August 16, 2007

ALTERNATIVES ANALYSIS REPORT/ REMEDIAL ACTION WORK PLAN

Coral Island Shopping Center
1650 Richmond Avenue
Staten Island, New York

Prepared for:

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LIST OF ACRONYMS

1,2 DCE	Cis-1, 2 dichloroethene
AAR/RAWP	Alternatives Analysis Report/Remedial Action Work Plan
ARARS	Applicable or relevant and appropriate requirements
ASP	Analytical Services Protocol
AS/SVE	Air Sparge / Soil Vapor Extraction
AWQSGVs	Ambient Water Quality Standards and Guidance Values
BLS	Below Land Surface
CAMP	Community Air Monitoring Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CPP	Citizen Participation Plan
DER-10	NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 25, 2002
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DUSR	Data Usability Summary Report
ERD	Enhanced Reductive Dechlorination
HASP	Health and Safety Plan
ISCO	*In Situ* Chemical Oxidation
NOD	Natural Oxidant Demand

LIST OF ACRONYMS (Continued)

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OM&M	Operation, Maintenance and Monitoring
ORP	Oxidation-Reduction Potential
Part 375	Title 6 of the New York Code of Rule and Regulations (6 NYCRR) Part 375
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RI	Remedial Investigation
RSCOs	Recommended Soil Cleanup Objectives
SCGs	Standards, Criteria and Guidance
SCOs	Soil Cleanup Objectives
SRI	Supplementary Remedial Investigation
SVOCs	Semivolatile Organic Compounds
TAGM	NYSDEC Technical and Administrative Guidance Memorandum

LIST OF ACRONYMS (Continued)

TAL	Target Analyte List
TBC	To Be Considered
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristics Leaching Procedure
TOGS	Technical and Operational Guidance Series
TPH	Total Petroleum Hydrocarbon
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOCs	Volatile Organic Compounds

CERTIFICATIONS

I, Brian P. Morrissey, am currently a registered professional engineer licensed by the State of New York. I have primary direct responsibility for implementation of the remedial program for the Coral Island Shopping Center Site (NYSDEC BCA Index No. W2-1040-05-01 Site No. C243033).

I certify that the Site description presented in this RAWP is identical to the Site descriptions presented in the Brownfield Cleanup Agreement for the Coral Island Shopping Center and related amendments.

This RAWP requires that all affected local governments, as defined in ECL 71-3603, will be notified that such Easement has been recorded. This RAWP requires that a Site Management Plan must be submitted by the Applicant for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, for approval by the Department [if Track 1 is not achieved]. Proposed use restrictions, Institutional Controls, Engineering Controls, and plans for all operation and maintenance requirements applicable to the Site and provision for development of an Environmental Easement to be created and recorded pursuant ECL 71-3605 [if Track 1 is not achieved] will be presented as part of the Site Management Plan.

I certify that this RAWP has a plan for transport and disposal of all soil, fill, fluids and other material removed from the property under this Plan, and that all transport and disposal will be performed in accordance with all local, State and Federal laws and requirements. All exported material will be taken to facilities licensed to accept this material in full compliance with all Federal, State, and local laws.

I certify that this RAWP has a plan for import of all soils and other material from off-Site and that all activities of this type will be in accordance with all local, State and Federal laws and requirements.

I certify that that this RAWP has a plan for nuisance control during the remediation and all invasive development work, including a dust, odor and vector suppression plan and that such plan is sufficient to control dust, odors and vectors and will prevent nuisances from occurring.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

062617	July 2, 2007	
NYS Professional Engineer #	Date	Signature

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

EXECUTIVE SUMMARY

Site Description

On behalf of WWP Associates, LLP (WWP), Roux Associates, Inc. (Roux Associates) and Remedial Engineering, P.C (Remedial Engineering), have prepared this Alternative Analysis Report/Remedial Action Work Plan (AAR/RAWP) for the Coral Island Shopping Center (Site) located at 1650 Richmond Avenue, Staten Island, New York (Figure 1). This AAR/RAWP evaluates remedial alternatives and describes the proposed remedial action to address an area of impacted soil and groundwater most probably resulting from the direct discharge to the ground of PCE associated with the historic use of the tenant space as a dry cleaner.

In order to address the environmental conditions, WWP, as a participant, entered into a Brownfield Cleanup Agreement, Index Number: W2-1040-05-01 (BCP Site No. C243033) dated March 2005 with the New York State Department of Environmental Conservation (NYSDEC).

The Site is comprised entirely of the Coral Island Shopping Center, which consists of two single story buildings, each with multiple tenants and a parking lot (Plate 1). The building at the north end of the Site includes the Dry Cleaner, the focus of the AAR/RAWP. The Site is situated on Victory Boulevard and Richmond Avenue, two large commercial corridors with mixed residential and commercial use. The Our Lady of Pity Church and Moore Catholic High School are located to the north of the Site.

Summary of the Remedial Investigation

Based on a review of the RI results, the area of the Site immediately behind and beneath the Dry Cleaner (i.e., the source area) is underlain by the following generalized layers:

- A one-inch thick surface course of gravel underlain by landscaping fabric.
- Fill – ranging from two to four feet thick and described as a brown coarse to fine sand with brick, glass, concrete and wood fragments.
- Sand and Silt – two to six-foot thick layer of grey to brown, coarse to fine sand and silt, with occasional variable amounts of gravel. For clarification purposes in the discussion below, this layer will be referred to as the sand layer.
- Silt – eight to 13-foot thick layer of brown silt with some gravel and little fine sand.

- Silt and Clay – Brown silt and clay, greater than 12-feet thick immediately beneath the dry cleaner.

A geologic cross section of the area is shown as Plate 5 of the AAR/RAWP.

The shallow water-level elevation map produced from data obtained during the SRI in August 2006 indicated groundwater at depths ranging from approximately 4.1 feet bls to 7.5 feet bls, with flow components in a northwesterly direction in the vicinity of the source area behind the Dry Cleaner (Plate 8 of the AAR/RAWP).

Water level elevations measured in deep wells in August 2006 indicated groundwater at depths ranging from approximately 4.1 feet bls to 8.9 feet bls. There was a "high spot" observed in the potentiometric surface immediate vicinity of the Dry Cleaner with groundwater flow directions radially outward from that location to the south, west and northwest. Deeper groundwater flows toward the west beneath the western portion of the Site, and to the west-northwest beneath School property (Plate 9 of the AAR/RAWP).

Soil Quality

A review of soil quality data obtained from 46 soil borings advanced during three phases of soil investigations at the Site indicated that shallow soil in a focused area behind the Dry Cleaner and Market, and extending onto the Church property in one location immediately to the north, is impacted by relatively high concentrations of primarily PCE and TCE. The impacted zone is generally restricted to the upper two to five feet of fill.

Groundwater Quality

Groundwater data obtained from 38 sampling locations indicated that groundwater to a depth of approximately 20 feet bls is impacted by relatively high concentrations of PCE and associated degradation products beneath the source area behind the Dry Cleaner. A plume of groundwater impacted by VOCs extends off site toward the west-northwest beneath the Church and School properties (Plate 10 of the AAR/RAWP).

Soil Vapor/Indoor Air Quality

Air data obtained from 31 air samples at 24 locations, and soil vapor data obtained from 13 soil vapor samples at 9 locations indicated that with the exception three samples, PCE in indoor air of the Dry Cleaner itself, PCE in indoor air of the utility room off the Market, and PCE in an initial sample from Room A-6 of the School, all of the levels of PCE detected in indoor air fall below the background level and the outdoor ambient air concentrations collected concurrently with each sample. Confirmatory sampling of indoor air in Room A-6 of the School was below background levels.

Based on the analytical results of the ambient air and soil vapor investigation, an area of broken concrete in a utility room off the Market was repaired; however, no remedy is evaluated or proposed to address either air or soil vapor as part of this AAR/RAWP.

Qualitative Human Health Exposure Assessment

The potential on-site receptors include occupational workers, construction workers, visitors, or trespassers. Future on-site receptors could also include residents if the property was rezoned and the Site use changed. The potential off-site receptors include off-site workers, students, parishioners, visitors, and trespassers.

Potential Points and Routes of Exposure

Contaminated soil is limited to specific areas of the Site and at depths below the immediate surface as indicated by subsurface and surficial soil samples collected as part of the RI. However, there is the potential for direct exposure to contaminated soil by anyone digging in the contaminated area.

The Site and surrounding community are supplied by public sources of drinking water which meets all State and Federal standards for drinking water quality. As such, there is no potential for exposure to site contaminants from the public sources of drinking water. Private non-potable water supply wells are not operated on the Site or by the adjacent Church or School.

In areas where there are Site buildings (or future Site buildings) in the vicinity of groundwater contamination, there is potential for volatilization of VOCs to accumulate beneath the building

and migrate into indoor air. If such circumstances occur, Site workers could be exposed to contaminants via the indoor air inhalation route of exposure.

Summary of the Remedy

A concise but complete description of the selected remedy is presented below. To the extent possible, items are listed in the order they will be implemented.

1. On-site soils impacted with PCE and degradation products will be excavated from four areas and disposed of off site. At each area, the upper two to five feet of fill will be excavated. Post excavation samples will be collected and additional excavation may be conducted until restricted commercial standards are met or to the extent feasible based on the water table and lateral limitations of underground utilities, building foundations, and a nearby transformer. The estimated volume of soil to be removed to achieve restricted commercial use on-site is approximately 18 cubic yards. Excavations will be backfilled with clean soil that meets 6NYCRR Part 375-6 Track 1 Unrestricted SCOs.

2. Off-site soils impacted with PCE and degradation products will be excavated from one area and disposed of off site. Initially, the upper five feet of soil will be excavated. Post excavation samples will be collected and additional excavation will be conducted until unrestricted residential standards are met. The estimated volume of soil to be removed to achieve restricted commercial use on-site is approximately 5 cubic yards. Excavations will be backfilled with clean soil that meets 6NYCRR Part 375-6 Track 1 Unrestricted SCOs.

3. Prior to backfilling, Enhanced Reductive Dechlorination (ERD) substrates will be applied to the bottom of the open on-site and off-site excavations created during the removal of impacted soils.

4. One round of off-site ERD injections will be conducted in the area of the leading edge of the 10,000 microgram per liter total volatile organic compound contour as shown in Plate 4. The ERD substrate will be injected every five feet as a row of injections. The depth of ERD injection will extend from approximately 4 ft to 8 ft bls into the groundwater (depth to groundwater is approximately 4 ft bls). The amount of ERD substrate may be altered depending on the field measurements made in the monitoring wells and the analytical results of the baseline round of groundwater sampling.

5. To assess the performance of the ERD injections, periodic groundwater monitoring will be conducted.

1.0 INTRODUCTION

On behalf of WWP Associates, LLP (WWP), Roux Associates, Inc. (Roux Associates) and Remedial Engineering, P.C (Remedial Engineering), have prepared this Remedial Action Work Plan (RAWP) for the Coral Island Shopping Center (Site) located at 1650 Richmond Avenue, Staten Island, New York (Figure 1). This RAWP evaluates remedial alternatives and describes the proposed remedial action to address an area of impacted soil and groundwater from historic releases associated with a dry cleaner at the Site (Dry Cleaner). The alternatives evaluated and remedial action selected took into consideration:

- The proposed Cleanup Track for on-site soil under the Brownfield Cleanup Program (BCP) is Track 4 (Restricted Use), with source removal (grossly contaminated soil) and plume stabilization;
- The proposed Cleanup Track for off-site soil under the Brownfield Cleanup Program (BCP) is Track 1 (Unrestricted Use);
- The Our Pady of Pity church, (Church) and Moore Catholic High School (School) are on adjacent properties; and
- There are no potable supply wells in the vicinity.

In order to address the environmental conditions, WWP entered into a Brownfield Cleanup Agreement, Index Number: W2-1040-05-01 dated March 2005 between the New York State Department of Environmental Conservation (NYSDEC) and WWP.

Under this agreement, the Site entered into New York State's Brownfield Cleanup Program (BCP). The "Site" is defined, for the purposes of the BCP, as the area within the limits of the property boundary as shown in Plate 1. The Site is comprised entirely of the Coral Island Shopping Center, which consists of two single story buildings, each with multiple tenants and a parking lot (Plate 1). The building at the north end of the Site includes the Dry Cleaner, the focus of the RAWP.

The requirements and recommendations of the NYSDEC guidance document, Draft Brownfield Cleanup Program Guide (May 2004), were incorporated into this RAWP, in addition to the requirements and recommendations of the NYSDEC "Draft DER-10 Technical Guidance for Site Investigation and Remediation (DER-10)," dated December 25, 2002. It is our intention to

conduct the remediation the Site in accordance with the Draft BCP Guide, Draft DER-10 and Title 6 of the New York Code of Rule and Regulations (6 NYCRR) Part 375.

The remainder of this AAR/RAWP is organized as follows:

- Section 2.0: Provides a summary of the history of the Site
- Section 3.0: Provides a summary of environmental conditions based upon the results of all investigations completed at the Site
- Section 4.0: Identifies remedial goals and remedial action objectives
- Section 5.0: Describes the alternative analysis and remedy selection process for soil
- Section 6.0: Describes the alternative analysis and remedy selection process for groundwater
- Section 7.0: Describes the selected soil remedy
- Section 8.0: Describes the selected groundwater remedy
- Section 9.0: Describes the Remedial Action Report
- Section 10.0: Describes the Operation, Maintenance and Monitoring
- Section 11.0: Describes the Citizen Participation Plan (CPP)
- Section 12.0: Describes the project schedule

Included with the AAR/RAWP are the following appendices:

- Appendix A: Community Air Monitoring Plan
- Appendix B: Quality Assurance Project Plan
- Appendix C: Site-specific Health and Safety Plan

2.0 SITE SETTING AND HISTORY

The Site is located at 1650 Richmond Avenue, Staten Island, New York (Figure 1), which is located in Richmond County, Borough of Staten Island, Block 2236, Lot 125, at latitude 40° 36' 27" north and longitude 74° 9' 47" west. The Coral Island Shopping Center consists of two single story buildings, each with multiple tenants and a parking lot (Plate 1). A complete list of tenants for the shopping center was provided to the NYSDEC as part of the Brownfield Cleanup Program (BCP) Application. The building at the north end of the Site includes the Charming Cleaners dry cleaner, the focus of the RI. The tenant space to the west of the dry cleaner is the Tic-Tac Meats and Deli (Deli), a small market with a kitchen and storage in the rear of the store. A utility room for the entire building is located off the kitchen area at the rear of the tenant space. The tenant space to the east of the dry cleaner is the J+J Page Stationary (Stationary).

The area behind the Dry Cleaner is gravel covered (over landscaping fabric) and is only 15 feet wide (approximate), with the building to the south and a chain link fence on the property line to the north. A transformer is located approximately 20 feet to the west of the back door of the cleaners, with less than three feet of clearance between the building and the transformer, and the transformer and the chain link fence. There is a concrete sidewalk east of the Dry Cleaner space to a point where there is less than four feet of clearance between the property line fence and the corner of the building.

Immediately north of the Site and adjacent to the dry cleaner is the Our Lady of Pity Church property, specifically a grass covered area behind a large multi-use building that includes meeting rooms, a kitchen, and a gym mostly used for basketball. The chapel and a residence for Church personnel are located further to the north. The Moore Catholic High School is located to the west and northwest. The School property includes three main buildings, a group of modular classrooms consisting of multiple trailers parked on an asphalt parking lot, the main school building, and an administration building. The School's football field is to the west. Richmond Avenue is located to the east of the Site. There is a McDonalds restaurant located immediately to the southeast of the Site that has an access driveway from the Coral Island Shopping Center parking lot. There is a Mobil service station, additional commercial buildings and Victory Boulevard located to the south of McDonalds. Residential properties and

Victory Boulevard are located to the southwest. Victory Boulevard and Richmond Avenue are large commercial corridors with mixed residential and commercial use, including auto repair, gasoline station, and car wash facilities.

3.0 SUMMARY OF ENVIRONMENTAL CONDITIONS

The following provides a summary of major investigations, reports and correspondences regarding the investigations performed at the Site. A more detailed summary of environmental conditions may be found in the Remedial Investigation Report (Roux Associates, 2007).

- August 1994 – "Hazardous Substances Survey and Report" prepared by MTS EnviroSurv.
  - Site Inspection;
  - Review of Building Department records; and
  - Nine soil samples.

  MTS reviewed records that indicated Building A was connected to a septic tank with a leachfield from 1958 to 1982. The location of the leachfield, as described by MTS, placed it partially under Building B (Building B was built in 1995) and the parking lot just south of Building B. MTS obtained a soil sample (Sample 1) from 8 to 10 feet below land surface (bls) in the reported location of the former leachfield. Analytical results indicated that PCE was not detected. A detection of lead in Sample 1 of 7,070 milligrams per kilogram (mg/kg) resulted in an additional eight samples being obtained and analyzed for lead only. Lead concentrations in the additional samples ranged from 6.0 mg/kg to 62.6 mg/kg, suggesting either an erroneous result from Sample 1 or a very limited area exhibiting a high concentration of lead that could not be duplicated.

- June 2004 – "Phase I Environmental Site Assessment Report" (Phase I ESA) (EBI).
  - No sampling was conducted as part of the Phase I ESA.

- July 2004 – Limited Subsurface Investigation (EBI).
  - Identified soil impacted by PCE and trichloroethene (TCE) behind the Dry Cleaner at concentrations ranging from 2,600 µg/kg to 7,400,000 µg/kg.
  - Identified groundwater beneath the Dry Cleaner impacted by cis-1,2 dichloroethene (cis-1,2-DCE), TCE, and PCE at concentrations ranging from 4,800 micrograms per liter (µg/L) to 170,000 µg/L.
  - Samples collected south of, and under, the building slab did not indicate impacts above NYSDEC Recommended Soil Cleanup Objectives (RSCOs) or Ambient Water Quality Standards (AWQS).

- July 2004 – Limited Site Assessment (Roux Associates).
  - Four air, 16 soil, and 5 groundwater samples.
  - 3,100 µg/kg of cis-1,2-DCE in soil boring SB-2 from the one to two foot interval bls, approximately 20 feet west of the back door of the Dry Cleaner).

- The maximum concentration of PCE observed was 2,000 µg/kg from the 1-2 foot interval bls at SB-2.

- Despite sampling within a few feet of the samples obtained by EBI, Roux Associates was not able to confirm the 7,400,000 µg/kg PCE concentration observed in the EBI samples.

- Five groundwater samples were collected. Impacts by VOCs, including PCE and its associated degradation products, were detected in the shallow saturated zone at concentrations above NYSDEC AWQS but significantly lower than observed by EBI. The maximum concentration of PCE observed by Roux Associates was 7,500 µg/L (PZ-4), compared to 170,000 µg/L observed by EBI. The shallow saturated zone did not extend to the downgradient (western) property boundary. A deeper saturated zone was observed at two locations and sampled at the western Site boundary (PZ-6). VOCs were detected in the deeper saturated zone at this location but at concentrations below AWQS.

- One indoor air sample was collected within the Dry Cleaner. Two indoor air samples were collected in adjacent businesses, one in the Deli to the west and one in the Stationery to the east. One outdoor ambient air sample was collected in the parking lot approximately 50 feet south of Dry Cleaner. PCE was not detected in the Deli or the Stationery air samples. PCE was detected at 3,900 micrograms per cubic meter (µg/m3) in the sample collected from inside the Dry Cleaner. This concentration falls within a range of PCE concentrations typically detected in dry cleaning facilities and may be attributed to off-gassing of cleaned clothing hanging in the facility.

- March 2005 – WWP and the NYSDEC entered into a Brownfield Cleanup Agreement to implement a Remedial Response Program for the Site.

- April 2005 – "Remedial Investigation Work Plan" (Roux Associates).

- August through September 2005 – Remedial Investigation (Roux Associates).
  - Compliance audit of the dry cleaner
  - 55 soil vapor screening locations
  - Three ambient air samples and a duplicate
  - Three soil vapor samples
  - 26 soil borings (31 samples analyzed)
  - Two surface soil samples
  - 13 two-well clusters completed

- October 25, 2005 – "Draft Preliminary Soil Gas Analytical Results" letter to the NYSDEC.

- November 2005 – 10 air samples were collected (Roux Associates).
- June 12, 2006 – "Supplemental Investigation Proposal" letter to the NYSDEC.
- July 20, 2006 – letter from the NYSDEC to Roux Associates approving the Supplemental Remedial Investigation.
- August 2006 – Supplemental Remedial Investigation (Roux Associates).
  - Seven air samples plus a duplicate
  - Five soil vapor samples and a duplicate
  - 19 soil borings (34 samples analyzed)
  - 4 two-well clusters completed
- October 25, 2006 – "Confirmation Vapor Sampling" letter from the New York State Department of Health (NYSDOH) to the NYSDEC.
- December 2006 – seven air samples and five soil vapor samples plus a duplicate were collected.

3.1 Results of Remedial Investigation

The following provides a summary of the results of the investigations performed at the Site, including the Limited Site Assessment, RI and SRI.

3.1.1 Hydrogeology

Based on a review of the RI results, the area of the Site immediately behind and beneath the Dry Cleaner (i.e., the source area) is underlain by the following generalized layers:

- A one-inch thick surface course of gravel underlain by landscaping fabric.
- Fill – ranging from two to four feet thick and described as a brown coarse to fine sand with brick, glass, concrete and wood fragments.
- Sand and Silt – two to six-foot thick layer of grey to brown, coarse to fine sand and silt, with occasional variable amounts of gravel. For clarification purposes in the discussion below, this layer will be referred to as the sand layer.
- Silt – eight to 13-foot thick layer of brown silt with some gravel and little fine sand.
- Silt and Clay – Brown silt and clay, greater than 12-feet thick immediately beneath the dry cleaner.

The sand layer ranges from two to 6.5 feet in thickness beneath most of the Site, with the exception of the western portion. In the vicinity of Well Cluster MW-103S/D beneath the western portion of the Site, the sand layer dips down and increases in thickness to approximately 15 feet, and is overlain by a four-foot thick zone of primarily silt with a one-foot thick embedded sand and silt layer. The shallow silt zone was observed to the west at the MW-104S/D cluster, where it is approximately three-feet thick. In the vicinity of Well Cluster MW-108S/D in the eastern portion of the Site, the sand layer is also overlain by a two-foot thick silt layer.

The eight to 13 foot-thick layer consisting of primarily silt beneath the sand layer was also identified beneath most of the Site with the exception of the western portion, where it pinches out or grades to the coarser sand and silt layer in the vicinity of Well Cluster MW-103S/D.

Beneath the silt layer is a finer-grained silt and clay to clay layer. The silt and clay layer is thickest beneath the source area in the vicinity of Well Cluster MW-101S/D, where it is over 12-feet thick. Note that the bottom of the silt and clay layer was not encountered in the boring for Well Cluster MW-101S/D. The silt and clay layer decreases in thickness toward the east and west away from beneath the source area. Toward the east at MW-108S/D, the silt and clay layer is only approximately 2 feet thick. Toward the west at Well Cluster MW-103S/D, only a 1.5-foot thick clay layer is present. The clay layer increases again in thickness further toward the west at Well Cluster MW-104S/D, where it is over three-feet thick. Note that the bottom of the clay layer at MW-104S/D was not encountered.

A sand and silt layer was observed beneath the silt and clay layer at the borings for SB-1, MW-103S/D and MW-108S/D. The thickness of this layer is unknown, and it represents the lowest unit observed at the Site.

A geologic cross section of the area is shown as Plate 8 of the Remedial Investigation Report.

The shallow water-level elevation map produced from data obtained during the SRI in August 2006 indicated groundwater at depths ranging from approximately 4.1 feet bls to 7.5 feet bls, with flow components in a northwesterly direction in the vicinity of the source area behind the Dry Cleaner (Plate 5 of the Remedial Investigation Report).

Water level elevations measured in deep wells in August 2006 indicated groundwater at depths ranging from approximately 4.1 feet bls to 8.9 feet bls. There was a "high spot" observed in the potentiometric surface immediate vicinity of the Dry Cleaner with groundwater flow directions radially outward from that location to the south, west and northwest. Deeper groundwater flows toward the west beneath the western portion of the Site, and to the west-northwest beneath School property (Plate 6 of the Remedial Investigation Report).

3.1.2 Soil Quality

A review of soil quality data obtained during the three phases of soil investigations performed by Roux Associates at the Site (Limited Site Assessment, RI and SRI) indicated that shallow soil in a focused area behind the Dry Cleaner and Deli, and extending onto the Church property in one location immediately to the north, is impacted by relatively high concentrations of primarily PCE and TCE. The impacted zone is generally restricted to the upper two to five feet of fill. Sampling locations are shown on Plate 2 of the RI Report.

PCE was the only volatile organic compound detected in on-site soil at concentrations above the restricted commercial SCOs, as summarized below:

Designation	Depth (ft bls)	PCE (150)
SB-101	0.5-2	390
SB-102X	2.5-5	500
SB-103X (DUP)	0.5-2	180
SB-201	3-5	2,200

Concentrations in milligrams per kilogram (mg/kg)
ft bls – feet below land surface
(150) – denotes restricted commercial SCO
(DUP) – duplicate sample
-- – not detected or detected below SCO

PCE, TCE and cis-1,2-DCE were the compounds potentially associated with the Dry Cleaner detected in off-site soil at concentrations above the unrestricted residential SCOs, as summarized below:

Designation	Depth (ft bls)	PCE (1.3)	TCE (0.47)	cis-1,2-DCE (0.25)
SB-214	0-2	1,600	15	0.57
SB-214	3-5	11	--	--

Concentrations in milligrams per kilogram (mg/kg)
ft bls – feet below land surface
(1.3) – denotes unrestricted residential SCO
(DUP) – duplicate sample
-- – not detected or detected below SCO

Location SB-214 is in the grassy area behind the Church's gym immediately north of the Dry Cleaner. One additional VOC (acetone) was detected in soil boring SB-210 at a depth of 3-5 feet at a concentration that slightly exceeded the unrestricted residential SCO.

High concentrations of PCE and TCE were also observed in shallow soil (i.e., less than 5 ft bls) immediately behind and slightly to the west of the Dry Cleaner along the fence:

- SB-101 – 390 mg/kg PCE and 18 mg/kg TCE (0.5 – 2 ft bls);
- SB-103X(duplicate) – 180 mg/kg PCE and 4.8 mg/kg TCE (estimated) (0.5 – 2 ft bls); and
- SB-102X – 500 mg/kg PCE and 2.1 mg/kg TCE (estimated) (2.5 – 5 ft bls).

Based on the information obtained as part of the RI, the probable source of the PCE in shallow soil was direct discharge to the ground of PCE associated with the historic use of the tenant space as a dry cleaner.

One semivolatile organic compound (SVOC) (benzo(a)pyrene) was detected in three soil samples (SB-109, SB-114, and SB-115), and one SVOC (dibenzo(a,h)anthracene) was detected in one soil sample (SB-109), all from the zero to two foot interval bls, at concentrations slightly above the restricted commercial SCO. There were no other SVOCs, metals, PCBs, or pesticides/herbicides detected above the restricted commercial SCOs in soil samples collected at

the Site. The presence of SVOCs in soil at the Site is considered representative of urban fill of undocumented origin that is present beneath most of the Site, and is not representative of impacts due to Site-related activities.

In addition to the contaminants discussed above in the focused area behind the Dry Cleaner and Deli, and extending onto the Church property –two VOCs (acetone and methylene chloride) were detected in at least one of 14 samples, five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene) were detected in at least one of five soil samples, five metals (chromium, copper, lead, mercury, and zinc) were detected in at least one of eight soil samples, one PCB (Aroclor-1260) was detected in two samples, and four pesticides (4,4'-DDD, 4,4'-DDE, Chlordane, and Dieldrin) were detected in at least one of seven samples at concentrations above the unrestricted residential SCO on Site. As discussed above, the presence of these compounds in soil at the Site is considered representative of urban fill of undocumented origin that is present beneath most of the Site, and is not representative of impacts due to Site-related activities.

3.1.3 Groundwater Quality

Groundwater sampling locations are shown on plate 2 of the RI Report. The following data from the RI summarizes detections of compounds potentially associated with the Dry Cleaner (i.e., PCE and it degradation products) at concentrations above NYSDEC ambient water-quality standards and guidance values (AWQSGVs):

Well Designation	Location	PCE (5)	TCE (5)	1,1-DCE (5)	cis-1,2-DCE (5)	VC (2)
MW-101S	On Site	3,500	9,900	220J	31,000	2,800
MW-101D	On Site	17,000	6,700	--	19,000	1,500
MW-102S	On Site	1,200	3,200	--	11,000	610
MW-102D	On Site	--	670	--	7,800	660
MW-103D	On Site	--	--	--	220	15
MW-104D	On Site	--	--	--	69	16
MW-107S	On Site	--	--	--	21	63

Well Designation	Location	PCE (5)	TCE (5)	1,1-DCE (5)	cis-1,2-DCE (5)	VC (2)
MW-107D	On Site	--	--	--	380	300
MW-111D	On Site	--	--	--	17	4.6J
MW-112D	Off Site	--	20J	--	760	44J
MW-113S	Off Site	150J	1,600	--	11,000	380J
MW-113D	Off Site	250	780	--	2,700	52J

Concentrations in micrograms per liter (µg/L)
(5) – denotes AWQSGV in µg/L
-- – not detected or detected below AWQSGV
J – estimated concentration

In addition to VOCs of concern, methylene chloride and toluene were detected above the NYSDEC AWQSGVs in two wells and ethylbenzene was detected above the NYSDEC AWQSGV in one piezometer (PZ-5). Five metals (iron, magnesium, manganese, nickel, and sodium) were detected in at least one of all six groundwater samples collected for metals at the Site above the NYSDEC AWQSGVs. There were no other metals, SVOCs, PCBs, or pesticides/herbicides detected above the NYSDEC AWQSGV in groundwater samples collected at the Site.

