DRAFT
Feasibility Study Report for the Former Roxy Cleaners Site Delmar, Albany County, New York

Site Number 401058

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Table of Contents

Section | **Page**

1 Introduction 1-1
1.1 Purpose and Organization 1-1
1.2 Background Information 1-2
1.2.1 Site Description and Surrounding Land Uses 1-2
1.2.2 Site History/Previous Investigations 1-2
1.3 Roxy Cleaners Remedial Investigation 1-4
1.3.1 Site Geology and Hydrology 1-4
1.3.2 Nature and Extent of Contamination 1-4
1.3.3 Contamination Fate and Transport 1-6
1.3.4 Qualitative Human Health Risk Evaluation 1-6

2 Identification of Standards, Criteria, Guidelines, and Remedial Action Objectives 2-1
2.1 Introduction 2-1
2.2 Potentially Applicable Standards, Criteria, and Guidelines (SCGs) and Other Criteria 2-1
2.2.1 Chemical-Specific SCGs 2-2
2.2.2 Location-Specific SCGs 2-2
2.2.3 Action-Specific SCGs 2-2
2.3 Remedial Action Objectives 2-3
2.4 Cleanup Objectives and Volume of Impacted Media 2-3
2.4.1 Soil 2-3
2.4.1.1 Selection of Soil Cleanup Goals 2-3
2.4.1.2 Selection of Contaminants of Concern 2-5
2.4.1.3 Determination of Contaminated Soil Volumes 2-5
2.5.1 Soil Vapor Intrusion 2-6
2.5.1.1 Selection of Soil Vapor Intrusion Cleanup Goals 2-6
2.5.1.2 Selection of Contaminants of Concern 2-7
2.5.1.3 Determination of the Extent of Soil Vapor Intrusion 2-7
2.6.1 Groundwater 2-7
2.6.1.1 Selection of Groundwater Cleanup Goals 2-7
2.6.1.2 Selection of Contaminants of Concern 2-8
2.6.1.3 Determination of the Extent of the Contaminated Groundwater Plume 2-8

3 Identification of Alternatives 3-1

Table of Contents (cont.)

Section **Page**

3.1 Introduction 3-1
3.2 Alternative No. 1: No Action 3-1
3.3 Alternative No. 2: Sub-Slab Depressurization System, Long-term Monitoring, and Institutional Controls 3-1
3.4 Alternative No. 3: Excavation and Off-Site Disposal, Chemical Oxidation, SSD Systems, Long-Term Monitoring, and Institutional Controls 3-2

4 Detailed Analysis of Alternatives 4-1

4.1 Introduction 4-1
4.1.1 Detailed Evaluation of Criteria 4-1
4.2 Remedial Alternatives 4-3
4.2.1 Alternative No. 1: No Action 4-3
4.2.1.1 Description 4-3
4.2.1.2 Detailed Evaluation of Criteria 4-3
4.2.2 Alternative No. 2: Sub-Slab Depressurization System, Long-Term Monitoring, and Institutional Controls 4-4
4.2.2.1 Description 4-4
4.2.2.2 Detailed Evaluation of Criteria 4-5
4.2.3 Alternative No. 3: Excavation and Off-Site Disposal, Chemical Oxidation, Sub-Slab Depressurization System, Long-Term Monitoring, and Institutional Controls 4-6
4.2.3.1 Detailed Description 4-6
4.2.3.2 Detailed Evaluation of Criteria 4-8
4.3 Comparative Evaluation of Alternatives 4-9

5 References 5-1

List of Tables

Table **Page**

2-1 Chemical-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York 2-9

2-2 Location-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York 2-12

2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York 2-13

2-4 Soil Cleanup Objectives, Former Roxy Cleaners Site 2-19

2-5 Soil Vapor Cleanup Objectives, Former Roxy Cleaners Site 2-20

2-6 Groundwater Cleanup Objectives, Former Roxy Cleaners Site 2-22

4-1 Cost Estimate for Alternative 2, Long-Term Monitoring, Institutional Controls, and Sub-Slab Depressurization Systems, Former Roxy Cleaners Site, Delmar, NY 4-11

