and environment already protected, natural attenuation and operation of the GWCS will continue to reduce the level of contamination	No additional action necessary	None (no additional costs)	Yes	Has some effectiveness in the short term and meets some RAOs, so is being retained
Institutional/Administrative Controls	Deed Restrictions	Public health and environment already protected, provides additonal restrictions to protect public health.	Easily implemented; Many controls already in place	Low to Moderate	Yes	Technology is being retained since it would be implemented to some degree with other alternatives unless all contaminant levels reduced below ARARs.
	Groundwater and Soil Management Plan					
	Site Security	Public health and environment already protected, provides additonal restrictions to protect public health.	Easily implemented; Fencing surrounds all of site already; Site is monitored remotely by video camera; Signs to deter trespassing are already present	Moderate		
	Health and Safety Measures					
Natural Attenuation	Groundwater Monitoring	Natural attenuation is occurring but degree of degradation varies with contaminant levels, require extended time period to complete	Easily Implemented	Low to moderate	Yes	Will reduce the level of contamination contained in the Process Area over an extended period of time. Being retained since it would be implemented to some degree with other alternatives unless all contaminant levels reduced below ARARs.
	Soil Monitoring					
	Air Monitoring					
Containment	Soil Cover	Reduce potential exposure to contaminants from a public health standpoint, reduces contaminant levels	Easily Impemented	Low to Moderate	Yes	A permeable soil cover is determined to be the preferred method since it will enhance natural soil flushing and biodegradation of site contaminants. Would require long-term (30+ yrs) operation of GWCS.
	Synthetic Membrane	Reduce potential exposure to contaminants from a public health standpoint, reduce surface water infiltration.	Easily Implemented	Moderate	No	Would require long term (30+ yrs) operation of GWCS with limited effect, not being retained.
	Asphalt/Concrete Cap					
	Multimedia Cap					

TABLE 14
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
Removal & Disposal	Excavation and Off-Site Disposal	Removal of contaminated soil	Difficult to implement	High	Yes	Considered the most difficult technology to implement and the most expensive but would reduce soil contaminant levels to below ARARs; limited excavation potential remedy.
In-Situ Treatment	Bioremediation	Effective in treating SVOC and VOC contamination, VOC concentrations may be too high and are toxic to the microorganisms	Easily implemented	Moderate	No	Other options are preferable for initial treatment to reduce VOC levels; May be used in conjunction with other methods (Enhanced SVE - Building 10 Demonstration)
	Bioventing/Biosparging	Effective in treating SVOC and VOC contamination, VOC concentrations may be too high and are toxic to the microorganisms	Implementable	Moderate	Yes	Other options are preferable for initial treatment to reduce VOC levels; May be used in conjunction with other methods (Enhanced SVE - Building 10 Demonstration)
	Chemical Oxidation	Effective in treating VOCs & SVOCs in the saturated zone	Difficult to control and predict due to variability of subsurface; May require raising of the groundwater table to create more saturated soils and increase effectiveness	Moderate to High	No	Would not effectively address unsaturated soils.
	Soil Flushing	Effective in permeable and homogeneous soils and only unsaturated soils	Easily implemented; Difficult to control and predict due to variability of subsurface	Moderate	No	Would not effectively address saturated zone nor the types of soils on-site.
	Conventional Soil Vapor Extraction	Effective for VOC removal in permeable soils. Reduction in SVOCs would be depending on biodegradation	Difficult to implement due to low permeable soils; Would require dewatering system to create more unsaturated soils and increase effectiveness	Moderate	No	Enhanced SVE may be more effective and is thus preferable due to soil conditions

TABLE 14
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
In-Situ Treatment	Multi-Phase Extraction	Effective for VOC removal and process would encourage biodegradation of SVOCs	Difficult to implement due to low permeable soils; Would require dewatering system to create more unsaturated soils and increase effectiveness	Moderate	Yes	Technology considered for initial phase to reduce VOC levels. Would then be combined with another alternative.
	Enhanced Soil Vapor Extraction	Effective for VOC removal and process would encourage biodegradation of SVOCs	More effective then other alternatives in low permeable soils; Would require dewatering system to create more unsaturated soils and increase effectiveness	Moderate	Yes	Technology considered for initial phase to reduce VOC levels. Would then be combined with another alternative.
	Thermal Desorption	Effective for VOCs & SVOCs remvoal in less permeable and heterogeneity soils	Moderate level of implementability	High	Yes	Technology potentially effective for the area, dependent on ultimate temperature that needs to be obtained.

NOTES:
VOCs: Volatile organic compounds
SVOCs: Semi-volatile organic compounds
GWCS: Groundwater collection system
ARARs: Applicable or Relevant and Appropriate Requirements
SVE: Soil vapor extraction
Eliminated from further consideration

Table 15: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE 1 – NO FURTHER ACTION	ALTERNATIVE 2 – PHYSICAL CONTAINMENT	ALTERNATIVE 3 – EXCAVATION	ALTERNATIVE 4 – LIMITED EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Capping of Process Area ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Process Area, Off-site Disposal (70,600 ft^2 to a depth of 35 feet) ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Limited Excavation of Impacted Soils in Process Area, Off-site Disposal (26,260 ft^2 to a depth of 15 feet) ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Protection of Human Health & the Environment	*Advantages:* ▪ Existing institutional controls (e.g. signing, fencing) limits Site access. ▪ Potential for off-site impacts are being controlled with the elimination of aboveground contamination and operation of GWCS. ▪ RAOs for protection of human health and the environment are currently being met through containment of the site by the GWCS and administrative controls. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to contaminants	*Advantages:* ▪ Permeable soil cover will allow for infiltration of oxygen-rich surface water, possibly enhancing natural biodegradation of contaminants ▪ Soil cover further limits potential for human exposure to contaminants ▪ Existing institutional controls (e.g. signing, fencing) limits Site access. ▪ Potential for off-site impacts are being controlled with the operation of GWCS. *Disadvantages:* ▪ Provides limited reduction in subsurface contaminants. ▪ Does not eliminate potential for human health and environmental exposure to contaminants.	*Advantages:* ▪ Removal of contaminated soil will eliminate potential exposure risks to human health and the environment from this area. ▪ RAOs can be achieved within a relatively short time period. *Disadvantages:* ▪ Some contaminants will potentially remain in the groundwater.	*Advantages:* ▪ Removal of source-area soil will significantly reduce potential exposure risks to human health and the environment. ▪ Cleanup goals can be achieved within a relatively short time period. *Disadvantages:* ▪ Removal of source-area soil will not eliminate potential exposure risks to human health and the environment from this area. ▪ Technology does not address dissolved contaminants; residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.
Compliance with SCGs/ARARs	▪ Only some RAOs would be met in the short-term. Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in the short-term. ▪ Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Remedial objectives would be met following remediation because contaminated media will be removed and replaced with clean fill. ▪ Operation of GWCS will need to be maintained until the RAOs are met along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Remedial objectives would eventually be met following remediation because contaminated media will be removed and replaced with clean fill. Remaining contaminants would naturally attenuate after active remediation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. ▪ Migration of contaminants from the Process Area is controlled through operation of the GWCS *Disadvantages:* ▪ Continued operation of the GWCS will be required to control potential contamination migration. . ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Soil cover would reduce potential for human exposure subsurface contaminants over long-term. ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. *Disadvantages:* ▪ Continued operation of the GWCS will be required to control potential contamination migration. ▪ Some long-term maintenance may be required to maintain effectiveness. ▪ Significant institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants. ▪ Limited potential redevelopment of Process area.	*Advantages:* ▪ Effective. Potential impacts posed by impacted soil in Process Area are eliminated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the area because soils disposed off-site. ▪ Redevelopment would be viable within the Process Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants may remain in groundwater for a period of time.	*Advantages:* ▪ Effective. Potential on-site impacts posed by impacted soil are reduced significantly. ▪ Process Area contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the Process Area because soils disposed off-site. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants will remain in groundwater for some time period. ▪ Residual contaminants in the soils outside the area of excavation will remain for some time period.

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Table 15: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE 1 – NO FURTHER ACTION	ALTERNATIVE 2 – PHYSICAL CONTAINMENT	ALTERNATIVE 3 – EXCAVATION	ALTERNATIVE 4 – LIMITED EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Capping of Process Area ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Process Area, Off-site Disposal (70,600 ft^2 to a depth of 35 feet) ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Limited Excavation of Impacted Soils in Process Area, Off-site Disposal (26,260 ft^2 to a depth of 15 feet) ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Reduction in Toxicity, Mobility & Volume	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media (soils and groundwater) remains and limits potential redevelopment of the Process Area.	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation limits potential mobility and for off-site contamination migration. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ No reduction in toxicity of contaminants beyond natural attenuation. Contaminated media (soils and groundwater) remains and limits potential redevelopment of the area.	*Advantages:* ▪ Volume of contaminants in Process Area significantly reduced in short-time frame. ▪Removal of contamination will reduce the need for continued operation of the GWCS *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.	*Advantages:* ▪ Volume of contaminants significantly reduced in short-time frame. ▪Removal of contamination with continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates potential exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such as fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment remains but is limited by administrative controls and continued operation of the GWCS.	*Advantages:* ▪ Hazards associated with open excavations avoided, such as fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants, and would require administrative and engineering controls. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities during the entire excavation and backfilling operations. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.	*Advantages:* ▪ Remediation would be effective within a relatively short time period. ▪ Redevelopment of the property would be viable within Process Area, with some restrictions. *Disadvantages:* ▪ Residual contamination would remain and would require an extended period to naturally attenuate and operation of the GWCS. ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants, and would require administrative and engineering controls. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities during the entire excavation and backfilling operations. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.

Table 15: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE 1 – NO FURTHER ACTION	ALTERNATIVE 2 – PHYSICAL CONTAINMENT	ALTERNATIVE 3 – EXCAVATION	ALTERNATIVE 4 – LIMITED EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Capping of Process Area ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Process Area, Off-site Disposal (70,600 ft^2 to a depth of 35 feet) ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Limited Excavation of Impacted Soils in Process Area, Off-site Disposal (26,260 ft^2 to a depth of 15 feet) ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Site will continue.	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Process Area will continue. ▪ No other activities or development will be supported until cap installation activities are complete.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to depth and instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to potential instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.
Cost	▪ Present Worth of Alternative P-1= $2.98 Million.	▪ Present Worth of Alternative P-2 = $4.82 Million.	▪ Present Worth of Alternative P-3 = $56.3 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for extensive slope stabilization to allow for excavation. ▪ Significantly higher overall remediation costs than other active remediation methods.	▪ Present Worth of Alternative P-4 = $14.2 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for excavation engineering. ▪ Higher overall remediation costs than most other active remediation methods.

Table 15: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE 5 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE 6 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION	ALTERNATIVE 7 – IN-SITU TREATMENT USING THERMAL DESORPTION
Remedial Alternative Summary	▪ In-Situ Treatment in Process Areas Using Thermally-Enhanced SVE ▪ Bioventing/Biosparging ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment in Process Area Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using ISTD ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Protection of Human Health & the Environment	*Advantages:* ▪ Remediation of contaminated soil in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Technology does not address dissolved contaminants; residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.	*Advantages:* ▪ Remediation of contaminated soil in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.	*Advantages:* ▪ Remediation of contaminated soil and groundwater in the Process Area will reduce potential exposure risks to human health and the environment from this area. ▪ Cleanup goals in Process Area can be achieved within a relatively short time period. *Disadvantages:* ▪ Higher treatment temperature may hinder bioremediation of residual contaminants, potentially requiring bio-augmentation to complete remediation. ▪ Residual contaminants remaining in the groundwater and surrounding soils will require continued operation of the GWCS.
Compliance with SCGs/ARARs	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to maintain a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ RAOs would be met in Process Area following remediation because most contaminated media will be remediated in-situ. Remaining contaminants would be removed via natural attenuation and operation of the GWCS after active remediation. ▪ Operation of GWCS will need to maintain a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in the groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.	*Advantages:* ▪ Very effective. A significant portion of impacted media would be irreversibly remediated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent because Process Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Significantly reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. *Disadvantages:* ▪ Residual contaminants will remain in groundwater. ▪ Residual contaminants will remain in the soils outside of treatment area.