A review of groundwater quality data indicates that groundwater to a depth of approximately 20 feet bls is impacted by relatively high concentrations of PCE and associated degradation products beneath the source area behind the Dry Cleaner. A plume of groundwater impacted by VOCs extends off site toward the west-northwest beneath the Church and School properties (Plate 7 of the Remedial Investigation Report). The downgradient off-site extent of the plume was delineated by non-detected concentrations of VOCs in Wells MW-201S/D and MW-203S/D beneath the School property. The lateral off-site (i.e., to the north) extent of the plume was delineated by samples from Wells MW-202S/D, which also did not contain detections of VOCs. The plume extends laterally to the south beneath most of the shopping center building containing the Dry Cleaner, and just south to beneath the northern portion of the parking lot. The eastward extent of the plume was delineated by non-detected concentrations of VOCs in Well MW-108D.

The presence of significant concentrations of PCE degradation products (TCE, cis and trans-1,2-DCE and vinyl chloride) and limited downgradient extent of the VOC plume (less than 260 feet from the source area to the leading edge of the plume) indicates that *in situ* biodegradation of PCE in groundwater is occurring. The relative low permeability of the sand and silt units beneath the site result in low groundwater flow rates that, together with reductive dechlorination, have limited the downgradient migration of VOCs. Assuming that the source of contamination began as soon as a dry cleaner began operation at the Site in 1975, the downgradient extent of the plume suggests migration rates of significantly less than 0.1 foot per day. Therefore, the plume is probably in a stable configuration and not increasing significantly in downgradient extent.

3.1.4 Soil Vapor and Air Quality

With the exception three samples, the September 2005 detection of PCE in the Dry Cleaner itself, the September 2005 detection of 42 micrograms per cubic meter ($\mu g/m^3$) PCE in the utility room off the Market, and the August 2006 detection of 18 $\mu g/m^3$ PCE in the School's Main Building Room A-6, all of the levels of PCE detected in indoor air fall below the background level and the outdoor ambient air concentrations collected concurrently with each sample. Soil vapor and air sampling locations are shown on Plate 2 of the RI Report.

Based on the analytical results of the ambient air and soil vapor investigation, an area of broken concrete in a utility room off the Deli was repaired; however, no remedy is evaluated or proposed to address either air or soil vapor as part of this RAWP. Periodic air and soil vapor sampling to confirm previous results will be proposed as part of the operation, maintenance and monitoring plan that will be prepared as part of the Remedial Action Report.

4.0 REMEDIAL GOALS, SCGS AND REMEDIAL ACTION OBJECTIVES

Based upon the results of the previous site investigations and the current and potential future use of the property, the remedial goals and remedial action objectives (RAOs) have been developed for the Site. Also provided is a description of Standards, Criteria and Guidance (SCGs) applicable to the remedial action. In accordance with the Draft BCP Guide and the Part 375 Regulations, cleanup for the Site will follow the draft Track 4 cleanup approach for on-site soil and the draft Track 1 cleanup approach for off-site soil. The remedial goals have been developed considering that the reasonably anticipated future use on site will be commercial and off site is mixed residential and commercial use.

4.1 Remedial Goals

As described in Section 4.1 of the Draft BCP Guide, "the goal of the remedy selection process in the BCP is to select a remedy for a site that is fully protective of public health and the environment, taking into account the current, intended, and reasonably anticipated future land use of the site."

The remedial goals for soil at the Site are to meet the restricted commercial criteria for on-site areas and to meet unrestricted criteria for off-site areas, as described in the Draft BCP Guide. The remedial goals for the groundwater are to obtain mass reductions of VOCs in on-site groundwater and mitigate off-site impacts to NYSDEC Water Quality Standards for Class GA groundwater, to the extent practicable. Consistent with the Draft BCP Guide, the proposed remedies for the Site will be fully protective of public health and the environment, taking into account the current, intended, and potential future land use.

According to Section 4.6 of the Draft BCP Guide, for Track 1 cleanup remedies:

- A generic table is utilized to identify soil cleanup objectives for unrestricted use remedies which allow the property to be developed for any use;
- Restrictions on the use of the site are not permitted;
- Contaminated soil that generally exceeds the unrestricted use limits should be removed or treated; and
- Reliance upon institutional control/engineering controls to address exposure and achieve the RAOs for the site is not allowed, except one that allows for a groundwater use

restriction if a Volunteer has taken steps to reduce groundwater contamination to asymptotic levels.

According to Section 4.6 of the Draft BCP Guide, for Track 4 cleanup remedies:

- A generic table is utilized to identify soil cleanup objectives for commercial and industrial use remedies;
- Restrictions can be placed on the use of the site as commercial or industrial and on the use of site groundwater;
- Reliance upon institutional control/engineering controls to address soil exposure and achieve the RAOs for the site is not allowed; and
- A groundwater use restriction may be placed upon the site.

4.2 Standards, Criteria and Guidance

SCGs are promulgated requirements ("standards" and "criteria") and non-promulgated guidance ("guidance") that govern activities that may affect the environment and are used by the DER at various stages in the investigation and remediation of a site. SCGs incorporate both the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986's (CERCLA) concept of "applicable or relevant and appropriate requirements" (ARARs) and the United States Environmental Protection Agency's (USEPA) "to be considered" (TBCs) category of non-enforceable criteria or guidance. SCGs applicable to the Site are as follows:

SCGs for Soil

The SCGs for soil were developed to remediate impacts that are the result of historic releases from the on-site dry cleaners based on a restricted commercial use scenario for on-site areas (which is consistent with the current zoning) or unrestricted use scenario for off-site areas (consistent with the zoning off site) and the reasonably anticipated future use of the Site as a commercial strip mall. Therefore, the SCGs for soil are the restricted commercial or unrestricted industrial cleanup criteria, consistent with the criteria contained in the 6 NYCRR Part 375 Regulations. The selection of the appropriate SCG for soil will be determined based upon the results of the alternatives analysis presented in Section 5.

In addition, the unrestricted use criteria presented in the Part 375 Regulations are used in this AAR/RAWP to evaluate an unrestricted use remedial alternative for on-site areas, as required for the AAR portion of this document. Unrestricted use of on-site areas is not planned.

SCGs for soil for the protection of groundwater and the protection of ecological resources were considered, however, were determined to be not applicable based on site-specific conditions. In accordance with the Part 375 Regulations, the protection of groundwater soil cleanup objectives may not be applicable where:

1. The groundwater standard contravention is the result of an on-site source which is addressed by the remedial program;
2. An environmental easement will be put in place which provides for a groundwater use restriction on the site as set forth in paragraph 375-1.8(h)(2);
3. The Department determines that contaminated groundwater at the site:
   - Is not migrating, or likely to migrate, off-site; or
   - Is migrating, or is likely to migrate, off-site, however, the remedy includes controls or treatment to address off-site migration; and
   - The Department determines the groundwater quality will improve over time.

In this situation, all of these conditions will be met and therefore, use of SCGs for soil for protection of groundwater is not applicable.

In accordance with the Part 375 Regulations, protection of ecological resources soil cleanup objectives do not and/or will not apply to sites or portions of sites where the condition of the land (e.g., paved, covered by impervious surfaces, buildings and other structures) precludes the existence of an ecological resource that constitutes an important component of the environment. At this site, the majority of the on-site and off-site areas are either paved or covered by buildings, therefore, use of SCGs for protection of ecological resources is not applicable.

<u>SCGs for Groundwater</u>

Based upon the evaluation of the current groundwater data, as described in Section 3.0, the following SCGs for the groundwater were identified:

- New York State Groundwater Quality Standards – 6 NYCRR Part 703; and

- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1.

4.3 Remedial Action Objective

The RAO for the Site is established for the protection of public health and the environment and is developed based on the SCGs, described above.

As specified in Draft DER-10, Section 4.1(c), RAOs are to be established by the following:

1. Identifying contaminants exceeding applicable SCGs and the environmental media impacted by the contaminants;
2. Identifying applicable SCGs, taking into consideration the current and, where applicable, future land use for the Site; and
3. Identifying all actual or potential public health and/or environmental exposures resulting from contaminants in environmental media at, or impacted by, the Site.

Based upon the identification of the contaminants and impacted media, as described in previous investigation reports and summarized in Section 3.0, identification of the applicable SCGs, taking into consideration current and potential future land use and identification of the actual or potential public health and/or environmental exposures, the appropriate RAOs for the proposed remedial action for soil are to (1) prevent ingestion/direct contact with impacted soil and (2) source removal. The RAOs for the proposed remedial action for the groundwater are to (1) obtain mass reductions of VOCs in on-site groundwater and (2) mitigate off-site impacts to NYSDEC Water Quality Standards for Class GA groundwater, to the extent practicable.

5.0 ON-SITE SOIL REMEDY SELECTION PROCESS

The following is a detailed description of the alternatives analysis and remedy selection process to address impacted on-site soil from historic releases associated with the dry cleaner. Cleanup for off-site soil impacted from historic releases associated with the dry cleaner will follow the draft Track 1 cleanup approach. Therefore, no alternatives are provided for off-site soil. The on-site areas are defined as areas within the property boundary of the Coral Island shopping center, which is shown on Plate 1 and outlined with a chain link fence. The off-site areas are defined as all other areas of concern (outside the property boundary) within the realm of the RI and as shown on the north side of the chain link fence on Plate 1.

In accordance with Section 4.8 of the Draft BCP Guide, this section of the AAR/RAWP was prepared in accordance with Section 4.3[c] of DER-10. As required, a minimum of two remedial alternatives (one being an unrestricted use scenario) are evaluated, as follows:

- One alternative that will achieve unrestricted use relative to on-site soil without the use of institutional or engineering controls; and
- One alternative assuming a restricted commercial use scenario for on-site areas (which is consistent with the current zoning and reasonably anticipated future use), coupled with the use of institutional and engineering controls.

The following remedial action alternatives for the media of concern were developed based upon the remedial goals and RAOs identified in Section 4:

Remedial Alternative 1: Excavation and off-site disposal of soil exceeding the unrestricted use criteria presented in the Part 375 Regulations at any depth above or below the water table for all on-site areas impacted from historic releases associated with the dry cleaner; and backfill of excavated areas.

Remedial Alternative 2: Excavation and off-site disposal of soil exceeding the restricted commercial use criteria for on-site areas at any depth above the water table impacted from historic releases associated with the dry cleaner; backfill of excavated areas; and institutional and engineering controls.

5.1 Evaluation Criteria

Each alternative was evaluated based on the following eight evaluation criteria presented in Section 4.1 of the Draft DER-10 Technical Guidance and/or the Draft BCP Guide:

- Overall protection of public health and the environment;

- Compliance with SCGs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume with treatment;
- Short-term effectiveness;
- Implementability;
- Cost; and
- Compatibility with land use.

Each of the criteria is described below. In addition, DER-10 and the Draft BCP Guide require that the remedy be evaluated on the basis of Community Acceptance. In accordance with NYSDEC guidance, the proposed remedy will be evaluated for community acceptance once the public notice is issued and the public comment period is completed.

5.1.1 Overall Protection of Human Health and the Environment

Description of Criteria

From DER-10: "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."

5.1.2 Compliance with Remedial Goals, SCGs and RAOs

Description of Criteria

From DER-10: "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."

5.1.3 Long-term Effectiveness and Permanence

Description of Criteria

From DER-10: "This criteria 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:

- 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);
- The adequacy of the engineering and institutional controls intended to limit the risk;
- The reliability of these controls; and
- The ability of the remedy to continue to meet RAOs in the future."

5.1.4 Reduction in Toxicity, Mobility or Volume through Treatment

Description of Criteria

From DER-10: "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."

5.1.5 Short-term Effectiveness

Description of Criteria

From DER-10: "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."

5.1.6 Implementability

Description of Criteria

From DER-10: "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."

5.1.7 Cost

Description of Criteria

From DER-10: "Capital, operation, maintenance and monitoring costs are estimated for the remedy and presented on a present worth basis."

5.1.8 Compatibility with Land Use

Description of Criteria

From the Draft BCP Guide: "Preliminary information regarding the land use factor was submitted as part of the application. The Department accepted this initial determination of use by approval of the application. This preliminary determination is confirmed and updated as necessary during the remedy selection process. Current, intended, or reasonably anticipated future land uses of the site and its surroundings must be considered in the selection of the remedy."

5.2 On-Site Soil Remedial Alternative 1: Excavation and Off-Site Disposal of Soil Exceeding the Unrestricted Use Criteria Presented in the Part 375 Regulations for On-Site Areas Impacted from Historic Releases Associated with the Dry Cleaner at Any Depth Above the Water Table; and Backfill of Excavated Areas

The following sections provide a description of Remedial Alternative 1. An evaluation based on the specific evaluation criteria is also presented below.

5.2.1 Description

Plate 2 shows the areas to be addressed under Remedial Alternative 1. Remedial Alternative 1 includes the following remedial elements:

- Mobilization and Site Preparation;
- Storm Water Management and Erosion Control;
- Dust Control;

- Excavation and off-site disposal of soil exceeding the unrestricted use criteria presented in the Part 375 Regulations at any depth above the water table for soil impacted from historic releases associated with the dry cleaner;
- Temporary Staging and Stockpiling;
- Waste Characterization Sampling;
- Traffic Control;
- Off-site Disposal and Equipment Decontamination;
- Post-Excavation Sampling;
- Backfill of the excavated areas with imported soil meeting the unrestricted use criteria presented in the Part 375 Regulations;
- Site Restoration; and
- Health and Safety and Community Air Monitoring.

Each of these elements is discussed in greater detail below.

5.2.1.1 Mobilization and Site Preparation

Upon mobilization to the Site, the Contractor will set up all temporary utilities and temporary facilities, if required. The Contractor will clear vegetation, as necessary, for access to the excavation area. A pre-construction survey will also be prepared by a land surveyor licensed by the State of New York.

5.2.1.2 Storm Water Management and Erosion Control

All necessary measures to temporarily control erosion will be employed. Soil erosion and sediment control measures will be installed prior to the implementation of the remediation and will be maintained throughout the duration of all remedial construction activities, as appropriate. Hay bales and/or silt fences will be placed by the Contractor to control sediment around the disturbed area/excavations or other work areas. Erosion and sediment control measures (i.e., hay bales, silt fences, etc.) will be used to protect any storm water drain in proximity to the construction activities.

In addition, the entrance and adjacent street areas will be swept and/or cleaned, as necessary, throughout the work day, and at the end of the workday, to keep the streets free of soil or other debris generated from the work site during the duration of all excavation activities.

5.2.1.3 Dust Control

Dust (particulate matter) will be controlled at the Site in accordance with the site specific Community Air Monitoring Plan (CAMP), the NYSDEC Technical and Administrative Guidance Memorandum #4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (TAGM 4031), and all federal, state and local requirements. The Contractor will be required to maintain all excavations, stockpiles, and all other work areas to minimize dust that would cause a hazard or nuisance to others.

Dust will be monitored in accordance with the requirements of the Contractor's HASP, the CAMP, and the NYSDEC TAGM 4031. Based on the results of the monitoring, the Contractor will implement necessary measures to control dust to acceptable levels, including but not limited to, one or more of the following measures:

1. Misting equipment and excavation fences;
2. Spraying water (using atomizer) on buckets during excavation and dumping;
3. Hauling materials in tarped or lined containers;
4. Reducing speed of vehicles moving through the construction area;
5. Covering excavated material stockpiles and/or portions of the stockpile, as necessary, throughout the day and after excavation activities cease each day; and
6. Stopping work.

5.2.1.4 Excavation

A comparison of the available data to the unrestricted use criteria presented in the Part 375 Regulations was conducted for this alternative and a summary of the soil sampling locations and exceedances from historic releases associated with the dry cleaner is provided on Plate 2. Based on the results of the RI, the impacted zone is restricted to the upper two to five feet of fill, just above the observed water table. The remedial alternative to achieve unrestricted use of the site assumes that the five on-site areas of concern would be excavated to the water table. However,

there are considerable physical limitations within the areas of concern that will most likely hinder the excavation activities (i.e., proximity to underground utilities, transformer, building foundation). The estimated volume of soil to be removed to achieve unrestricted use on-site would be 27 cubic yards. The five proposed excavation areas for Remedial Alternative 1 are designated as Areas 1, 2, 3, 4 and 6, and are shown on Plate 2.

Based upon the investigation results, excavation dewatering will not be required.

The final horizontal and vertical limits of the excavation will be surveyed. This alternative is estimated to require one month to complete.

5.2.1.5 Temporary Staging and Stockpiling

All impacted materials are to be stored in stockpiles lined and covered with a single layer of minimum 6-mil plastic sheeting. Stockpiles will be routinely inspected and broken sheeting covers will be promptly replaced. Soil stockpiles will be continuously encircled with silt fence or hay bales.

5.2.1.6 Waste Characterization Sampling

One sample per 500 cubic yards of soil to be excavated will be collected for waste characterization, based upon the requirements of the approved disposal facility. The samples will be analyzed for the following:

- Target compound list (TCL) VOCs and SVOCs according to USEPA Methods SW-846 8260 and 8270, respectively;
- TPH for gasoline and diesel range organics (by Method SW-846 8015B);
- Reduced TAL metals by Method SW-846 6010 (includes cadmium, chromium, lead, nickel, selenium, thallium, and vanadium) and Method SW-846 7471 for mercury;
- The full list of toxicity characteristics leaching procedure (TCLP) analyses (metals, VOCs, SVOCs, pesticides, and herbicides);
- Corrosivity;
- Reactivity; and
- Ignitability.

Waste characterization laboratory data are to be reported in NYSDEC ASP Category A deliverables.

5.2.1.7 Traffic Control

Detailed traffic control procedures will be developed when preparing the Contractor's HASP.

5.2.1.8 Off-Site Disposal and Equipment Decontamination

All impacted soil excavated from the Site and other remediation-derived waste will be transported and disposed of in accordance with all applicable federal, state, and local regulations. The remediation-derived waste that will be generated during the construction activities include:

- Soil impacted from historic releases associated with the dry cleaner;
- Personal Protective Equipment (PPE); and
- Decontamination water, if any is generated.

Haul vehicles for bulk soil will be secured with appropriate covers prior to exiting the construction area to prevent a release of waste. PPE waste generated during the implementation of the remedy will be consolidated and stored in appropriate bulk containers and temporarily staged at the designated waste storage area. Any full or partially filled containers will be appropriately labeled.

All wastewater that is generated from equipment decontamination will be disposed of off site at an approved disposal facility.

5.2.1.9 Post-Excavation Sampling

Post-excavation bottom sampling (at a frequency of one sample per 900 square feet of bottom area in accordance with the guidance provided in NYSDEC DER-10 Sections 3.5 and 5.4 for excavations 20 to 300 feet in perimeter) would be conducted for constituents that exceeded the unrestricted use criteria in previous sampling events to confirm that the unrestricted criteria were met. Constituents or groups of constituents that did not exceed the criteria in previous investigations would not be sampled for. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation bottom sample results indicate that concentrations of target constituents are detected below the unrestricted use criteria, the

excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the unrestricted use criteria, the excavation activities, including additional post-excavation bottom sampling, will continue deeper until these conditions are met or to the maximum depth reasonably attainable.

Post-excavation sidewall samples (at a frequency of one sample per 30 linear feet or at least one sample per sidewall) would be conducted for chlorinated solvents and breakdown products. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation sidewall sample results indicate that concentrations of target constituents are detected below the unrestricted use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the unrestricted use criteria, the excavation activities, including additional post-excavation sidewall sampling, will continue until these conditions are met or to the extent feasible with underground utilities, building foundations and a nearby transformer providing lateral limitations.

The locations of the post-excavation samples will be surveyed.

Post-excavation samples will be submitted to Hampton Clarke/Veritech of Fairfield, New Jersey. Category B laboratory data deliverables, as defined in the analytical services protocol (ASP), will be requested. In addition, a Data Usability Summary Report (DUSR) will be prepared by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10.

5.2.1.10 Backfilling

When excavation and removal of the impacted soil is complete, the excavation will be backfilled and compacted using off-site common fill material and topsoil meeting the requirements of the unrestricted use criteria presented in the Part 375 Regulations. The backfill material will be free of extraneous debris or solid waste. The source of the fill must be documented by the supplier, including the location where the fill was obtained and a brief history of the site that is the source of the fill. The fill material must be approved in advance by the NYSDEC. If the NYSDEC agrees that the material originated from a virgin source, then a minimum of one grab sample must be collected and analyzed per source. If the source is not virgin, the following sampling

frequency shall apply to each source: one grab sample per 500 cubic yards for the first 1,000 yards, one grab sample per 1,000 cubic yards for 1,000 to 5,000 cubic yards and one grab sample per 5,000 cubic yards thereafter. Samples will be analyzed for VOCs, SVOCs, metals, PCBs, herbicides and pesticides. Analytical results will be submitted to the NYSDEC prior to use of the backfill.

5.2.1.11 Site Restoration

After backfilling activities are completed, the work area will be graded, seeded or the landscape fabric and gravel will be replaced, as appropriate for each excavation. Once site restoration activities have been completed, all temporary work zone barriers, soil erosion, and sedimentation controls and remedial construction equipment will be removed. The Contractor will then decontaminate all equipment in the established decontamination area prior to removal from the Site.

5.2.1.12 Health and Safety and Community Air Monitoring

All remedial construction activities will be performed in a manner consistent with 29CFR 1910 and 1926. Each consultant and contractor on site will operate under a site-specific HASP for the project. The HASP will be readily available during the work. During all phases of Site work, the Contractor will monitor safety and health conditions and fully enforce the site-specific HASP. The Contractor will be responsible for monitoring general Site conditions and for safety hazards. Specifically, monitoring will be performed to verify that all requirements of the Occupational Safety and Health Administration, as outlined on 29 CFR Part 1910 and 1926, are adhered to. The HASP for the Site is provided in Appendix C.

Ambient air will be monitored at the site perimeter throughout the course of the work for particulate matter and VOCs in accordance with the CAMP included as Appendix A. During the course of the work, the Contractor will take abatement measures, as directed or as otherwise necessary, to minimize the levels of particulates at the limits of the work.

5.2.2 Evaluation

The following sections provide a detailed evaluation of Remedial Alternative 1 based on the seven specific evaluation criteria.

5.2.2.1 Overall Protection of Human Health and the Environment

Alternative 1 will be protective of human health and the environment by eliminating the concentrations in soil of constituents due to the historic releases associated with the dry cleaner through source removal. The potential for human and environmental exposure to these constituents on-site will be eliminated by excavation of the impacted materials, disposing of impacted material off site and backfilling the area with material meeting the unrestricted use criteria.

5.2.2.2 Compliance with Remedial Goals, SCGs and RAOs

SCGs for the proposed remedy are presented in Section 4.0. Alternative 1 will achieve compliance with the unrestricted use criteria for on-site areas.

The excavation will be backfilled with material meeting the unrestricted use criteria presented in the Part 375 Regulations.

5.2.2.3 Long-term Effectiveness and Permanence

Alternative 1 removes all soil that was impacted by the historic releases. Therefore, incremental risk from impacts from the historic releases is eliminated, engineering and institutional controls are not necessary, and the remedy will continue to meet RAOs in the future, thus providing a permanent long-term solution for the Site.

5.2.2.4 Reduction in Toxicity, Mobility or Volume through Treatment

By removing all soil with concentrations that exceeded the unrestricted use criteria, Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants within the Site.

5.2.2.5 Short-term Effectiveness

The health and environmental risks associated with implementation of Alternative 1 are minimal. The remedy implementation time (one month) is relatively short and the potential adverse impacts to the community and workers can be mitigated with engineering controls. These potential impacts (exposure to contaminants and traffic during soil excavation and transportation) will be addressed in the site-specific HASP and CAMP, which also detail monitoring during the construction. These risks will be mitigated through the implementation of

engineering controls as necessary (i.e., dust suppression and traffic control) and will only be an issue during the excavation and transportation of soils.

5.2.2.6 Implementability

The materials, equipment, and personnel associated with the implementation of Alternative 1 are commercially available and have been proven effective and reliable for remediation of the media of concern under similar circumstances. However, due to site-specific physical conditions (i.e., close proximity to underground utilities, transformer and building), implementation of this remedy would be difficult and completion is most likely not feasible. If completed, it is not anticipated that future remedial action following the remedial construction will be required.

5.2.2.7 Cost

The construction and equipment costs associated with Alternative 1 are estimated at approximately $120,000. The following assumptions were made to develop this cost estimate:

- It is anticipated that long-term Operation, Maintenance and Monitoring (OM&M) are not required due to the nature of the remedy, which is anticipated to achieve the unrestricted use goal;
- Excavations depths will be less than three feet into the water table; and
- Excavations will be larger than proposed, to meet the unrestricted use criteria for all post-excavation samples. It has been assumed that the excavated volume will be at least 50 cubic yards.

5.2.2.8 Compatibility with Land Use

The current and reasonably anticipated future zoning of on-site areas is commercial. The present and reasonably anticipated future use of the Site is a commercial strip mall. Following implementation of the remedy, the backfilled area will be restored to unrestricted use conditions, thereby retaining compatibility with future land use.

5.3 On-Site Soil Remedial Alternative 2: Excavation and Off-Site Disposal of Soil Exceeding the Restricted Commercial Use Criteria for On-Site Areas; and Backfill of Excavated Areas

The following sections provide a description of Remedial Alternative 2. An evaluation based on the specific evaluation criteria is also presented below.

5.3.1 Description

Plate 3 shows the areas to be addressed under Remedial Alternative 2. Remedial Alternative 2 includes the following remedial elements:

- Mobilization and Site Preparation;
- Storm Water Management and Erosion Control;
- Dust Control;
- Excavation and off-site disposal of soil exceeding the restricted commercial use criteria for on-site areas impacted from historic releases associated with the dry cleaner;
- Temporary Staging and Stockpiling;
- Waste Characterization Sampling;
- Traffic Control;
- Off-site Disposal and Equipment Decontamination;
- Post-Excavation Sampling;
- Backfill of the excavated areas with imported soil meeting the unrestricted criteria, as an added measure of protection;
- Site Restoration; and
- Health and Safety and Community Air Monitoring.

Each of these elements is discussed in greater detail below.

5.3.1.1 Mobilization and Site Preparation

Mobilization and site preparation will be the same as described in Section 5.2.1.1

5.3.1.2 Storm Water Management and Erosion Control

Storm water management and erosion control will be the same as described in Section 5.2.1.2.

5.3.1.3 Dust Control

Dust control will be the same as described in Section 5.2.1.3.

5.3.1.4 Excavation

A comparison of the available data to the restricted commercial use criteria presented in the Part 375 Regulations was conducted for this alternative and a summary of the soil sampling locations and exceedances from historic releases associated with the dry cleaner is provided on Plate 3. Based on the results of the RI, the impacted zone is restricted to the upper two to five feet of fill, just above the observed water table. The remedial alternative to achieve restricted commercial use of the site assumes that the four on-site areas of concern would be excavated to the water table. The estimated volume of soil to be removed to achieve restricted commercial use on-site would be 18 cubic yards. The four proposed excavation areas for Remedial Alternative 2 are designated as Areas 1, 2, 3, and 4, and are shown on Plate 3.

Based upon the investigation results, excavation dewatering will not be required.

The final horizontal and vertical limits of the excavation will be surveyed. This alternative is estimated to require three weeks to complete.

5.3.1.5 Temporary Staging and Stockpiling

Temporary staging and stockpiling will be the same as described in Section 5.2.1.5.

5.3.1.6 Waste Characterization Sampling

Waste characterization sampling will be the same as described in Section 5.2.1.6.

5.3.1.7 Traffic Control

Traffic control will be the same as described in Section 5.2.1.7.

5.3.1.8 Off-Site Disposal and Equipment Decontamination

Off-site disposal and equipment decontamination will be the same as described in Section 5.2.1.8.

5.3.1.9 Post-Excavation Sampling

Post-excavation bottom sampling (at a frequency of one sample per 900 square feet of bottom area in accordance with the guidance provided in NYSDEC DER-10 Sections 3.5 and 5.4 for excavations 20 to 300 feet in perimeter) would be conducted for chlorinated solvents and

breakdown products to confirm that the restricted commercial criteria were met. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation bottom sample results indicate that concentrations of target constituents are detected below the proposed restricted commercial use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the restricted commercial use criteria, the excavation activities, including additional post-excavation bottom sampling, will continue deeper until these conditions are met or to the maximum depth reasonably attainable.

Post-excavation sidewall samples (at a frequency of one sample per 30 linear feet or at least one sample per sidewall) would be conducted for constituents that exceeded the restricted commercial use criteria in previous sampling events to confirm that the restricted commercial criteria were met. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation sidewall sample results indicate that concentrations of target constituents are detected below the restricted commercial use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the restricted commercial use criteria, the excavation activities, including additional post-excavation sidewall sampling, will continue until these conditions are met or to the extent feasible with underground utilities, building foundations and a nearby transformer providing lateral limitations.

For excavation areas that are located on both sides of the site property boundary (chain link fence), Areas 1, 2 and 3, post-excavation samples collected within the on-site areas will be compared to the restricted commercial use criteria and post-excavation samples collected within the off-site areas will be compared to the unrestricted use criteria.

The locations of the post-excavation samples will be surveyed.