4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY 4-14

4-3 Summary of Total Present Values of Remedial Alternatives at the Former Roxy Cleaners Site 4-19

List of Figures

Figure		Page
1-1	Former Roxy Cleaners Site Location Map, Delmar, New York	1-9
2-1	Site Contamination Source Areas, Former Roxy Cleaners	2-23
2-2	Site Contamination Cross-Section A – A’, Former Roxy Cleaners	2-25
2-3	Overburden Groundwater Zone Color-Tec and Total Chlorinated VOC Results, Former Roxy Cleaners	2-27
4-1	Alternative 2, Former Roxy Cleaners	4-21
4-2	Alternative 3, Former Roxy Cleaners	4-23

List of Abbreviations and Acronyms

AMSL	above mean sea level
ARAR	applicable or relevant and appropriate requirement
BGS	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-DCE	cis-1,2-dichloroethene
cm/sec	centimeters per second
COC	contaminant of concern
CP-51	Final Commissioner Policy CP-51 / Soil Cleanup Guidance
CY	cubic yards
EEEPC	Ecology and Environment Engineering, P.C.
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
ESMI	Environmental Soil Management, Inc.
F	Fahrenheit
FS	Feasibility Study
HHRE	Human Health Risk Evaluation
HTTD	high-temperature thermal desorption
ISTD	in situ thermal desorption
ISV	in situ vitrification
LTTD	low-temperature thermal desorption
mg/kg	milligrams per kilogram
MNA	Monitored Natural Attenuation
NAAQS	National Ambient Air Quality Standards
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
NWI	National Wetland Inventory
NYCRR	New York Codes, Rules, and Regulations

List of Abbreviations and Acronyms (cont.)

NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCE	tetrachloroethene
PPE	personal protective equipment
ppm	parts per million
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
Roxy	Roxy United Cleaners, Inc.
SCG	standards, criteria, and guideline
SCO	soil cleanup objective
SVE	soil vapor extraction
TBC	to be considered criteria
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
USGS	United States Geological Survey
SVE	soil vapor extraction
SVOC	semivolatile organic compound
VOC	volatile organic compound

1 Introduction

1.1 Purpose and Organization

Ecology and Environment Engineering, P.C. (EEEPC) has prepared this Feasibility Study (FS) for the Former Roxy Cleaners site (Roxy Site) for the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation, under State Superfund Contract Work Assignment D004435-24. The Roxy Site (Site No. 401058) is located in the hamlet of Delmar, town of Bethlehem, Albany County, New York (see Figure 1-1). This FS was developed using information from the following sources: the United States Environmental Protection Agency's (EPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) (EPA 540/G-89/004) (EPA 1988a); EPA's *CERCLA Compliance with Other Laws Manual* (EPA 1988b); NYSDEC's Final Commissioner Policy No. 51 Soil Cleanup Guidance (CP-51); NYSDEC's DER-10, *Technical Guidance for Site Investigation and Remediation*; NYSDOH's *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (2006); and New York State Codes, Rules, and Regulations (NYCRR) Title 6, Part 375, *Environmental Remediation Programs*.

A remedial investigation (RI) was completed to characterize the nature and extent of contamination at the Roxy Site. The details and findings of the RI are described in the *Remedial Investigation Report for the Former Roxy Cleaners Site Delmar, Albany County, New York* (EEEPC 2012).

This FS describes the technologies proposed and evaluated to address the on-site contamination identified during the RI completed at the Roxy Site. The FS report is divided into the following five sections:

- Section 1 describes the purpose for the study and discusses site background information.

- Section 2 presents the process used to identify the appropriate standards, criteria, and guidance (SCG) values applicable to the various contaminants found at the site and provides insight into the development of appropriate remedial action objectives (RAOs) to protect human health and the environment.

- Section 3 evaluates various technologies that may be appropriate for remediating site contamination, presents combinations of these technologies as remedial alternatives, and provides detailed analyses of these alternatives.

- Section 4 presents a detailed comparative analysis of the proposed remedial alternatives along with supporting rationale and preliminary cost estimates for each of the proposed alternatives.