Table 15: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE 5 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE 6 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION	ALTERNATIVE 7 – IN-SITU TREATMENT USING THERMAL DESORPTION
Remedial Alternative Summary	▪ In-Situ Treatment in Process Areas Using Thermally-Enhanced SVE ▪ Bioventing/Biosparging ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment in Process Area Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using ISTD ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 15 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Reduction in Toxicity, Mobility & Volume	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. *Disadvantages:* ▪ Volume of contaminants is reduced but not eliminated.	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Volume of contaminants is reduced but not eliminated.	*Advantages:* ▪ Volume of contaminants in Process Area reduced significantly in relatively short-time frame. ▪ Continued operation of the GWCS will be required until RAOs are met. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Volume of contaminants is reduced but not eliminated.
Short-Term Effectiveness	*Advantages:* ▪ Remediation of the Process Area would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.	*Advantages:* ▪ Remediation of the Process Area would be effective within short time period. ▪ Redevelopment of the property would be viable within Process Area. *Disadvantages:* ▪ Remedial work could increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within the Process Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Some human exposure possible during concrete removal as well as safety hazards associated with removal.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Energy consumption will be high due to thermal enhancement to volatilize contaminants.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of the Process Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Energy consumption will be high due to need for higher operating temperatures to volatilize all contaminants.
Cost	▪ Present Worth of Alternative P-5 Alternative 5A = $5.84 Million. Alternative 5B = $9.10 Million	▪ Present Worth of Alternative P-6 Alternative 6A = $5.53 Million. Alternative 6B = $8.80 Million	▪ Present Worth of Alternative P-7 Alternative 7A = $8.27 Million. Alternative 7B = $12.48 Million

TABLE 16
ALTERNATIVE P-1: NO FURTHER ACTION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
CAPITAL COSTS							
1	No Additional Capital Expenditures		--	--	--		--
				Capital Costs Total			**--**
ANNUAL COSTS							
2	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
3	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
4	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
				Annual Costs Total		**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
	TOTAL COST FOR ALTERNATIVE P-1					**$**	**2,980,000**

TABLE 16
ALTERNATIVE P-2: PHYSICAL CONTAINMENT COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description	Unit Cost	Unit	Quantity	Cost
INSTITUTIONAL CONTROL COSTS					
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000
		Institutional Control Costs Total			**$ 30,000**
CAPITAL COSTS					
Site Preparation					
2	Clear & Grub	$ 5,325	AC	1.6	$ 9,000
3	Containment & Decontamination Pads	$ 20,000	LS	1	$ 20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000
5	Remove, Preserve and Stockpile Rail Siding	$ 50	FT	320	$ 16,000
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	170	$ 285,600
7	Dust Suppression During Concrete Removal	$ 4,000	LS	1	$ 4,000
8	Dispose Product/Manmade Materials associated w/ Concrete Removal	$ 300	TON	1,000	$ 300,000
9	Waste Characterization Samples	$ 500	EA	5	$ 3,000
10	Replacement of Clean Soil in Excavations	$ 40	TON	2,500	$ 100,000
				SUBTOTAL	$ 768,000
Permeable Cover System					
11	Dust Suppression During Cover Installation	$ 2,000	LS	1	$ 2,000
12	Installation of Permeable Cover System	$ 30	CY	5,230	$ 156,889
13	Seed Green Space after Cover Installation	$ 13,625	AC	1.6	$ 21,800
14	Extend Monitoring Wells	$ 750	EA	9	$ 6,750
				SUBTOTAL	$ 187,000
				Capital Costs Sub-Total	$ 960,000
				Mob/Demob, General Conditions (4%)	$ 38,400
				Health & Safety (1.5%)	$ 14,400
				Engineering Design Services (10%)	$ 96,000
				Construction Inspection (5%)	$ 48,000
				Legal and Administrative (8%)	$ 76,800
				Contingency (20%)	$ 192,000
				Capital Costs Total	**$ 1,426,000**
ANNUAL COSTS					
15	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000
16	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600
17	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400
18	On-Site Natural Attenuation Monitoring	$ 12,500	YEAR	2	$ 25,000
				Annual Costs Total	**$ 219,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate				$ 3,370,000
				TOTAL COST FOR ALTERNATIVE P-2	**$ 4,826,000**

TABLE 16
ALTERNATIVE P-3: EXCAVATION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
Site Preparation							
2	Clear & Grub	$	5,325	AC	1.6	$	8,520
3	Containment & Decontamination Pads	$	30,000	LS	1	$	30,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Remove, Preserve and Stockpile Rail Siding	$	50	FT	320	$	16,000
6	Abandon Monitoring Wells in Excavation Area	$	3,750	EA	9	$	33,750
					SUBTOTAL	$	118,270
Excavation							
7	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	170	$	285,600
8	Install Temporary Sheeting	$	60	SF	47,250	$	2,835,000
9	Excavation Dewatering[1]	$	500,000	LS	1	$	500,000
10	Dust Suppression During Excavations	$	24,000	LS	1	$	24,000
11	Excavate, Transport and Dispose Impacted Soils	$	300	TON	15,561	$	4,668,000
12	Excavate, Transport and Dispose Non-Hazardous Soils	$	175	TON	130,868	$	22,902,000
13	Excavation Limit Confirmatory Samples	$	500	EA	60	$	30,000
14	Waste Characterization Samples	$	500	EA	120	$	60,000
15	Replacement of Clean Soil in Excavations	$	40	TON	146,430	$	5,857,000
16	Regrading of Site After Excavation	$	10,000	AC	1.6	$	16,000
17	Seed Green Space after Excavation	$	13,625	AC	1.6	$	22,000
					SUBTOTAL	$	37,199,600
			Capital Costs Sub-Total			$	37,320,000
			Mob/Demob, General Conditions (4%)			$	1,492,800
			Health & Safety (1.5%)			$	559,800
			Engineering Design Services (10%)			$	3,732,000
			Construction Inspection (5%)			$	1,866,000
			Legal and Administrative (8%)			$	2,985,600
			Contingency (20%)			$	7,464,000
			Capital Costs Total			**$**	**55,420,000**
ANNUAL COSTS							
18	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
19	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
20	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
			Annual Costs Total			**$**	**194,000**
	Present Worth of Annual Costs Assuming 5 Years Monitoring, 5 Years GWCS Operation, and 5% Discount Rate					$	840,000
			TOTAL COST FOR ALTERNATIVE P-3			**$**	**56,290,000**

NOTES:
1) Alternative assumes current Treatment Facility has capacity to treat water from excavation dewatering system.

TABLE 16
ALTERNATIVE P-4: LIMITED EXCAVATION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
	Site Preparation						
2	Clear & Grub	$	5,325	AC	1.6	$	8,520
3	Containment & Decontamination Pads	$	30,000	LS	1	$	30,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Remove, Preserve and Stockpile Rail Siding	$	50	FT	320	$	16,000
6	Abandon Monitoring Wells in Excavation Area	$	3,750	EA	5	$	18,750
					SUBTOTAL	$	103,270
	Excavation						
7	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	170	$	285,600
8	Install Temporary Sheeting	$	25	SF	19,125	$	478,000
9	Excavation Dewatering[1]	$	225,000	LS	1	$	225,000
10	Dust Suppression During Excavations	$	6,000	LS	1	$	6,000
11	Excavate, Transport and Dispose Impacted Soils	$	300	TON	15,541	$	4,662,000
12	Excavate, Transport and Dispose Non-Hazardous Soils	$	175	TON	7,771	$	1,360,000
13	Excavation Limit Confirmatory Samples	$	500	EA	40	$	20,000
14	Waste Characterization Samples	$	500	EA	80	$	40,000
15	Replacement of Clean Soil in Excavations	$	40	TON	23,312	$	932,000
15	Replace Monitoring Wells in Excavation Area	$	5,000	EA	9	$	45,000
16	Regrading of Site After Excavation	$	10,000	AC	1.6	$	16,000
17	Seed Green Space after Excavation	$	13,625	AC	1.6	$	22,000
					SUBTOTAL	$	8,091,600
					Capital Costs Sub-Total	$	8,190,000
					Mob/Demob, General Conditions (4%)	$	327,600
					Health & Safety (1.5%)	$	122,850
					Engineering Design Services (10%)	$	819,000
					Construction Inspection (5%)	$	409,500
					Legal and Administrative (8%)	$	655,200
					Contingency (20%)	$	1,638,000
					Capital Costs Total	**$**	**12,160,000**
ANNUAL COSTS							
18	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
19	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
20	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
					Annual Costs Total	**$**	**194,000**
	Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate					$	2,020,000
					TOTAL COST FOR ALTERNATIVE P-4	**$**	**14,210,000**

NOTES:
1) Alternative assumes current Treatment Facility has capacity to treat water from excavation dewatering system.

TABLE 16
ALTERNATIVE P-5: ENHANCED SOIL VAPOR EXTRACTION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		ALTERNATIVE 5A Area A					ALTERNATIVE 5B Area A and B				
Item No.	**Description**	**Unit Cost**	**Unit**	**Quantity**	**Cost**		**Unit Cost**	**Unit**	**Quantity**	**Cost**	
INSTITUTIONAL CONTROL COSTS											
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000		$ 30,000	LS	1	$ 30,000	
		Institutional Control Costs Total			**$ 30,000**		**Institutional Control Costs Total**			**$ 30,000**	
CAPITAL COSTS											
Site Preparation											
2	Clear & Grub	$ 5,325	AC	1.6	$ 8,520		$ 5,325	AC	1.6	$ 9,000	
3	Containment & Decontamination Pads	$ 20,000	LS	1	$ 20,000		$ 20,000	LS	1	$ 20,000	
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000		$ 30,000	LS	1	$ 30,000	
5	Remove, Preserve and Stockpile Rail Siding	$ 50	FT	320	$ 16,000		$ 50	FT	320	$ 16,000	
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	170	$ 285,600		$ 1,680	CY	170	$ 285,600	
7	Dust Suppression During Concrete Removal	$ 4,000	LS	1	$ 4,000		$ 4,000	LS	1	$ 4,000	
8	Dispose Product/Manmade Materials associated w/ Concrete Removal	$ 300	TON	1,000	$ 300,000		$ 300	TON	1,000	$ 300,000	
9	Waste Characterization Samples	$ 500	EA	5	$ 2,500		$ 500	EA	5	$ 3,000	
10	Replacement of Clean Soil in Excavations	$ 40	TON	2,500	$ 100,000		$ 40	TON	2,500	$ 100,000	
				SUBTOTAL	$ 767,000				*SUBTOTAL*	$ 768,000	
Enhanced SVE											
11	In-Situ Treatment System Installation[1]	$ 715,000	LS	1	$ 715,000		$ 1,400,000	LS	1	$ 1,400,000	
12	In-Situ Treatment of Residually Contaminated Soils[2]	$ 950,000	LS	1	$ 950,000		$ 2,630,000	LS	1	$ 2,630,000	
13	Install Dewatering System	$ 225,000	LS	1	$ 225,000		$ 225,000	LS	1	$ 225,000	
14	Seed Green Space after Remedial Activities	$ 13,625	AC	1.6	$ 21,800		$ 13,625	AC	1.6	$ 21,800	
15	Air Treatment Permitting	$ 10,000	LS	1	$ 10,000		$ 10,000	LS	1	$ 10,000	
				SUBTOTAL	$ 1,921,800				*SUBTOTAL*	$ 4,286,800	
		Capital Costs Subtotal			$ 2,690,000		Capital Costs Subtotal			$ 5,050,000	
		Mob/Demob, General Conditions (4%)[3]			$ 30,680		Mob/Demob, General Conditions (4%)[3]			$ 30,720	
		Health & Safety (1.5%)[3]			$ 11,505		Health & Safety (1.5%)[3]			$ 11,520	
		Engineering Design Services (10%)			$ 269,000		Engineering Design Services (10%)			$ 505,000	
		Construction Inspection (5%)[3]			$ 38,350		Construction Inspection (5%)[3]			$ 38,400	
		Legal and Administrative (8%)			$ 215,200		Legal and Administrative (8%)			$ 404,000	
		Contingency (20%)			$ 538,000		Contingency (20%)			$ 1,010,000	
		Capital Costs Total			**$ 3,790,000**		**Capital Costs Total**			**$ 7,050,000**	
ANNUAL COSTS											
16	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000		$ 136,000	YEAR	1	$ 136,000	
17	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600		$ 48,600	YEAR	1	$ 48,600	
18	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400		$ 9,400	YEAR	1	$ 9,400	
		Annual Costs Total			**$ 194,000**		**Annual Costs Total**			**$ 194,000**	
		Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000		Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000	
		TOTAL COST FOR ALTERNATIVE P-5			**$ 5,840,000**		**TOTAL COST FOR ALTERNATIVE P-5**			**$ 9,100,000**	

Notes:
1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
2. Alternative 5A assumes 2 years of treatment; Alternative 5B assumes 4 years of treatment.
3. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation costs only.