Post-excavation samples will be submitted to Hampton Clarke/Veritech of Fairfield, New Jersey. Category B laboratory data deliverables, as defined in the analytical services protocol (ASP), will be requested. In addition, a Data Usability Summary Report (DUSR) will be prepared by a

party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10.

5.3.1.10 Backfilling

Backfilling will be the same as presented in Section 5.2.1.10.

5.3.1.11 Site Restoration

Site restoration will be the same as described in Section 5.2.1.11.

5.3.1.12 Health and Safety and Community Air Monitoring

Health and safety and community air monitoring will be the same as described in Section 5.2.1.12.

5.3.2 Evaluation

The following sections provide a detailed evaluation of Remedial Alternative 2 based on the specific evaluation criteria.

5.3.2.1 Overall Protection of Human Health and the Environment

Alternative 2 will be protective of human health and the environment by removing the all soil above the water table that was impacted above the restricted commercial criteria by the historic on-site releases associated with the dry cleaner. The potential for human and environmental exposure to these constituents on-site will be reduced by excavation of the impacted materials to the water table, disposing of impacted material off site and backfilling the area with material meeting the unrestricted criteria, as an added measure of protection.

5.3.2.2 Compliance with Remedial Goals, SCGs and RAOs

SCGs for the proposed remedy are presented in Section 4.0. Alternative 2 will achieve compliance with the restricted commercial criteria at all depths above the water table, as required in Section 4.6 of the Draft BCP Guide. In conjunction with the selected groundwater remedy, contamination below the water table that cannot be excavated will be treated using enhanced reductive dechlorination (ERD).

The excavation will be backfilled with material meeting the unrestricted use criteria presented in the Part 375 Regulations, as an added measure of protection.

5.3.2.3 Long-Term Effectiveness and Permanence

Alternative 2 removes all soil on-site that was impacted above the restricted commercial criteria by the historic releases associated with the dry cleaner. Alternative 2 returns the Site to conditions that are compatible with the zoning and reasonably anticipated future use of the Site as a commercial strip mall. Therefore, the incremental risk from impacts from the historic releases is eliminated, engineering and institutional controls are not necessary, and the remedy will continue to meet RAOs in the future, thus providing a permanent long-term solution for the Site.

5.3.2.4 Reduction in Toxicity, Mobility or Volume through Treatment

By removing all soil between zero and the water table impacted above the restricted commercial use criteria, Alternative 2 will permanently reduce the toxicity, mobility, and volume of contaminants at the Site.

5.3.2.5 Short-term Effectiveness

The health and environmental risks associated with implementation of Alternative 2 are minimal. The remedy implementation time is relatively short (three weeks) and the potential adverse impacts to the community and workers can be mitigated with engineering controls. These potential impacts (exposure to contaminants and traffic during soil excavation and transportation) will be addressed in the site-specific HASP and CAMP, which also detail monitoring during the construction. These risks will be mitigated through the implementation of engineering controls as necessary (i.e., dust suppression and traffic control) and will only be an issue during the excavation and transportation of soils.

5.3.2.6 Implementability

The materials, equipment, and personnel associated with the implementation of Alternative 2 are commercially available and have been proven effective and reliable for remediation of the media of concern at the Site under similar circumstances. Although proximity of utilities is still a

concern, implementability of Alternative 2 is feasible. It is not anticipated that future remedial action following the remedial construction will be required.

5.3.2.7 Cost

The construction and equipment costs associated with Alternative 2 are estimated at approximately $85,000. The following assumptions were made to develop this cost estimate:

- It is anticipated that long-term Operation, Maintenance and Monitoring (OM&M) are not required due to the nature of the remedy;
- Excavations depths will be less than three feet into the water table; and
- Excavations will be slightly larger than proposed, to meet the restricted commercial use criteria for all post-excavation samples. It has been assumed that the excavated volume will be approximately 25 cubic yards.

5.3.2.8 Compatibility with Land Use

The current and reasonably anticipated future zoning of the Site is commercial. The present and reasonably anticipated future use of the Site is a commercial strip mall. Following implementation of the remedy, the Site will be restored to commercial use conditions, thereby retaining compatibility with future land use.

5.4 Selected On-Site Soil Remedial Alternative

Remedial Alternative 2 was selected for implementation in on-site area since it adequately meets each of the evaluation criteria, but is more easily implemented than Alternative 1. Due to numerous site-specific constrictions (proximity to underground utilities, transformer and building) completion of Alternative 1 is most likely not feasible. In summary, Alternative 2:

- Is protective of public health and the environment;
- Complies with the appropriate restricted commercial criteria for soil;
- Provides long-term effectiveness and permanence through source removal;
- Reduces the toxicity, mobility, or volume of impacted material through source removal;
- Provides short-term effectiveness, including minimal impacts to workers or the surrounding neighborhood through the implementation of engineering controls during construction;
- Is readily implemented, as opposed to Alternative 1;

- Can be implemented at a lower cost than Alternative 1; and
- Is compatible with land use.

Alternative 2 is consistent with the approach for a restricted commercial use scenario described in the Draft BCP Guide and the Part 375 Regulations.

5.5 Selected Off-Site Soil Remedy

Cleanup of off-site soil impacted from historic releases associated with the dry cleaner will follow the Track 1 cleanup approach, to meet the unrestricted criteria for soil above the water table. As previously discussed, the on-site areas are defined as areas within the property boundary of the Coral Island shopping center impacted from historic releases associated with the dry cleaner, which is shown on Plate 3 and outlined with a chain link fence. The off-site areas are defined as all other areas of concern (outside the property boundary) within the realm of the RI, impacted from historic releases associated with the dry cleaner and as shown on the north side of the chain link fence on Plate 3. The following sections provide a detailed evaluation of the Track 1 approach based on the specific evaluation criteria. Further descriptions of the remedial construction for off-site and on-site soil are provided on Section 7.0.

5.5.1 Overall Protection of Human Health and the Environment

The Track 1 cleanup approach for off-site will be protective of human health and the environment by eliminating the concentrations in soil of constituents due to the historic releases associated with the dry cleaner through source removal. The potential for human and environmental exposure to these constituents off-site will be eliminated by excavation of the impacted materials, disposing of impacted material off site and backfilling the area with material meeting the unrestricted use criteria.

5.5.2 Compliance with Remedial Goals, SCGs and RAOs

SCGs for the proposed remedy are presented in Section 4.0. The Track 1 cleanup approach will achieve compliance with the unrestricted use criteria for off-site areas.

The excavation will be backfilled with material meeting the unrestricted use criteria presented in the Part 375 Regulations.

5.5.3 Long-term Effectiveness and Permanence

The Track 1 cleanup approach removes all soil that was impacted by the historic releases associated with the dry cleaner. Therefore, incremental risk from impacts from the historic releases is eliminated, engineering and institutional controls are not necessary, and the remedy will continue to meet RAOs in the future, thus providing a permanent long-term solution for the off-site area.

5.5.4 Reduction in Toxicity, Mobility or Volume through Treatment

By removing all soil with concentrations that exceeded the unrestricted use criteria, the Track 1 cleanup approach will permanently eliminate the toxicity, mobility, and volume of contaminants in off-site areas of concern.

5.5.5 Short-term Effectiveness

The health and environmental risks associated with implementation of the Track 1 cleanup approach are minimal. The remedy implementation time (one week) is relatively short and the potential adverse impacts to the community and workers can be mitigated with engineering controls. These potential impacts (exposure to contaminants and traffic during soil excavation and transportation) will be addressed in the site-specific HASP and CAMP, which also detail monitoring during the construction. These risks will be mitigated through the implementation of engineering controls as necessary (i.e., dust suppression and traffic control) and will only be an issue during the excavation and transportation of soils.

5.5.6 Implementability

The materials, equipment, and personnel associated with the implementation of the Track 1 cleanup approach for the off-site area of concern are commercially available and have been proven effective and reliable for remediation of the media of concern under similar circumstances. It is not anticipated that future remedial action following the remedial construction will be required.

5.5.7 Cost

The construction and equipment costs associated with the Track 1 cleanup approach for the off-site area of concern are estimated at approximately $15,000. It is anticipated that long-term

Operation, Maintenance and Monitoring (OM&M) are not required due to the nature of the remedy, which is anticipated to achieve the unrestricted use goal.

5.5.8 Compatibility with Land Use

The current and reasonably anticipated future zoning of off-site areas is mixed commercial and residential use. The present and reasonably anticipated future uses of the off-site areas are a school and church, as described in Section 2.0. Following implementation of the remedy, the backfilled area will be restored to unrestricted use conditions, thereby retaining compatibility with future land use.

6.0 GROUNDWATER REMEDY SELECTION PROCESS

The following is a detailed description of the alternatives analysis and remedy selection process for on-site and off-site groundwater.

6.1 Remedial Technology Screening

Remedial Engineering has considered several potential remedial technologies for the impacted groundwater that may be applicable for the Site based on the results of the RI. The potential remedial technologies that will be evaluated for the Site are (1) Pump and Treat, (2) air sparging/soil vapor extraction (AS/SVE), (3) enhanced reductive dechlorination (ERD), and (4) *In situ* Chemical Oxidation. The following sections discuss an overview of each remedial technology.

6.1.1 Pump and Treat

Pump and treat is a proven ex-situ remedial technology to hydraulically contain and treat contaminated groundwater. Pump and treat consists of the removal of impacted groundwater from the subsurface, aboveground treatment for the contaminants of concern, and discharge of treated water such as to a surface water body or Publicly Owned Treatment Works (POTW). The impacted groundwater is pumped to a treatment building via underground piping for treatment. Due to the concentration and type of VOCs in the groundwater, air stripping would be used for treatment. Air stripping uses countercurrent flows of air and water for removal of VOCs from the groundwater. Any dissolved metals (i.e., iron) in the groundwater would require additional treatment system components.

The limited access to the Site would impede the installation of extraction wells, underground piping, and a treatment building in the optimal locations. The low permeability in the groundwater zone will minimize effectiveness and require numerous extraction wells. In addition, the pump and treat system requires on-site equipment and long term operation and maintenance (O&M) activities.

6.1.2 AS/SVE

AS/SVE are proven remedial technologies which are used to remediate VOCs. Air sparging is an *in situ* mass transfer technology that can remove VOCs that are dissolved in groundwater,

adsorbed to saturated zone soils, and trapped in soil pores. Removal of VOCs by air sparging is achieved by injecting compressed air into the saturated zone through one or more air sparging wells. During contact with the groundwater and the adsorbed (residual) phases, VOCs are transferred (stripped) to the vapor phase. Soil vapor extraction removes VOCs from the unsaturated zone by collecting VOC vapors in the soil and the VOCs from the unsaturated zone as a result of the volatilization caused by air sparging. The contaminants in the extracted soil vapors are then removed or destroyed by an off-gas treatment unit prior to discharge to the atmosphere. When used in combination, AS/SVE forms an effective system for remediation of VOCs in the subsurface.

The AS/SVE technology would be effective for the VOCs in the groundwater. The applicability of AS/SVE for the treatment of VOCs at the Site is also dependent upon the type of soil. The ability of AS/SVE is greatly influenced by the ability to achieve significant air distribution within the target zone. Air distribution is controlled by aquifer hydraulic conductivity and homogeneity. The sandy soils in the deeper groundwater (i.e., 10 ft bls) are amenable to AS/SVE because they require lower air entry pressures and enable greater air distribution that allows for an increased radius of influence that will yield greater mass transfer efficiencies. However, the low permeability soil in the shallow groundwater zone would limit the effectiveness of the SVE in collecting the VOC vapors in the soil and the VOCs volatilized by the air sparging, increasing the potential for uncontrolled vapor migration.

6.1.3 Enhanced Reductive Dechlorination

As summarized in Section 3.0, VOC degradation products have been found at the Site. This is most likely due to the presence of favorable biogeochemical conditions for reductive dechlorination (anaerobic conditions) in the groundwater. The typical degradation sequences for TCE, PCE are presented below:

- TCE → 1,2 DCE → VC → ethene → ethane → carbon dioxide and water
- PCE → TCE →1,2 DCE → VC → ethene → ethane → carbon dioxide and water

Reducing environments with negative oxidation-reduction potential [ORP] conditions and a dissolved oxygen [DO] level below 1.0 milligrams per liter [mg/L] will accelerate the dechlorination processes listed above. The ORP of the groundwater ranged from -97 milliVolts

(mV) in MW-102D to -57 mV in MW-112D. Additionally, the DO measured in the groundwater was predominantly 0 mg/L. The present reducing conditions would lead the primary constituents impacting groundwater (PCE, and TCE) to degrade into "daughter products" 1,2 DCE and VC unassisted. However, the degradation of 1,2 DCE to VC, and the degradation of VC to ethane, generally requires much stronger reducing conditions in groundwater (typically in the range of -200 to –400 mV) than the initial degradation steps require.

ERD is founded on the concept of enhancing the natural conditions in the groundwater system to drive the conditions to a state that is more conducive to degradation of VOCs. The enhanced degradation mechanism is reductive dechlorination, which occurs primarily in anaerobic and reducing groundwater environments (i.e., low dissolved oxygen [DO]). Reductive dechlorination involves the sequential substitution of a chlorine atom from the VOC with a hydrogen atom. In order to enhance the biogeochemical conditions, selected ERD substrates are added to the groundwater to enhance, or modify groundwater conditions to degrade the VOCs and are maintained as strongly reducing environments. This environment can be maintained by the addition of ERD substrates that are either naturally degradable organic mass (e.g, molasses, whey protein, vegetable oil) or chemical reductants (e.g., Hydrogen Release Compound [HRC®]).

With regard to the shallow groundwater, the low permeability, anaerobic environment and groundwater velocity are ideal for creating and maintaining an anaerobic environment. However, the injections rates may be limited by the ability of the formation to accept the reagent. Once injected, the reagent will tend to follow zones of higher hydraulic conductivity, relying on diffusion to reach areas of lower hydraulic conductivity.

6.1.4 *In situ* Chemical Oxidation

In Situ chemical oxidation (ISCO) is the process of adding an oxidizing agent (e.g., potassium permanganate) to chemically transform a contaminant through oxidation-reduction reactions. During the oxidation-reduction reaction, an exchange of electrons affects the oxidation state of the contaminant and as a result, double carbon bonds are broken. The double carbon bonds that characterize chlorinated ethenes are far more reactive than the single carbon bonds of chlorinated ethanes. The contaminant is either completely destroyed or converted to smaller less hazardous

compounds. These compounds may also be oxidized to eventually yield carbon dioxide, water and chloride.

There are chemical species in groundwater and the saturated soil that may be oxidized in addition to the contaminant. In the subsurface, the oxidant reacts with naturally occurring organics and inorganics or natural oxidant demand (NOD). The demand for these reactions has to be accommodated to calculate the overall amount of reagent required. Typically, low permeability soil contains high amounts of organics and thus would require several injections of an oxidant just to overcome the NOD without reacting with the VOCs. Based on the shallow depth to groundwater, caution would be exercised while injecting ISCO reagents as the mounding effect created can raise the water table elevation to close proximity of the surface.

6.2 Proposed Groundwater Remedy

In addition to the screening analysis above, Remedial Engineering has also considered other factors such as our experiences in their application, NYSDEC acceptance of the technologies, logistics, access limitations (e.g., buried utility lines and limited access), and Site-specific constraints (e.g., presence of silt/clay layers, and shallow depth to groundwater). Thus, in addition to soil excavation, Remedial Engineering proposes to use ERD to accelerate VOC degradation.

As discussed earlier in Section 6.1.3, ERD is based on the concept of enhancing the natural conditions in the groundwater using ERD substrate (i.e., degradable organic carbon) to drive the groundwater conditions to a state that is more conducive to degradation of the VOCs. The proposed remedy will consist of ERD injections in the bottom of the open excavations in order to achieve mass reduction. The proposed locations of the excavations are shown on Plates 3 and 4.

In addition, ERD substrates will be injected into the groundwater off-site along the southeastern border of the Site (Plate 4). These ERD injections will form a passive permeable barrier that will intercept groundwater that is migrating off the Site. The barrier will treat VOC impacts to the groundwater as the groundwater is leaving the Site. The ERD substrate solutions will be injected into groundwater using a Geoprobe™ unit.

6.3 Evaluation of Proposed Groundwater Remedy

The purpose of this engineering evaluation is to demonstrate that the proposed remedy can achieve the cleanup objectives for the Site. This section fulfills the requirements stipulated in the Draft BCP Guide by evaluating the proposed remedy against the factors given in 6 NYCRR 375-1.8(f).

6.3.1 Overall Protection of Human Health and the Environment

VOCs will be reduced on-site and mitigate off-site impacts to the NYSDEC Water Quality Standards Class GA groundwater, to the extent possible, by the injection of ERD agents combined with groundwater monitoring. The ERD agents will accelerate the destruction of VOCs in the groundwater, while the groundwater monitoring will ensure the effectiveness of the remedy as natural degradation processes continue to achieve the remediation goal.

6.3.2 Compliance with Applicable Regulatory Standards, Criteria and Guidelines

The proposed remedy will utilize ERD agents with groundwater monitoring to reduce concentrations of VOCs in the groundwater on-site and to mitigate off-site impacts to NYSDEC Water Quality Standards Class GA groundwater, to the extent practicable, beyond the Site boundary.

6.3.3 Short-Term Impacts and Effectiveness

The risks posed to the community, workers and environment due to the implementation of the proposed remedy are minimal:

- The ERD injections will be performed on-site and the ERD agents are food grade material. Also, the ERD agents will be injected into groundwater below land surface, thus minimizing the exposure to the ERD agents.

- It is possible that workers on the Site will be exposed to VOC concentrations during the ERD injections. The potential risks include material handling, electrical shock, off-gas vapor inhalation, general trip hazards, and noise. The workers will be required to review a HASP prepared for the Site.

- The possible environmental risks during the ERD injections are the potential for generating methane and vinyl chloride during the dechlorination process. This will be controlled through monitoring of the groundwater in the area of injections and modifying the injection frequency and rate.

6.3.4 Long-Term Effectiveness and Permanence

The remedy for groundwater will reduce in effectiveness as the ERD agents are used by anaerobic microbes. Subsequent groundwater sampling rounds may determine that additional injections of ERD are required. Follow-up injections will be undertaken as necessary.

After the cleanup objectives, as described in Section 4.0, are managed to the extent practicable, no significant threats, exposure pathways or risks to the public or environment will be present at the Site.

6.3.5 Reduction of Toxicity, Mobility, and Volume

The ERD processes will be irreversible, and will be maintained to the extent practicable. The ERD injected will dechlorinate the VOCs in groundwater as they pass the treatment areas thereby reducing toxicity and off-site mobility.

6.3.6 Implementability

By placing the ERD substrates in the open excavations and in temporary injection points off-site, implementation of the proposed remedy is not anticipated to encounter any significant difficulties. Roux Associates and Remedial Engineering personnel have experience in applications utilizing ERD. Additional expertise in ERD injections is readily available through product suppliers, literature and local contractors. Remedial Engineering anticipates supplies for ERD injections are readily available.

6.3.7 Cost

The implementation and monitoring costs associated with the groundwater remedy are estimated at approximately $100,000. It is anticipated that long-term OM&M are not required due to the *in situ* nature of the remedy.

6.3.8 Compatibility with Land Use

Following implementation of the remedy, the backfilled excavations will be restored and the injection points are temporary, thereby retaining compatibility with future land use.

7.0 REMEDIAL CONSTRUCTION FOR SOIL

This section provides a general description of the construction activities to be performed as part of the proposed soil remedy. Detailed specifications for the construction of the remedy will be provided under separate cover.

7.1 Summary of Work

The remedial construction will be limited to excavation of soil at varying depths to the water table, appropriate off-site disposal of the fill material impacted above the restricted commercial criteria for on-site areas and above the unrestricted use criteria for off-site areas, and site restoration. The areas to be excavated are Areas 1, 2, 3, 4 and 5 as shown on Plate 3.

The work to be performed by the Contractor will include but not be limited to:

1. Obtain all necessary permits and licenses required to complete all work and pay all necessary fees for the permits obtained.
2. Verification of utility locations.
3. Mobilization to the Site and the provision of any temporary utilities, if needed.
4. Provision of health and safety services for Contractor's employees.
5. Set-up and maintenance of decontamination areas, staging areas, if necessary, erosion control devices, and dust control measures. Erosion and sediment control measures (i.e., hay bales, silt fences, etc.) will be used to protect any storm drain in proximity to any construction activities and any adjacent property boundaries.
6. Preparation, submittal, and obtaining approval of the specified surveys, drawings, and other submittals, as necessary.
7. Maintenance (during construction) of perimeter fencing and signs.
8. Protection of excavations and other work areas. These areas will be protected using temporary fencing and other security measures to prevent unauthorized access.
9. Performance of site preparation work.
10. Excavation of soil impacted from historic releases associated with the dry cleaner, to the water table, exceeding the restricted commercial criteria for on-site (Areas 1, 2, 3 and 4) and exceeding the unrestricted use criteria for off-site (Area 5) in the proposed excavation areas as shown on Plate 3.
11. Backfill and compaction of the excavations with common fill material meeting the unrestricted use criteria presented in the Part 375 Regulations.

12. Off-site disposal of excavated fill material in accordance with all applicable federal, state, and local regulations. Includes transportation in accordance with the New York State Department of Transportation (NYSDOT) regulations.

13. Collection and off-site disposal of any wastewater generated during construction activities.

14. Final Site restoration and demobilization from the Site.

Additional details regarding critical work elements are described below.

7.1.1 Mobilization and Site Preparation

Prior to mobilizing to the Site, the Contractor will obtain all necessary permits and licenses required to complete all work and pay all necessary fees for the permits obtained and verify all utility locations. Upon mobilization to the Site, the Contractor will set up all temporary utilities and temporary facilities, if required. A pre-construction survey will also be prepared by a land surveyor licensed by the State of New York.

7.1.2 Storm Water Management and Erosion Control

All necessary measures to temporarily control erosion will be employed. Erosion control will be implemented in accordance with the report titled "NYS Guidelines for Urban and Sediment Control" dated April 1997. Soil erosion and sediment control measures for control of storm water will be installed prior to the implementation of the remediation and will be maintained throughout the duration of all remedial construction activities, as appropriate. Hay bales and/or silt fences will be placed by the Contractor to control sediment around the disturbed area/excavations or other work areas. The Contractor will install these silt fences and/or hay bales prior to initiating intrusive activities. Erosion and sediment control measures (i.e., hay bales, silt fences, etc.) will be used to protect any storm water drain in proximity to the construction activities. In addition to silt fence and hay bales, if necessary, temporary diversion swales and berms shall also be created as necessary to control storm runoff and surface water from entering or exiting excavations.

In addition, the entrance and adjacent street areas will be swept and/or cleaned, as necessary, throughout the work day, and at the end of the workday, to keep the streets free of soil or other debris generated from the work site during the duration of all excavation activities.

7.1.3 Dust Control

Dust (particulate matter) will be controlled at the Site in accordance with the site specific CAMP, the NYSDEC Technical and Administrative Guidance Memorandum #4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (TAGM 4031), and all federal, state and local requirements. The Contractor will be required to maintain all excavations, stockpiles, and all other work areas to minimize dust that would cause a hazard or nuisance to others.

Dust will be monitored in accordance with the requirements of the Contractor's HASP, the CAMP, and the NYSDEC TAGM 4031. Based on the results of the monitoring, the Contractor will implement necessary measures to control dust to acceptable levels, including but not limited to, one or more of the following measures:

1. Misting equipment and excavation fences;
2. Spraying water (using atomizer) on buckets during excavation and dumping;
3. Hauling materials in tarped or lined containers;
4. Reducing speed of vehicles moving through the construction area;
5. Covering excavated material stockpiles and/or portions of the stockpile, as necessary, throughout the day and after excavation activities cease each day; and
6. Stopping work.

7.1.4 Excavation

On-Site Excavations

A comparison of the available data to the restricted commercial use criteria presented in the Part 375 Regulations was conducted for this alternative and a summary of the soil sampling locations and exceedances is provided on Plate 3. Based on the results of the RI, the impacted zone is restricted to the upper two to five feet of fill, just above the observed water table. The remedial alternative to achieve restricted commercial use on-site assumes that the four on-site areas of concern would be excavated to the water table. The estimated volume of soil to be removed to achieve restricted commercial use on-site would be 18 cubic yards. The four proposed excavation areas for on-site are designated as Areas 1, 2, 3, and 4, and are shown on Plate 3.

Off-Site Excavations

A comparison of the available data to the unrestricted use criteria presented in the Part 375 Regulations was conducted for off-site areas of concern and a summary of the soil sampling locations and exceedances from historic releases associated with the dry cleaner is provided on Plate 3. Based on the results of the RI, the impacted zone is restricted to the upper two to five feet of fill, just above the observed water table. The remedial alternative to achieve unrestricted use off-site assumes that the one off-site area of concern would be excavated to the water table. The estimated volume of soil to be removed to achieve unrestricted use off-site would be 5 cubic yards. The proposed excavation area for off-site is designated as Area 5 and is shown on Plate 3.

Based upon the investigation results, excavation dewatering is not anticipated to be required.

The final horizontal and vertical limits of the excavations will be surveyed.

7.1.5 Temporary Staging and Stockpiling

Stockpiles will be lined and covered with a single layer of minimum 6-mil plastic sheeting. Stockpiles will be routinely inspected and broken sheeting covers will be promptly replaced. Soil stockpiles will be continuously encircled with silt fence or hay bales.

7.1.6 Waste Characterization Sampling

One sample per 500 cubic yards of material to be excavated will be collected from the soil to be excavated for waste characterization using a hand auger prior to excavation. In accordance with the approved disposal facility, the samples will be analyzed for the following:

- Target compound list (TCL) VOCs and SVOCs according to USEPA Methods SW-846 8260 and 8270, respectively;
- TPH for gasoline and diesel range organics (by Method SW-846 8015B);
- Reduced TAL metals by Method SW-846 6010 (includes cadmium, chromium, lead, nickel, selenium, thallium, and vanadium) and Method SW-846 7471 for mercury;
- The full list of toxicity characteristics leaching procedure (TCLP) analyses (metals, VOCs, SVOCs, pesticides, and herbicides);
- Corrosivity;
- Reactivity; and

- Ignitability.

Waste characterization laboratory data are to be reported in NYSDEC ASP Category A deliverables.

7.1.7 Traffic Control

Detailed traffic control procedures will be developed when preparing the contractor's HASP.

7.1.8 Off-Site Disposal and Equipment Decontamination

All impacted soil excavated from the Site and other remediation-derived waste will be transported and disposed of in accordance with all applicable federal, state, and local regulations. The remediation-derived waste that will be generated during the construction activities include:

- Soil impacted from historic releases associated with the dry cleaner;
- Personal Protective Equipment (PPE); and
- Decontamination water, if any is generated.

Haul vehicles for bulk soil will be secured with appropriate covers prior to exiting the construction area to prevent a release of waste. PPE waste generated during the implementation of the remedy will be consolidated and stored in appropriate bulk containers and temporarily staged at the Site waste storage area within the Site limits. Any full or partially filled containers will be appropriately labeled.

If any is generated, decontamination water will be collected and disposed of off site at an approved disposal facility.

7.1.9 Post-Excavation Sampling

Summaries of post-excavation sampling for off-site areas and on-site areas are provided in the following subsections.

7.1.9.1 On-Site Post-Excavation Sampling

Post-excavation bottom sampling (at a frequency of one sample per 900 square feet of bottom area in accordance with the guidance provided in NYSDEC DER-10 Sections 3.5 and 5.4 for

excavations 20 to 300 feet in perimeter) would be conducted for constituents that exceeded the restricted commercial use criteria in previous sampling events to confirm that the restricted commercial criteria were met. Constituents or groups of constituents that did not exceed the criteria in previous investigations would not be sampled for. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation bottom sample results indicate that concentrations of target constituents are detected below the restricted commercial use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the restricted commercial use criteria, the excavation activities, including additional post-excavation bottom sampling, will continue deeper until these conditions are met or to the maximum depth reasonably attainable.

Post-excavation sidewall samples (at a frequency of one sample per 30 linear feet or at least one sample per sidewall) would be conducted for constituents that exceeded the restricted commercial use criteria in previous sampling events to confirm that the restricted commercial criteria were met. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation sidewall sample results indicate that concentrations of target constituents are detected below the restricted commercial use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the restricted commercial use criteria, the excavation activities, including additional post-excavation sidewall sampling, will continue until these conditions are met or to the extent feasible with underground utilities, building foundations and a nearby transformer providing lateral limitations.

For excavation areas that are located on both sides of the site property boundary (chain link fence), Areas 1, 2 and 3, post-excavation samples collected within the on-site areas will be compared to the restricted commercial use criteria and post-excavation samples collected within the off-site areas will be compared to the unrestricted use criteria.

7.1.9.2 Off-Site Post-Excavation Sampling

Post-excavation bottom sampling (at a frequency of one sample per 900 square feet of bottom area in accordance with the guidance provided in NYSDEC DER-10 Sections 3.5 and 5.4 for excavations 20 to 300 feet in perimeter) would be conducted for constituents that exceeded the

unrestricted use criteria in previous sampling events to confirm that the unrestricted criteria were met. Constituents or groups of constituents that did not exceed the criteria in previous investigations would not be sampled for. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation bottom sample results indicate that concentrations of target constituents are detected below the unrestricted use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the unrestricted use criteria, the excavation activities, including additional post-excavation bottom sampling, will continue deeper until these conditions are met or to the maximum depth reasonably attainable.

Post-excavation sidewall samples (at a frequency of one sample per 30 linear feet or at least one sample per sidewall) would be conducted for constituents that exceeded the unrestricted use criteria in previous sampling events to confirm that the unrestricted criteria were met. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation sidewall sample results indicate that concentrations of target constituents are detected below the unrestricted use criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the unrestricted use criteria, the excavation activities, including additional post-excavation sidewall sampling, will continue until these conditions are met or to the extent feasible.