- Section 5 presents a list of the references cited in this report.

1.2 Background Information

1.2.1 Site Description and Surrounding Land Uses

The Roxy Site is located at 156 Delaware Avenue (State Route 443) in the hamlet of Delmar, town of Bethlehem, Albany County, New York (see Figure 1-1). The site consists of a single-story concrete-block and brick building measuring approximately 100 feet long by 40 feet wide on the northern portion of a 1.1-acre parcel. A 50-foot-wide by 125-foot-long building currently operating as a commercial pet center is located adjacent to the single-story building. The two buildings occupy adjacent tax parcels owned by a single owner and are separated by an 8-foot-wide alleyway mostly covered by a rubber membrane. The southern portion of the parcel is a gravel-covered parking lot.

The site is currently operating as a pickup/drop-off location for an off-site dry cleaning operation (Best Cleaners NY); by May 2011, cleaning equipment was no longer present on the site. The property is located in a retail/commercial area that is bordered by Delaware Avenue to the north, a gas station and wooded area to the east, an inactive Canadian Pacific railroad easement on the south, and an improved easement owned by the City of Albany Water Board on the west. The parcels adjacent to the site are zoned commercial.

The surface water body nearest to the site is Normans Kill, which is located approximately 0.3 mile northeast of the site. The nearest approach of the Hudson River is approximately 2.5 miles east of the site.

1.2.2 Site History/Previous Investigations

According to the Albany County Clerk records, the building was constructed in 1958, and the site is currently owned by “Lot in Delmar, Inc.” Best Cleaners NY has been leasing the site for dry cleaning operations since March 5, 2005. Prior to Best Cleaners NY, Roxy United Cleaners, Inc. (Roxy) operated a dry cleaning facility at this location for several decades. The actual length of time the site was operated by Roxy is unknown; however, according to information presented in the Phase I Environmental Site Assessment (ESA) discussed below, the area was being commercially developed by 1974 and Roxy began operations here by 1990.

Phase I Environmental Site Assessment (ESA)

A Phase I ESA for the site was performed by Spectrum Environmental Associates in 2006 (Spectrum 2006). At the time of that investigation, Best Cleaners NY was operating a dry cleaning operation at the site that used aliphatic hydrocarbon solvents, not chlorinated hydrocarbon solvents (such as tetrachloroethene, or PCE). The ESA report identified the fact that Roxy was listed in the Resource Conservation and Recovery Act (RCRA) database as a small-quantity generator of PCE and trichloroethene (TCE).

Phase II ESA

A Phase II ESA for the site was performed by H2H Associates, LLC (H2H) in 2007 as part of the action to close an open NYSDEC Region 4 Spill File (0602941) called in during the Phase I ESA field investigation, as well as to investigate recommendations identified in the Phase I investigation (H2H 2007). According to Best Cleaners NY staff, past dry cleaning operations occurred in the southwest corner of the building, and solvent-laden filters were typically washed off by Roxy staff approximately 5 to 20 feet outside the southern end of the building. Based on this information, the Phase II subsurface investigation focused on the area immediately south of the building as a potential source area.

Laboratory results for subsurface soil samples collected during the Phase II ESA identified PCE in concentrations exceeding the NYSDEC Soil Cleanup Objective (SCO). Six of the borehole locations were converted into temporary monitoring wells, and groundwater grab samples were collected from all six wells. Chlorinated volatile organic compounds (VOCs) were detected in all of the samples, most at concentrations exceeding NYSDEC groundwater standards. In addition, four chlorinated VOCs (PCE, TCE, cis-1,2-dichloroethene [cis-DCE], and vinyl chloride) were detected at elevated concentrations in the three soil vapor samples collected at the site.

The sample data collected during this investigation confirmed that the building and the area immediately south of the building were impacted by elevated concentrations of chlorinated VOCs, with concentrations decreasing with distance from the building. Since Best Cleaners NY does not use chlorinated dry cleaning solvents and Roxy was listed in the RCRA database as a small-quantity generator of chlorinated solvents, the Phase II report concluded that Roxy was the source for this contamination (H2H 2007).