TABLE 16
ALTERNATIVE P-6: MULTI-PHASE EXTRACTION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		ALTERNATIVE 6A Area A				ALTERNATIVE 6B Area A and B			
Item No.	**Description**	**Unit Cost**	**Unit**	**Quantity**	**Cost**	**Unit Cost**	**Unit**	**Quantity**	**Cost**
INSTITUTIONAL CONTROL COSTS									
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000	$ 30,000	LS	1	$ 30,000
		Institutional Control Costs Total			**$ 30,000**	**Institutional Control Costs Total**			**$ 30,000**
CAPITAL COSTS									
Site Preparation									
2	Clear & Grub	$ 5,325	AC	1.6	$ 9,000	$ 5,325	AC	1.6	$ 9,000
3	Containment & Decontamination Pads	$ 20,000	LS	1	$ 20,000	$ 20,000	LS	1	$ 20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000	$ 30,000	LS	1	$ 30,000
5	Remove, Preserve and Stockpile Rail Siding	$ 50	FT	320	$ 16,000	$ 50	FT	320	$ 16,000
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	170	$ 285,600	$ 1,680	CY	170	$ 285,600
7	Dust Suppression During Concrete Removal	$ 4,000	LS	1	$ 4,000	$ 4,000	LS	1	$ 4,000
8	Dispose Product/Manmade Materials associated w/ Concrete Removal	$ 300	TON	1,000	$ 300,000	$ 300	TON	1,000	$ 300,000
9	Waste Characterization Samples	$ 500	EA	5	$ 3,000	$ 500	EA	5	$ 3,000
10	Replacement of Clean Soil in Excavations	$ 40	TON	2,500	$ 100,000	$ 40	TON	2,500	$ 100,000
				SUBTOTAL	$ 768,000			*SUBTOTAL*	$ 768,000
Multi-Phase Extraction									
11	Multi-Phase Extraction System Installation[1]	$ 715,000	LS	1	$ 715,000	$ 1,400,000	LS	1	$ 1,400,000
12	Multi-Phase Extraction Treatment of Residually Contaminated Soils[2]	$ 950,000	LS	1	$ 950,000	$ 2,630,000	LS	1	$ 2,630,000
13	Seed Green Space after Remedial Activities	$ 13,625	AC	1.6	$ 21,800	$ 13,625	AC	1.6	$ 21,800
14	Air Treatment Permitting	$ 10,000	LS	1	$ 10,000	$ 10,000	LS	1	$ 10,000
				SUBTOTAL	$ 1,696,800			*SUBTOTAL*	$ 4,061,800
		Capital Costs Subtotal			$ 2,460,000	Capital Costs Subtotal			$ 4,829,800
		Mob/Demob, General Conditions (4%)[3]			$ 30,720	Mob/Demob, General Conditions (4%)[3]			$ 30,720
		Health & Safety (1.5%)[3]			$ 11,520	Health & Safety (1.5%)[3]			$ 11,520
		Engineering Design Services (10%)			$ 246,000	Engineering Design Services (10%)			$ 482,980
		Construction Inspection (5%)[3]			$ 38,400	Construction Inspection (5%)[3]			$ 38,400
		Legal and Administrative (8%)			$ 196,800	Legal and Administrative (8%)			$ 386,384
		Contingency (20%)			$ 492,000	Contingency (20%)			$ 965,960
		Capital Costs Total			**$ 3,480,000**	**Capital Costs Total**			**$ 6,750,000**
ANNUAL COSTS									
15	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000	$ 136,000	YEAR	1	$ 136,000
16	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600	$ 48,600	YEAR	1	$ 48,600
17	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400	$ 9,400	YEAR	1	$ 9,400
		Annual Costs Total			**$ 194,000**	**Annual Costs Total**			**$ 194,000**
		Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000	Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000
		TOTAL COST FOR ALTERNATIVE P-6			**$ 5,530,000**	**TOTAL COST FOR ALTERNATIVE P-6**			**$ 8,800,000**

Notes:
1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
2. Alternative 6A assumes 2 years of treatment; Alternative 6B assumes 4 years of treatment.
3. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation costs only.

TABLE 16
ALTERNATIVE P-7: IN-SITU THERMAL DESORPTION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

		ALTERNATIVE 7A Area A				ALTERNATIVE 7B Area A and B			
Item No.	**Description**	**Unit Cost**	**Unit**	**Quantity**	**Cost**	**Unit Cost**	**Unit**	**Quantity**	**Cost**
INSTITUTIONAL CONTROL COSTS									
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000	$ 30,000	LS	1	$ 30,000
		Institutional Control Costs Total			**$ 30,000**	**Institutional Control Costs Total**			**$ 30,000**
CAPITAL COSTS									
Site Preparation									
2	Clear & Grub	$ 5,325	AC	1.6	$ 9,000	$ 5,325	AC	1.6	$ 9,000
3	Containment & Decontamination Pads	$ 20,000	LS	1	$ 20,000	$ 20,000	LS	1	$ 20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000	$ 30,000	LS	1	$ 30,000
5	Remove, Preserve and Stockpile Rail Siding	$ 50	FT	320	$ 16,000	$ 50	FT	320	$ 16,000
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	170	$ 285,600	$ 1,680	CY	170	$ 285,600
7	Dust Suppression During Concrete Removal	$ 4,000	LS	1	$ 4,000	$ 4,000	LS	1	$ 4,000
8	Dispose Product/Manmade Materials associated w/ Concrete Removal	$ 300	TON	1,000	$ 300,000	$ 300	TON	1,000	$ 300,000
9	Waste Characterization Samples	$ 500	EA	5	$ 3,000	$ 500	EA	5	$ 3,000
10	Replacement of Clean Soil in Excavations	$ 40	TON	2,500	$ 100,000	$ 40	TON	2,500	$ 100,000
				SUBTOTAL	$ 768,000			*SUBTOTAL*	$ 768,000
In-Situ Thermal Desorption									
11	Turn-Key ISTD Treatment System[1]	$ 3,650,000	LS	1	$ 3,650,000	$ 6,700,000	LS	1	$ 6,700,000
12	Seed Green Space after Remedial Activities	$ 13,625	AC	1.6	$ 21,800	$ 13,625	AC	1.6	$ 21,800
13	Air Treatment Permitting	$ 10,000	LS	1	$ 10,000	$ 10,000	LS	1	$ 10,000
				SUBTOTAL	$ 3,681,800			*SUBTOTAL*	$ 6,731,800
		Capital Costs Subtotal			$ 4,450,000	Capital Costs Subtotal			$ 7,500,000
		Mob/Demob, General Conditions (4%)[2]			$ 30,720	Mob/Demob, General Conditions (4%)[2]			$ 30,720
		Health & Safety (1.5%)[2]			$ 11,520	Health & Safety (1.5%)[2]			$ 11,520
		Engineering Design Services (10%)			$ 445,000	Engineering Design Services (10%)			$ 750,000
		Construction Inspection (5%)[2]			$ 38,400	Construction Inspection (5%)[2]			$ 38,400
		Legal and Administrative (8%)			$ 356,000	Legal and Administrative (8%)			$ 600,000
		Contingency (20%)			$ 890,000	Contingency (20%)			$ 1,500,000
		Capital Costs Total			**$ 6,220,000**	**Capital Costs Total**			**$ 10,430,000**
ANNUAL COSTS									
14	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000	$ 136,000	YEAR	1	$ 136,000
15	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600	$ 48,600	YEAR	1	$ 48,600
16	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400	$ 9,400	YEAR	1	$ 9,400
		Annual Costs Total			**$ 194,000**	**Annual Costs Total**			**$ 194,000**
		Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000	Present Worth of Annual Costs Assuming 15 Years Monitoring, 15 Years GWCS Operation, and 5% Discount Rate			$ 2,020,000
		TOTAL COST FOR ALTERNATIVE P-7			**$ 8,270,000**	**TOTAL COST FOR ALTERNATIVE P-7**			**$ 12,480,000**

Notes:
1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
3. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation costs only.

TABLE 17: COMPARATIVE RATING OF ALTERNATIVES FOR THE PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Alternative	Description	Overall Protection of Public Health and the Environment	Compliance with RAOs/SCGs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-term Impacts and Effectiveness	Implementability	Cost	Total
1	No Further Action (Operation of GWCS)	4	5	5	4	1	1	1	**21**
2	Physical Containment via an Permeable Cap, Institutional Controls, Operation of GWCS	3	4	4	4	2	2	1	**20**
3	Excavation and Off-Site Disposal of Contaminated Media	1	1	1	1	5	5	5	**19**
4	Limited Excavation and Off-Site Disposal of Contaminated Media, Institutional Controls, and Operation of the GWCS	2	2	3	2	4	4	4	**21**
5	Enhanced Soil Vapor Extraction Treatment, Institutional Controls and Operation of the GWCS	2	2	2	2	3	2	3	**16**
6	Multi-Phase Extraction Treatment, Institutional Controls and Operation of the GWCS	2	2	3	2	3	2	3	**17**
7	In-Situ Thermal Desorption Treatment, Institutional Controls and Operation of the GWCS	2	2	4	2	3	2	3	**18**

TABLE 18
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
No Action	No Further Action (Site Containment and Monitoring)	Public health and environment already protected, natural attenuation and operation of the GWCS will continue to reduce the level of contamination	No additional action necessary	None (no additional costs)	Yes	Has some effectiveness in the short term and meets some RAOs, so is being retained
Institutional/Administrative Controls	Deed Restrictions	Public health and environment already protected, provides additional restrictions to protect public health	Easily implemented; Many controls already in place	Low to Moderate	Yes	Technology is being retained since it would be implemented to some degree with other alternatives unless all contaminant levels reduced below ARARs.
	Groundwater and Soil Management Plan					
	Site Security	Public health and environment already protected, provides additional restrictions to protect public health	Easily implemented; Fencing surrounds all of site already; Site is monitored remotely by video camera; Signs to deter trespassing are already present	Moderate		
	Health and Safety Measures					
Monitored Natural Attenuation	Groundwater Monitoring	Natural attenuation is occurring but degree of degration varies with contaminant levels, require extended time period to complete	Easily Implemented	Low to moderate	Yes	Will reduce the level of contamination contained in the Process Area over an extended period of time. Being retained since it would be implemented to some degree with other alternatives unless all contaminant levels reduced below ARARs.
	Soil Monitoring					
	Air Monitoring					
Containment	Soil Cover	Reduce potential exposure to contaminants from a public health standpoint, reduces contaminant levels	Easily Implemented	Low to Moderate	Yes	Will enhance natural soil flushing and biodegradation of site contaminants. Would require long term (30+ yrs) operation of GWCS.
	Synthetic Membrane	Reduce potential exposure to contaminants from a public health standpoint, reduce surface water infiltration.	Easily Implemnted	Moderate	Yes	Will restrict infiltration of surface water and limit leaching of contaminants to groundwater. Would require long term (30+ yrs) operation of GWCS.
	Asphalt/Concrete Cap					
	Multimedia Cap					

TABLE 18
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
Removal & Disposal	Excavation and Off-Site Disposal	Removal of Waste and Contaminated Soil	Extremely difficult to implement in fill area due to steep, unstable slopes and close proximity of railroad tracks	High	Yes	Considered the most difficult technology to implement and most expensive; Would require relocation of the Treatment Building prior to excavation;
In-Situ Treatment	Bioremediation	Effective in treating SVOC and VOC contamination. It would only be effective in areas suitable for microorganisms. Many areas are not suitable.	Easily implemented	Moderate	No	Effectiveness would be random throughout the waste mas due to the heterogeneity of the waste mass and the unsuitable conditions that exist for the microorganisms.
	Bioventing/Biosparging	Effective in treating SVOC and VOC contamination. It would only be effective in areas suitable for microorganisms. Many areas are not suitable.	Easily Implementable	Moderate	Yes	Effectiveness would be random throughout the waste mas due to the heterogeneity of the waste mass and the unsuitable conditions that exist for the microorganisms.
	Chemical Oxidation	Effective in treating VOCs and SVOCs in the saturated zone; will not address tar-like material and other waste materials	Difficult to control and predict due to variability of subsurface. Not applicable in unsaturated zone.	Moderate to High	No	Not effective in unsaturated soils or fill.
	Soil Flushing	Effective in treating VOCs and SVOCs in the unsaturated zone; need to identfy suitable reagent effective in treating the different waste materials	Difficult to control and predict due to variability of subsurface.	Moderate to High	No	The potential to identify a suitable reagent that could be used to remove the different contaminants is considered very low.
	Conventional Soil Vapor Extraction	Effective for VOCs. Reduction in SVOCs would be dependent on biodegradation, but over a longer period of time; will not address tar-like material and other waste materials	Implementable; Difficult to control and predict due to variability of subsurface; Would require extensive dewatering system to create more unsaturated soils and increase effectiveness.	Moderate	Yes	Effectiveness would be random throughout the waste mas due to the heterogeneity of the waste mass.