The locations of the all post-excavation samples will be surveyed.

Post-excavation samples will be submitted to Hampton Clarke/Veritech of Fairfield, New Jersey. Category B laboratory data deliverables, as defined in the analytical services protocol (ASP), will be requested. In addition, a Data Usability Summary Report (DUSR) will be prepared by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10.

7.1.10 Backfilling

When excavation and removal of the impacted soil is complete, based on field observations and the results of the post-excavation sampling, the selected groundwater remedy (ERD) will be implemented within each excavation. Additional detail regarding implementation of the

groundwater remedy is provided in Section 8.0. Following completion of the ERD treatment within the excavations, the excavations will be backfilled and compacted using off-site common fill material and topsoil meeting the requirements of the unrestricted use criteria presented in the Part 375 Regulations. The backfill material will be free of extraneous debris or solid waste. The source of the fill must be documented by the supplier, including the location where the fill was obtained and a brief history of the site that is the source of the fill. The fill material must be approved in advance by the NYSDEC. If the NYSDEC agrees that the material originated from a virgin source, then a minimum of one composite sample will be collected and analyzed per source. If the source is not virgin, the following sampling frequency will apply to each source: one composite sample per 500 cubic yards for the first 1,000 yards and one composite sample per 1,000 cubic yards for 1,000 to 5,000 cubic yards. Samples will be analyzed for VOCs, SVOCs, metals, PCBs, herbicides and pesticides. Analytical results will be submitted to the NYSDEC prior to use of the backfill.

7.1.11 Site Restoration

After backfilling activities are completed, the work areas will be graded and seeded, the landscape fabric and gravel will be replaced or the sidewalk repaired, as appropriate for each excavation. Once site restoration activities have been completed, all temporary work zone barriers, soil erosion, and sedimentation controls and remedial construction equipment will be removed. The Contractor will then decontaminate all equipment in the established decontamination area prior to removal from the Site.

7.2 Health and Safety and Community Air Monitoring

All remedial construction activities will be performed in a manner consistent with 29CFR 1910 and 1926. Each consultant and contractor on site will operate under a Contractor's site-specific HASP for the project. The Contractor's site-specific HASP will be readily available during the work. During all phases of Site work, the Contractor will monitor safety and health conditions and fully enforce the site-specific HASP. The Contractor will be responsible for monitoring general Site conditions and for safety hazards. Specifically, monitoring will be performed to verify that all requirements of the Occupational Safety and Health Administration, as outlined on 29 CFR Part 1910 and 1926, are adhered to. The Contractor will be responsible for preparation

of the Contractor's HASP. The HASP prepared for the Remedial Investigation is provided in Appendix C as a reference.

Ambient air will be monitored at the site perimeter throughout the course of the work for particulate matter and VOCs in accordance with the CAMP included as Appendix A. During the course of the work, the Contractor will take abatement measures, as directed or as otherwise necessary, to minimize the levels of particulates at the limits of the work.

7.3 Quality Assurance/Quality Control

Quality assurance and quality control for all laboratory sampling conducted as part of this remediation will be completed in accordance to the site-specific Quality Assurance Project Plan (QAPP) for the Site provided in Appendix B. This QAPP was prepared in accordance with the DER-10 Section 2.2.

As discussed in Section 7.1.8, a DUSR will be prepared for the post-excavation samples only by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10.

8.0 PROPOSED GROUNDWATER REMEDY IMPLEMENTATION PLAN

The proposed groundwater remedy implementation plan provides a more detailed description of the proposed groundwater remedy and how the selected remedial technologies will be implemented to meet the RAOs discussed in Section 4.0.

8.1 ERD Injections in the Excavations

The ERD substrates will be applied at the bottom of the open excavations created during the removal of impacted soil as discussed in Section 7.0. The excavation footprints will be segregated into thirds to allow equal distribution and mixing using the excavator bucket to gently mix the ERD substrate thoroughly throughout the groundwater in the excavation footprints. The excavations will be backfilled following the ERD substrate applications in order to minimize exposure of air to the ERD substrate. A total of approximately 5,000 pounds of the ERD substrate will be applied to the bottom of the open excavations.

8.2 Off-Site ERD Injections

The off-site injections will be focusing in the area of the leading edge of the 10,000 µg/L total VOC contour as shown in Plate 4. The ERD substrate will be injected using a Geoprobe™ unit spaced every five feet as a row of injections along the leading edge of the 10,000 µg/L contour. The depth of ERD injection will extend from approximately 4 ft to 8 ft bls into the groundwater (depth to groundwater is approximately 4 ft bls). Approximately 100 pounds of the ERD substrate will be used at each injection point. The amount of ERD substrate may be altered depending on the field measurements made in the monitoring wells and the analytical results of the baseline round of groundwater sampling (discussed in detail in Section 8.3.1). The ERD substrate will be injected in one event.

8.3 Groundwater Monitoring

To assess the performance of the ERD injections, a groundwater monitoring program will be established. The groundwater-monitoring program will include two components: baseline sampling and performance monitoring. The sampling, sample handling, decontamination and field instrument calibration procedures will be performed as outlined in the Quality Assurance Project Plan (QAPP) for the Site (Appendix B). In addition, to provide additional performance

monitoring information, one additional observation well (2-inch diameter) is proposed to be installed further down gradient of MW-113 (Plate 4).

8.3.1 Baseline Sampling

Prior to initiation of the ERD injections, baseline groundwater sampling will be performed to evaluate levels of VOCs and naturally occurring biogeochemical conditions in the groundwater zone. During the baseline testing, existing monitoring wells MW-101S, MW-101D, MW-102S, MW-102D, MW-103S, MW-103D, MW-112S, MW-112D, MW-113S and MW-113D and the new observation well (OW-1) will be sampled and analyzed for a variety of organic and inorganic parameters to evaluate the biogeochemical environment in the groundwater zone. These analyses will include field parameters, electron acceptors, biodegradation byproducts and end products, other biogeochemical indicators, and conventional VOC analyses (focusing on PCE, TCE, 1,2 DCE, and VC). Details regarding these various analyses are included below:

- Field Parameters – The field parameters are measured at each of the monitoring wells in the field, and include indicator parameters that can be used to assess if conditions in the groundwater can support the biodegradation of the VOCs. These field parameters include DO, ORP, pH, temperature, and specific conductance.

- Electron Acceptors – Analysis for electron acceptors indicate the relative levels of inorganic compounds present in the groundwater that act as electron acceptors for the various respiration processes. These compounds include sulfate, nitrate, ferric iron and manganese. Concentrations of electron acceptors in the groundwater before and after the ERD injections can be used to determine the predominant degradation mechanisms (i.e., sulfate reduction).

- Degradation Byproducts and End Products – Analysis for the degradation byproducts and end products indicate the relative levels of compounds formed by the biodegradation and are therefore can be an indicator of reductive dechlorination in concert with other observations. These byproducts and end products include ferrous iron, dissolved manganese, sulfide, nitrite, nitrogen, hydrogen, carbon dioxide, chloride, ethene, ethane, and methane.

- Others – Other parameters to be analyzed will include dissolved organic carbon (DOC) and VOCs. The DOC analyses will measure the presence of organic carbon in the groundwater and will be used to assess if sufficient substrate is present for the degradation reactions to occur. VOC analyses will allow for a direct assessment of the degradation during the injection program.

Prior to sample and data collection, the monitoring wells will be purged via low-flow means using a submersible pump. Samples and parameter readings will be collected using a low

flow-through cell to prevent sample contact with atmospheric air. All laboratory samples will be submitted to Hampton Clarke/Veritech of Fairfield, New Jersey for analysis. Purge water from the sampling will be containerized so that it can be characterized and properly disposed off-site.

8.3.2 Performance Monitoring

Following initiation of the ERD injections, performance monitoring samples will be collected from monitoring wells MW-102S, MW-102D, MW-113S and MW-113D and proposed observation well OW-1 every three months for the following the injection program. The wells will be sampled for the same parameters outlined in the baseline sampling event, once again using the low flow purging and sampling procedures. In addition, monthly performance monitoring will be conducted for the biogeochemical field parameters.

The performance monitoring results will be used to verify that the appropriate reducing environment (ORP of –200 milliVolts) is maintained to degrade VC to ethene. However, if VC generation becomes problematic and is the primary VOC, an evaluation of alternative *in situ* methods to enhance the aerobic degradation of the VC will be performed. In order to monitor the effectiveness of the off-site ERD injections, performance monitoring samples will be collected from monitoring wells MW-102S, MW-102D, MW-113S and MW-113D and proposed observation well OW-1 every three months for a year. The wells will be sampled for the same parameters outlined in the baseline sampling event, once again using the low flow purging and sampling procedures.

9.0 REMEDIAL ACTION REPORT

The Remedial Action Report (RAR) will be prepared following completion of the remedial activities in accordance with Section 5.7 of the Draft BCP Guide and Section 5.8 of the Draft DER-10. The Remedial Action Report will describe the work performed as part of the remediation and will include:

- Disposal documentation for all material removed from the Site, including excavated impacted soil, solid waste, and fluids (if any).
- Survey drawings and site maps including, but not limited to, excavation areas and injection point locations.
- A certification by a New York professional engineer that all construction activities completed during the remediation were performed in accordance with the specifications provided in this AAR/RAWP, as approved by the NYSDEC, and that the activities were personally witnessed by a person under the direct supervision of the professional engineer.
- Any changes or modifications to the work, as well as any problems encountered during construction and their resolution, will be documented.
- A list of all remediation standards applied and results of the post-excavation sampling compared to the restricted commercial criteria and unrestricted criteria for on-site and off-site, respectively. A certification that the post-excavation sampling data was usable and met the remedial requirements.
- A description of all backfill material used for site restoration, including source and quality.

10.0 OPERATION, MAINTENANCE AND MONITORING

The RAOs for Site soil will be met upon completion of the proposed remedy. Therefore, an operation, maintenance and monitoring (OM&M) plan for only groundwater and periodic ambient air and soil vapor sampling will be developed. A formal OM&M Plan will be submitted with the Remedial Action Report to describe the minimal OM&M activities required.

11.0 CITIZEN PARTICIPATION PLAN

A Citizen Participation Plan (CPP) has been prepared in accordance with Section 2.10 and Section 8 of the Draft BCP Guide (NYSDEC 2004). The CPP was submitted under separate cover.

The citizen participation activities relevant to approval and implementation of this AAR/RAWP, which are outlined in the CPP, include:

- Transmittal of a public notice and fact sheet regarding the NYSDEC approved AAR/RAWP to the Brownfield Site Contact List presented in the CPP.
- Placement of the AAR/RAWP in the Site's document repository.
- Forty-five day comment period on the AAR/RAWP.
- Transmittal of a public notice and fact sheet announcing the proposed start of remedial construction to the Brownfield Site Contact List presented in the CPP at least 10 days prior to the start of construction.
- Placement of any additional design related documents in the Site's document repository.
- Transmittal of a public notice and fact sheet regarding the Remedial Action Report to the Brownfield Site Contact List presented in the CPP.
- Placement of the Remedial Action Report in the Site's document repository.

12.0 SCHEDULE

It is anticipated that the remedial construction will commence as soon as practicable following completion of the public comment period. Completion of the soil excavation and ERD injection will take approximately three weeks. The Remedial Action Report will be submitted within 90 days of completion of the work.

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-1 7/29/04 1-2 onsite	SB-1 7/29/04 4-5 onsite	SB-1 7/29/04 9-10 onsite	SB-1 7/29/04 18-19 onsite	SB-2 7/29/04 1-2 onsite	SB-2 7/29/04 5-6 onsite	SB-2 7/29/04 9-10 onsite	SB-3 7/29/04 4-5 onsite
Acetone	50	500,000		28 U	240	31 U	30 U	3800 U	29 U	28 U	150 U
Benzene	60	44,000		1.1 U	1.2 U	1.3 U	1.2 U	150 U	1.2 U	1.1 U	6.2 U
Bromodichloromethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Bromoform	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Bromomethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
2-Butanone (MEK)	120	500,000		28 U	29 U	31 U	30 U	3800 U	29 U	28 U	150 U
Carbon disulfide	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Carbon tetrachloride	760	22,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Chlorobenzene	1,100	500,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Chloroethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Chloroform	370	350,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Chloromethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Dibromochloromethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,1-Dichloroethane	270	240,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,2-Dichloroethane	20	30,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,1-Dichloroethene	330	500,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
cis-1,2-Dichloroethene	250	500,000		5.7 U	5.8 U	6.3 U	1.4 J	3,100	5.9 U	87	87
trans-1,2-Dichloroethene	190	500,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,2-Dichloropropane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
cis-1,3-Dichloropropene	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
trans-1,3-Dichloropropene	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Ethylbenzene	1,000	390,000		1.1 U	1.2 U	1.3 U	1.2 U	150 U	1.2 U	1.1 U	6.2 U
2-Hexanone	–	–		23 U	23 U	25 U	24 U	3000 U	24 U	23 U	120 U
4-Methyl-2-pentanone				23 U	23 U	25 U	24 U	3000 U	24 U	23 U	120 U
Methylene chloride	50	500,000		9.5 B	10 B	11 B	11 B	760 U	21 B	9.9 B	110 B
Styrene	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,1,2,2-Tetrachloroethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Tetrachloroethene	1,300	150,000		5.7 U	5.8 U	6.3 U	6.1 U	2,000	5.9 U	5.7 U	920
Toluene	700	500,000		5	14	7	1.2 U	150 U	1.2 U	1.3	31
1,1,1-Trichloroethane	680	500,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
1,1,2-Trichloroethane	–	–		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	5.7 U	31 U
Trichloroethene	470	200,000		5.7 U	5.8 U	6.3 U	6.1 U	1,300	5.9 U	5.7 U	66
Vinyl chloride	20	13,000		5.7 U	5.8 U	6.3 U	6.1 U	760 U	5.9 U	4.1 J	31 U
M&p-Xylenes	260	500,000		2.3 U	2.3 U	2.5 U	2.4 U	300 U	2.4 U	2.3 U	12 U
o-Xylene	260	500,000		1.1 U	1.2 U	1.3 U	1.2 U	150 U	1.2 U	1.1 U	6.2 U
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-4 7/29/04 8-9 onsite	SB-5 7/29/04 8-9 onsite	SB-6 7/30/04 4-5 onsite	SB-6 7/30/04 6-8 onsite	SB-7 7/30/04 6-8 onsite	SB-8 7/30/04 7-8 onsite	SB-9 7/30/04 6-7 onsite	SB-10 7/30/04 7-8 onsite
Acetone	50	500,000		31 U	30 U	29 U	29 U	29 U	29 U	30 U	30 U
Benzene	60	44,000		1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Bromodichloromethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Bromoform	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Bromomethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
2-Butanone (MEK)	120	500,000		31 U	30 U	100	50	46	79	72	81
Carbon disulfide	–	–		6.3 U	6 U	2.1 J	5.8 U	5.8 U	5.8 U	6 U	6 U
Carbon tetrachloride	760	22,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Chlorobenzene	1,100	500,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Chloroethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Chloroform	370	350,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Chloromethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Dibromochloromethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,1-Dichloroethane	270	240,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,2-Dichloroethane	20	30,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,1-Dichloroethene	330	500,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
cis-1,2-Dichloroethene	250	500,000		24	6 U	39	180	98	5.8 U	6 U	6 U
trans-1,2-Dichloroethene	190	500,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,2-Dichloropropane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
cis-1,3-Dichloropropene	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
trans-1,3-Dichloropropene	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Ethylbenzene	1,000	390,000		1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
2-Hexanone	–	–		25 U	24 U	24 U	23 U	23 U	23 U	24 U	24 U
4-Methyl-2-pentanone				25 U	24 U	24 U	23 U	23 U	23 U	24 U	24 U
Methylene chloride	50	500,000		11 B	11 B	12 B	13 B	22 B	24 B	27 B	26 B
Styrene	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,1,2,2-Tetrachloroethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Tetrachloroethene	1,300	150,000		37	6 U	15	23	5.8 U	5.8 U	6 U	6 U
Toluene	700	500,000		1.3 U	1.8	7.4	3.4	2.1	1.3	1.2 U	2.7
1,1,1-Trichloroethane	680	500,000		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
1,1,2-Trichloroethane	–	–		6.3 U	6 U	5.9 U	5.8 U	5.8 U	5.8 U	6 U	6 U
Trichloroethene	470	200,000		12	6 U	3.8 J	16	5.8 U	5.8 U	6 U	6 U
Vinyl chloride	20	13,000		6.3 U	6 U	2.6 J	3.6 J	5.8 U	5.8 U	6 U	6 U
M&p-Xylenes	260	500,000		2.5 U	2.4 U	2.4 U	2.3 U	2.3 U	2.3 U	2.4 U	2.4 U
o-Xylene	260	500,000		1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-101 09/06/05 0.5-2 onsite	SB-101 09/06/05 5-7.5 onsite	SB-101 09/06/05 27.5-30 onsite	SB-102X 09/08/05 0.5-2 onsite	SB-102X 09/08/05 2.5-5 onsite	SB-102X 09/08/05 30-32.5 onsite	SB-103X 09/06/05 0.5-2 onsite	SB-103X 09/06/05 7.5-10 onsite
Acetone	50	500,000		79,000 U	46	130 J	90 J	36,000 U	24 J	37,000 U	26 J
Benzene	60	44,000		3,200 U	1.2 U	5.9 U	5.6 U	1,500 U	1.1 U	1,500 U	1.1 U
Bromodichloromethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Bromoform	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Bromomethane	–	–		16,000 U	12 U	59 U	28 U	7,300 U	5.7 U	7,400 U	11 U
2-Butanone (MEK)	120	500,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Carbon disulfide	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Carbon tetrachloride	760	22,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Chlorobenzene	1,100	500,000		16,000 U	1.2 U	5.9 U	28 U	7,300 U	5.7 U	7,400 U	1.1 U
Chloroethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Chloroform	370	350,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Chloromethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Dibromochloromethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,1-Dichloroethane	270	240,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,2-Dichloroethane	20	30,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,1-Dichloroethene	330	500,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
cis-1,2-Dichloroethene	250	500,000		16,000 U	34	130	240	7,300 U	19	7,400 U	1.2 J
trans-1,2-Dichloroethene	190	500,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,2-Dichloropropane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
cis-1,3-Dichloropropene	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
trans-1,3-Dichloropropene	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Ethylbenzene	1,000	390,000		3,200 U	1.2 U	5.9 U	5.6 U	1,500 U	1.1 U	1,500 U	1.1 U
2-Hexanone	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
4-Methyl-2-pentanone				16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Methylene chloride	50	500,000		10,000 JB	41 B	210 B	84 B	2,400 JB	18 B	7,400 U	32 B
Styrene	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,1,2,2-Tetrachloroethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Tetrachloroethene	1,300	150,000		**390,000**	110	280	1100	**500,000**	2.7 J	88,000	5.7 U
Toluene	700	500,000		3,200 U	1.2 U	5.9 U	5.6 U	1,500 U	1.1 U	1,500 U	1.1 U
1,1,1-Trichloroethane	680	500,000		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
1,1,2-Trichloroethane	–	–		16,000 U	5.8 U	29 U	28 U	7,300 U	5.7 U	7,400 U	5.7 U
Trichloroethene	470	200,000		18,000	22	19 J	50	2,100 J	5.7 U	3,500 J	5.7 U
Vinyl chloride	20	13,000		16,000 U	5.8 U	5.9 J	55	7,300 U	5.7 U	7,400 U	5.7 U
M&p-Xylenes	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr
o-Xylene	260	500,000		3,200 U	1.2 U	5.9 U	5.6 U	1,500 U	1.1 U	1,500 U	1.1 U
Xylenes (total)	260	500,000		6,300 U	2.3 U	12 U	11 U	2,900 U	2.3 U	3,000 U	2.3 U

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	Sample Location:	SB-103X DUP	SB-104X	SB-104X	SB-104X	SB-105X	SB-105X	SB-107	SB-107
			Sample Date:	09/06/05	09/08/05	09/08/05	09/08/05	09/07/05	09/07/05	09/01/05	09/01/05
			Sample Depth (ft bls):	0.5-2	0.5-2	4-6	7.5-10	1.5-3	4.5-6	0.5-2	4-6
			Onsite/Offsite:	onsite	onsite	onsite	onsite	onsite	onsite	onsite	onsite
Acetone	50	500,000		38,000 U	59	64	29 U	28 U	52	28	19 J
Benzene	60	44,000		1,500 U	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromodichloromethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Bromoform	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Bromomethane	–	–		7,500 U	6 U	6.1 U	5.7 U	11 U	11 U	11 U	11 U
2-Butanone (MEK)	120	500,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Carbon disulfide	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Carbon tetrachloride	760	22,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Chlorobenzene	1,100	500,000		7,500 U	6 U	6.1 U	5.7 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloroethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Chloroform	370	350,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Chloromethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Dibromochloromethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,1-Dichloroethane	270	240,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,2-Dichloroethane	20	30,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,1-Dichloroethene	330	500,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
cis-1,2-Dichloroethene	250	500,000		3,200 J	6 U	49	49	5.7 U	5.7 U	5.4 U	5.4 U
trans-1,2-Dichloroethene	190	500,000		7,500 U	6 U	3.7 J	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,2-Dichloropropane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
cis-1,3-Dichloropropene	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
trans-1,3-Dichloropropene	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Ethylbenzene	1,000	390,000		1,500 U	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2-Hexanone	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
4-Methyl-2-pentanone				7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Methylene chloride	50	500,000		8,200 B	20 B	24 B	19 B	27 B	28 B	24 B	25 B
Styrene	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,1,2,2-Tetrachloroethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Tetrachloroethene	1,300	150,000		**180,000**	3.7 J	6.1 U	5.7 U	1.3 J	5.7 U	1.1 J	5.4 U
Toluene	700	500,000		1500 U	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,1,1-Trichloroethane	680	500,000		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
1,1,2-Trichloroethane	–	–		7,500 U	6 U	6.1 U	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Trichloroethene	470	200,000		4,800 J	6 U	3.1 J	5.7 U	5.7 U	5.7 U	5.4 U	5.4 U
Vinyl chloride	20	13,000		7,500 U	6 U	6.1 U	5.7 U	1.7 J	5.7 U	5.4 U	5.4 U
M&p-Xylenes	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr
o-Xylene	260	500,000		1,500 U	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Xylenes (total)	260	500,000		3,000 U	2.4 U	2.4 U	2.3 U	2.3 U	2.3 U	2.2 U	2.2 U

Notes:

-- - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
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NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-107A 09/14/05 0.5-2 onsite	SB-107A 09/14/05 4-6 onsite	SB-108 09/19/05 0.5-2 onsite	SB-108 09/19/05 2-4 onsite	SB-108 09/19/05 4-6 onsite	SB-109 09/01/05 0.5-2 onsite	SB-109 09/01/05 4-6 onsite	SB-111 09/16/05 0.5-2 onsite
Acetone	50	500,000		99	30 U	63	100	52	24 J	51	35
Benzene	60	44,000		1.1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U
Bromodichloromethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Bromoform	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Bromomethane	–	–		11 U	12 U	11 U	12 U	11 U	11 U	11 U	11 U
2-Butanone (MEK)	120	500,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Carbon disulfide	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Carbon tetrachloride	760	22,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Chlorobenzene	1,100	500,000		1.1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloroethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Chloroform	370	350,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Chloromethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Dibromochloromethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,1-Dichloroethane	270	240,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,2-Dichloroethane	20	30,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,1-Dichloroethene	330	500,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
cis-1,2-Dichloroethene	250	500,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
trans-1,2-Dichloroethene	190	500,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,2-Dichloropropane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
cis-1,3-Dichloropropene	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
trans-1,3-Dichloropropene	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Ethylbenzene	1,000	390,000		3.9	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U
2-Hexanone	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
4-Methyl-2-pentanone				5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Methylene chloride	50	500,000		12 B	17 B	30 B	32 B	34 B	23 B	31 B	24 B
Styrene	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,1,2,2-Tetrachloroethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Tetrachloroethene	1,300	150,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Toluene	700	500,000		1.1 U	1.2 U	1.1 U	2.7	1.1 U	1.1 U	1.1 U	1.3
1,1,1-Trichloroethane	680	500,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
1,1,2-Trichloroethane	–	–		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Trichloroethene	470	200,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
Vinyl chloride	20	13,000		5.3 U	6 U	5.6 U	5.8 U	5.7 U	5.6 U	5.7 U	5.3 U
M&p-Xylenes	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr
o-Xylene	260	500,000		6.4	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U
Xylenes (total)	260	500,000		16	2.4 U	2.2 U	2.3 U	2.3 U	2.2 U	2.3 U	2.1 U

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-111 09/16/05 4-6 onsite	SB-113 09/01/05 0-2 onsite	SB-114 09/01/05 0-2 onsite	SB-115 09/01/05 0-2 onsite	SB-116 09/01/05 6-8 onsite	SB-117 09/20/05 0.5-2 onsite	SB-127 09/21/05 0-0.17 offsite	SB-128 09/21/05 0-0.17 offsite
Acetone	50	500,000		53	28 U	27 U	27 U	20 J	55	31 U	26 U
Benzene	60	44,000		1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U
Bromodichloromethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Bromoform	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Bromomethane	–	–		12 U	11 U	11 U	11 U	12 U	11 U	12 U	11 U
2-Butanone (MEK)	120	500,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Carbon disulfide	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	1.9 J	6.2 U	5.3 U
Carbon tetrachloride	760	22,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Chlorobenzene	1,100	500,000		1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U
Chloroethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Chloroform	370	350,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Chloromethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Dibromochloromethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,1-Dichloroethane	270	240,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,2-Dichloroethane	20	30,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,1-Dichloroethene	330	500,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
cis-1,2-Dichloroethene	250	500,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	3 J	5.3 U
trans-1,2-Dichloroethene	190	500,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,2-Dichloropropane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
cis-1,3-Dichloropropene	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
trans-1,3-Dichloropropene	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Ethylbenzene	1,000	390,000		1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U
2-Hexanone	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
4-Methyl-2-pentanone				6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Methylene chloride	50	500,000		31 B	27 B	25 B	23 B	28 B	30 B	27 B	32 B
Styrene	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,1,2,2-Tetrachloroethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Tetrachloroethene	1,300	150,000		6 U	1.2 J	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Toluene	700	500,000		2.1	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U
1,1,1-Trichloroethane	680	500,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
1,1,2-Trichloroethane	–	–		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Trichloroethene	470	200,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
Vinyl chloride	20	13,000		6 U	5.6 U	5.4 U	5.5 U	5.8 U	5.5 U	6.2 U	5.3 U
M&p-Xylenes	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr
o-Xylene	260	500,000		1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U
Xylenes (total)	260	500,000		2.4 U	2.2 U	2.2 U	2.2 U	2.3 U	2.2 U	2.5 U	2.1 U

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-201 8/8/2006 3-5 onsite	SB-202 8/4/2006 3-5 onsite	SB-202 DUP 8/4/2006 3-5 onsite	SB-203 8/4/2006 3-5 onsite	SB-204 8/4/2006 3-5 onsite	SB-205 8/2/2006 8-10 onsite	SB-205 8/2/2006 12-14 onsite	SB-206 8/1/2006 0-2 offsite
Acetone	50	500,000		370,000 U	30 U	30 U	29 U	30 U	29 U	29 U	28 U
Benzene	60	44,000		15,000 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.1 U
Bromodichloromethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Bromoform	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Bromomethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
2-Butanone (MEK)	120	500,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Carbon disulfide	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Carbon tetrachloride	760	22,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Chlorobenzene	1,100	500,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Chloroethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Chloroform	370	350,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Chloromethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Dibromochloromethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,1-Dichloroethane	270	240,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,2-Dichloroethane	20	30,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,1-Dichloroethene	330	500,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
cis-1,2-Dichloroethene	250	500,000		74,000 U	6 U	6 U	5.9 U	6 U	9.7	5.3 J	5.7 U
trans-1,2-Dichloroethene	190	500,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,2-Dichloropropane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
cis-1,3-Dichloropropene	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
trans-1,3-Dichloropropene	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Ethylbenzene	1,000	390,000		15,000 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.1 U
2-Hexanone	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
4-Methyl-2-pentanone				74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Methylene chloride	50	500,000		74,000 U	14 B	13 B	19 B	17 B	11 B	9.8 B	9.6 B
Styrene	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,1,2,2-Tetrachloroethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Tetrachloroethene	1,300	150,000		**2,200,000**	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	8.7
Toluene	700	500,000		15,000 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.1 U
1,1,1-Trichloroethane	680	500,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
1,1,2-Trichloroethane	–	–		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Trichloroethene	470	200,000		65,000 J	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
Vinyl chloride	20	13,000		74,000 U	6 U	6 U	5.9 U	6 U	5.8 U	5.7 U	5.7 U
M&p-Xylenes	260	500,000		30000 U	2.4 U	2.4 U	2.4 U	2.4 U	2.3 U	2.3 U	2.3 U
o-Xylene	260	500,000		15,000 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.1 U
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

-- - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-206 8/1/2006 3-5 offsite	SB-207 8/1/2006 0-2 offsite	SB-207 8/1/2006 3-5 offsite	SB-208 8/1/2006 0-2 offsite	SB-208 8/1/2006 3-5 offsite	SB-209 8/1/2006 0-2 offsite	SB-209 8/1/2006 3-5 offsite	SB-210 8/1/2006 0-2 offsite
Acetone	50	500,000		30 U	28 U	29 U	28 U	28 U	29 U	45	33 U
Benzene	60	44,000		1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U
Bromodichloromethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Bromoform	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Bromomethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
2-Butanone (MEK)	120	500,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Carbon disulfide	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	2.3 J	6.6 U
Carbon tetrachloride	760	22,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Chlorobenzene	1,100	500,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Chloroethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Chloroform	370	350,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Chloromethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Dibromochloromethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,1-Dichloroethane	270	240,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,2-Dichloroethane	20	30,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,1-Dichloroethene	330	500,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
cis-1,2-Dichloroethene	250	500,000		3.6 J	5.7 U	5.8 U	2.2 J	5.7 U	7.5	14	6.9
trans-1,2-Dichloroethene	190	500,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,2-Dichloropropane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
cis-1,3-Dichloropropene	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
trans-1,3-Dichloropropene	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Ethylbenzene	1,000	390,000		1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U
2-Hexanone	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
4-Methyl-2-pentanone				6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Methylene chloride	50	500,000		19 B	13 B	14 B	16 B	13 B	14 B	14 B	10 B
Styrene	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,1,2,2-Tetrachloroethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Tetrachloroethene	1,300	150,000		6 U	6.6	5.8 U	12	5.7 U	310	55	38
Toluene	700	500,000		1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U
1,1,1-Trichloroethane	680	500,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
1,1,2-Trichloroethane	–	–		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	5.8 U	6.6 U
Trichloroethene	470	200,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	24	25	6.6 U
Vinyl chloride	20	13,000		6 U	5.7 U	5.8 U	5.7 U	5.7 U	5.8 U	1.5 J	6.6 U
M&p-Xylenes	260	500,000		2.4 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.6 U
o-Xylene	260	500,000		1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-210 8/1/2006 3-5 offsite	SB-211 8/1/2006 0-2 offsite	SB-211 8/1/2006 3-5 offsite	SB-212 8/1/2006 0-2 offsite	SB-212 8/1/2006 3-5 offsite	SB-213 8/1/2006 0-2 offsite	SB-213 8/1/2006 3-5 offsite	SB-214 8/1/2006 0-2 offsite
Acetone	50	500,000		**90**	28 J	30 U	21 J	29 U	25 J	29 U	30 U
Benzene	60	44,000		1.2 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.1 U	1.2 U
Bromodichloromethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Bromoform	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Bromomethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
2-Butanone (MEK)	120	500,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Carbon disulfide	–	–		1.7 J	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Carbon tetrachloride	760	22,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Chlorobenzene	1,100	500,000		10	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Chloroethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Chloroform	370	350,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Chloromethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Dibromochloromethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
1,1-Dichloroethane	270	240,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
1,2-Dichloroethane	20	30,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
1,1-Dichloroethene	330	500,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	1.8 J
cis-1,2-Dichloroethene	250	500,000		1.3 J	2.6 J	3.2 J	5.7 U	5.8 U	20	5.7 U	570
trans-1,2-Dichloroethene	190	500,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	3.6 J
1,2-Dichloropropane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
cis-1,3-Dichloropropene	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
trans-1,3-Dichloropropene	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Ethylbenzene	1,000	390,000		1.2 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.1 U	1.2 U
2-Hexanone	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
4-Methyl-2-pentanone				6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Methylene chloride	50	500,000		15 B	13 B	14 B	13 B	14 B	15 B	13 B	12 B
Styrene	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
1,1,2,2-Tetrachloroethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Tetrachloroethene	1,300	150,000		6.1 U	20	130	4.9 J	3.4 J	74	5.7 U	**1,600,000**
Toluene	700	500,000		1.2 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.1 U	1.2 U
1,1,1-Trichloroethane	680	500,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
1,1,2-Trichloroethane	–	–		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	6.1 U
Trichloroethene	470	200,000		6.1 U	4.1 J	9.3	5.7 U	5.8 U	16	5.7 U	**15,000 J**
Vinyl chloride	20	13,000		6.1 U	6 U	6 U	5.7 U	5.8 U	6 U	5.7 U	1.3 J
M&p-Xylenes	260	500,000		2.4 U	2.4 U	2.4 U	2.3 U	2.3 U	2.4 U	2.3 U	2.4 U
o-Xylene	260	500,000		1.2 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.1 U	6.5
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-214 8/1/2006 3-5 offsite	SB-214 DUP 8/1/2006 3-5 offsite	SB-215 8/1/2006 0-2 offsite	SB-215 8/1/2006 3-5 offsite	SB-216 8/1/2006 0-2 offsite	SB-216 8/1/2006 3-5 offsite	SB-217 8/1/2006 0-2 offsite	SB-217 8/1/2006 3-5 offsite
Acetone	50	500,000		29 U	150 U	30 U	35	28 U	18 J	29 U	29 J
Benzene	60	44,000		1.2 U	6 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Bromodichloromethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Bromoform	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Bromomethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
2-Butanone (MEK)	120	500,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Carbon disulfide	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Carbon tetrachloride	760	22,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Chlorobenzene	1,100	500,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Chloroethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Chloroform	370	350,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Chloromethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Dibromochloromethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
1,1-Dichloroethane	270	240,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
1,2-Dichloroethane	20	30,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
1,1-Dichloroethene	330	500,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
cis-1,2-Dichloroethene	250	500,000		120	30 U	6 U	6 U	5.7 U	6 U	21	6 U
trans-1,2-Dichloroethene	190	500,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	1.9 J	6 U
1,2-Dichloropropane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
cis-1,3-Dichloropropene	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
trans-1,3-Dichloropropene	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Ethylbenzene	1,000	390,000		1.2 U	6 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
2-Hexanone	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
4-Methyl-2-pentanone				5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Methylene chloride	50	500,000		12 B	**79 B**	15 B	16 B	16 B	16 B	13 B	16 B
Styrene	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
1,1,2,2-Tetrachloroethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Tetrachloroethene	1,300	150,000		**11,000**	1,300	6 U	6 U	2.5 J	6 U	52	1.6 J
Toluene	700	500,000		1.2 U	6 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
1,1,1-Trichloroethane	680	500,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
1,1,2-Trichloroethane	–	–		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
Trichloroethene	470	200,000		390	8.8 J	6 U	6 U	5.7 U	6 U	11	6 U
Vinyl chloride	20	13,000		5.8 U	30 U	6 U	6 U	5.7 U	6 U	5.8 U	6 U
M&p-Xylenes	260	500,000		2.3 U	12 U	2.4 U	2.4 U	2.3 U	2.4 U	2.3 U	2.4 U
o-Xylene	260	500,000		1.2 U	6 U	1.2 U	1.2 U	1.1 U	1.2 U	1.2 U	1.2 U
Xylenes (total)	260	500,000		nr	nr	nr	nr	nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 1. Summary of Volatile Organic Compounds Detected in Soil, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/kg)	NYSDEC Unrestricted Residential (offsite)	NYSDEC Restricted Commercial (onsite)	**Sample Location:** **Sample Date:** **Sample Depth (ft bls):** **Onsite/Offsite:**	SB-218 8/1/2006 0-2 offsite	SB-218 8/1/2006 3-5 offsite	SB-219 8/1/2006 0-2 offsite	SB-219 8/1/2006 3-5 offsite
Acetone	50	500,000		31 U	29 U	30 U	29 U
Benzene	60	44,000		1.2 U	1.2 U	1.2 U	1.2 U
Bromodichloromethane	–	–		6.2 U	5.9 U	6 U	5.9 U
Bromoform	–	–		6.2 U	5.9 U	6 U	5.9 U
Bromomethane	–	–		6.2 U	5.9 U	6 U	5.9 U
2-Butanone (MEK)	120	500,000		6.2 U	5.9 U	6 U	5.9 U
Carbon disulfide	–	–		6.2 U	5.9 U	6 U	5.9 U
Carbon tetrachloride	760	22,000		6.2 U	5.9 U	6 U	5.9 U
Chlorobenzene	1,100	500,000		6.2 U	5.9 U	6 U	5.9 U
Chloroethane	–	–		6.2 U	5.9 U	6 U	5.9 U
Chloroform	370	350,000		6.2 U	5.9 U	6 U	5.9 U
Chloromethane	–	–		6.2 U	5.9 U	6 U	5.9 U
Dibromochloromethane	–	–		6.2 U	5.9 U	6 U	5.9 U
1,1-Dichloroethane	270	240,000		6.2 U	5.9 U	6 U	5.9 U
1,2-Dichloroethane	20	30,000		6.2 U	5.9 U	6 U	5.9 U
1,1-Dichloroethene	330	500,000		6.2 U	5.9 U	6 U	5.9 U
cis-1,2-Dichloroethene	250	500,000		6.2 U	5.9 U	6 U	5.9 U
trans-1,2-Dichloroethene	190	500,000		6.2 U	5.9 U	6 U	5.9 U
1,2-Dichloropropane	–	–		6.2 U	5.9 U	6 U	5.9 U
cis-1,3-Dichloropropene	–	–		6.2 U	5.9 U	6 U	5.9 U
trans-1,3-Dichloropropene	–	–		6.2 U	5.9 U	6 U	5.9 U
Ethylbenzene	1,000	390,000		1.2 U	1.2 U	1.2 U	1.2 U
2-Hexanone	–	–		6.2 U	5.9 U	6 U	5.9 U
4-Methyl-2-pentanone				6.2 U	5.9 U	6 U	5.9 U
Methylene chloride	50	500,000		17 B	17 B	19 B	17 B
Styrene	–	–		6.2 U	5.9 U	6 U	5.9 U
1,1,2,2-Tetrachloroethane	–	–		6.2 U	5.9 U	6 U	5.9 U
Tetrachloroethene	1,300	150,000		6.2 U	5.9 U	6 U	5.9 U
Toluene	700	500,000		1.2 U	1.2 U	1.2 U	1.2 U
1,1,1-Trichloroethane	680	500,000		6.2 U	5.9 U	6 U	5.9 U
1,1,2-Trichloroethane	–	–		6.2 U	5.9 U	6 U	5.9 U
Trichloroethene	470	200,000		6.2 U	5.9 U	6 U	5.9 U
Vinyl chloride	20	13,000		6.2 U	5.9 U	6 U	5.9 U
M&p-Xylenes	260	500,000		2.5 U	2.4 U	2.4 U	2.4 U
o-Xylene	260	500,000		1.2 U	1.2 U	1.2 U	1.2 U
Xylenes (total)	260	500,000		nr	nr	nr	nr

Notes:

– - No NYSDEC standard available
µg/kg - Micrograms per kilogram
B - Analyte detected in laboratory blank
Bold - analyte was detected above the NYSDEC Standard
DUP - Duplicate
E - Result exceeded calibration range, secondary dilution required
ft bls - Feet below land surface
J - Estimated value
nr - Not reported
NYSDEC - New York State Department of Environmental Conservation
U - Analyte not detected at the detection limit shown

Table 2. Summary of Volatile Organic Compounds Detected in Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Location:** **Sample Date:**	MW-101D 09/30/05	MW-101S 09/30/05	MW-102D 09/29/05	MW-102S 09/29/05	MW-103D 09/29/05	MW-104D 09/29/05	MW-104D DUP 09/29/05	MW-105D 09/28/05
Acetone	50		2,500 U	2,500 U	2,500 U	2,500 U	25 U	25 U	25 U	25 U
Benzene	1		100 U	100 U	100 U	100 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Bromoform	50		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Bromomethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	50		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Chloroethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Chloroform	7		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Chloromethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		500 U	**220**	500 U	500 U	1.3	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**19,000**	**31,000**	**7,800**	**11,000**	**220**	**69**	**84**	5 U
trans-1,2-Dichloroethene	5		500 U	500 U	500 U	500 U	1.5	5 U	5 U	5 U
1,2-Dichloropropane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Ethylbenzene	5		100 U	100 U	100 U	100 U	1 U	1 U	1 U	1 U
2-Hexanone	50		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	--		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Methylene chloride	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Styrene	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		**17,000**	**3,500**	500 U	**1,200**	5 U	5 U	5 U	5 U
Toluene	5		100 U	100 U	100 U	100 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		500 U	500 U	500 U	500 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**6,700**	**9,900**	**670**	**3,200**	**9.6**	5 U	5 U	5 U
Vinyl chloride	2		**1,500**	**2,800**	**660**	**610**	**15**	**16**	**26**	1.2
M&p-Xylenes	5		200 U	200 U	200 U	200 U	2 U	2 U	2 U	2 U
o-Xylene	5		100 U	100 U	100 U	100 U	1 U	1 U	1 U	1 U

Notes:

New York State Department of Environmental Conservation (NYSDEC)

Ambient Water-Quality Standards and Guidance Values (AWQSGVs)

µg/L -Micrograms per liter

B - Analyte detected in laboratory blank

J - Estimated Value

U - Analyte was analyzed for but not detected at the detection limit shown

-- No NYSDEC AWQSGV available

Bold data indicates that analyte was detected above the NYSDEC AWQSGVs

DUP - Duplicate

Table 2. Summary of Volatile Organic Compounds Detected in Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Location:** **Sample Date:**	MW-106D 09/29/05	MW-107D 09/29/05	MW-107S 09/29/05	MW-108D 09/30/05	MW-109D 09/29/05	MW-111D 09/30/05	MW-112D 09/30/05	MW-112D DUP 09/30/05
Acetone	50		25 U	25 U	25 U	25 U	25 U	25 U	500 U	250 U
Benzene	1		1 U	1 U	1 U	1 U	1 U	1 U	20 U	10 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
2-Butanone (MEK)	50		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Chloromethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,2-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,1-Dichloroethene	5		5 U	1.2	5 U	5 U	5 U	5 U	100 U	50 U
cis-1,2-Dichloroethene	5		5 U	**380**	**21**	5 U	5 U	**17**	**760**	**1,100**
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,2-Dichloropropane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
trans-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Ethylbenzene	5		1 U	1 U	1 U	1 U	1 U	1 U	20 U	10 U
2-Hexanone	50		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
4-Methyl-2-pentanone	--		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Styrene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Toluene	5		1 U	1 U	1 U	1 U	1 U	1 U	20 U	10 U
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	100 U	50 U
Trichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	**20**	**38**
Vinyl chloride	2		5 U	**300**	**63**	5 U	5 U	**4.6**	**44**	50 U
M&p-Xylenes	5		2 U	2 U	2 U	2 U	2 U	2 U	40 U	20 U
o-Xylene	5		1 U	1 U	1 U	1 U	1 U	1 U	20 U	10 U

Notes:

New York State Department of Environmental Conservation (NYSDEC)

Ambient Water-Quality Standards and Guidance Values (AWQSGVs)

µg/L -Micrograms per liter

B - Analyte detected in laboratory blank

J - Estimated Value

U - Analyte was analyzed for but not detected at the detection limit shown

- - No NYSDEC AWQSGV available

Bold data indicates that analyte was detected above the NYSDEC AWQSGVs

DUP - Duplicate

Table 2. Summary of Volatile Organic Compounds Detected in Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Location: / Sample Date:	MW-113D 09/30/05	MW-113S 09/30/05	MW-126D 09/28/05	MW-201D 8/14/2006	MW-201S 8/15/2006	MW-202D 8/15/2006	MW-202S 8/15/2006	MW-203D 8/14/2006
Acetone	50		1,200 U	2,500 U	25 U	25 U	25 U	25 U	25 U	25 U
Benzene	1		50 U	100 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	50		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		250 U	500 U	5 U	5 U	1.5 J	5 U	5 U	5 U
Carbon tetrachloride	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**2,700**	**11,000**	5 U	1.9	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5		50 U	100 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Hexanone	50		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	--		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	5		250 U	500 U	5 U	1.2 B	1 B	5 U	5 U	1.6 B
Styrene	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		**250**	**150**	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5		50 U	100 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		250 U	500 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**780**	**1,600**	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	2		**52**	**380**	5 U	5 U	5 U	5 U	5 U	5 U
M&p-Xylenes	5		100 U	200 U	2 U	2 U	2 U	2 U	2 U	2 U
o-Xylene	5		50 U	100 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:

New York State Department of Environmental Conservation (NYSDEC)
Ambient Water-Quality Standards and Guidance Values (AWQSGVs)
µg/L -Micrograms per liter
B - Analyte detected in laboratory blank
J - Estimated Value
U - Analyte was analyzed for but not detected at the detection limit shown
- - No NYSDEC AWQSGV available
Bold data indicates that analyte was detected above the NYSDEC AWQSGVs
DUP - Duplicate

Table 2. Summary of Volatile Organic Compounds Detected in Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Location:** **Sample Date:**	MW-203S 8/14/2006	MW-204D 8/14/2006	MW-204D DUP 8/14/2006	MW-204S 8/14/2006	PZ-2 08/30/04	PZ-3 08/30/04	PZ-4 08/30/04	PZ-5 08/30/04
Acetone	50		25 U	25 U	25 U	25 U	2.8 U	2.8 U	140 U	280 U
Benzene	1		1 U	1 U	1 U	1 U	0.41 U	0.41 U	21 U	41 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	0.52 U	0.52 U	26 U	52 U
Bromoform	50		5 U	5 U	5 U	5 U	0.36 U	0.36 U	18 U	36 U
Bromomethane	5		5 U	5 U	5 U	5 U	0.9 U	0.9 U	45 U	90 U
2-Butanone (MEK)	50		5 U	5 U	5 U	5 U	12 U	12 U	610 U	1,200 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	0.53 U	0.53 U	26 U	53 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	0.52 U	0.52 U	26 U	52 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	0.55 U	0.55 U	28 U	55 U
Chloroethane	5		5 U	5 U	5 U	5 U	1.3 U	1.3 U	66 U	130 U
Chloroform	7		5 U	5 U	5 U	5 U	1.2 U	1.2 U	59 U	120 U
Chloromethane	5		5 U	5 U	5 U	5 U	1.1 U	1.1 U	56 U	110 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	0.49 U	0.49 U	25 U	49 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	0.89 U	0.89 U	44 U	89 U
1,2-Dichloroethane	5		5 U	5 U	5 U	5 U	0.69 U	0.69 U	35 U	69 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	0.69 U	0.69 U	35 U	**150**
cis-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	**38**	0.69 U	**3,900**	**12,000**
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	0.69 U	0.69 U	35 U	44 U
1,2-Dichloropropane	5		5 U	5 U	5 U	5 U	0.44 U	0.44 U	22 U	44 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	0.51 U	0.51 U	26 U	51 U
trans-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	0.62 U	0.62 U	31 U	62 U
Ethylbenzene	5		1 U	1 U	1 U	1 U	0.87 U	0.87 U	44 U	**360**
2-Hexanone	50		5 U	5 U	5 U	5 U	0.45 U	0.45 U	22 U	45 U
4-Methyl-2-pentanone	--		5 U	5 U	5 U	5 U	0.44 U	0.44 U	22 U	44 U
Methylene chloride	5		2 B	1 B	5 U	5 U	3.7	2.6	**390**	**660**
Styrene	5		5 U	5 U	5 U	5 U	0.44 U	0.44 U	22 U	44 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	0.63 U	0.63 U	32 U	63 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	**46**	0.63 U	**7,500**	**630**
Toluene	5		1 U	1 U	1 U	1 U	2.1	1.5	**110**	**1,900**
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	0.64 U	0.64 U	32 U	64 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	0.43 U	0.43 U	21 U	43 U
Trichloroethene	5		5 U	5 U	5 U	5 U	**11**	0.43 U	**2,200**	**680**
Vinyl chloride	2		5 U	5 U	5 U	5 U	1.2	0.43 U	21 U	**2,200**
M&p-Xylenes	5		2 U	2 U	1.1 J	1.3 J	1.1 U	1.1 U	**100**	**1,800**
o-Xylene	5		1 U	1 U	1 U	1 U	0.72 U	0.72 U	36 U	**770**

Notes:
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U - Analyte was analyzed for but not detected at the detection limit shown
-- No NYSDEC AWQSGV available
Bold data indicates that analyte was detected above the NYSDEC AWQSGVs
DUP - Duplicate

Table 2. Summary of Volatile Organic Compounds Detected In Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Location: / Sample Date:	PZ-6 (11-12) 08/30/04	SB-GW-113 09/01/05	SB-GW-114 09/01/05	SB-GW-115 09/01/05	SB-GW-116 09/01/05	SB-GW-117 09/22/05	SB-GW-118 09/22/05	SB-GW-119 09/22/05
Acetone	50		2.8 U	25 U	25 U	25 U	25 U	35	25 U	25 U
Benzene	1		0.41 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50		0.52 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		0.36 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		0.9 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	50		12 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		0.53 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		0.52 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		0.55 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		1.3 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		1.2 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	5		1.1 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50		0.49 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		0.89 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5		0.69 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		0.44 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		4.9	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		0.44 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5		0.44 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		0.51 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5		0.62 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5		0.87 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Hexanone	50		0.45 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	--		0.44 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	5		2.9	2.4 B	5 U	1.6	5 U	5 U	5 U	5 U
Styrene	5		0.44 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		0.63 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		2.3	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5		1.7	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5		0.64 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		0.43 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		1	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	2		0.43 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
M&p-Xylenes	5		1.1 U	2 U	2 U	2 U	2 U	2 U	1.1 J	2 U
o-Xylene	5		0.72 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:

New York State Department of Environmental Conservation (NYSDEC)

Ambient Water-Quality Standards and Guidance Values (AWQSGVs)

µg/L -Micrograms per liter

B - Analyte detected in laboratory blank

J - Estimated Value

U - Analyte was analyzed for but not detected at the detection limit shown

-- No NYSDEC AWQSGV available

Bold data indicates that analyte was detected above the NYSDEC AWQSGVs

DUP - Duplicate

Table 2. Summary of Volatile Organic Compounds Detected in Groundwater, Coral Island Shopping Center, Staten Island, New York

Analyte (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Location:** **Sample Date:**	SB-GW-120 09/22/05	FB-081406 8/14/2006	FB-081506 8/15/2006	TB 8/9/2006	Trip blank 08/30/04
Acetone	50		25 U	25 U	25 U	25 U	2.8 U
Benzene	1		1 U	1 U	1 U	1 U	0.41 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	0.52 U
Bromoform	50		5 U	5 U	5 U	5 U	0.36 U
Bromomethane	5		5 U	5 U	5 U	5 U	0.9 U
2-Butanone (MEK)	50		5 U	5 U	5 U	5 U	12 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	0.53 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	0.52 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	0.55 U
Chloroethane	5		5 U	5 U	5 U	5 U	1.3 U
Chloroform	7		5 U	5 U	5 U	5 U	1.2 U
Chloromethane	5		5 U	5 U	5 U	5 U	1.1 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	0.49 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	0.89 U
1,2-Dichloroethane	5		5 U	5 U	5 U	5 U	0.69 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	0.69 U
cis-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	0.69 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	0.69 U
1,2-Dichloropropane	5		5 U	5 U	5 U	5 U	0.44 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	0.51 U
trans-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	0.62 U
Ethylbenzene	5		1 U	1 U	1 U	1 U	0.87 U
2-Hexanone	50		5 U	5 U	5 U	5 U	0.45 U
4-Methyl-2-pentanone	--		5 U	5 U	5 U	5 U	0.44 U
Methylene chloride	5		5 U	1.9 B	1.9 B	2 B	1 U
Styrene	5		5 U	5 U	5 U	5 U	0.44 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	0.63 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	0.69 U
Toluene	5		1 U	1 U	1 U	1 U	0.63 U
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	0.64 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	0.43 U
Trichloroethene	5		5 U	5 U	5 U	5 U	0.43 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	0.43 U
M&p-Xylenes	5		2.1	2 U	2 U	2 U	1.1 U
o-Xylene	5		1.1	1 U	1 U	1 U	0.72 U

Notes:

New York State Department of Environmental Conservation (NYSDEC)

Ambient Water-Quality Standards and Guidance Values (AWQSGVs)

µg/L -Micrograms per liter

B - Analyte detected in laboratory blank

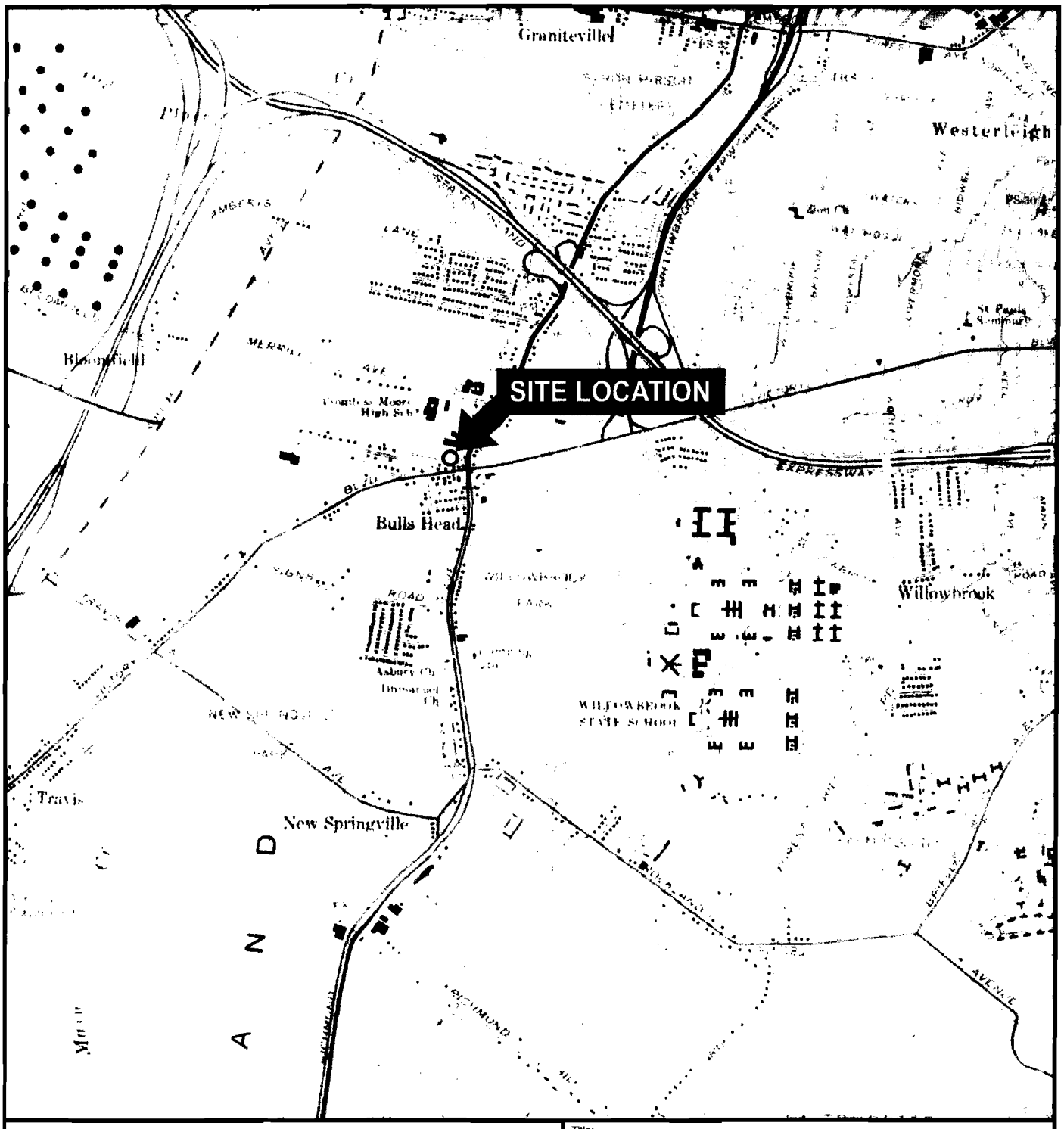
J - Estimated Value

U - Analyte was analyzed for but not detected at the detection limit shown

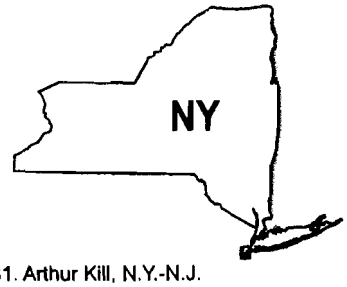
-- No NYSDEC AWQSGV available

Bold data indicates that analyte was detected above the NYSDEC AWQSGVs

DUP - Duplicate



QUADRANGLE LOCATION



N

0 2000'

SOURCE:
USGS; 1981. Arthur Kill, N.Y.-N.J.
7.5 Minute Topographic Quadrangle

Title:

SITE LOCATION PLAN

CORAL ISLAND SHOPPING CENTER
STATEN ISLAND, NEW YORK

Prepared for:

WWP ASSOCIATES, LLP

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.		Date: 05JAN07	FIGURE
Prepared by: M.R.		Scale: AS SHOWN	1
Project Mgr.: M.R.		Office: NY	
File No.: RRA0112509.CDR		Project No.: 125801Y	

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APPENDIX A

Community Air Monitoring Plan

COMMUNITY AIR MONITORING PLAN

This Community Air Monitoring Plan (CAMP) provides real-time monitoring for volatile organic compounds (VOCs) in the designated work area during intrusive activities to provide a measure of protection for the downwind community from potential airborne contaminant releases. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

This CAMP addresses the scope of work presented in the January 25, 2007 Remedial Alternatives Analysis/Remedial Action Work Plan for the Coral Island Shopping Center facility in Staten Island, New York. The scope of work includes ground intrusive activities including: Geoprobe soil borings, and soil excavation using hand or mechanical methods. Remedial Investigations at the Coral Island Shopping Center facility have determined that the contaminants of concern are limited to VOCs. Based on the scope of work and known contaminants, only real-time air monitoring for VOCs will be performed.