TABLE 18
PRELIMINARY SCREENING OF POTENTIAL REMEDIAL TECHNOLOGIES FOR THE FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GENERAL RESPONSE ACTION	TECHNOLOGY/PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COMPARITIVE COST	RETAINED	COMMENTS
In-Situ Treatment	Multi-Phase Extraction	Effective for VOCs. Reduction in SVOCs would be dependent on biodegradation, but over a longer period of time; will not address tar-like material and other waste materials	Implementable; Difficult to control and predict due to variability of subsurface; Would require extensive dewatering system to create more unsaturated soils and increase effectiveness.	Moderate to High	Yes	Effectiveness would be random throughout the waste mas due to the heterogeneity of the waste mass.
	Enhanced Soil Vapor Extraction	Effective for VOCs. Reduction in SVOCs would be dependent on biodegradation, but over a longer period of time; will not address tar-like material and other waste materials	Implementable; Difficult to control and predict due to variability of subsurface; Would require extensive dewatering system to create more unsaturated soils and increase effectiveness.	Moderate to High	Yes	Effectiveness would be random throughout the waste mas due to the heterogeneity of the waste mass.
	Thermal Desorption	Effective for VOCs & SVOCs; elevated temperatures would be required to remove the different waste materials.	Extensive investigation required to complete a characterization of the waste mass, evaluate the effect on heating the different waste materials, and evaluate the different chemical vapors emitted.	High	No	Effect of heating the waste mass is unknown and potential safety concerns from heating the waste mass exist.

NOTES:
VOCs: Volatile organic compounds
SVOCs: Semi-volatile organic compounds
GWCS: Groundwater collection system
ARARs: Applicable or Relevant and Appropriate Requirements
SVE: Soil vapor extraction
Eliminated from further consideration

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-1 – NO FURTHER ACTION	ALTERNATIVE F-2 – PHYSICAL CONTAINMENT	ALTERNATIVE F-3 – NATURAL ATTENUATION	ALTERNATIVE F-4 – EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Long-Term Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Natural Attenuation ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Protection of Human Health & the Environment	*Advantages:* ▪ Existing institutional controls (e.g. signing, fencing) limit Fill Area access. ▪ Potential for off-site impacts are being controlled with the elimination of aboveground contamination and operation of GWCS. ▪ RAOs for protection of human health and the environment are currently being met through containment of site by the GWCS and administrative controls. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants.	*Advantages:* ▪ Engineered cover would reduce potential emissions of volatile contaminants from soils to the atmosphere. ▪ Engineered cover further limits potential for human exposure to Fill Area contaminants and reduce surface water infiltration and leachate generation. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with control of infiltration into the Fill Area, reducing the amount of leachate generation, and isolation of the area. *Disadvantages:* ▪ Provides limited reduction in subsurface contaminants. ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants.	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Reduces but does not eliminate potential for human health and environmental exposure to Fill Area contaminants.	*Advantages:* ▪ Removal of contaminated soil and waste mass will eliminate potential exposure risks to human health and the environment from this area. ▪ RAOs can be achieved within a relatively short time period. *Disadvantages:* ▪ Remedial activities would result in an increased short-term human exposure risk. ▪ Dissolved contaminants and some residual contaminants will remain in surrounding soil and groundwater.
Compliance with SCGs/ARARs	▪ Only some RAOs would be met in the short-term ▪ Concentrations in groundwater and soil should decrease with time due to natural attenuation and operation of the GWCS. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in the short-term ▪ Concentrations in groundwater and soil will decrease with time due to natural attenuation, operation of the GWCS, and isolation of Fill Area, but SCOs would not be achieved within a reasonable period of time. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in the short-term. ▪ Concentrations in groundwater and soil will decrease with time due to natural attenuation and removal via the GWCS, but SCOs would be achieved over a long period of time. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Remedial objectives would be met following remediation because contaminated media will be removed and replaced with clean fill. ▪ Operation of GWCS will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.
Long-Term Effectiveness & Permanence	*Advantages:* ▪ On-site contamination will be reduced with continued operation of the GWCS and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Potential exists for continued contamination migration, although unlikely with continued operation of the GWCS. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Engineered cover would reduce potential for human exposure subsurface contaminants. ▪ Engineered cover would reduce leachate generation. ▪ Fill Area contamination will be reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Permeable cover would reduce potential for human exposure subsurface contaminants. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Fill Area contamination will be reduced with continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Effective. Potential impacts posed by impacted soil in Fill Area are eliminated. ▪ On-site contamination will be further reduced with continued operation of the GWCS and natural attenuation. ▪ Remedy is permanent for the Fill Area because soils are disposed off-site. ▪ Redevelopment of the property would be viable within Fill Area. *Disadvantages:* ▪ Remedy only transfers contaminants to an off-site location, does not destroy them. ▪ Residual contaminants may remain in groundwater for a period of time.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-1 – NO FURTHER ACTION	ALTERNATIVE F-2 – PHYSICAL CONTAINMENT	ALTERNATIVE F-3 – NATURAL ATTENUATION	ALTERNATIVE F-4 – EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Long-Term Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Natural Attenuation ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Reduction in Toxicity, Mobility & Volume	*Advantages:* ▪ Continued operation of the GWCS and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ GWCS will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media remains on site and limits potential redevelopment of Fill Area.	*Advantages:* ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ Groundwater/leachate collection system will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media and waste mass remains on-site and limits potential redevelopment of Fill Area.	*Advantages:* ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. ▪ Groundwater/leachate collection system will continue to properly treat groundwater removed, thereby reducing volume of contamination present. *Disadvantages:* ▪ Contaminated media and waste mass remains on-site and limits potential redevelopment of Fill Area.	*Advantages:* ▪ Volume of contaminants in Fill Area significantly reduced in short-time frame. ▪ Removal of contamination with continued operation of the GWCS and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced, but rather transferred to a disposal facility.
Short-Term Effectiveness	*Advantages:* ▪ No intrusive activity eliminates potential exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment remains but is limited by administrative controls and continued operation of the GWCS.	*Advantages:* ▪ No intrusive activity eliminates exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment during construction of soil cover.	*Advantages:* ▪ No intrusive activity eliminates exposures to workers during implementation of an intrusive remedial project. ▪ Hazards associated with open excavations avoided, such has fugitive dust emissions, storm water management, open trench hazards, hauling contaminated soils through residential communities, etc. *Disadvantages:* ▪ Potential impact on human health and the environment during construction of soil cover.	*Advantages:* ▪ Remediation would be effective within short time period. ▪ Redevelopment of the property would be viable within Fill Area. *Disadvantages:* ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Significant engineering controls required to limit human and environmental exposures during excavation activities. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-1 – NO FURTHER ACTION	ALTERNATIVE F-2 – PHYSICAL CONTAINMENT	ALTERNATIVE F-3 – NATURAL ATTENUATION	ALTERNATIVE F-4 – EXCAVATION
Remedial Alternative Summary	▪ No Further Action ▪ Institutional/Administrative Controls ▪ 30 Years Long-Term Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Natural Attenuation ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Impermeable Cap ▪ Institutional/Administrative Controls ▪ 5 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Implementability	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of GWCS and monitoring of Fill Area will continue.	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of Fill Area will continue. ▪ No other activities or development will be supported until cap installation activities are complete.	*Advantages:* ▪ Readily implemented with no significant technical requirements. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of Fill Area will continue.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require significant engineering controls to complete the work due to depth and instabilities of the soils. Required excavation may be Infeasible due to depth and control requirements. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will likely result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete. ▪ Removal of a portion of the existing GWCS system and relocation of the existing treatment facility required.
Cost	▪ Present Worth of Alternative F-1= $2.98 Million.	▪ Present Worth of Alternative F-2 = $3.29 Million.	▪ Present Worth of Alternative F-3 = $3.51 Million.	▪ Present Worth of Alternative F-4 = $29.8 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for extensive slope stabilization to allow for excavation. ▪ Significantly higher overall remediation costs than other active remediation methods.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-5 – LIMITED EXCAVATION	ALTERNATIVE F-6 – IN-SITU TREATMENT USING CONVENTIONAL SOIL VAPOR EXTRACTION	ALTERNATIVE F-7 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE F-8 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION
Remedial Alternative Summary	▪ Limited Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Conventional SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Enhanced SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Protection of Human Health & the Environment	*Advantages:* ▪ Cover in Fill Area will reduce potential human exposure to the waste mass remaining in the Fill Area. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through operation of the GWCS and natural attenuation. *Disadvantages:* ▪ Excavation does not reduce potential exposure risk to human health and the environment from this area.	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of SVE system provides little additional protection of human health and the environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of enhanced SVE system provides little additional protection of human health and the environment	*Advantages:* ▪ Permeable cover will reduce potential for human exposure to Fill Area contaminants. ▪ Existing institutional controls (e.g. signing, fencing) limits Fill Area access. ▪ Potential for off-site impacts are being reduced with continued removal of contaminants through use of the GWCS and natural attenuation. *Disadvantages:* ▪ Does not eliminate potential for human health and environmental exposure to Fill Area contaminants. ▪ Operation of MPE system provides little additional protection of human health and the environment
Compliance with SCGs/ARARs	▪ RAOs would not be met in the short-term. ▪ Will not meet RAOs for groundwater due to residual contaminants in the groundwater. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in short term. ▪ Operation of SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in short term. ▪ Operation of enhanced SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.	▪ Only some RAOs would be met in short term. ▪ Operation of SVE system will provide little additional long-term benefit in reaching SCGs. ▪ Operation of a groundwater/leachate collection system will need to be maintained along with a State Pollutant Discharge Elimination System (SPDES) permit to discharge treated groundwater.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-5 – LIMITED EXCAVATION	ALTERNATIVE F-6 – IN-SITU TREATMENT USING CONVENTIONAL SOIL VAPOR EXTRACTION	ALTERNATIVE F-7 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE F-8 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION
Remedial Alternative Summary	▪ Limited Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Conventional SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Enhanced SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Long-Term Effectiveness & Permanence	*Advantages:* ▪ Permanently removes 35% of non-impacted fill materials from the Fill Area. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. *Disadvantages:* ▪ Most of the chemical contamination remains in place, requiring long-term control and management.	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.	*Advantages:* ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term. ▪ On-site contamination will be further reduced with continued operation of a groundwater/leachate collection system and natural attenuation. ▪ Permeable cover would enhance removal of contaminants via the GWCS through natural soil flushing. ▪ Cover in Fill Area would reduce potential for human exposure to subsurface contaminants. ▪ Remedy is permanent because Fill Area contaminants are destroyed rather than transferred to a disposal facility. ▪ Reduces the amount of contaminants that could potentially migrate off-site and the amount of contaminants requiring attenuation. ▪ Migration of contaminants from the Fill Area is controlled through operation of the GWCS. *Disadvantages:* ▪ Long-term maintenance will be required to maintain effectiveness. ▪ Institutional controls and land-use restrictions necessary to ensure long-term protectiveness from contaminants.
Reduction in Toxicity, Mobility & Volume	*Advantages:* ▪ Removal of fill materials with continued operation of a groundwater/leachate collection system and natural attenuation limits potential for off-site contamination migration. *Disadvantages:* ▪ Contaminant mobility may be increased during excavation. ▪ The overall volume and toxicity of the contaminants is not reduced in the short-term.	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via SVE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via enhanced SVE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.	*Advantages:* ▪ A limited amount of contaminants in Fill Area are reduced in short-time frame. ▪ Removal of remaining contamination will rely on continued operation of a groundwater/ leachate collection system and natural attenuation. ▪ The overall volume and toxicity of the contaminants is reduced rather than transferred off-site. ▪ Continued operation of a groundwater/leachate collection system and natural attenuation will reduce toxicity, mobility, and volume of contamination in long term. *Disadvantages:* ▪ Amount of contaminants removed is via MPE is undefined and limited throughout the waste mass. ▪ Volume of contaminants actively removed would be limited, and a large portion of the waste mass would remain in place, limiting potential redevelopment.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-5 – LIMITED EXCAVATION	ALTERNATIVE F-6 – IN-SITU TREATMENT USING CONVENTIONAL SOIL VAPOR EXTRACTION	ALTERNATIVE F-7 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE F-8 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION
Remedial Alternative Summary	▪ Limited Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Conventional SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Enhanced SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Short-Term Effectiveness	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the residual subsurface contaminants. ▪ Redevelopment of the property may be viable within Fill Area with proper land use/deed restrictions. *Disadvantages:* ▪ Most of the waste mass would remain and would require an extended period to naturally attenuate. ▪ Remedial work would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Significant human exposure possible during intrusive excavations as well as safety hazards associated with deep excavations. ▪ Significant engineering controls required to limit human and environmental exposures during excavation activities. ▪ Large volume of excavated soil will result in increased truck traffic in local residential communities. ▪ Management of excavation faces and soil stockpiles required to control fugitive dust and volatilization of contaminants.	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of SVE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of enhanced SVE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.	*Advantages:* ▪ Cover in Fill Area would reduce potential for human exposure to the subsurface contaminants. ▪ Operation of MPE system will remove a portion of VOC contamination in the short-term *Disadvantages:* ▪ Concrete removal would increase potential off-site exposure from the generation of fugitive dust emissions and air emissions of contaminants. ▪ Potential impact on human health and the environment during construction of soil cover.
Implementability	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Excavation would require engineering controls to complete the work due to potential instabilities of the soils. ▪ Significant engineering controls required during excavation to reduce exposure to humans and the environment from the contaminants. ▪ Removing large quantities of soil off-site and importing clean fill will likely result in a significantly increased amount of noise and truck traffic through local residential communities. ▪ No other activities or development will be supported until excavation and removal activities are complete.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.	*Advantages:* ▪ Remedial alternative could be implemented within a short time period. *Disadvantages:* ▪ Costs associated with continued operation of a groundwater/leachate collection system and monitoring of the Fill Area will continue. ▪ Engineering controls required during removal of concrete to reduce exposure to humans and the environment from contaminants.

Table 19: Comparative Analysis of Alternatives

CRITERION	ALTERNATIVE F-5 – LIMITED EXCAVATION	ALTERNATIVE F-6 – IN-SITU TREATMENT USING CONVENTIONAL SOIL VAPOR EXTRACTION	ALTERNATIVE F-7 – IN-SITU TREATMENT USING ENHANCED SOIL VAPOR EXTRACTION	ALTERNATIVE F-8 – IN-SITU TREATMENT USING MULTI-PHASE EXTRACTION
Remedial Alternative Summary	▪ Limited Excavation of Impacted Soils in Fill Area, Off-site Disposal ▪ Permeable Cap ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Conventional SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Enhanced SVE ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring	▪ In-Situ Treatment Using Multi-Phase Extraction ▪ Bioventing/Biosparging ▪ Permeable Cap ▪ Removal of Slabs, Surface Obstructions and Building Footings ▪ Institutional/Administrative Controls ▪ 30 Years Groundwater Hydraulic Containment, On-site Treatment ▪ Surface Water and Groundwater Monitoring
Cost	▪ Present Worth of Alternative F-5 = $9.7 Million. ▪ High costs due to large quantity of material requiring off-site disposal and need for slope stabilization to allow to excavation. ▪ Higher overall remediation costs than other remediation methods with no significant reduction in risk or in contaminant mass.	▪ Present Worth of Alternative F-6 = $9.05 Million.	▪ Present Worth of Alternative F-7 = $9.61 Million. ▪ Cost is moderate to high and does not significantly reduce the risk to human health and the environment when compared to one or more other lower cost alternatives.	▪ Present Worth of Alternative F-6 = $9.08 Million.

TABLE 20
ALTERNATIVE F-1: NO FURTHER ACTION

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
CAPITAL COSTS							
1	No Additional Capital Expenditures		0.00	LS	0	$	-
				Capital Costs Total		**$**	**-**
ANNUAL COSTS							
2	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
3	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
4	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
				Annual Costs Total		**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
	TOTAL COST FOR ALTERNATIVE F-1					**$**	**2,980,000**

TABLE 20
ALTERNATIVE F-2: PHYSICAL CONTAINMENT COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description	Unit Cost	Unit	Quantity	Cost
INSTITUTIONAL CONTROL COSTS					
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000
				Institutional Control Costs Total	**$ 30,000**
CAPITAL COSTS					
Site Preparation					
2	Clear & Grub	$ 5,325	AC	0.6	$ 3,195
3	Containment & Decontamination Pads	$ 30,000	LS	1	$ 30,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000
				SUBTOTAL	$ 63,195
Engineered Cover System					
5	Dust Suppression During Cover Installation	$ 2,000	LS	1	$ 2,000
6	Preparation of Site for Cover Installation	$ 10,000	AC	0.6	$ 5,500
7	Installation of Engineered Cover System	$ 4	SF	27,275	$ 109,100
8	Seed Green Space after Cover Installation	$ 13,625	AC	0.6	$ 7,494
9	Extend Monitoring and Pumping Wells	$ 750	EA	6	$ 4,500
				SUBTOTAL	$ 129,000
				Capital Costs Subtotal	$ 190,000
				Mob/Demob, General Conditions (4%)	$ 7,600
				Health & Safety (1.5%)	$ 2,850
				Engineering Design Services (10%)	$ 19,000
				Construction Inspection (5%)	$ 9,500
				Legal and Administrative (8%)	$ 15,200
				Contingency (20%)	$ 38,000
				Capital Costs Total	**$ 280,000**
ANNUAL COSTS					
10	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000
11	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600
12	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400
				Annual Costs Total	**$ 194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate				$ 2,980,000
				TOTAL COST FOR ALTERNATIVE F-2	**$ 3,290,000**

TABLE 20
ALTERNATIVE F-3: NATURAL ATTENUATION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description	Unit Cost	Unit	Quantity	Cost
INSTITUTIONAL CONTROL COSTS					
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000
				Institutional Control Costs Total	**$ 30,000**
CAPITAL COSTS					
Site Preparation					
2	Clear & Grub	$ 5,325	AC	0.6	$ 3,200
3	Containment & Decontamination Pads	$ 20,000	LS	1	$ 20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000
5	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	50	$ 84,000
6	Dust Suppression During Concrete Removal	$ 7,500	LS	1	$ 8,000
7	Dispose Product/Manmade Material associated w/ Concrete Removal	$ 175	TON	500	$ 88,000
8	Waste Characterization Samples	$ 500	EA	5	$ 3,000
9	Replacement of Clean Soil in Excavations	$ 40	TON	500	$ 20,000
				SUBTOTAL	$ 256,000
Permeable Cover System					
10	Dust Suppression During Cover Installation	$ 2,000	LS	1	$ 2,000
11	Preparation of Site for Cover Installation	$ 10,000	AC	0.6	$ 5,500
12	Installation of Permeable Cover System	$ 30	CY	2,025	$ 60,750
13	Seed Green Space after Cover Installation	$ 13,625	AC	0.6	$ 7,494
14	Extend Monitoring and Pumping Wells	$ 750	EA	6	$ 4,500
				SUBTOTAL	$ 80,000
				Capital Costs Subtotal	$ 340,000
				Mob/Demob, General Conditions (4%)	$ 13,600
				Health & Safety (1.5%)	$ 5,100
				Engineering Design Services (10%)	$ 34,000
				Construction Inspection (5%)	$ 17,000
				Legal and Administrative (8%)	$ 27,200
				Contingency (20%)	$ 68,000
				Capital Costs Total	**$ 500,000**
ANNUAL COSTS					
15	Operation and Maintenance of Groundwater Collection and Treatment System	$ 136,000	YEAR	1	$ 136,000
16	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600
17	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400
				Annual Costs Total	**$ 194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate				$ 2,980,000
				TOTAL COST FOR ALTERNATIVE F-3	**$ 3,510,000**

TABLE 20
ALTERNATIVE F-4: EXCAVATION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description	Unit Cost	Unit	Quantity	Cost
INSTITUTIONAL CONTROL COSTS					
1	Deed Restrictions	$ 30,000	LS	1	$ 30,000
				Institutional Control Costs Total	**$ 30,000**
CAPITAL COSTS					
Site Preparation					
2	Clear & Grub	$ 5,325	AC	0.6	$ 3,195
3	Containment & Decontamination Pads	$ 30,000	LS	1	$ 30,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$ 30,000	LS	1	$ 30,000
5	Replace Monitoring and Pumping Wells in Excavation Area	$ 5,000	EA	6	$ 30,000
				SUBTOTAL	$ 93,195
Excavation					
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$ 1,680	CY	50	$ 80,000
7	Install Temporary Sheeting	$ 37	SF	54,560	$ 1,990,000
8	Excavation Dewatering[1]	$ 750,000	LS	1	$ 750,000
9	Dust Suppression During Excavations	$ 18,000	LS	1	$ 20,000
10	Excavate, Transport and Dispose Impacted Soils	$ 300	TON	21,215	$ 6,360,000
11	Excavate, Transport and Dispose Non-Hazardous Soils	$ 175	TON	43,265	$ 7,570,000
12	Excavation Limit Confirmatory Samples	$ 500	EA	20	$ 10,000
13	Waste Characterization Samples	$ 500	EA	40	$ 20,000
14	Replacement of Clean Soil in Excavations	$ 40	TON	64,480	$ 2,580,000
15	Regrading of Site After Excavation	$ 10,000	AC	0.6	$ 10,000
16	Seed Green Space after Excavation	$ 13,625	AC	0.6	$ 10,000
				SUBTOTAL	$ 19,400,000
				Capital Costs Sub-Total	$ 19,490,000
				Mob/Demob, General Conditions (4%)	$ 779,600
				Health & Safety (1.5%)	$ 292,350
				Engineering Design Services (10%)	$ 1,949,000
				Construction Inspection (5%)	$ 974,500
				Legal and Administrative (8%)	$ 1,559,200
				Contingency (20%)	$ 3,898,000
				Capital Costs Total	**$ 28,940,000**
ANNUAL COSTS					
17	Operation and Maintenance of Groundwater Collection and Treatment Sy	$ 136,000	YEAR	1	$ 136,000
18	Quarterly Groundwater Sampling w/ Letter Summary Report	$ 48,600	YEAR	1	$ 48,600
19	Site Maintenance (Mowing, etc)	$ 9,400	YEAR	1	$ 9,400
				Annual Costs Total	**$ 194,000**
	Present Worth of Annual Costs Assuming 5 Years Monitoring, 5 Years GWCS Operation, and 5% Discount Rate				$ 840,000
				TOTAL COST FOR ALTERNATIVE F-3	**$ 29,810,000**

NOTES:

1) Alternative assumes current Treatment Facility has capacity to treat water from excavation dewatering system.

TABLE 20
ALTERNATIVE F-5: LIMITED EXCAVATION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
Site Preparation							
2	Clear & Grub	$	5,325	AC	0.6	$	3,195
3	Containment & Decontamination Pads	$	30,000	LS	1	$	30,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Abandon Monitoring and Pumping Wells in Excavation Area	$	2,000	EA	6	$	12,000
					SUBTOTAL	$	75,000
Excavation							
6	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	50	$	84,000
7	Install Temporary Sheeting	$	23	SF	2,000	$	45,000
8	Excavation Dewatering[1]	$	225,000	LS	1	$	225,000
9	Dust Suppression During Excavations	$	6,000	LS	1	$	6,000
10	Relocate Treatment Building	$	500,000	LS	1	$	500,000
11	Excavate, Transport and Dispose Non-Hazardous Soils	$	175	TON	15,645	$	2,738,000
12	Excavation Limit Confirmatory Samples	$	500	EA	20	$	10,000
13	Waste Characterization Samples	$	500	EA	40	$	20,000
14	Replacement of Clean Soil in Excavations	$	40	TON	15,645	$	626,000
15	Regrading of Site After Excavation	$	10,000	AC	0.6	$	6,000
16	Seed Green Space after Excavation	$	13,625	AC	0.6	$	8,000
					SUBTOTAL	$	4,268,000
Engineered Cover System							
17	Dust Suppression During Cover Installation	$	2,000	LS	1	$	2,000
18	Preparation of Site for Cover Installation	$	10,000	AC	0.6	$	6,000
19	Installation of Engineered Cover System	$	4	SF	27,275	$	109,100
20	Seed Green Space after Cover Installation	$	13,625	AC	0.6	$	8,175
21	Replace Monitoring and Pumping Wells in Excavation Area	$	5,000	EA	6	$	30,000
					SUBTOTAL	$	160,000
					Capital Cost Sub-Total	$	4,503,000
					Mob/Demob, General Conditions (4%)	$	180,120
					Health & Safety (1.5%)	$	67,545
					Engineering Design Services (10%)	$	450,300
					Construction Inspection (5%)	$	225,150
					Legal and Administrative (8%)	$	360,240
					Contingency (20%)	$	900,600
					Capital Costs Total	**$**	**6,690,000**
ANNUAL COSTS							
22	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
23	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
24	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
					Annual Costs Total	**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
					TOTAL COST FOR ALTERNATIVE F-4	**$**	**9,700,000**

NOTES:

1) Alternative assumes current Treatment Facility has capacity to treat water from excavation dewatering system.