Upwind VOC concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. All monitoring will be performed using a PID calibrated at least once per day.

Due to the restricted work area and close proximity of buildings, VOCs will be monitored in the immediate work area on a continuous basis. If the ambient air concentration of total organic vapors within the work area exceeds 5 parts per million (ppm) above background for a 15-minute average, work activities will be temporarily halted and monitoring continued. Work activities will resume, with continued monitoring, when total organic vapor levels decrease below 5 ppm over background.

Should total organic vapor levels in the work area persist at levels in excess of 5 ppm over background, the source of vapors will be identified, corrective actions will be taken to abate emissions, and monitoring continued until total organic vapor levels decrease below 5 ppm over background. Work activities will resume, with continued monitoring, when total organic vapor levels decrease below 5 ppm over background.

All readings will be recorded and be available for New York State Department of Environmental Conservation and New York State Department of Health personnel to review.

APPENDIX B

Quality Assurance Project Plan

February 23, 2007

DRAFT
QUALITY ASSURANCE PROJECT PLAN

Coral Island Shopping Center
1650 Richmond Avenue
Staten Island, New York

Prepared for:

WWP ASSOCIATES, LLP
8816 Six Forks Road
Suite 201
Raleigh, North Carolina 27615

Remedial Engineering, P.C.
Environmental Engineers

and ROUX ASSOCIATES, INC.

209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

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1. Remedial Action Work Plan Field and Quality Control Sampling Summary

1.0 INTRODUCTION

Roux Associates, Inc. (Roux Associates) and Remedial Engineering, P.C. (Remedial Engineering) have developed this Quality Assurance Project Plan (QAPP) as part of the Alternatives Analysis Report (AAR)/Remedial Action Work Plan (RAWP) for the Coral Island Shopping Center (Site) located at 1650 Richmond Avenue, Staten Island, New York to describe in detail the field sampling and quality assurance/quality control methods to be used during implementation of a remedial action for the Site (Figure 1 of the AAR/RAWP). The selected soil remedy is excavation and offsite disposal of soil exceeding the proposed restricted commercial criteria (on-site areas) or the unrestricted use criteria (off-site areas) at depths to the water table, followed by backfilling with imported soil meeting the unrestricted use criteria, as an added measure of protection. The selected groundwater remedy is Enhanced Reduction Dechlorination (ERD).

The remedial tasks covered by this QAPP are post-excavation soil sampling, waste characterization sampling, and backfill sampling for soil. The remedial tasks covered by this QAPP for groundwater include baseline sampling and monitoring. The goals of the sampling that will be conducted during implementation of the remedial action for soil are to document the effectiveness of the soil removal activities, to characterize soil for offsite disposal, and to confirm the acceptability of offsite clean backfill. The goals of the sampling that will be conducted during implementation of the remedial action for groundwater are to evaluate levels of VOCs and naturally occurring biogeochemical conditions in the groundwater zone, before and after the implementation of the remedy.

This QAPP was prepared in accordance with the NYSDEC's December 2002 Draft DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) and provides guidelines and procedures to be followed by field personnel during performance of the remedial action sampling. Information contained in this QAPP relates to:

- Sampling objectives (Section 2);
- Project organization (Section 3);
- Sample media, sampling locations, analytical suites, sampling frequencies, and analytical laboratory (Section 4);

- Field sampling procedures (Section 5);
- Sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- Site control procedures and decontamination (Section 7).

2.0 SAMPLING OBJECTIVES

The remedial action sampling program is designed to meet the data quality objectives (DQOs) set forth in the Draft DER-10. Specifically, analytical parameters selected for each sample, as described in Section 4, are comprehensive and are intended to meet the following objectives:

- Analyze post-excavation soil samples for likely contaminants of concern given the known history and current use of the property (e.g., sampling for volatile organic compounds [VOCs] which were identified in previous investigations above the proposed restricted commercial criteria or the unrestricted use criteria presented in the AAR/RAWP);
- Analyze excavated soil for parameters required by the selected disposal facility;
- Analyze offsite backfill for parameters required to evaluate its suitability for use as backfill that meets the unrestricted use criteria;
- Analyze groundwater samples prior to the ERD injections to evaluate levels of VOCs and naturally occurring biogeochemical conditions in the groundwater zone; and
- Analyze groundwater samples following the remedial action to evaluate levels of VOCs and naturally occurring biogeochemical conditions in the groundwater zone.

Sampling procedures are discussed in Section 5 of this QAPP. A discussion of the data quality objectives (DQOs) and quality assurance/quality control for the project is provided in Section 6.

3.0 PROJECT ORGANIZATION

The overall management structure and a general summary of the responsibilities of project team members are presented below.

Project Manager

Michael Roux of Roux Associates will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the remedial action. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

The Field Team Leader has not yet been identified. The Field Team Leader bears the responsibility for the successful execution of the field program, as scoped in the AAR/RAWP. The Field Team Leader will direct the activities of the technical staff in the field, as well all subcontractors. He will also assist in the interpretation of data. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

The analytical laboratory selected based on a competitive bid will provide a Project Manger responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Project Manager.

4.0 SAMPLE MEDIA, LOCATIONS, ANALYTICAL SUITES, AND FREQUENCY

The media to be sampled during the implementation of the remedial action are soil and groundwater. Sampling locations, analytical suites, and frequency vary by the type of media to be sampled. A discussion of the sampling for each type of soil and groundwater is provided below. Specifics regarding the collection of samples for each type of soil and groundwater are provided in Section 5 of this QAPP.

4.1 Post-Excavation Soil Sampling

Post excavation bottom sampling (at a frequency of one sample per 900 square feet of bottom area in accordance with the guidance provided in NYSDEC DER-10 Sections 3.5 and 5.4 for excavations 20 to 300 feet in perimeter) would be conducted for constituents that exceeded the restricted commercial use criteria (for on-site areas) or the unrestricted use criteria (for off-site areas) in previous sampling events to confirm that the criteria were met (target compound list [TCL] VOCs via method 8260). Constituents or groups of constituents that did not exceed the criteria in previous investigations would not be sampled for. Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation bottom sample results indicate that concentrations of target constituents are detected below the criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the criteria, the excavation activities, including additional post-excavation bottom sampling, will continue deeper until these conditions are met or to the extent feasible based on Site-specific limitations or potential damage to those limitations including but not necessarily limited to underground utilities, building foundations, and a nearby electrical transformer.

Post excavation sidewall samples (at a frequency of one sample per 30 linear feet or at least one sample per sidewall) would be conducted for constituents that exceeded the restricted commercial use criteria (for on-site areas) or the unrestricted use criteria (for off-site areas) in previous sampling events to confirm that the criteria were met (TCL VOCs via method 8260). Areas that appear more heavily impacted, if any, will be given sampling preference. If the post-excavation sidewall sample results indicate that concentrations of target constituents are detected below the criteria, the excavation activities will be considered complete. However, if concentrations of target constituents are detected at a level above the criteria, the excavation

activities, including additional post-excavation sidewall sampling, will continue until these conditions are met or to the extent feasible based on Site-specific limitations or potential damage to those limitations including but not necessarily limited to underground utilities, building foundations, and a nearby electrical transformer.

For excavation areas that are located on both sides of the site property boundary (chain link fence), Areas 1, 2 and 3 (see Figure 3 of AAR/RAWP), post-excavation samples collected within the on-site areas will be compared to the restricted commercial use criteria and post-excavation samples collected within the off-site areas will be compared to the unrestricted use criteria.

QA/QC samples, including duplicates, field blanks, and matrix spike/matrix spike duplicate (MS/MSD) will also be collected at the frequencies described in Table 1.

4.2 Waste Characterization Sampling

One sample per 500 cubic yards of excavated material will be collected from the soil for waste characterization. The samples will be composite samples comprised of three representative grab samples. The samples will be analyzed as required by the disposal facility selected based on a competitive bid. QA/QC samples are not required for waste characterization samples.

4.3 Backfill Sampling

When excavation and removal of the impacted soil is complete, the excavation will be backfilled and compacted using offsite clean fill material meeting the unrestricted use criteria for the parameters described below. The backfill material will be free of extraneous debris or solid waste.

For offsite fill material (common fill and topsoil), if the NYSDEC agrees that the material originated from a virgin source, then a minimum of one composite sample will be collected and analyzed per source. If the source is not virgin, the following sampling frequency will apply to each source: one composite sample per 250 cubic yards for the first 1,000 yards and one composite sample per 1,000 cubic yards for 1,000 to 5,000 cubic yards. The backfill material will be common fill material. The source of the offsite fill must be documented by the supplier,

including the location where the fill was obtained and a brief history of the site that is the source of the fill.

Samples of offsite backfill will be analyzed by the supplier for the following parameters:

- Herbicides by United States Environmental Protection Agency (USEPA) method SW-846-8151A.
- Pesticides and polychlorinated biphenyls (PCBs) by USEPA methods SW-846-8081A/8082.
- VOCs by USEPA method SW-846-8260.
- SVOCs by USEPA method SW-846-8270.
- Arsenic, barium, beryllium, cadmium, copper, cyanide, lead, manganese, nickel, selenium, silver, thallium, vanadium, and zinc by USEPA method SW-846-6010B.
- Total mercury by USEPA method SW-846-7471.
- Total chromium, hexavalent chromium, and trivalent chromium method SW-846-7196A.

QA/QC samples are not required for backfill samples.

4.4 Groundwater Sampling

Field monitoring of selected indicator parameters and groundwater sampling for field and laboratory analyses will be conducted to evaluate levels of VOCs and naturally occurring biogeochemical conditions in the groundwater zone.

Monitoring will take the form of a baseline sampling event and periodic monitoring events. The baseline monitoring event (1 event) will be used to establish the biogeochemical conditions and VOC concentrations in groundwater, prior to initiation of the ERD injections. Baseline groundwater samples will be collected from existing monitoring wells MW-101S, MW-101D, MW-103S, MW-103D, MW-112S, MW-112D, MW-113S and MW-113D for the following:

- VOCs by USEPA method SW-846 8260B.
- Nitrate and nitrite by USEPA methods SW-846-353.2/300.0.
- Sulfate by USEPA methods SW-846-375.3/300.0.

- Ferric and dissolved iron, and total and dissolved manganese by USEPA method SW-846-6010.
- Chloride by USEPA methods SW-846-9056/300.0.
- Ethene and Ethane by USEPA modified method SW-846-3810.
- Total organic carbon by USEPA method SW-846-9060.

Periodic monitoring will commence immediately following reagent injections. Monthly monitoring of field parameters and total organic carbon (TOC) from the existing or replacement baseline monitoring wells will be conducted for the first six months following the ERD injections (6 events). Quarterly monitoring of electron acceptors and biodegradation indicators will be conducted for one year following the monthly monitoring period (four events). Quarterly monitoring of VOCs will be conducted for two years following the ERD injections (eight events).

QA/QC samples, including duplicates, field blanks, trip blanks and MS/MSD will also be collected at the frequencies described in Table 1.

4.5 Analytical Laboratory

Laboratory analyses will be performed by a NYSDOH ELAP certified laboratory in accordance with the NYSDEC Analytical Services Protocol (ASP) using USEPA SW-846 Methods. A laboratory will be selected for this project following a competitive bid.

5.0 FIELD SAMPLING PROCEDURES

This section provides a discussion of the field procedures to be used for sampling of soil and groundwater during implementation of the remedial action. The post-excavation soil samples will be collected as a grab sample at the middle of the excavation using pre-cleaned stainless steel sampling tools (i.e., trowels, spatulas, etc.) or the excavator bucket. However, areas that appear more heavily impacted, if any, will be given sampling preference. Samples will be labeled based on each area's designation.

The waste characterization samples will be composite samples comprised of three grab samples, collected by using pre-cleaned stainless steel sampling tools (i.e., trowels, spatulas, etc.).

6.0 SAMPLE HANDLING AND ANALYSIS

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and quality assurance/quality control.

6.1 Field Sample Handling

A detailed discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed can be found in Section 4.0 and in Table 1 of this QAPP.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting a sample is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person and/or to/from a secure storage area and/or to the shipper, and/or to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping

containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

6.3 Sample Shipment

Sample packaging and shipping procedures are based upon USEPA specifications, as well as U.S. Department of Transportation (DOT) regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection.

6.4 Quality Assurance/Quality Control

The primary DQO of the post-excavation, backfill and waste characterization soil sampling and groundwater sampling is that data be accurate and precise and, hence, representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples. Field MS/MSD and field duplicate samples will only be collected for the post-excavation soil samples and all groundwater samples. They are not required for the waste characterization or backfill samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called "field blanks"). Field blanks will only be collected for the post-excavation soil samples and are not required for the waste characterization or backfill samples.

Table 1 lists the field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. These tables also list the data acceptance criteria against which the data will be compared to verify that the project DQOs have been achieved.

All soil and groundwater sample analyses will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP) using USEPA SW-846 methods. The laboratory selected to analyze the field samples collected during the remedial action will maintain New York State Department of Health (NYSDOH) ELAP CLP certification for each of the required analyses.

All groundwater sample laboratory data and post-excavation data are to be reported in NYSDEC ASP Category B deliverables. Waste characterization and backfill characterization laboratory data are to be reported in NYSDEC ASP Category A deliverables.

7.0 SITE CONTROL PROCEDURES

Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the site. In order to accomplish this objective, the QAPP addresses three main considerations:

- The establishment of discrete work zones in the work area;
- The decontamination of field equipment; and
- The handling and disposal of all remediation-derived waste.

All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of the contractor's Site-Specific Health and Safety Plan (HASP), which will be submitted under separate cover.

7.1 Field Work Zones

Field work zones will be limited to areas where excavation, stockpiling, and soil sampling is being conducted for the soil remedy. Field work zones will be limited to areas where the ERD and groundwater sampling is being conducted for the groundwater remedy. Access to these areas will be limited in accordance with the HASP. Control of work zone access will be the responsibility of the individual(s) designated as a Site Health and Safety Manager. At the completion of each working day, all loose equipment (e.g., sampling equipment, coolers, etc.) will be secured. Heavy equipment, such as the excavator, may remain onsite within an established, secured zone.

7.2 Decontamination

In an attempt to avoid the spread of contamination, all excavation, ERD injection and sampling equipment must be decontaminated at a reasonable frequency. Temporary decontamination pads will be set up by the contractor as deemed necessary. The location of the decontamination area(s) will be determined as necessary during the field operations. The decontamination area will be constructed to ensure that any wash water generated during decontamination can be collected. Decontamination water (if any) will be disposed offsite at an approved disposal facility.

7.3 Waste Handling and Disposal

All impacted soil excavated from the Site and other remediation-derived waste will be transported and disposed of in accordance with all applicable federal, state, and local regulations at an approved disposal facility. The remediation-derived waste that will be generated during the construction activities include:

- Impacted soil from the Site (non-hazardous);
- Personal Protective Equipment (PPE); and
- Decontamination water, if any is generated.

Haul vehicles for bulk soil will be secured with appropriate covers prior to exiting the construction area to prevent release of waste.

PPE generated during the implementation of the remedial action will be consolidated and stored in appropriate bulk containers (drums, etc.), and temporarily staged at a waste storage area within the Site limits. Any full or partially filled containers will be appropriately labeled after the completion of the work.

Decontamination water, if any, will be collected and disposed offsite at an approved disposal facility.

Table 1. Remedial Action Field and Quality Control Sampling Summary

Sample Medium	Sample Parameters	Field Samples	Replicates[1]	Field Blanks[2]	Matrix Spikes[1]	Spike Duplicates[1]	Trip Blank[1]	Total No. of Samples
Soil (Excavation Sidewalls)[3]	TCL VOCs	20	1	2	1	1	0	25
Soil (Excavation Bottom)[4]	TCL VOCs	5	1	2	1	1	0	10
Offsite Backfill Material from Virgin Source (Soil)	VOCs	1 per source	0	0	0	0	0	0
	SVOCs	1 per source	0	0	0	0	0	0
	Pesticides and PCBs	1 per source	0	0	0	0	0	0
	Herbicides	1 per source	0	0	0	0	0	0
	Metals	1 per source	0	0	0	0	0	0
Groundwater	VOCs	72	9	18	9	9	9	126
	Electron Acceptors[5]	40	5	10	5	5	0	65
	Degradation End Products[6]	40	5	10	5	5	0	65
	TOC	88	11	22	11	11	0	143

[1] - Based on 1 per 20 samples or 1 per Sample Delivery Group (3 days max)

[2] - Based on 1 per day

[3] - Based on 1 per 30 linear feet of sidewall

[4] - Based on 1 per 900 square feet of bottom

[5] - Electron acceptors consist of nitrate, ferric iron, manganese and sulfate

[6] - Degradation end products consist of dissolved iron and manganese, sulfide, nitrite, chloride, ethene, and ethane

VOCs - Volatile Organic Compounds

SVOCs - Semivolatile Organic Compounds

TOC - Total Organic Carbon

TCL - USEPA Contract Laboratory Program Target Compound List

APPENDIX C

Site-Specific Health and Safety Plan

March 7, 2005

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Coral Island Shopping center
1650 Richmond Avenue
Staten Island, New York

Prepared for

WWP ASSOCIATES, LLC

ROUX ASSOCIATES, INC.

Environmental Consulting & Management

ROUX

209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

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1.0 INTRODUCTION

On behalf of WWP Associates, LLC (WWP Associates), Roux Associates, Inc. (Roux Associates) has prepared this site-specific Health and Safety Plan (HASP) in accordance with the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Operation and Emergency Response Standard (29 CFR 1910.120 and 1926.65) and other OSHA requirements for job safety and health protection, and our Standard Operating Procedures (SOPs). In addition, various guidance documents were also consulted in preparing this HASP including the National Institute for Occupational Safety and Health's (NIOSH's) Occupation Safety, Health Guidance Manual for Hazardous Waste Site Activities, and the OSHA Job Safety and Health Protection Poster (Appendix A). This HASP addresses work associated with a remedial response program at the Coral Island Shopping Center located in Staten Island, New York (Site) and will be implemented by the designated Site Health and Safety Officer (SHSO) during Site work. The HASP attempts to identify all potential hazards at the Site; however, Site conditions are dynamic and new hazards may appear constantly. Personnel must remain alert to existing and potential hazards as Site conditions change and protect themselves accordingly.

Compliance with this HASP is required for Roux Associates personnel who enter this Site. Assistance in implementing this HASP can be obtained from the Roux Associates Office Health and Safety Manager (OHSM). The content of this HASP may undergo revision based upon additional information made available. Any changes proposed must be reviewed and approved by the Roux Associates OHSM or his designee and documented on the Field Change Request form included as Appendix B. Key Roux Associates personnel involved with this project include the following.

Responsibility	**Name**	**Telephone/*Cellular Phone***
Project Principal	Nathan Epler, Ph.D.	(631) 232-2600
Project Manager	Michael Roux	(631) 232-2600/*(631) 774-7289*
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600
Site Health and Safety Officer	Martin Kroll	(631) 232-2600/*(631) 831-6770*

In the event the SHSO identified above is not on Site during a particular phase of work, an alternate SHSO will be assigned by the SHSO, Project Manger, or Project Principal.

1.1 Scope of Work

A specific scope of work will be prepared for different project tasks and will vary depending on the task and the objectives for that task. In general, the scope of work may include the following:

- Site survey;
- advancement of soil borings and soil sample collection;
- groundwater sample collection;
- soil gas sample collection;
- excavation of soils;
- monitoring well installation; and
- *in situ* material injection.

1.2 Emergency Contacts

Type	Name	Telephone Numbers
Police	122nd Precinct	911
Fire Department	Police Dispatches	911
Hospital (see Figure 1)	St. Vincent's Hospital	(718) 818-1234
Poison Control Center	Poison Control Center	(800) 876-4766
Emergency Response	Police Dispatches	911
Ambulance	Police Dispatches	911
Police Non-Emergency	122nd Precinct	(718) 667-2211
Fire Department Non-Emergency	Engine 166	311

Environmental Emergency (e.g., release or spill)

Contact	**Name**	**Telephone/*Cellular* Numbers**
Project Principal	Nathan Epler, Ph.D.	(631) 232-2600
Project Manager	Michael Roux	(631) 232-2600/*(631) 774-7289*
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600
Site Health and Safety Officer	Martin Kroll	(631) 232-2600/*(631) 831-6770*
National Response Center		(800) 424-8802
Client Contact (Hancock & Estabrook)	Wendy Marsh, Esq.	(315) 471-3151

Note: Roux Associates personnel will be equipped with a cellular telephone.

(Additional emergency information is provided in Section 13.0).

2.0 HEALTH AND SAFETY PERSONNEL RESPONSIBILITIES

2.1 Office Health and Safety Manager – Mr. Stephen Bates, Ph. D.

The Office Health and Safety Manager (OHSM) serves in assuring that the policies and procedures of the HASP are implemented by the SHSO. The OHSM provides guidance regarding the appropriate monitoring and safety equipment and other resources necessary in implementing the HASP.

2.2 Site Health and Safety Officer – Mr. Martin Kroll

The Site Health and Safety Officer (SHSO) will be onsite during oversight activities and intrusive field operations. The SHSO is responsible for health and safety activities and has the authority to make related decisions. The determination of hazard levels will be made by the SHSO. The SHSO has stop-work authorization, which he or she will execute upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation, such as detrimental weather conditions. Authorization to proceed with work will be issued by the OHSM in consultation with the Project Principal (PP) or his/her designee, e.g., Project Manager (PM). The SHSO or PP will contact emergency facilities and personnel when appropriate. Alternate SHSOs may be designated by the SHSO, if required, but must be pre-qualified and approved by the OHSM.

2.3 Project Principal – Mr. Nathan Epler, Ph.D.

The Project Principal is responsible for defining the overall project objectives (field and office related activities) determining chain-of-command, evaluating program outcome and serves as final technical review of deliverables. For Roux Associates, the Project Principal is ultimately responsible for overall Site activities including health and safety issues. The day-to-day management of health and safety issues is the responsibility of the Project Manager. The SHSO, OHSM, Project Engineer, Project Manager, and Project Principal shall consult and make an agreeable determination should Site information or unforeseen circumstances indicate a change in field procedures may be warranted. Changes to the HASP must be made by formal addendum and be approved by the Project Principal, Project Manager, OHSM and SHSO.

2.4 Project Manager – Mr. Michael Roux

The Project Manager is responsible for day-to-day activities associated with his/her project including health and safety. Because there may be more than one Project Manager for a site (for example, a Remedial Project Manager and a Site Investigation Project Manager), each Project Manager must ensure that the HASP addresses the hazards associated with each phase of the project and is appropriate for the current specified scope of work. The PM ensures that all Roux Associates personnel designated to work onsite are qualified according to applicable Environmental Protection Agency (EPA), OSHA and New York State requirements. The PM is responsible for ensuring that a duplicate office copy of this HASP is placed in the central project files. The PM is also responsible for ensuring that all required signatures are in place prior to implementing field work.

2.5 Project Personnel

All field crew personnel are responsible for reporting unsafe or hazardous conditions to SHSO. All field personnel (including the above listed personnel) are responsible for understanding and complying with this HASP, taking all reasonable precautions to prevent injury to themselves and to their fellow employees, performing only those tasks that they believe they can do safely, notifying the PM and SHSO of any special medial problems (i.e., allergies), and making certain that all on-site personnel are aware of any such problems.

3.0 SITE DESCRIPTION AND HISTORY

The following section provides a physical description and a brief history of the Site.

3.1 Physical Description

The Coral Island Shopping Center is located at 1650 Richmond Avenue in Staten Island, New York (Figure 1). The Site consists of two single story buildings, each with multiple tenants, and a parking lot (Figure 2). The building at the north end of the site includes the Charming Cleaners dry cleaning facility. Immediately north of the Site is our Lady of Mercy Church. The Moore Catholic School is located to the northwest and the school's football field is to the west. A McDonalds restaurant located to the southeast has an access driveway from the Coral Island Shopping Center parking lot. Richmond Avenue is located to the east and residential houses and Victory Boulevard are located to the south. Victory Boulevard and Richmond Avenue are commercial corridors with mixed residential and commercial use including auto repair, gasoline station, and car wash facilities.

The area behind Charming Cleaners is approximately 20 feet wide with the building to the south and a chain link fence o the property line to the north. The entire area is covered with gravel. A transformer is located approximately 15 feet to the west with less than three feet of clearance between the building and transformer and the transformer and the chain link fence. A concrete sidewalk runs to the east where the property line moves to less than four feet from the building.

3.2 Site History

Complete Site operational history and Site investigation history are presented in the Remedial Investigation Work Plan. To summarize the information presented in the Work Plan, there was apparently a residential house located on the Site in 1917 and that between 1937 and 1950, the Site appeared vacant. The property was used as a parking lot as early as 1949 and a bowling alley was constructed on the Site sometime between 1955 and 1958. Two pipeline easements (one liquefied natural gas and one jet fuel) were granted in 1958 that cross the Site in a west to east direction approximately 30 feet south of the building at the north end of the Site.

In 1974, the Site was converted into a strip mall-type shopping center. This building was enlarged in 1995 and a separate building was constructed in the southern portion of the Site. A

dry cleaning operation commenced in the building at the north end of the Site in 1975. Soil and groundwater samples collected behind the dry cleaner in 2004 by EBI Consultants, Inc. and Roux Associates discovered volatile organic compounds (VOCs) in both the shallow soil and groundwater.

4.0 WASTE DESCRIPTION AND CHARACTERIZATION

Wastes may be encountered or generated during Site activities. Based on Roux Associates Scope of Work, these wastes are anticipated to be characterized as follows:

- Waste Types

Liquid	☒	Solid	☒	Gas	☐
Sludge	☐	Semi-Solid	☐	Other (describe)	

- Waste Characteristics

Corrosive	☐	Toxic	☒	Flammable	☐
Volatile	☒	Carcinogen	☒	Radioactive	☐
Reactive	☐	Other (describe) _____			

For purposes of this HASP, toxic chemicals are those materials as defined by OSHA in Appendix A of 29 CFR 1910.120. In general, toxicity is defined by OSHA on the basis of median lethal dose (LD50) or median lethal concentration (LC50) based upon the effects of the chemical in laboratory studies. A chemical is considered a carcinogen, as defined by Appendix A of OSHA in 29 CFR 1910.1200, if "(a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or (b) It is listed as a carcinogen or a potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or (c) It is regulated by OSHA as a carcinogen."

- Waste Containment

Pond	☐	Process Vessel	☐	Tank	☐
Lagoon	☐	Piping	☐	Lab	☐
Lake	☐	Drum	☒	Other	☐
Tank Car	☐	Soil Stockpile	☒	Describe: _____	

5.0 HAZARD ASSESSMENT

Chemical Hazards

Investigation results indicate that VOCs including tetrachloroethene (PCE), trichloroethene (TCE), and 1,2-dichloroethene are present at the Site. The toxicological, physical, and chemical properties of compounds of concern are presented in Table 1. The compounds listed in Table 1 may pose a potential exposure hazard through ingestion, inhalation, injection or skin absorption, or a combination of these routes. The potential for encountering these hazards exists during intrusive activities. These exposures will be minimized through the use of personal protective equipment (PPE) as described in Section 7.2.1 and the assignment of experienced field personnel.

Ambient Air Hazards

Potential exposure to impacted airborne particulates during intrusive activities. All personnel will remain up-wind as the task allows.

Inhalation hazards at the Site will be monitored with the following instrument:

- Photoionization detector (PID).

Action levels for level of protection upgrades are discussed in Section 7.2.1

Physical Hazards

A variety of physical hazards may be present during Site activities. These physical hazards include motor vehicle traffic; heavy equipment operation; slip, trip, and fall hazards associated with uneven terrain, obstacles and slippery or icy surfaces; broken glass; exposed nails or rusty metal; pinch points; overhead hazards; and flying objects or airborne particulate hazards. These exposures will be minimized through the use of personal protective equipment (PPE) as described in Section 7.2.1 and safety procedures as described in Section 9.0.

Heat/Cold Stress and Sun Exposure

Heat and cold stress are potential hazards associated with seasonal temperatures in Staten Island, New York. Heat stress and cold stress symptoms, prevention, and treatment are described in Section 9.0. These exposures will be minimized through the use of personal protective equipment (PPE) as described in Section 7.2.1.

Noise

Noise, associated with close proximity to operating heavy equipment, power tools, pumps, and generators. Personnel with 8-hour time weighted average (TWA) exposures exceeding 85dBA must be included in a hearing conservation program in accordance with 29 CFR 1910.95. High noise operations will be evaluated by the SHSO. Noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs as described in Section 7.2.1 or by maintaining set-backs from high noise equipment as warranted.

Electrical Hazards

Electrical hazards are associated with portable pumps, generators, and other power tools. This equipment requires proper grounding and/or a ground fault circuit interrupter (GFCI) before operation. Personnel should never attempt to move an operating pump or generator. In addition, overhead and underground utility lines present electrical hazards.

Biological Hazards

Biological hazards include the possibility of potentially rabid stray or wild animal bites, ticks or other insect bites, bee and wasp stings, and snake bites. Ticks may carry lyme disease and/or rocky mountain spotted fever. Personnel shall periodically examine themselves for ticks. Insecticides containing DEET may be an effective tick repellent. Personnel allergic to bee and/or wasp stings shall notify the SHSO of their condition and have medicine or antidotes to treat allergic reactions as prescribed by their personal physician available.

Other biological hazards include poison ivy, poison oak and poison sumac. Exposure to these hazards will be minimized through the use of PPE as described in Section 7.2.1. If exposed to these plants, wash skin thoroughly with soap and water.