TABLE 20
ALTERNATIVE F-6: CONVENTIONAL SVE COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
Site Preparation							
2	Clear & Grub	$	5,325	AC	0.6	$	3,200
3	Containment & Decontamination Pads	$	20,000	LS	1	$	20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	50	$	84,000
6	Dust Suppression During Concrete Removal	$	7,500	LS	1	$	8,000
7	Dispose Product/Manmade Material associated w/ Concrete Removal	$	175	TON	500	$	88,000
8	Waste Characterization Samples	$	500	EA	5	$	3,000
9	Replacement of Clean Soil in Excavations	$	40	TON	500	$	20,000
					SUBTOTAL	$	256,000
In-Situ Treatment							
10	In-Situ Treatment System Installation	$	1,265,000	LS	1	$	1,265,000
11	Multi-Phase Extraction Treatment of Waste Mass + Contaminated Soils (assumes 4 years)[1]	$	2,365,000	LS	1	$	2,365,000
12	Pumping Test to Determine Dewatering Well Spacing	$	25,000	LS	1	$	25,000
13	Install Dewatering System	$	350,000	LS	1	$	350,000
14	Air Treatment Permitting	$	10,000	LS	1	$	10,000
					SUBTOTAL	$	4,015,000
Permeable Cover System							
15	Dust Suppression During Cover Installation	$	2,000	LS	1	$	2,000
16	Preparation of Site for Cover Installation	$	10,000	AC	0.6	$	6,000
17	Installation of Permeable Cover System	$	30	CY	2,025	$	60,750
18	Seed Green Space after Cover Installation	$	13,625	AC	0.6	$	8,175
19	Extend Monitoring/Pumping Wells	$	750	EA	6	$	4,500
					SUBTOTAL	$	80,000
			Capital Cost Sub-Total			$	4,350,000
			Mob/Demob, General Conditions (4%)[2]			$	13,440
			Health & Safety (1.5%)[2]			$	5,040
			Engineering Consulting Services (10%)			$	435,000
			Construction Inspection (5%)[2]			$	16,800
			Legal and Administrative (8%)			$	348,000
			Contingency (20%)			$	870,000
			Capital Costs Total			**$**	**6,040,000**
ANNUAL COSTS							
20	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
21	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
22	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
			Annual Costs Total			**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
			TOTAL COST FOR ALTERNATIVE F-5			**$**	**9,050,000**

Notes:
1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
2. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation, Cover System and Miscellaneous costs only.

TABLE 20
ALTERNATIVE F-7: ENHANCED SVE COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
Site Preparation							
2	Clear & Grub	$	5,325	AC	0.6	$	3,200
3	Containment & Decontamination Pads	$	20,000	LS	1	$	20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	50	$	84,000
6	Dust Suppression During Concrete Removal	$	7,500	LS	1	$	8,000
7	Dispose Product/Manmade Material associated w/ Concrete Removal	$	175	TON	500	$	88,000
8	Waste Characterization Samples	$	500	EA	5	$	3,000
9	Replacement of Clean Soil in Excavations	$	40	TON	500	$	20,000
					SUBTOTAL	$	256,000
In-Situ Treatment							
10	In-Situ Treatment System Installation	$	1,405,000	LS	1	$	1,405,000
11	Multi-Phase Extraction Treatment of Waste Mass + Contaminated Soils (assumes 4 years)[1]	$	2,629,000	LS	1	$	2,629,000
12	Pumping Test to Determine Dewatering Well Spacing	$	25,000	LS	1	$	25,000
13	Install Dewatering System	$	350,000	LS	1	$	350,000
14	Air Treatment Permitting	$	10,000	LS	1	$	10,000
					SUBTOTAL	$	4,419,000
Permeable Cover System							
15	Dust Suppression During Cover Installation	$	2,000	LS	1	$	2,000
16	Preparation of Site for Cover Installation	$	10,000	AC	0.6	$	6,000
17	Installation of Permeable Cover System	$	30	CY	2,025	$	60,750
18	Seed Green Space after Cover Installation	$	13,625	AC	0.6	$	8,175
19	Extend Monitoring/Pumping Wells	$	750	EA	6	$	4,500
					SUBTOTAL	$	80,000
			Capital Cost Sub-Total			$	4,760,000
			Mob/Demob, General Conditions (4%)[2]			$	13,440
			Health & Safety (1.5%)[2]			$	5,040
			Engineering Consulting Services (10%)			$	476,000
			Construction Inspection (5%)[2]			$	16,800
			Legal and Administrative (8%)			$	380,800
			Contingency (20%)			$	952,000
			Capital Costs Total			**$**	**6,600,000**
ANNUAL COSTS							
20	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
21	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
22	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
			Annual Costs Total			**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
			TOTAL COST FOR ALTERNATIVE F-5			**$**	**9,610,000**

Notes:
1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
2. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation, Cover System and Miscellaneous costs only.

TABLE 20
ALTERNATIVE F-8: MULTI-PHASE EXTRACTION COST ESTIMATE

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Item No.	Description		Unit Cost	Unit	Quantity		Cost
INSTITUTIONAL CONTROL COSTS							
1	Deed Restrictions	$	30,000	LS	1	$	30,000
			Institutional Control Costs Total			**$**	**30,000**
CAPITAL COSTS							
Site Preparation							
2	Clear & Grub	$	5,325	AC	0.6	$	3,200
3	Containment & Decontamination Pads	$	20,000	LS	1	$	20,000
4	Preparation/Restoration of Site Access Roads and Haul Roads	$	30,000	LS	1	$	30,000
5	Demolition and Disposal of Concrete (assume non-hazardous disposal)	$	1,680	CY	50	$	84,000
6	Dust Suppression During Concrete Removal	$	7,500	LS	1	$	8,000
7	Dispose Product/Manmade Material associated w/ Concrete Removal	$	175	TON	500	$	88,000
8	Waste Characterization Samples	$	500	EA	5	$	3,000
9	Replacement of Clean Soil in Excavations	$	40	TON	500	$	20,000
					SUBTOTAL	$	256,200
Multi-Phase Extraction							
10	Multi-Phase Extraction System Installation[1]	$	1,400,000	LS	1	$	1,400,000
11	Multi-Phase Extraction Treatment of Waste Mass + Contaminated Soils (assumes 4 years)[1]	$	2,630,000	LS	1	$	2,630,000
12	Air Treatment Permitting	$	10,000	LS	1	$	10,000
					SUBTOTAL	$	4,040,000
Permeable Cover System							
13	Dust Suppression During Cover Installation	$	2,000	LS	1	$	2,000
14	Preparation of Site for Cover Installation	$	10,000	AC	0.6	$	6,000
15	Installation of Permeable Cover System	$	30	CY	2,025	$	60,750
16	Seed Green Space after Cover Installation	$	13,625	AC	0.6	$	8,175
17	Extend Monitoring/Pumping Wells	$	750	EA	6	$	4,500
					SUBTOTAL	$	80,000
					Capital Costs Subtotal	$	4,376,000
					Mob/Demob, General Conditions (4%)[2]	$	13,448
					Health & Safety (1.5%)[2]	$	5,043
					Engineering Consulting Services (10%)	$	437,620
					Construction Inspection (5%)[2]	$	16,810
					Legal and Administrative (8%)	$	350,080
					Contingency (20%)	$	875,200
					Capital Costs Total	**$**	**6,070,000**
ANNUAL COSTS							
18	Operation and Maintenance of Groundwater Collection and Treatment System	$	136,000	YEAR	1	$	136,000
19	Quarterly Groundwater Sampling w/ Letter Summary Report	$	48,600	YEAR	1	$	48,600
20	Site Maintenance (Mowing, etc)	$	9,400	YEAR	1	$	9,400
					Annual Costs Total	**$**	**194,000**
	Present Worth of Annual Costs Assuming 30 Years Monitoring, 30 Years GWCS Operation, and 5% Discount Rate					$	2,980,000
					TOTAL COST FOR ALTERNATIVE F-6	**$**	**9,080,000**

Notes:

1. Lump sum cost includes design, mobilization, installation, operation and soil vapor treatment system.
2. Mob/Demob, General Conditions, Health & Safety and Construction Inspections Services fees are based on Site Preparation, Cover System and Miscellaneous costs only.

TABLE 21: COMPARATIVE RATING OF ALTERNATIVES FOR THE FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Alternative	Description	Overall Protection of Public Health and the Environment	Compliance with RAOs/SCGs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-term Impacts and Effectiveness	Implementability	Cost	Total
1	No Further Action (Operation of GWCS)	4	5	5	4	1	1	1	**21**
2	Physical Containment via an Impermeable Cap, Institutional Controls, Operation of GWCS	3	4	4	4	2	2	1	**20**
3	Natural Attenuation, Physical Containment via a Permeable Cap, Institutional Controls, Operation of GWCS	3	4	4	3	2	2	1	**19**
4	Excavation and Off-Site Disposal of Contaminated Media	1	1	1	1	5	5+	5+	**19+**
5	Limited Excavation and Off-Site Disposal of Contaminated Media, Impermeable Cap, Institutional Controls, and Operation of the GWCS	3	4	4	3	5	4	4	**27**
6	Conventional Soil Vapor Extraction Treatment, Impermeable Cap, Institutional Controls and Operation of the GWCS	3	4	3	3	3	3	3	**22**
7	Thermally-Enhanced Soil Vapor Extraction Treatment, Permeable Cap, Institutional Controls and Operation of the GWCS	3	4	3	3	3	3	3	**22**
8	Mulit-Phase Extraction Treatment, Impermeable Cap, Institutional Controls and Operation of the GWCS	3	4	3	3	3	3	3	**22**

APPENDIX A
Summary of Average Contaminant Concentrations

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Area A Soil															
	Sampling Location	**GP-08-07**	**GP-29-07**	**OW16A/B-07**	**OW17A/B-07**	**OW22-07**	**Average Contaminant Concentration**	**Conversion Factor**	**Average Contaminant Concentration**	**Depth**	**Process Area**	**Total Volume of Soil**	**Soil Bulk Density**	**Lbs. of Soil**	**Chemical Mass**
	Sample Identification	**S-101107-SDN-003**	**S-101507-SDN-023**	**S-102307-SDN-029**	**S-102407-SDN-030**	**S-102407-SDN-031**									
	Sample Date	**10/11/2007**	**10/15/2007**	**10/23/2007**	**10/24/2007**	**10/24/2007**									
	Sample Start Depth	**5**	**3**	**10**	**10**	**8**									
	Sample End Depth	**6**	**4**	**12**	**12**	**10**	**µg/kg**		**lbs/lb**	**ft**	**ft^2**	**ft^3**	**lbs/ft^3**		**lbs**
PARAMETER	***UNITS***														
Volatiles															
Ethylbenzene	µg/kg	13000	54000	28000	25000	190000	62,000	1.00E-09	6.2.E-05	15	26260	393900	90	35451000	2198
Methylene Chloride	µg/kg	--	--	220 J	--	--	220	1.00E-09	2.2.E-07	15	26260	393900	90	35451000	7.80
Toluene	µg/kg	--	240000	12000	--	2300 J	84,767	1.00E-09	8.5.E-05	15	26260	393900	90	35451000	3005
Total Xylenes	µg/kg	83000	150000	120000	84000	**700000**	227,400	1.00E-09	2.3.E-04	15	26260	393900	90	35451000	8062
Trichloroethylene	µg/kg	--	--	--	490 J	--	490	1.00E-09	4.9.E-07	15	26260	393900	90	35451000	17.37
														Subtotal:	***13290***
Semi-Volatiles															
2,4-Dimethylphenol	µg/kg	--	28000	200 J	--	400	9,533	1.00E-09	9.5.E-06	15	26260	393900	90	35451000	338
2-Methylnaphthalene	µg/kg	4400	63000	780	22000	98 J	18,056	1.00E-09	1.8.E-05	15	26260	393900	90	35451000	640
Acenaphthene	µg/kg	270 J	--	--	1900 J	--	1,085	1.00E-09	1.1.E-06	15	26260	393900	90	35451000	38
Bis(2-Ethylhexyl) Phthalate	µg/kg	130 J	--	--	--	200 J	165	1.00E-09	1.7.E-07	15	26260	393900	90	35451000	5.85
Dibenzofuran	µg/kg	370 J	--	--	1900 J	--	1,135	1.00E-09	1.1.E-06	15	26260	393900	90	35451000	40
Di-N-Butylphthalate	µg/kg	--	--	--	120000	--	120,000	1.00E-09	1.2.E-04	15	26260	393900	90	35451000	4254
Fluorene	µg/kg	250 J	--	--	1700 J	--	975	1.00E-09	9.8.E-07	15	26260	393900	90	35451000	35
Naphthalene	µg/kg	5300	180000	1300	21000	220 J	41,564	1.00E-09	4.2.E-05	15	26260	393900	90	35451000	1474
Phenanthrene	µg/kg	130 J	--	--	2800 J	--	1,465	1.00E-09	1.5.E-06	15	26260	393900	90	35451000	52
Phenol	µg/kg	--	--	--	--	620	620	1.00E-09	6.2.E-07	15	26260	393900	90	35451000	21.98
														Subtotal:	***6899***
														AREA A TOTAL:	***20,189***