6.0 TRAINING REQUIREMENTS

6.1 Basic Training

Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety trained prior to performing work onsite per OSHA 29 CFR 1910.120(e). Training records will be maintained by the onsite SHSO and as described in Section 6.4.

6.2 Site-Specific Training

Training will be provided by the SHSO and Field Team Leader (FTL) that will specifically address the activities, procedures, monitoring, and equipment for the Site operations to Site personnel and visitors. The training will include Site and facility layout, hazards, emergency services at the Site, and will detail provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Site-specific training will be documented as part of the project records. There are no facility Health and Safety requirements currently in place. However, any facility Health and Safety requirements implemented in the future will be followed.

6.3 Safety Briefings

Project personnel will be given briefings by the FTL or SHSO on an as-needed basis to further assist them in conducting their activities safely. Safety briefings will be provided when new operations are to be conducted, changes in work practices must be implemented due to new information made available, and before work is begun at each project site. Records of safety briefings will be part of the project records.

6.4 Record Keeping Requirements

Record keeping requirements mandated by OSHA 29 CFR 1910.120 will be strictly followed. Specifically, all personnel training records, incident reports (Appendix C), and medical examination records will be maintained by Roux Associates for a period of at least 30 years after the employment termination date of each employee. The SHSO will maintain a daily written log of health and safety monitoring activities and monitoring results will become part of the project records.

7.0 ZONES, PROTECTION AND COMMUNICATIONS

7.1 Site Zones

The Scope of Work will be performed in level "D" Personal Protective Equipment, upgrading to Level C protection is not anticipated on this project. However, should the level of protection worn by field personnel be upgraded to level C, Roux Associates will employ a three-zone approach to site operations to control the potential spread of contamination. Level D operation will not generally require segregated zones; however, the work zone may be designated by barriers, flagging, flag tape, or signs to notify others of activity. The three zones to be employed when Level C is in use include:

- The Exclusion Zone;
- The Contamination Reduction Zone; and
- The Support Zone.

7.1.1 Exclusion Zone

The area(s) which contain or are suspected to contain hazardous materials will be considered the Exclusion Zone. This zone will be clearly delineated by a "Hotline." The "Hotline" is a length of colored flag tape completely surrounding the Exclusion Zone. The SHSO may establish more than one restricted area within the Exclusion Zone when different levels of protection may be used or various hazards exist. Personnel are not allowed in the Exclusion Zone without the following:

- a buddy;
- appropriate personal protective equipment;
- medical authorization; and
- training certification.

For purposes of this project, if Level C protection is required on this project, the Exclusion Zone's Hotline will include, at a minimum, a 30-foot radius around all areas that contain or are suspected to contain hazardous materials. This area will be determined by the SHSO.

7.1.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is established between the Exclusion Zone and the Support Zone. The CRZ will contain the Contamination Reduction Corridor (CRC) and will

provide for full personnel and portable equipment decontamination. The CRZ is used for general site entry and egress in addition to access for heavy equipment for investigation activities. The CRZ will also contain safety and emergency equipment (see Section 7.2.3). No personnel are allowed in the Contamination Reduction Zone without:

- a buddy;
- the proper personal protective equipment;
- medical authorization; and
- training certification.

For purposes of this project, if Level C protection is required on this project, the CRZ will include a 20 foot radius area outside of the Exclusion Zone.

7.1.3 Support Zone

The Support Zone is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line." The "Contamination Control Line" will be a different colored flag tape than the "Hotline." The Support Zone will contain the support facility which will provide for team communications and emergency response. At least one person will remain in the Support Zone at all times during operations downrange to facilitate communications and emergency response. Appropriate sanitary facilities and safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The support facility will be located upwind of site operations, if possible and may be used as a potential evacuation point. No potentially contaminated personnel or materials are allowed in this zone except appropriately packaged/ decontaminated and labeled samples and drummed wastes.

For purposes of this project, the Support Zone will include all areas outside of the CRZ.

7.1.4 Buddy System

Select field activities conducted in hazardous or remote areas of the Site, may require the used of the buddy system. Instances when the buddy system should be employed include, but are not limited to confined space entry (permit required and non-permit required). Prior to commencing

with field tasks in a potentially hazardous or remote area, the need for using the buddy system should be evaluated. If required, a buddy should be able to:

- provide their partner with assistance;
- observe their partner for signs of chemical or heat/cold exposure;
- periodically check the integrity of their partner's PPE; and
- notify the SHSO or others if emergency help is needed.

7.2 Personal Protection

This section describes personal protective equipment (PPE) and safety equipment to be used onsite.

7.2.1 General

Appropriate PPE shall be worn by site personnel when there is a potential exposure to chemical hazards or physical hazards (i.e., falling objects, flying particles, sharp edges, electricity, noise) and as otherwise directed by the SHSO. The level of personal protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

Roux Associates maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. PPE to be used at the site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for PPE.

- head protection – 29 CFR 1910.135;
- eye and face protection – 29 CFR 1910.133;
- respiratory protection – 29 CFR 1910.134;
- hand protection – 29 CFR 1910.138;
- foot protection – 29 CFR 1910.136; and
- protective clothing – 1910.132, 1910.120.

The level of protection to be worn by field personnel will be defined and controlled by the SHSO in conjunction with the Project Principal or his/her designee. Where more than one hazard area is indicated, further definition will be provided by review of site hazards, conditions, and operational requirements and by monitoring at the particular operation being conducted. Any upgrades or downgrades must be immediately communicated to the Project Principal or his/her designee. The anticipated PPE level of protection for Site tasks are listed below.

Task	Level of Protection
Site Survey	Level D
Installation of Monitoring Wells	Level D
Collection of Soil Samples	Level D
Collection of Groundwater Samples	Level D
Soil Excavation	Level D
In situ Material Injection	Level D

Respiratory protection may be upgraded or downgraded by the SHSO in conjunction with the Project Principal on the basis of action levels presented below:

Action Levels for Respiratory Protection	
Volatile Concentration in Breathing Zone (ppm)	**Action**
≤5	No Action
>5 - <25	Level C or Cease Work Until Level Drops
≥25	Cease Field Operations

If photoionization (PID) measurements are above 5 parts per million (ppm) but below 25 ppm and above background for 15 minutes in the breathing zone, employee protection will be upgraded to Level C with the use of a full-face respirator or work will cease until the relative measurements of volatile organic compounds are below 5 ppm.

If PID measurements exceed 25 ppm above background for 15 minutes in the breathing zone, work activities will cease until volatile organic compounds can be reduced to less than 25 ppm and are quantified or the SHSO determines alternate methods to be followed in order to proceed.

7.2.2 PPE Level Descriptions

The type of respiratory protection and clothing to be worn in each level of protection indicated above includes the following:

- Level D
  - Full-length pants and short-sleeved shirt at a minimum. Long-sleeved shirt or coveralls as required.
  - Boots/shoes - chemical resistant with steel toes and shanks.
  - Safety glasses.
  - Hard hat – depending on task.
  - Chemical-resistant or cut-resistant gloves – depending on task.
  - Hearing protection – depending on task.
  - Fluorescent traffic safety vest with reflective strips – depending on task.
- Level C
  - Full-face, air-purifying, HEPA cartridge-equipped respirator (MSHA/NIOSH specifically approved for protection from organic vapors and particulates per OSHA 1910.1028).
  - Chemical-resistant clothing (coverall; hooded, two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls).
  - Gloves (outer), chemical-resistant – latex.
  - Gloves (inner), chemical-resistant – nitrile.
  - Boots (inner), chemical-resistant, steel toe and shank.
  - Boots (outer), chemical-resistant (disposable).
  - Hard hat – depending on task.
  - Hearing protection – depending on task.

7.2.3 Safety Equipment

Basic emergency and first-aid equipment will be available at the work site, as appropriate. This may include HASP-specified communications, first-aid kit, emergency eyewash or emergency shower or drench system, fire extinguisher, and other safety-related equipment. Other safety equipment will be located at the area of specific operations, e.g., drilling and sampling, as appropriate. Traffic cones or barricades, and traffic vests will be used when work is required in high traffic areas.

7.3 Communications

Roux Associates personnel will be equipped with a cellular telephone for communication with emergency support services or facilities.

8.0 MONITORING PROCEDURES FOR SITE OPERATIONS

8.1 Air Monitoring During Site Operations

The SHSO will monitor wind direction and approximate temperature during all invasive site activities and record the data in a log book. An air monitoring program is important to the safety of onsite and offsite personnel. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of site work. This survey will be conducted with the appropriate air monitoring instrument(s) as warranted by the field activity. Once this survey has been complete, any change in the type of personal protective equipment will be determined.

Air monitoring may be performed to verify that the proper level of equipment is used and to determine if increased protection or work stoppage is required. The following equipment may be used by Roux Associates onsite to monitor conditions:

- Photoionization detector (PID)

Section 7.2.1 lists the acceptable ranges for this air monitor and the action levels for changes in respiratory protection. Monitoring equipment will be calibrated in accordance with the owner's manual.

8.2 Personnel Monitoring Procedures

Personal breathing zone samples, 8-hour, time-weighted average (TWA) sampling, may be conducted if sustained operations in Level C are required. The personal breathing zone samples will be collected according to NIOSH analytical methods and analyzed by an AIHA-certified laboratory.

8.3 Medical Surveillance Requirements

Medical surveillance specifies any special medical monitoring and examination requirements as well as stipulates that all Roux Associates, Inc. personnel and subcontractors are required to pass the medical surveillance examination or equivalent for hazardous waste work required by 29 CFR 1910.120. As a minimum, the examination will include:

- complete medical and work histories;
- urinalysis;

- physical exam;
- vision and hearing exam;
- blood chemistry;
- pulmonary function test; and
- audiometry.

The examination will be annual, at a minimum, and upon termination of employment with the company. Additional medical testing may be required by the OHSM in consultation with the company physician and the SHSO if an overt exposure or accident occurs, or if other Site conditions warrant further medical surveillance.

9.0 SAFETY CONSIDERATIONS FOR SITE OPERATIONS

Field activities will be performed under the level of personal protection described in Section 7.0. In this section, non-monitoring safety-related procedures are described.

9.1 Site Walk-Throughs

As a full investigation of the Site has already been performed, Site walks will not encounter unknown situations. However, site walks still present the potential for dangerous situations based on the hazard assessment presented in Section 5.0. The SHSO must inform all personnel performing a Site walk of the hazards associated with the Site, describe the Site layout, and identify areas of particular hazard, if any.

9.2 Communications

- Telephones – A telephone will be available for communication with emergency support services/facilities.
- Hand Signals – To be employed by personnel required to use Level C or B respiratory protection. The entire field team shall know them before operations commence and covered during Site-specific training.

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breath
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I'm alright, okay
Thumbs down	No, negative

9.3 Hazard Communication

Personnel working at this Site have the right to know about the chemical hazards associated with hazardous materials used and stored onsite. This information will be readily available to all Site workers as required by OSHA's Hazard Communication Standard (29 CFR 1910.1200). This information will be communicated to personnel through the maintenance of a chemical inventory

system, chemical labeling, material safety data sheets (MSDSs), hazard communication training, and a written hazard communication program.

Chemicals imported to the Site will bear the original Department of Transportation (DOT) required labeling on the chemical's container. In addition, a new label will be affixed to the original containers, if necessary, and to a new container to which the chemical is dispensed providing the chemical name and specific hazard warnings (e.g., flammability, health, reactivity). Hazard warnings will follow either the National Fire Protection Association (NFPA) format or the Hazardous Material Information System (HMIS) format. Both systems are easy to use and rely on numerically ranking hazards on a 0 to 4 scale. Most chemicals used onsite, which are subject to the Hazard Communication Standard are related to sampling activities. These chemicals may include hexane, methanol, acetone and nitric acid.

9.4 Vehicular Traffic Safety Procedures

A vehicular traffic area is any area where a vehicle may legally travel including, but not limited to, a roadway, roadway shoulder, and driveway or parking area. Vehicular traffic in the Coral Island Shopping Center and along Richmond Avenue and Victory Boulevard varies from light and infrequent to very heavy. Traffic consists of car, bus, and large-commercial truck traffic typically moving at speeds of 25 to 30 miles per hour (mph) and frequently at speeds approaching 40 mph. Note that the local speed limit on all roads adjacent to the Site is 30 mph. Vehicle speed in work areas within parking lots is typically low but may be hazardous due to vision limitations caused by miscellaneous obstructions. The following procedures shall be followed to mitigate vehicular traffic hazards posed at the work areas at the Site during any activities within a roadway, roadway shoulder or any active parking area unless the area is secured (fenced and gated without any vehicle movement potential).

- Double parking shall not be permitted.
- All workers shall wear hardhats and reflective orange vests.
- Workers shall use caution when crossing any road.
- Workers should take care to avoid sudden movements across the road.
- Workers shall position vehicles and equipment to minimize exposure to traffic and to facilitate safe access and egress from vehicles while loading and unloading equipment and/or materials.

- Traffic cones shall be deployed around work areas while workers are present.
- Traffic cones shall be placed at strategic locations to warn approaching traffic.
- All vehicles shall be parked as close to the work area as possible to use the vehicle as a barrier against oncoming traffic.
- When performing activities on a roadway or on the shoulder of any roadway, a minimum of two people must be present. One person will serve as a "traffic watchman" whose sole responsibility is to monitor vehicular traffic conditions and alert worker(s) of potential traffic hazards. The "traffic watchman" must be alert at all times and focused on traffic conditions. At no time should the "traffic watchman" engage in activities other than monitoring traffic conditions.
- Project Personnel shall require that all project subcontractors conform to the same guidelines.
- If a specific task is required to be performed in high volume traffic areas or areas with unpredictable traffic patterns, a traffic watchman or police detail should be utilized. The need for a traffic watchman or police detail should be discussed with the Project Manager and client prior to deployment.
- Notify the local police of the work location, dates of work and the anticipated work times when work is to be conducted in a public roadway.
- Additional requirements of local transportation, highway, public safety, and police departments must also be followed when work is performed in a public roadway.

9.5 Inspection

Each piece of potentially hazardous equipment (i.e., power tools, drill rig) will be inspected for proper and safe operation prior to its use.

- All mechanical and rigging equipment will be inspected by the operators prior to beginning this work effort, and at least daily thereafter to ensure proper operating capability. Defective equipment must be repaired or replaced prior to continued use/operation.
- Inspect all cables, sheaves, slings, chains, hooks, and eyes prior to use.
- Secure equipment firmly or be sure it is supported.
- Be sure all power lines are inactivated, removed, or at a safe distance.
- Always use proper loading for capacity at lifting radius.
- Keep all equipment lubricated and maintained.
- Employ signal persons whenever needed.

- Make certain that signals are understood and observed.

9.6 Heavy Equipment and Drill Rig Safety

The SHSO will be present onsite during invasive operations such as drilling, and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are followed by Roux Associates personnel. The proximity of chemical, water, sewer and electrical lines will be identified by a utility mark-out service before any subsurface activity or sampling is attempted. The SHSO and Project Manager shall confirm that the utility mark-out service has been notified at least 72 hours prior to earth disturbing activities.

Hazardous waste sites use all of the mechanical equipment used on any major construction site. Typical machinery to be found includes pumps, compressors, generators, portable lighting systems, pneumatic tools (drum openers), hydraulic drum crushers, pug mills, fork lifts, trucks, dozers, backhoes, and drill rigs. From a safety standpoint, it is always important to be continually aware of the equipment around you. It poses a serious hazard if not operated properly, or if operators cannot see personnel near machinery. In particular, the following heavy equipment hazards are common at the Site and need to be considered from a safety standpoint.

- Hazards associated with truck traffic - Be sure to observe and comply with posted speed limits and traffic signs.
- Interaction/contact with heavy equipment contractors - Heavy equipment (i.e., drill rig) operators may not be aware of your presence. Be sure that the operator is aware of your presence before approaching any heavy equipment. When possible, inform operators of your planned activities in the area prior to them beginning their activities.

Drilling crews are confronted with all of these heavy equipment hazards. They must be responsible for good housekeeping around the rig because of the rods, auger sections, rope, and hand tools used for the operation. Maintenance is a constant requirement. Overhead and buried utilities require special precautions because of electrical and natural gas hazards. Electrical storms may seek out a standing derrick. The hoist or cathead rope poses specific hazards; always use clean, dry, sound rope. Keep hands away from the test hammer. Hearing loss, while not an immediate danger, is considerable over time. Use hearing protection.

Proper containment and disposal practices will be followed in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures

will be established prior to initiation of operations according to this HASP. The use of hard hats, eye protection, ear protection, and steel-toed boots will be required during heavy equipment operations. Contaminated equipment will be placed on liner material when not in use, or when awaiting and during decontamination. Communications with the Support Zone will be regularly maintained.

9.7 Heavy Equipment Decontamination

If a steam cleaner or pressure washer is used to decontaminate the drill rig and associated drilling equipment, personnel will exercise caution during use. The high pressure can cause severe injury and steam can cause severe burns. Protective gloves, face shields, hard hats, steel-toed boots, and Tyvek suits or rain gear must be worn when using these decontamination methods.

9.8 Groundwater Sampling

Personnel must wear prescribed clothing, especially eye protection and chemical resistant gloves when purging, sampling, or filtering groundwater samples. Sample bottles may be bagged prior to sampling to ease decontamination procedures. The sampling team must be aware of emergency evacuation procedures described in this HASP and the location of emergency equipment, including spill containment materials, prior to sampling. Contamination avoidance will be practiced at all times. In some situations, additional monitoring by the SHSO may be needed to confirm or establish the proper level of protection before the sampling team can proceed.

9.9 Soil Sampling

Personnel must wear prescribed clothing, especially eye protection and chemical resistant gloves when collecting soil samples. Sample jars may be bagged prior to sampling to ease decontamination procedures. The sampling team must be aware of emergency evacuation procedures described in this HASP and the location of emergency equipment, including spill containment materials, prior to sampling. Contamination avoidance will be practiced at all times. In some situations, additional monitoring by the SHSO may be needed to confirm or establish the proper level of protection before the sampling team can proceed.

9.10 Sample Handling

Personnel responsible for the handling of samples will wear the level of protection described in Section 7.2. Samples will be identified as to their hazard and packaged to prevent spillage or breakage. Any unusual sample conditions will be noted. Lab personnel will be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or inclusion of a written statement with the samples. It may be necessary for the SHSO to review safety procedures in handling site samples to assist or assure that these practices are appropriate for the type of suspected contaminants in the sample.

9.11 Waste Disposal

Waste disposal operations will be monitored by the SHSO and performed under the appropriate level of personal protection described in Section 7.2. Personnel will wear the prescribed clothing, especially eye protection and chemical resistant gloves, when handling waste materials. Contamination avoidance will be practiced at all times. Additional information on disposal procedures is described in Section 11.0.

9.12 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- severe muscle cramps, usually in the legs and abdomen;
- exhaustion, often to the point of collapse; and
- dizziness or periods of faintness.

First aid treatment includes shade, rest and fluid replacement. Normally, the individual should recover within one-half hour. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- rapid and shallow breathing;
- weak pulse;
- cold and clammy skin with heavy perspiration;
- skin appears pale;
- fatigue and weakness;
- dizziness; and
- elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a **MEDICAL EMERGENCY** requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- dry, hot red skin;
- body temperature approaching or above 105 degrees F;
- large (dilated) pupils; and
- loss of consciousness - the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semipermeable or impermeable) that prevents evaporative cooling is worn in hot weather environments.

9.13 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole body protection. Adequate insulating clothing must be used when the air temperature is below 40°F. A work/rest regimen will be initiated when

ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- severe shivering;
- abnormal behavior;
- slowing;
- weakness;
- stumbling or repeated falling;
- inability to walk;
- collapse; and/or
- unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

9.14 *In Situ* Material Injection

In Situ injection of food-grade materials such as molasses or HRC® are usually made with heavy equipment (Geoprobe®, pumps). Safety considerations for heavy equipment should be followed and care should be taken to ensure that the injection program is carried out in a safe manner. Gloves and safety goggles or a face shield should be worn at all times that molasses and HRC is being handled. Care should also be taken with respect to biological hazards (i.e., increased attraction of bees).

9.15 Confined Space Entry

The scope of work does not require Roux Associates personnel to enter confined space for this project. Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM. No Roux Associates personnel are permitted to make a confined space entry. Confined space is defined as any space, depression, or enclosure that has limited opening for entry and egress, may have limited ventilation, may contain or

produce life-threatening atmospheres due to oxygen deficiency, the presence of toxic, flammable, or corrosive contaminants, and which is not intended for continuous occupancy.

Examples of confined spaces prohibited from entry include, but are not limited to, storage tanks, ventilation and exhaust ducts, stacks, pits, basements, silos, vats, vaults, pipes and any topped open space 4 or more feet deep and not adequately ventilated.

9.16 Additional Safe Work Practices

Refer to the SHSO for specific concerns on each individual site task. The safety rules listed below must be strictly followed.

- Plan tasks ahead of time. Inform SM of planned activities and evaluate the degree of health and safety protection required for each task.
- Practice contamination avoidance, avoid any skin contact with potentially contaminated materials (i.e., surface or ground water, soil, etc.).
- Do not eat, drink, chew gum, apply cosmetics, or use tobacco products while working on site (except in a support zone).
- Wash hands before handling food and drink and other activities that could cause hand-to-mouth transfer of contaminants.
- Be aware of traffic, heavy equipment, and other obstacles around you.
- Appropriate foot, hearing, and hand protection will be worn by those directly involved in the work efforts when warranted.
- No facial hair that interferes with the face-to-face piece seal of respirators will be allowed.
- Personnel not involved in the operations, excavating, or monitoring activities will remain a safe distance from the equipment.
- Do not climb over/under obstacles.
- Be alert to your own physical condition.
- Use the buddy system when required. Watch your buddy / co-workers for signs of fatigue, exposure, heat or cold stress, etc.
- No work will be conducted without adequate light.
- Report all accidents, no matter how minor, immediately to the SHSO.

- Do not work onsite while under the influence of drugs or alcohol, including prescription drugs that may cause drowsiness.
- A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation.
- Note wind direction. Personnel shall remain upwind wherever possible during onsite activities.
- Copies of this HASP shall be readily accessible at all times.
- **READ AND SIGN YOUR HEALTH AND SAFETY PLAN BEFORE ENGAGING IN SITE ACTIVITIES.**

10.0 DECONTAMINATION PROCEDURES

10.1 Contamination Prevention

One of the most important aspects of decontamination is contamination prevention. Contamination prevention practices will minimize worker exposure and ensure valid sample results by precluding cross contamination. Procedures for contamination prevention include the following:

- For Personnel
  - do not walk through areas of obvious or known contamination;
  - do not handle or touch contaminated materials directly;
  - make sure all personal protective equipment (PPE) has no cuts or tears prior to donning;
  - fasten all closures on suits, covering with tape, if necessary;
  - take particular care to protect any skin injuries;
  - stay upwind of airborne contaminants; and
  - do not carry cigarettes, gum, etc. into contaminated areas.
- Sampling/Monitoring
  - when required by the SHSO, cover instruments with clear plastic, leaving opening for sampling and exhaust ports; and
  - bag sample containers prior to the placement of sample material.
- Heavy Equipment
  - care should be taken to limit the amount of contamination that comes in contact with heavy equipment;
  - if contaminated tools are to be placed on non-contaminated equipment for transport to the decontamination pad, plastic should be used to keep the equipment clean; and
  - drill cuttings (i.e., soil) should be contained and kept out of the way of workers.

10.2 Decontamination

All personnel and equipment exiting an Exclusion Zone will be thoroughly decontaminated. Safety briefings will explain the decontamination procedures for personnel and portable equipment for the various levels of protection indicated in Section 7.2. Heavy equipment may be decontaminated with a steam cleaner or pressure washer. Rinseates will be collected, handled,

and/or drummed prior to determination of classification and appropriate disposal method (see Section 11.0).

Non-disposable sampling equipment will be decontaminated through the following steps, if necessary:

- fresh water rinse;
- non-phosphorus detergent wash; and
- fresh water rinse.

11.0 DISPOSAL PROCEDURES

Discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. Potentially contaminated materials as determined by the SHSO, e.g., soil, clothing, gloves, etc., will be bagged or drummed, as necessary, and segregated for disposal. Contaminated materials will be disposed in accordance with appropriate regulations. Non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste. Waste disposal operations conducted by Roux Associates will be monitored by the SHSO and carried out under the appropriate level of personal protection described in Section 7.2.

12.0 EMERGENCY PLAN

As a result of the hazards onsite and the conditions under which operations are conducted, the possibility of an emergency exists. An emergency plan is required by OSHA 29 CFR 1910.120 to be available for use and is included below. A copy of this plan will be posted in the Support Zone at each work site. Figure 1 includes directions and a map to St. Vincent's Hospital.

12.1 Site Emergency Coordinator(s)

The Site Emergency Coordinator(s) are the Field Team Leader and the Site Health and Safety Officer. The Site Emergency Coordinator(s) will contact the local fire, police, and other emergency units prior to beginning work onsite. In these contacts, the Site Emergency Coordinator(s) will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time, the coordinators and the emergency response units will make arrangements to handle any emergencies that might occur.

The Site Emergency Coordinator(s) will implement the emergency plan whenever conditions at the site warrant such action. The coordinator(s) will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units, and the appropriate management staff.

Emergency Site Control

In the event of an emergency, the Site Emergency Coordinator(s) will discourage any unauthorized personnel from entering the Site. If necessary, the Site Emergency Coordinator(s) will contact the proper authorities.

12.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of particulates, etc., an air horn, automobile horn, or other appropriate device will be sounded by the SHSO or field crew personnel for approximately ten seconds indicating the initiation of evacuation procedures. All persons in both the restricted and non-restricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site Emergency Coordinator(s). The Site Emergency Coordinator(s) will have authority to initiate proper action

if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been sounded. The SHSO must see that access for emergency equipment is provided and that all combustion apparatus has been shutdown once the alarm has been sounded. Once the safety of all personnel is established, the fire department and other emergency response groups will be notified by telephone of the emergency. Then, other personnel listed in Section 12.4 will be notified.

12.3 Potential or Actual Fire or Explosion

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedures will be implemented:

- immediately evacuate the site as described above (Section 12.2); and
- notify fire, security, and police departments.

12.4 Environmental Incident (Release or Spread of Contamination)

If possible, the spread of contamination will be controlled or stopped. If necessary, the Site Emergency Coordinator(s) will instruct a person onsite to immediately contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National Response Center and other appropriate groups will be contacted. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the remaining personnel listed in the table below will be notified, as necessary.

Type	Name	Telephone Numbers
Police	123rd Precinct	911
Fire Department	Police Dispatches	911
Emergency Response	Police Dispatches	911
Hospital (see Figure 1)	St. Vincent's Hospital	(718) 818-1234
Project Manager	Michael Roux	(631) 232-2600/*(631) 774-7289*
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600
Site Health and Safety Officer	Martin Kroll	(631) 232-2600/*(631) 445-0793*

12.7 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO will determine if work can continue without risking the health and safety of onsite workers. Some of the items to be considered prior to determining if work should continue are the following:

- heavy rainfall;
- potential for heat stress;
- potential for cold stress and cold-related injuries;
- limited visibility;
- potential for electrical storms;
- potential for malfunction of H&S monitoring equipment or gear;
- potential for accidents;
- unsafe driving and working conditions due to snow or ice; and
- high wind.

Type	Name	Telephone Numbers
Project Principal	Douglas Swanson	(631) 232-2600
National Response Center (Release or Spill)		(800) 424-8802
Chemical Transport Emergency Center (CHEMTREC)		(800) 424-9300
Client Contact (Hancock & Estabrook)	Wendy Marsh, Esq.	(315) 471-3151

12.5 Personal Injury

If onsite personnel require emergency medical treatment, the following steps will be taken:

1. Notify the Fire Department or Ambulance service and request an ambulance or transport the victim to the hospital, as appropriate.
2. Decontaminate to the extent possible prior to administration of first aid or movement to emergency facilities.
3. First aid will be provided by emergency medical services (EMS) or by onsite personnel trained in first aid, CPR, and bloodborne pathogens, if available.
4. The OHSM will supply medical data sheets on the victim (if a Roux Associates, Inc. employee) to appropriate medical personnel.

12.6 Overt Personnel Exposure

If an overt exposure to toxic materials occurs, the exposed person will be treated onsite as follows:

Skin Contact:	Remove contaminated clothing. Wash immediately with water. Use soap if available. Contact EMS, if necessary.
Inhalation:	Remove from contaminated atmosphere. Contact EMS, if necessary. Transport to hospital.
Ingestion:	Never induce vomiting on an unconscious person. Also, never induce vomiting when acids, alkalis, or petroleum products are suspected. Contact the poison control center. Contact EMS, if necessary.
Puncture Wound or Laceration:	Decontaminate and transport to emergency medical facility or contact EMS. Do not contact blood or bodily fluids. The OHSM will provide medical data sheets to medical personnel as requested.

13.0 FIELD TEAM REVIEW

Each Roux Associates field member shall sign this section after site-specific training is completed and before being permitted to work onsite.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained herein. I have been provided with an opportunity to have questions and concerns addressed by the Project Manager.

Site/Project: Coral Island Shopping Center/Remedial Response Program
Staten Island, New York

Name Printed	Signature	Date

14.0 APPROVALS

The Approval Page must be attached and signed by the SHSO, OHSM, Project Manager and Project Principal.

By their signature, the undersigned certify that this HASP is approved and will be utilized by Roux Associates, Inc. personnel at the Coral Island Shopping Center located in Staten Island, New York.