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

Area B Soil

Sampling Location		OW20-07	OW21A/B-07	Average Contaminant Concentration	Conversion Factor	Average Contaminant Concentration	Depth	Process Area	Total Volume of Soil	Soil Bulk Density	Lbs. of Soil	Chemical Mass
Sample Identification		S-102907-SDN-035	S-102907-SDN-033									
Sample Date		10/29/2007	10/29/2007									
Sample Start Depth		2	2									
Sample End Depth		4	5	µg/kg		lbs/lb	ft	ft^2	ft^3	lbs/ft^3		lbs
PARAMETER	***UNITS***											
Volatiles												
Ethylbenzene	µg/kg	--	250 J	250	1.00E-09	2.5.E-07	15	12547	188205	90	16938450	4
Total Xylenes	µg/kg	--	5100	5,100	1.00E-09	5.1.E-06	15	12547	188205	90	16938450	86
											Subtotal:	***91***
Semi-Volatiles												
2,4-Dimethylphenol	µg/kg	220 J	--	220	1.00E-09	2.2.E-07	15	12547	188205	90	16938450	4
2-Methylnaphthalene	µg/kg	2800	1400 J	2,100	1.00E-09	2.1.E-06	15	12547	188205	90	16938450	36
2-Methylphenol	µg/kg	250 J	--	250	1.00E-09	2.5.E-07	15	12547	188205	90	16938450	4.23
4-Methylphenol	µg/kg	1300	--	1,300	1.00E-09	1.3.E-06	15	12547	188205	90	16938450	22.02
Acenaphthene	µg/kg	920	--	920	1.00E-09	9.2.E-07	15	12547	188205	90	16938450	16
Acenaphthylene	µg/kg	180 J	--	180	1.00E-09	1.8.E-07	15	12547	188205	90	16938450	3.05
Anthracene	µg/kg	110 J	--	110	1.00E-09	1.1.E-07	15	12547	188205	90	16938450	1.86
Benzo(A)Anthracene	µg/kg	190 J	--	190	1.00E-09	1.9.E-07	15	12547	188205	90	16938450	3.22
Benzo(A)Pyrene	µg/kg	150 J	120 J	135	1.00E-09	1.4.E-07	15	12547	188205	90	16938450	2.29
Benzo(B)Fluoranthene	µg/kg	270 J	230 J	250	1.00E-09	2.5.E-07	15	12547	188205	90	16938450	4.23
Benzo(G,H,I)Perylene	µg/kg	180 J	180 J	180	1.00E-09	1.8.E-07	15	12547	188205	90	16938450	3.05
Benzo(K)Fluoranthene	µg/kg	78 J	--	78	1.00E-09	7.8.E-08	15	12547	188205	90	16938450	1.32
Chrysene	µg/kg	300 J	--	300	1.00E-09	3.0.E-07	15	12547	188205	90	16938450	5.08
Dibenzo(A,H)Anthracene	µg/kg	220 J	--	220	1.00E-09	2.2.E-07	15	12547	188205	90	16938450	3.73
Dibenzofuran	µg/kg	1000	--	1,000	1.00E-09	1.0.E-06	15	12547	188205	90	16938450	17
Di-N-Butylphthalate	µg/kg	920	--	920	1.00E-09	9.2.E-07	15	12547	188205	90	16938450	16
Fluorene	µg/kg	140 J	--	140	1.00E-09	1.4.E-07	15	12547	188205	90	16938450	2
Naphthalene	µg/kg	2400	9900 J	6,150	1.00E-09	6.2.E-06	15	12547	188205	90	16938450	104
Phenanthrene	µg/kg	500	--	500	1.00E-09	5.0.E-07	15	12547	188205	90	16938450	8
Phenol	µg/kg	510	--	510	1.00E-09	5.1.E-07	15	12547	188205	90	16938450	8.64
Pyrene	µg/kg	360 JB	--	360	1.00E-09	3.6.E-07	15	12547	188205	90	16938450	6.10
											Subtotal:	***271***

Sampling Location		GP-09-07	GP-18-07	GP-18-07	GP-19-07	GP-19-07	Average Contaminant Concentration	Conversion Factor	Average Contaminant Concentration	Depth	Process Area	Total Volume of Soil	Soil Bulk Density	Lbs. of Soil	Chemical Mass
Sample Identification		S-101507-SDN-017	S-101207-SDN-011	S-101207-SDN-012	S-101107-SDN-008	S-101107-SDN-010									
Sample Date		10/15/2007	10/12/2007	10/12/2007	10/11/2007	10/11/2007									
Sample Start Depth		9	7	11	5	10									
Sample End Depth		10	7	13	5	11	µg/kg		lbs/lb	ft	ft^2	ft^3	lbs/ft^3		lbs
PARAMETER	***UNITS***														
Volatiles															
Acetone	µg/kg	9.1 J	--	--	--	--	9.1	1.00E-09	9.1.E-09	15	31793	476895	90	42920550	0.39
Carbon Disulfide	µg/kg	--	--	--	--	1.5 J	1.5	1.00E-09	1.5.E-09	15	31793	476895	90	42920550	0.06
Ethylbenzene	µg/kg	--	--	--	--	64	64	1.00E-09	6.4.E-08	15	31793	476895	90	42920550	3
Total Xylenes	µg/kg	--	--	--	--	210	210	1.00E-09	2.1.E-07	15	31793	476895	90	42920550	9
														Subtotal:	***12***
Semi-Volatiles															
2-Methylphenol	µg/kg	--	--	--	110 J	--	110	1.00E-09	1.1.E-07	15	31793	476895	90	42920550	4.72
4-Methylphenol	µg/kg	--	--	--	250 J	--	250	1.00E-09	2.5.E-07	15	31793	476895	90	42920550	10.73
Bis(2-Ethylhexyl) Phthalate	µg/kg	--	--	--	55 J	--	55	1.00E-09	5.5.E-08	15	31793	476895	90	42920550	2.36
														Subtotal:	***18***
														AREA B TOTAL:	***392***

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

SHALLOW GROUNDWATER																		
	Sampling Location	**OW16A-07**	**OW17A-07**	**OW20-07**	**OW21A-07**	**OW22-07**	**GP-09-07**	**GP-19-07**	**Average**	**Conversion**	**Average**			**Total Volume**		**Volume of**	**Volume of**	**Chemical**
	Sample Identification	**OW-16A**	**OW-17A**	**OW-20**	**OW-21A**	**OW-22**	**GW-101507-SDN-020**	**GW-101107-SDN-009**	**Contaminant**	**Factor**	**Contaminant**	**Depth**	**Process Area**	**of Process**	**Porosity**	**Groundwater**	**Groundwater**	**Mass**
	Sample Date	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**11/27/07**	**10/15/2007**	**10/11/2007**	**µg/L**	**µg to lbs**	**lbs/L**	**12 ft to 20.5 ft**	**ft^2**	**ft^3**	**%**	**ft^3**	**L**	**lbs**
PARAMETER	***Units***																	
Volatiles																		
Benzene	µg/L	--	6 J	--	6.7 J	--	--	--	6.4	2.20E-09	1.4.E-08	8.5	70600	600100	0.4	240040	6797177	0
Ethylbenzene	µg/L	4900	2100	440	110	14000	--	--	4,310	2.20E-09	9.5.E-06	8.5	70600	600100	0.4	240040	6797177	65
Toluene	µg/L	10000	21 J	120	5.3 J	1800	--	--	2,389	2.20E-09	5.3.E-06	8.5	70600	600100	0.4	240040	6797177	36
Total Xylenes	µg/L	22000	6700	3600	590	45000	--	--	15,578	2.20E-09	3.4.E-05	8.5	70600	600100	0.4	240040	6797177	233
																	Subtotal:	***334***
Semi-Volatiles																		
2,4-Dimethylphenol	µg/L	14	--	530 M	990 M	110 J	--	--	411	2.20E-09	9.1.E-07	8.5	70600	600100	0.4	240040	6797177	6
2-Methylnaphthalene	µg/L	1.4 J	1700	500 U	--	2.7 J	--	--	551	2.20E-09	1.2.E-06	8.5	70600	600100	0.4	240040	6797177	8
2-Methylphenol	µg/L	14	--	420 J	--	20 J	--	--	151	2.20E-09	3.3.E-07	8.5	70600	600100	0.4	240040	6797177	2
4-Methylphenol	µg/L	14	--	2500	13 J	24 J	--	--	638	2.20E-09	1.4.E-06	8.5	70600	600100	0.4	240040	6797177	10
Acenaphthene	µg/L	--	190 J	--	--	--	--	--	190	2.20E-09	4.2.E-07	8.5	70600	600100	0.4	240040	6797177	3
Anthracene	µg/L	--	46 J	--	--	--	--	--	46	2.20E-09	1.0.E-07	8.5	70600	600100	0.4	240040	6797177	1
Benzo(A)Anthracene	µg/L	--	36 J	--	--	--	--	--	36	2.20E-09	7.9.E-08	8.5	70600	600100	0.4	240040	6797177	1
Dibenzofuran	µg/L	--	220 J	--	--	--	--	--	220	2.20E-09	4.9.E-07	8.5	70600	600100	0.4	240040	6797177	3
Di-N-Butylphthalate	µg/L	--	1000	--	--	--	--	--	1,000	2.20E-09	2.2.E-06	8.5	70600	600100	0.4	240040	6797177	15
Di-N-Octyl Phthalate	µg/L	--	37 J	--	--	--	--	--	37	2.20E-09	8.2.E-08	8.5	70600	600100	0.4	240040	6797177	1
Fluoranthene	µg/L	--	52 J	--	--	--	--	--	52	2.20E-09	1.1.E-07	8.5	70600	600100	0.4	240040	6797177	1
Fluorene	µg/L	--	120 J	--	--	--	--	--	120	2.20E-09	2.6.E-07	8.5	70600	600100	0.4	240040	6797177	2
Naphthalene	µg/L	25	1800	80 J	--	9.6 J	--	--	479	2.20E-09	1.1.E-06	8.5	70600	600100	0.4	240040	6797177	7
Phenanthrene	µg/L	--	200 J	--	--	--	--	--	200	2.20E-09	4.4.E-07	8.5	70600	600100	0.4	240040	6797177	3
Phenol	µg/L	--	--	--	--	20 J	--	--	20	2.20E-09	4.4.E-08	8.5	70600	600100	0.4	240040	6797177	0
Pyrene	µg/L	--	63 J	--	--		--	--	63	2.20E-09	1.4.E-07	8.5	70600	600100	0.4	240040	6797177	1
																	Subtotal:	***63***
																	SHALLOW GROUNDWATER TOTAL:	***397***

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - PROCESS AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

DEEP GROUNDWATER

	Sampling Location	OW16B-07	OW17B-07	OW21B-07	GP-08-07	GP-12-07	GP-12-07	GP-23-07	GP-24-07	GP-29-07	Average	Conversion	Average			Total Volume of		Volume of	Volume of	Chemical
	Sample Identification	OW-16B	OW-17B	OW-21B	W-101107-SDN-0	W-101507-SDN-0	W-101507-SDN-0	W-101107-SDN-0	W-101107-SDN-0	W-101507-SDN-0	Contaminant	Factor	Contaminant	Depth	Process Area	Process Area	Porosity	Groundwater	Groundwater	Mass
	Sample Date	11/27/07	11/27/07	11/27/07	10/11/2007	10/15/2007	10/15/2007	10/11/2007	10/11/2007	10/15/2007	µg/L	µg to lbs	lbs/L	20.5 ft to 38 ft	ft^2	ft^3	%	ft^3	L	lbs
PARAMETER	***Units***																			
Volatiles																				
Ethylbenzene	µg/L	82	1.1 J	8.3	--	--	--	--	--	--	30	2.20E-09	6.7.E-08	17.5	70600	1235500	0.4	494200	13994187	0.94
Toluene	µg/L	47	--	--	--	--	--	--	--	0.87 J	24	2.20E-09	5.3.E-08	17.5	70600	1235500	0.4	494200	13994187	0.74
Total Xylenes	µg/L	340	7.3	41	--	--	--	--	--	--	129	2.20E-09	2.9.E-07	17.5	70600	1235500	0.4	494200	13994187	3.99
																			Subtotal:	***5.67***
Semi-Volatiles																				
2-Methylnaphthalene	µg/L	--	0.78 J	13	--	--	--	--	--	--	7	2.20E-09	1.5.E-08	17.5	70600	1235500	0.4	494200	13994187	0.21
Acenaphthene	µg/L	--	--	1.1 J	--	--	--	--	--	--	1	2.20E-09	2.4.E-09	17.5	70600	1235500	0.4	494200	13994187	0.03
Benzyl Alcohol	µg/L	2.5 J	--	--	--	--	--	--	--	--	3	2.20E-09	5.5.E-09	17.5	70600	1235500	0.4	494200	13994187	0.08
Dibenzofuran	µg/L	--	--	0.62 J	--	--	--	--	--	--	1	2.20E-09	1.4.E-09	17.5	70600	1235500	0.4	494200	13994187	0.02
Fluorene	µg/L	--	--	1.2 J	--	--	--	--	--	--	1	2.20E-09	2.6.E-09	17.5	70600	1235500	0.4	494200	13994187	0.04
Naphthalene	µg/L	0.73 J	0.65 J	--	--	--	--	--	--	--	1	2.20E-09	1.5.E-09	17.5	70600	1235500	0.4	494200	13994187	0.02
Phenanthrene	µg/L	--	--	1.9 J	--	--	--	--	--	--	2	2.20E-09	4.2.E-09	17.5	70600	1235500	0.4	494200	13994187	0.06
Phenol	µg/L	--	1.2 J	--	--	--	--	--	--	--	1	2.20E-09	2.6.E-09	17.5	70600	1235500	0.4	494200	13994187	0.04
																			Subtotal:	***0.50***
																			DEEP GROUNDWATER TOTAL:	***6.17***

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

SOIL

	Sampling Location	GP-17-07	GP-33-07	OW18A/B-07	Average Contaminant Concentration	Conversion Factor	Average Contaminant Concentration	Depth (15' to 28')	Fill Area	Total Volume of Soil	Soil Bulk Density	Lbs. of Soil	Chemical Mass
	Sample Identification	S-101207-SDN-014	S-101507-SDN-027	S-102507-SDN-032									
	Sample Date	10/12/2007	10/15/2007	10/25/2007									
	Sample Start Depth	19	16.5	20									
	Sample End Depth	20	17	22	µg/kg		lbs/lb	ft	ft^2	ft^3	lbs/ft^3		lbs
PARAMETER	***UNITS***												
Volatiles													
2-Butanone	µg/kg	9.9 J	--	27	18.5	1.00E-09	1.8.E-08	14	27,275	381,850	90	34,366,500	0.63
Acetone	µg/kg	--	8400 J	61	4,231	1.00E-09	4.2.E-06	14	27,275	381,850	90	34,366,500	145.39
Benzene	µg/kg	--	780 J	3.1 J	392	1.00E-09	3.9.E-07	14	27,275	381,850	90	34,366,500	13
Carbon Disulfide	µg/kg	--		1 J	1.0	1.00E-09	1.0.E-09	14	27,275	381,850	90	34,366,500	0.03
Ethylbenzene	µg/kg	--	81000	160	40,580	1.00E-09	4.1.E-05	14	27,275	381,850	90	34,366,500	1395
Methylene Chloride	µg/kg	--		7.7 J	7.7	1.00E-09	7.7.E-09	14	27,275	381,850	90	34,366,500	0
Toluene	µg/kg	--	130000		130,000	1.00E-09	1.3.E-04	14	27,275	381,850	90	34,366,500	4467.69
Total Xylenes	µg/kg	--	710000	330	355,165	1.00E-09	3.6.E-04	14	27,275	381,850	90	34,366,500	12205.90
												Subtotal:	***18,228***
Semi-Volatiles													
2,4-Dimethylphenol	µg/kg	580 J	1300000	--	650,290	1.00E-09	6.5.E-04	14	27,275	381,850	90	34,366,500	22348
2-Methylnaphthalene	µg/kg	750 J	--	10000	5,375	1.00E-09	5.4.E-06	14	27,275	381,850	90	34,366,500	184.72
2-Methylphenol	µg/kg	--	100000	--	100,000	1.00E-09	1.0.E-04	14	27,275	381,850	90	34,366,500	3436.69
2-Nitroaniline	µg/kg	--	130000 J	--	130,000	1.00E-09	1.3.E-04	14	27,275	381,850	90	34,366,500	4468
4-Methylphenol	µg/kg	1900	580000	--	290,950	1.00E-09	2.9.E-04	14	27,275	381,850	90	34,366,500	9999.04
4-Nitroaniline	µg/kg	--	--	5900	5,900	1.00E-09	5.9.E-06	14	27,275	381,850	90	34,366,500	202.76
Acenaphthene	µg/kg	--	--	3700	3,700	1.00E-09	3.7.E-06	14	27,275	381,850	90	34,366,500	127.16
Acenaphthylene	µg/kg	--	--	1400 J	1,400	1.00E-09	1.4.E-06	14	27,275	381,850	90	34,366,500	48.11
Anthracene	µg/kg	--	--	2000 J	2,000	1.00E-09	2.0.E-06	14	27,275	381,850	90	34,366,500	68.73
Benzo(A)Anthracene	µg/kg	--	--	6100	6,100	1.00E-09	6.1.E-06	14	27,275	381,850	90	34,366,500	209.64
Benzo(A)Pyrene	µg/kg	--	--	4100	4,100	1.00E-09	4.1.E-06	14	27,275	381,850	90	34,366,500	140.90
Benzo(B)Fluoranthene	µg/kg	--	--	7100	7,100	1.00E-09	7.1.E-06	14	27,275	381,850	90	34,366,500	244.00
Benzo(G,H,I)Perylene	µg/kg	--	--	5600	5,600	1.00E-09	5.6.E-06	14	27,275	381,850	90	34,366,500	192
Benzo(K)Fluoranthene	µg/kg	--	--	2800	2,800	1.00E-09	2.8.E-06	14	27,275	381,850	90	34,366,500	96
Bis(2-Ethylhexyl) Phthalate	µg/kg	--	33000 JB	940 J	16,970	1.00E-09	1.7.E-05	14	27,275	381,850	90	34,366,500	583
Carbazole	µg/kg	--	--	720 J	720	1.00E-09	7.2.E-07	14	27,275	381,850	90	34,366,500	25
Chrysene	µg/kg	--	--	6600	6,600	1.00E-09	6.6.E-06	14	27,275	381,850	90	34,366,500	227
Dibenzo(A,H)Anthracene	µg/kg	--	--	2300	2,300	1.00E-09	2.3.E-06	14	27,275	381,850	90	34,366,500	79.04
Dibenzofuran	µg/kg	--	--	4100	4,100	1.00E-09	4.1.E-06	14	27,275	381,850	90	34,366,500	140.90
Di-N-Butylphthalate	µg/kg	350 J	--	--	350	1.00E-09	3.5.E-07	14	27,275	381,850	90	34,366,500	12.03
Fluoranthene	µg/kg	--	--	15000	15,000	1.00E-09	1.5.E-05	14	27,275	381,850	90	34,366,500	515.50
Fluorene	µg/kg	--	--	3300	3,300	1.00E-09	3.3.E-06	14	27,275	381,850	90	34,366,500	113.41
Indeno(1,2,3-Cd)Pyrene	µg/kg	--	--	7000	7,000	1.00E-09	7.0.E-06	14	27,275	381,850	90	34,366,500	240.57
Naphthalene	µg/kg	730 J	19000 J	9500	9,743	1.00E-09	9.7.E-06	14	27,275	381,850	90	34,366,500	334.85
Phenanthrene	µg/kg	470 J	--	8200	4,335	1.00E-09	4.3.E-06	14	27,275	381,850	90	34,366,500	148.98
Phenol	µg/kg	--	210000	910 J	105,455	1.00E-09	1.1.E-04	14	27,275	381,850	90	34,366,500	3624.16
Pyrene	µg/kg	--	--	13000	13,000	1.00E-09	1.3.E-05	14	27,275	381,850	90	34,366,500	446.77
												Subtotal:	***48,258***
												SOIL TOTAL:	***66,486***

APPENDIX A
SUMMARY OF AVERAGE CONTAMINANT CONCENTRATIONS - FILL AREA

Updated Feasibility Study
SI Group, Inc.
Congress Street Facility
Schenectady, NY

GROUNDWATER																
Sampling Location / *Sample Identification* / *Sample Date*		OW18A-07 / OW-18A / 11/27/07	OW19A-07 / OW-19A / 11/27/07	OW18B-07 / OW-18B / 11/27/07	OW19B-07 / OW-19B / 11/27/07	GP-14-07 / GW-101207-SDN-016 / 10/12/2007	GP-16-07 / GW-101207-SDN-019 / 10/12/2007	Average Contaminant µg/L	Conversion Factor µg to lbs	Average Contaminant Concentration lbs/L	Depth 28' to 50'	Fill Area ft^2	Total Volume of Fill Area ft^3	Porosity %	Volume of Groundwater ft^3	Volume of Groundwater L	Chemical Mass lbs
PARAMETER	***Units***															
Volatiles																
Acetone	µg/L	9 J	--	--	--	7.6 J	--	8	2.20E-09	1.8.E-08	22	27275	600,050	0.4	240,020	6,796,610	0
Benzene	µg/L	1.3 J	31 J	--	--	7.2	--	13	2.20E-09	2.9.E-08	22	27275	600,050	0.4	240,020	6,796,610	0
Carbon Disulfide	µg/L	--	--	--	--	--	0.97 JM	1	2.20E-09	2.1.E-09	22	27275	600,050	0.4	240,020	6,796,610	0
Ethylbenzene	µg/L	7.7	460	0	2.3 J	23	26	87	2.20E-09	1.9.E-07	22	27275	600,050	0.4	240,020	6,796,610	1
Toluene	µg/L	4.3 J	380	0	1 J	6.3	0.77 J	65	2.20E-09	1.4.E-07	22	27275	600,050	0.4	240,020	6,796,610	1
Total Xylenes	µg/L	68	5300	0	35	200	120	954	2.20E-09	2.1.E-06	22	27275	600,050	0.4	240,020	6,796,610	14
															Subtotal:	***17***
Semi-Volatiles																
2,4-Dimethylphenol	µg/L	1.8 J	760	0	6.5 J	610	34	235	2.20E-09	5.2.E-07	22	27275	600,050	0.4	240,020	6,796,610	4
2-Methylnaphthalene	µg/L	4.2 J	34 J	--	--	--	2.2 J	13	2.20E-09	3.0.E-08	22	27275	600,050	0.4	240,020	6,796,610	0
2-Methylphenol	µg/L	1.9 J	180	--	--	88 J	9.5 J	70	2.20E-09	1.5.E-07	22	27275	600,050	0.4	240,020	6,796,610	1
4-Methylphenol	µg/L	4.2 J	420	--	--	730	44	300	2.20E-09	6.6.E-07	22	27275	600,050	0.4	240,020	6,796,610	4
Acenaphthene	µg/L	0.63 J	--	--	--	--	--	1	2.20E-09	1.4.E-09	22	27275	600,050	0.4	240,020	6,796,610	0
Dibenzofuran	µg/L	0.47 J	--	--	--	--	--	0	2.20E-09	1.0.E-09	22	27275	600,050	0.4	240,020	6,796,610	0
Diethylphthalate	µg/L	1.2 J	--	--	--	--	--	1	2.20E-09	2.6.E-09	22	27275	600,050	0.4	240,020	6,796,610	0
Di-N-Butylphthalate	µg/L	--	--	--	--	38 J	--	38	2.20E-09	8.4.E-08	22	27275	600,050	0.4	240,020	6,796,610	1
Naphthalene	µg/L	28	130	0	0.71 J	10 J	2.7 J	29	2.20E-09	6.3.E-08	22	27275	600,050	0.4	240,020	6,796,610	0
Phenol	µg/L	1.8 J	140			29 J	7.6 J	45	2.20E-09	9.8.E-08	22	27275	600,050	0.4	240,020	6,796,610	1
															Subtotal:	***11***
															GROUNDWATER TOTAL:	***28***