Site Health and Safety Officer	Date
Office Health and Safety Manager	Date
Project Manager	Date
Project Principal	Date

15.0 DIRECTIONS TO HOSPITAL

- Exit facility and head North on Richmond Avenue
- Turn Right onto Forest Avenue
- Turn Left and head North on Bard Avenue. Follow signs to St. Vincent's Hospital Emergency Room, 355 Bard Avenue

The approximate driving time from the site to the hospital is 11 minutes (4.35 miles).

A map depicting the above-described route is provided as Figure 1.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Benzene	71-43-2	1.6 mg/m^3 0.5 ppm	Ca (ND)	1 ppm	Dermal; inhalation ingestion	CNS depression Hematopoietic depression Dermatitis	CNS blood skin eyes resp system bone marrow	Liquid (solid below 42°F BP: 80.093°C flammable LEL: 1.4% UEL: 8.0%
1,1-Dichloroethane	75-34-3	405 mg/m^3 100 ppm	3,000 ppm	400 mg/m^3 100 ppm	Dermal; ingestion; inhalation	CNS depression Liver damage Sensory irritant	CNS liver eyes	Liquid; Chloroform odor BP: 57.3°C flammable LEL: 5.6% UEL: 11.4%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	40 mg/m^3 10 ppm	Ca (ND)	4.0 mg/m^3 1 ppm	Dermal; ingestion; inhalation	CNS depressant Liver neurosis Kidney damage Dermatitis	CNS liver kidneys skin	Colorless liquid BP: 83.5° LEL: 6.2% UEL: 15.9%
1,2-Dichloroethene	540-59-0	793 200 ppm	1,000 ppm	790 200 ppm	Dermal; ingestion; inhalation	CNS depressant Epigastric cramps Sensory irritant Dermatitis	CNS stomach skin	Colorless liquid BP: 59° LEL: 9.7% UEL: 12.8%
Diesel Fuel	68334-30-5	NA	NA	NA	Dermal; inhalation	Resp irritation Dizziness, nausea Skin disorders Liver disorders	lungs CNS skin liver	Light amber liquid Fl.Pt = >100°F LEL = 0.6% UEL = 7.0%
Ethylbenzene	100-41-4	434 mg/m^3 100 ppm	800 ppm (10% LEL)	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant CNS depressant Narcosis Hematological disorders	eyes skin CNS respiratory system blood	Liquid aromatic odor BP: 277°F Fl.P: 59°F LEL: 1.2% UEL: 7.0%
Fuel Oil	68476-33-5	NA	(ND)	NA	Dermal; inhalation ingestion	Skin cancer Liver damage Blood disorders	skin liver bone marrow	Dark liquid LEL = 1.0% UEL = 3.0% Fl.Pt = >140°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

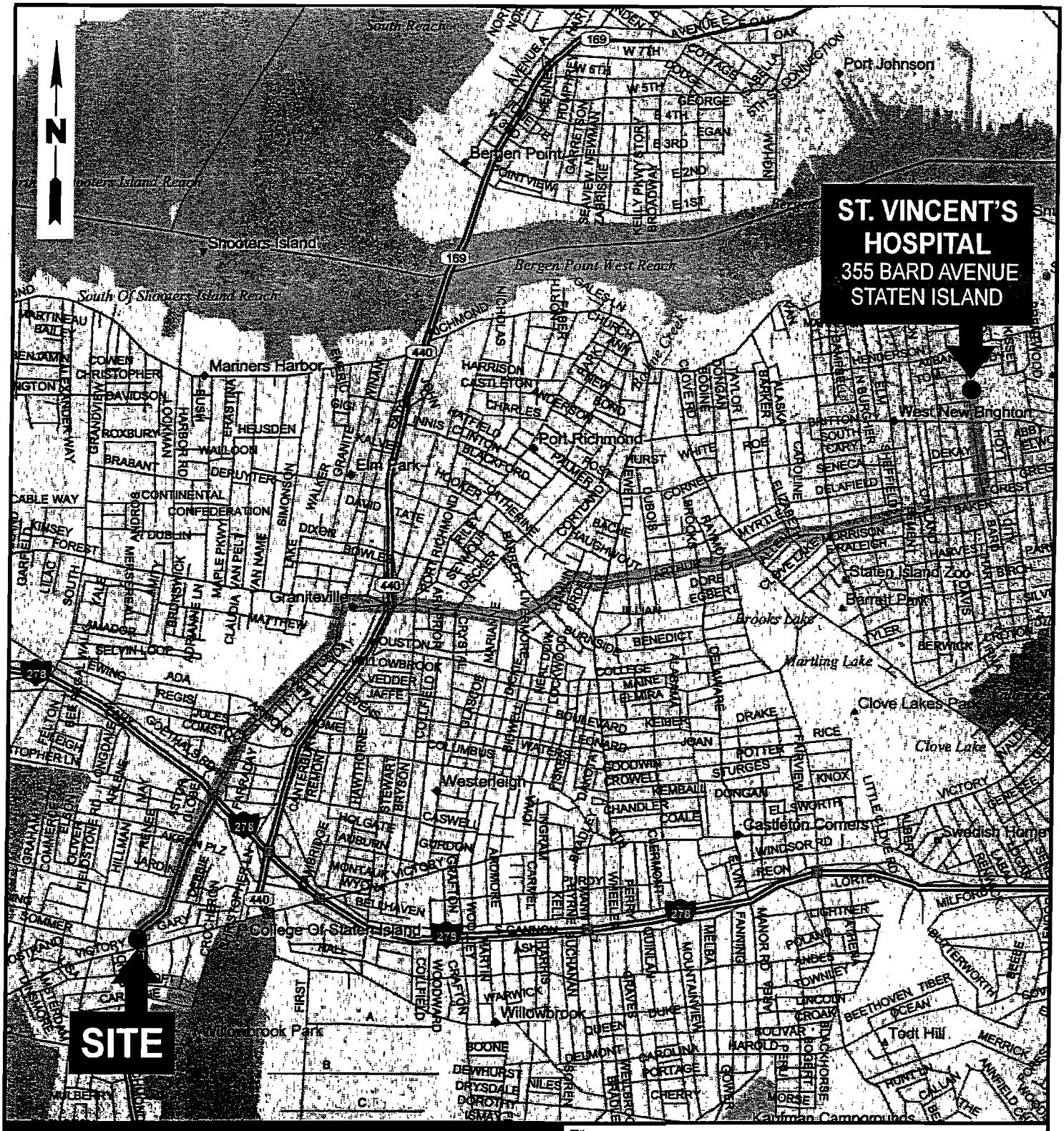
Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Gasoline	8006-61-9	896 mg/m^3 300 ppm	Ca (ND)	None	Dermal; inhalation; ingestion	CNS depression Sensory irritant Dermatitis Pelmonary Edema	CNS eyes skin resp system	Liquid, aromatic F1.Pt = -50°F
Tetrachloroethene (perchloroethylene PCE)	127-18-4	170 mg/m^3 25 ppm	Ca 150 ppm	100 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Sensory irritant	CNS liver skin eyes kidneys	Liquid ether-like odor BP: 121.20°C
Toluene	108-88-3	188 mg/m^3 50 ppm	500 ppm	200 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Kidney damage Defatting of skin	CNS liver kidney skin	Liquid benzene odor BP: 110.4°C flammable LEL: 1.2% UEL: 7.1%
Trichloroethene (TCE)	79-01-6	269 mg/m^3 50 ppm	Ca 1000 ppm	50 ppm	Dermal; inhalation; ingestion	CNS depression Sensory irritant Kidney damage Liver damage Heart damage	CNS skin eyes kidney liver CVS	Liquid BP: 86.7°flammable LEL: 12.5% UEL: 90%
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1,910 mg/m^3 350 ppm	700 ppm	1,900 mg/m^3 350 ppm	Dermal; ingestion; inhalation	Sensory irritant CNS depression Cardiac arrhythmia	skin CNS CVS eyes	Liquid; BP: 74.1° Fl.P: = 32.5°

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Vinyl chloride (chloroethylene)	75-01-4	2.6 mg/m^3 1 ppm	Ca (ND)	1 ppm	Inhalation; ingestion	Liver tumors Blood tumors Sensory irritant CNS depressant	liver blood eyes skin CNS	Colorless gas Highly flammable BP: 13° FP: -159.7° LEL: 4% UEL: 22%
Xylene(s)	1330-20-7	434 mg/m^3 100 ppm	900 ppm	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant Blood dyscrasia Bronchitis CNS depression	CNS eyes skin GI tract blood liver kidneys	Liquid Aromatic odor BP: 138.5° flammable LEL: 1.1% UEL: 7.0%

Notes:
% - Percent
°C – Degrees Celsius
°F – Degrees Fahrenheit
BP - Boiling Point
Ca – Carcinogen
CAS # - Chemical Abstracts Service Number
CNS – Central Nervous System
Fl. Pt. - Flash point
IDLH - Immediately Dangerous to Life and Health (OSHA)
LEL - Lower Explosive Level
mg/m^3 - milligrams per cubic meter
NA - Not Available
ND - Not Determined
PEL - Permissive Exposure Level (OSHA)
PPM - Parts per million
TLV - Threshold Limit Value (ACGIH)
UEL - Upper Explosive Level

References
Guide to Occupational Exposure Values, 2000. American Conference of Governmental Industrial Hygienists.
Hawley's Condensed Chemical Dictionary, Sax, N. Van Nostrand and Reinhold Company, 11th Edition, 1987.
Occupational Safety and Health Administration, 1993. General Industry Air Contaminant Standard (2a CFR 1910.1000).
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis, 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
U.S. Department of Health and Human Services, 1997. NIOSH Pocket Guide to Chemical Hazards.



DIRECTIONS TO HOSPITAL

1. EXIT FACILITY AND HEAD NORTH ON RICHMOND AVENUE.
2. TURN RIGHT AND HEAD EAST ON FOREST AVENUE.
3. TURN LEFT AND HEAD NORTH ON BARD AVENUE. FOLLOW SIGNS TO EMERGENCY ROOM.

Title:

HOSPITAL ROUTE MAP

ST. VINCENT'S HOSPITAL
355 BARD AVENUE, STATEN ISLAND

Prepared for:

WWP ASSOCIATES, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 21DEC04	FIGURE
Prepared by: M.R.	Scale: AS SHOWN	1
Project Mgr.: M.R.	Office: NY	
File No.: RRA0110006.CDR	Project No.: 125801Y	

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APPENDIX A

OSHA Job Safety and Health Protection Poster

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- ❑ You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- ❑ You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- ❑ You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- ❑ You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- ❑ Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- ❑ You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- ❑ Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, visit our website at www.osha.gov or call 1-800-321-OSHA or your nearest OSHA office:

Atlanta (404) 562-2300	Boston (617) 565-9860	Chicago (312) 353-2220	Dallas (214) 767-4731
Denver (303) 844-1600	Kansas City (816) 426-5861	New York (212) 337-2378	Philadelphia (215) 861-4900
San Francisco (415) 975-4310	Seattle (206) 553-5930	Teletypewriter (TTY) 1-877-889-5627	

If you work in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

OSHA Occupational Safety and Health Administration

www.osha.gov U.S. Department of Labor

OSHA 3165-09R

APPENDIX B

Field Change Request

HEALTH AND SAFETY FIELD CHANGE REQUEST FORM

SITE SAFETY REVIEW – CHANGES AND OVERALL EVALUATION
(To Be Completed For Each Field Change In Plan)

Was the Safety Plan followed as presented? _____ Yes _____ No

Describe, in detail, all changes to the Safety Plan:

_____

_____

_____

Reasons for changes:

_____

_____

_____

Follow-Up, Review and Evaluation Prepared by _____ Date _____

Discipline _____

Approved by: Site Manager _____ Date _____

Site Safety Officer _____ Date _____

Approved by: Office Health & Safety Supervisor _____ Date _____

Evaluation of Site Safety Plan:

Was the Safety Plan adequate? _____ Yes _____ No

What changes would you recommend?

_____

_____

_____

_____

APPENDIX C

Incident Report

INCIDENT REPORT

Site _____

Site Location _____

Report Prepared By _____
Name Printed Title

Incident Category (Check all that apply)

_____ Injury	_____ Illness	_____ Property Damage
_____ Near Miss	_____ On-Site Equipment	_____ Chemical Exposure
_____ Motor Vehicle	_____ Fire	_____ Electrical
_____ Mechanical	_____ Other	

Date and Time of Incident _____

Name of Persons Insured (see end of report for details)

_____

_____

_____

Narrative Report of Incident
(Provide sufficient detail so that the reader may fully understand the actions leading to or contributing to the incident, the incident occurrence, and actions following the incident. Append additional sheets of paper, if necessary.)

_____

_____

_____

_____

_____

Witnesses to Incident

1. Name _____
   Company _____
   Address _____
   Telephone No. _____

2. Name _____
   Company _____
   Address _____
   Telephone No. _____

Property Damage

Brief Description of Property Damage _____

_____

_____

_____

Estimate of Damage _____

Incident Location

_____

_____

Incident Analysis
(Causative agent most directly related to accident (object, substance, material, machinery, equipment, conditions.)

_____

_____

Was weather a factor? _____

Unsafe mechanical/physical/environmental condition at time of incident (be specific, must be answered):

_____

Unsafe act by injured and/or others contributing to the incident (be specific, must be answered):

_____

Personal factors (improper attitude, lack of knowledge or skill, slow reaction, fatigue):

_____

On-Site Incidents
Level of personal protection equipment required in Site Safety Plan:

_____

_____

_____

Modifications:

_____

_____

Was injured using required equipment?

_____

Incident Follow-Up

Date of Incident:

Brief Description of Incident:

Outcome of Incident:

Physician's Recommendations:

Date Injured Returned to Work:

APPENDIX D

Stipulation List
Remedial Action Work Plan Modifications

APPENDIX D

Stipulation List
Remedial Action Work Plan Modifications

August 3, 2007

Agency Approvals

1. The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or otherwise according to specific variances issued by that agency. DEC will be notified by Participant of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours.

2. A complete list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work will be provided prior to the start of remedial construction. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name in that agency and contact phone number. This list will be updated in the Final Remediation Report.

Construction Activities

3. A project sign will be erected at the main entrance to the site prior to the start of remedial construction. The sign will indicate that the project is being performed under the New York State Brownfield Cleanup Program. The sign will meet the detailed specifications provided by the NYSDEC project manager.

4. The Participant and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work and the structural integrity of excavations and structures that may be affected by those excavations (such as building foundations and bridge footings).

5. Each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to site development commence proximate to the hotspot or structure.

6. The estimated quantity of soil/fill to be removed from the site is approximately 23 cubic yards. The estimated quantity of soil to be imported into the site for backfill and cover soil is approximately 23 cubic yards. The estimated quantity of soil/fill expected to be relocated on site is 0 cubic yards.

7. The presence of utilities and easements on the site has been investigated by the Participant. It has been determined that there may be a risk or impediment to the planned work under this Remedial Action Work Plan posed by utilities or easements on the site (proposed excavation areas 1 through 4).

8. An itemized and detailed summary of actual costs for the remedial activity will be submitted as an appendix to the Final Remediation Report.

9. At a minimum silt fencing and hay bales will be installed on the west side of the site to protect drainage swales, surface water, run-off areas and drainage areas.

10. Mechanical processing of historical fill and contaminated soil on site is prohibited.

11. All primary contaminant sources (including but not limited to tanks and hotspots) identified during site characterization, remedial investigation, and remedial action will be surveyed by a surveyor licensed to practice in the State of New York. The location of these sources will be reported in the Final Remediation Report.

Truck Management

12. All trucks leaving the site will be lined with plastic and covered with plastic and will have tight-fitting covers.

13. All trucks will have tires brushed / scraped to keep offsite areas clean. If any truck or equipment requires washing, wash waters will be collected and disposed offsite in an appropriate manner.

14. All trucks loaded with site materials will exit the vicinity of the site using only approved truck routes.

15. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

16. Queuing of trucks will be performed near in the remediation area in order to minimize off-site disturbance. Queuing of trucks on public roadways is prohibited.

Pre-Construction Meeting

17. NYCDEC will be provided the opportunity to participate in a pre-remediation/construction meeting at the site. Advance notice and scheduling will be provided to enable NYSDEC attendance.

Stockpile Management

18. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

19. Soil stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points. This preventative measure is particularly necessary when stockpiles will be stored onsite overnight.

20. A dedicated water hose will be available onsite for dust control as necessary.

On-Site Roads

21. No onsite roads are anticipated to be needed for the project. As stated in item No. 13, above, trucks will be checked and cleaned as necessary.

Odor Controls

22. Odor control methods will be capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Remediation Engineer that will sign the certification of the Final Remediation Report.

23. All necessary means will be employed to control odors and eliminate associated nuisances on site and off site. The means to be considered for odor control when odors are caused by remedial actions or associated work include, but are not limited to: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; (c) use of foams to cover exposed odorous soils; (d) use of chemical odorants in spray or misting systems; and, (e) use of staff to monitor odors in surrounding neighborhoods. If these and other methods are not successful, enclosures will be erected around remedial work areas to control odors.

Residual Contamination Demarcation

24. After the completion of soil removal and other invasive remedial activities and prior to backfilling, the top elevation of residual soils will be noted. A physical demarcation layer, consisting of orange snow fencing material or equivalent will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the Site Management Plan. In addition, the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials will be noted. The horizontal location of the area will be marked on the surface and surveyed by a New York State licensed surveyor. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the Site Management Plan and Environmental Easements. A map showing the survey results will be included in the Final Remediation Report, the Site Management Plan, and Environmental Easement.

Underground Tank Management

25. UST closures will, at a minimum, conform to criteria defined in DER-10.

Contractor Management

26. Remedial Engineer will be responsible to insure compliance with all provisions of the approved remedial work plan, including those performed by contractors.

27. All contractor documents related to remedial work will be submitted to NYSDEC and NYSDOH.

Contingency Plans

28. If underground tanks or other previously unidentified contaminant sources are identified during onsite remedial excavation or development related construction at the site, sampling will be performed on product, sediment and surrounding soils, etc., with chemical analytical work for full scan parameters (TAL metals; TCL volatiles and semivolatiles, TCL pesticides and PCBs). These analyses will not be limited to STARS parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

29. Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's project manager. These findings will be also included in daily or periodic electronic media reports.

Off-Site Disposal

30. All soil/fill excavated and removed from the site will be treated as contaminated and regulated material and will be disposed in accordance with all local, state and federal laws. If disposal of soil/fill from this site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's project manager. Unregulated offsite management of materials from this site will not be performed without formal NYSDEC approval.

31. If materials derived from the site are planned to be disposed off site in an unregulated manner, these materials must meet TAGM 4046 criteria and must receive NYSDEC approval prior to unregulated disposal offsite.

32. Letters will be provided to NYSDEC that fully demonstrate and document that the disposal of material derived from the site conforms with all applicable laws. This will include, at minimum: (a) a letter from the Participant to the facility providing all pertinent soil chemistry data and noting that the soil/fill is a contaminated media being removed from a Brownfield site in New York State as part of a environmental remediation project; (b) a letter from the receiving facility stating that they understand the source and that the material is acceptable under the all appropriate permits.

33. Non-hazardous historic fill and contaminated soils taken off site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2

34. Historical fill and contaminated soils from the site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

35. Soils that are contaminated but non-hazardous and are being removed from the site are considered by the Division of Solid & Hazardous Materials (DSHM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted

C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DSHM. This material is prohibited from being redirected to a Part 360-16 Registration Facility. In this case, as dictated by DSHM, special procedures will include, at a minimum, written correspondence to the C/D facility that provides detailed explanation that the material is derived from a DER remediation site, that the soil material is contaminated and that it must not be redirected to on-site or off-site Soil Recycling Facilities. The chemical data for the soil must be attached to the correspondence.

36. The Final Remediation Report will include an accounting of the destination of all material removed from the site, including excavated contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material.

37. Bill of Lading system or equivalent will be used for off-site movement of non-hazardous wastes and contaminated soils. This information will be reported in the Final Remediation Report.

38. Hazardous wastes derived from on site will be stored, transported, and disposed in full compliance with applicable local, state, and federal regulations.

39. All liquids to be removed from the site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

40. Dewatered fluids will not be recharged back to the land surface or subsurface of the site. Dewatering fluids will be managed off site.

41. Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream or river) is prohibited without a SPDES permit.

42. Appropriately licensed haulers will be used for material removed from this site and will be in full compliance with all applicable local, state and federal laws.

On-Site Materials Re-Use

43. Concrete crushing or processing on site is prohibited. [DEC will consider the use of specially designed devices that are self-contained and capable of providing misting for dust control. DEC approval must be obtained. If dust-free operations are not achieved with such devices, this exception will be revoked.]

44. Organic matter (wood, roots, stumps, etc.) or other solid waste derived during clearing and grubbing of the site is prohibited for re-use on site.

45. Contaminated on-site material, including historic fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This will be expressed in the final Site Management Pan.

Import of Soil

46. All imported soils will meet TAGM 4046 standards. Non-compliant soils will not be imported onto the site without prior approval by NYSDEC. Nothing in the approved Remedial Action Work Plan or its approval by NYSDEC should be construed as an approval for this purpose.

47. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet TAGM 4046 RSCOs, will not be imported onto the site without prior approval by NYSDEC. Nothing in the approved Remedial Action Work Plan should be construed as an approval for this purpose.

48. Solid waste will not be imported onto the site.

49. Trucks entering the site with imported soils will be securely covered with tight fitting covers.

Cover Details

50. Surface cover will be restored to match existing cover identified during remedial construction. The Final Remediation Report will include a site map and plan that shows the as-built design detail and location for each of the final surfaces for the site.

Treatment

51. Application rates for [chemical oxidant/biological nutrient] for both volume and density of application will be based on manufacturer recommendations. A letter from the manufacturer will be provided to NYSDEC and included in the Final Remediation Report stating recommended dosage rates. Any proposed deviation from manufacturer recommendations will be presented to the NYSDEC prior to remedial construction for review and approval.

52. [Chemical oxidant/biological nutrient] will be applied to the base of excavation areas to address potential recontamination from groundwater migration following completion of dewatering.

53. Design plans will be submitted to NYSDEC for injection and reinjection of [chemical oxidant/biological nutrient]. This will include a schedule of work.

Screening

54. Screening of soils and fill will be performed (i.e., visual, olfactory, FID/PID, etc.) during all excavations and invasive work that may penetrate residual contamination, including excavations for remediation and development. This will be performed regardless of when the invasive work is done and includes all excavation and invasive work performed after the remedy and during the development phase, such as excavations for foundations and utility work.

55. Resumes will be provided for all personnel responsible for field screening (i.e., those representing the Remedial Engineer) of invasive work during remediation and development work for unknown contaminant sources.

Remedial Performance Monitoring

56. Chemical labs used for all end-point sample results and contingency sampling will be NYSDOH ELAP certified.

57. End point sampling, including bottom and side-wall sampling, will be performed in accordance with DER-10 sample frequency requirements. Side-wall samples will be collected a minimum of every 30 linear feet. Bottom samples will be collected at least one for every 900 square feet.

Project Oversight

58. The Remedial Engineer is Brian P. Morrissey, P.E. of Remedial Engineering, P.C. In addition to other duties specified in these stipulations, the Remedial Engineer will be responsible for providing all required P.E. certifications listed in this Remedial Action Work Plan.

59. All invasive work performed during remedy or subsequent development on this site until a Certificate of Completion is issued will be witnessed by the Remedial Engineer or his/her qualified representative.

60. The Remedial Engineer will review all pre-remedial plans submitted by contractors for compliance with this Remedial Action Work Plan and will certify compliance in the Final Remediation Report.

Remedial Engineer Certifications

61. This Remedial Action Work Plan has been P.E. certified and stamped by the Remedial Engineer. [Certification is attached in Attachment 2 to Addendum No. 1 to Alternatives Analysis Report/Remedial Action Work Plan.]

62. The Final Remediation Report will include a P.E. certification by the Remedial Engineer that all remedial work was performed according to the approved Remedial Action Work Plan.

63. The Final Remediation Report will include a P.E. certification by the Remedial Engineer that all invasive work done during the remediation and development (i.e., grading cuts, utility trenches, footings, etc.) was performed in accordance with the contaminant field screening methodology defined in the approved Remedial Action Work Plan.

64. The Final Remediation Report will include a P.E. certification by the Remedial Engineer that all import of soils from offsite, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the approved Remedial Action Work Plan.

65. The Final Remediation Report will include a P.E. certification by the Remedial Engineer that all invasive work completed during the remediation (including IRM's) and all invasive development work was done in accordance with dust and odor suppression methodology defined in the approved Remedial Action Work Plan.

Health and Safety

66. All remedial work performed under this plan will be in full compliance with governmental requirements, including site and worker safety requirements mandated by federal OSHA.

67. The Participant and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate Health and Safety Plan and for the appropriate performance of work according to that plan and applicable laws.

68. The Health and Safety Plan (HASP) and requirements defined in this Remedial Action Work Plan will pertain to all work performed until the issuance of a Certificate of Completion.

69. The Site Safety Coordinator will be identified. A resume will be provided to NYSDEC.

70. Exceedances observed in the CAMP will be reported in the daily report to the NYSDEC and NYSDOH Project Manager.

Reporting

71. A metes and bounds description of the site with a global positioning system coordinate for the starting point will be included in the Final Engineering report.

72. A separate list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work will be provided prior to the start of remedial construction. This list will be updated in the Final Remedial Report. It will include a citation of the law, statute or code to be complied with, the originating agency, and a contact name and contact phone number.

73. Daily Reports will be provided to the Project Managers for NYSDEC and NYSDOH by email during all periods of major invasive activity for this project. These reports will include description of daily activities keyed to an alpha-numeric map for the site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

74. Daily reports are not intended as the primary means to convey sensitive or time-critical information (i.e., notification of an accident, spill or emergency) or notification of changes to approved plans. These communications must be made directly with project managers.

75. Monthly reports will be submitted to NYSDEC and NYSDOH and will include a summary with quantities for all work performed during the reporting period.

76. An emergency contact sheet will be submitted to NYSDEC's Project Manager. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

77. Before completion of a project (before approval of a Final Remediation Report and issuance of a Certificate of Completion), all project reports must be submitted to NYSDEC in digital form (PDF). [For older projects that have passed through the Remedial Investigation Work Plan and Remedial Investigation phase, the approved documents must be scanned and resubmitted in digital form to the project manager for NYSDEC to provide a complete digital project archive.]

78. Photographs will be taken of all remedial action activities and submitted to NYSDEC in digital form. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the site prior to any remedial actions will be provided. Representative photos will be provided of each contaminant source and source area, and structures before, during and after remediation. Photos will be submitted to NYSDEC on CD and will be sent to NYSDEC's project Manager (2 copies) and to NYSDOH Project Manager (1 copy). CD's should have a label and a general file inventory structure that separates photos into directories and sub-directories according to logical lines. A photo log keyed to photo file ID numbers should be prepared to provide explanation for all representative photos. For larger and longer projects, photos should be submitted on a monthly basis or other agreed upon time interval.

79. A site map that shows a predefined alpha-numeric grid for use to identify locations in reports will be provided to the NYSDEC prior to the start of remedial construction.

80. Mandatory job-site record keeping will be performed. These records must be maintained on site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

81. All digital and hard copy submittals will be made to assigned project managers for both the NYSDEC and the NYSDOH.

82. Project numbers will appear on the cover and face page of all reports.

Fact Sheets and Repositories

83. A certification of mailing will be sent by the Participant to the NYSDEC project manager following distribution of all Fact Sheets and notices, providing certification that the Fact Sheets were mailed, when they were mailed, a copy of the Fact Sheet, a list of recipients (contact list) and a statement that the repository was inspected and contained all of the applicable project documents.

84. No changes will be made to approved Fact Sheets authorized for release by NYSDEC without the consent of the NYSDEC in writing. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

85. The approved Community Participation Plan for this project will be provided prior to the start of remedial construction.

Site Management Plan

86. The Site Management Plan will include provisions for, at a minimum: a description of all engineering controls; an Operation and Maintenance Plan for all engineering controls (such as maintenance of the cover); a plan for annual inspection and certification that all engineering and institutional controls are still in place and effective; groundwater use prohibition; management plan for soil and other forms of residual contamination left on site (such as underground piping); and all use prohibitions (such as prohibition on change in use to unrestricted residential, vegetable gardens, etc.).

87. The Site Management Plan in the Final Remediation Report will include a monitoring plan for groundwater at the down-gradient site perimeter to evaluate site-wide performance of the remedy. [Appropriately placed groundwater monitor wells will also be installed immediately down-gradient of all volatile organic carbon remediation areas for the purpose of evaluation of the effectiveness of the remedy that is implemented.]

88. No exclusions for handling of residual contaminated soils will be provided in the Site Management Plan (SMP). All handling of residual contaminated material will be subject to provisions contained in the SMP.

Environmental Easement

89. An Environmental Easement as defined in Article 71 Title 36 of the Environmental Conservation Law will be required if residual contamination is left on site after the remedial action is complete. The successful execution of the Environmental Easements will be documented in the Final Remediation Report.

90. The Environmental Easement must include reference to the Site Management Plan and a listing of all institutional controls, engineering controls, operation, monitoring and maintenance requirements, and annual remedial inspection and certification requirements for the site.

91. The Environmental Easement must be submitted as part of the Final Remediation Report.

Final Remediation Report

92. The Final Remediation Report will include as-built drawings for all constructed elements, certifications, manifests and bills of lading, and the Site Management Plan.

93. The Final Remediation Report will include an accounting of the destination of all material removed from the site, including excavated contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material.

94. An itemized and detailed summary of actual costs for the remedial activity will be submitted as an appendix to the Final Remediation Report.