Vapor Intrusion Investigation

Based on the soil vapor results from the 2007 Phase II ESA, a vapor intrusion investigation was conducted at the site in March 2009 (H2H 2009). During this investigation, one sub-slab vapor sample and two indoor air samples were collected from both 154 and 156 Delaware Avenue. Based on the sample results, the report indicated the Roxy Site building required vapor intrusion mitigation (a sub-slab depressurization system [SSDS]) and a post-mitigation monitoring program, while the 154 Delaware Avenue building likely required continued monitoring.

1.3 Roxy Cleaners Remedial Investigation

EEEPC completed an RI at the Roxy Site in 2011-2012 on behalf of NYSDEC in order to define the nature and extent of identified contamination at the site and assess the potential threats posed by site contaminants relative to human health. A summary of the RI findings is presented in Sections 1.3.1 through 1.3.4 of this report.

1.3.1 Site Geology and Hydrology

In general, three stratigraphic units were identified at the site: 2 to 4 feet of tightly packed fill material, which is underlain by an approximately 14-foot-thick grayish brown, dense, clay with a low water content, which overlays a softer and brownish gray clay with a higher water content that extends to at least 50 feet below ground surface (bgs). The overburden thickness at the site is unknown, as bedrock was not encountered at any of the drilling locations.

The site consists of the single-story building, a paved parking lot adjacent to and north of the building, and a mix of paved surface and tightly compacted gravel to the south of the building. No water bodies are present on the site. The topography of the site is relatively flat. Surface water drains either to storm water grates along Delaware Avenue or collects in topographic lows on the site before evaporating or slowly infiltrating into the subsurface. There is no direct surface water drainage to Normans Kill.

Two hydrostratigraphic units were identified at the site, an intermittent aquifer in the fill material perched atop the upper grayish brown clay unit and a saturated overburden aquifer present in the deeper wet, brownish gray clay unit. Based on two groundwater measurement events, a groundwater mound appears to be present near the southwest corner of the site building, with groundwater on the northern half of the site flowing to the northwest and groundwater on the southern half of the site (including the suspected contamination source area) flowing to the southeast.

1.3.2 Nature and Extent of Contamination

The RI sample results confirmed that chlorinated VOC contamination (primarily PCE and, to a lesser extent, TCE, cis-DCE, and vinyl chloride) is present at the Roxy Site. Chlorinated compounds are commonly used in the dry cleaning industry for their ability to dissolve and remove stains without damaging natural or man-made fibers. Chlorinated VOCs have light to moderate molecular weight, are more soluble in water than heavier semivolatile compounds (solubilities generally range from 150 to 3,500 milligrams per liter), tend to have high volatilization rates, and do not sorb to soil or other organic material at a high rate. Because of these characteristics, the migration of chlorinated compounds via groundwater can be significant (especially with cis-DCE and vinyl chloride).

The concentrations of four chlorinated VOCs (PCE, TCE, cis-DCE, and vinyl chloride) detected in the soil samples exceeded the unrestricted use SCOs in multiple samples, and the concentration of PCE in one sample exceeded the restricted commercial use SCO of 150 milligrams per kilogram (mg/kg). The highest concentrations of PCE and TCE were detected in the soil samples collected closest to the back door of the facility and immediately above the water table. Therefore, the primary source area appears to extend up to the width of the building and at least 10 feet south of the building's south wall. The depth of contamination for this primary source area (soil likely exceeding the SCO for PCE) appears to begin between 14 and 16 feet bgs and extends to a couple of feet below the top of the water table, ending above 25 feet bgs and probably above 20 feet bgs. Therefore, the estimated depth range of the primary source area is considered to be 14 to 20 feet bgs. The data indicate that as the chlorinated solvents migrated downward through the vadose zone, the contamination also spread out horizontally to the surrounding area and formed a larger secondary area of significant soil contamination (defined as soil exceeding approximately 10 mg/kg of total chlorinated VOCs), which is approximately 10 times the volume of material present in the primary source area. The primary and secondary source areas are not likely to contain a significant quantity of non-aqueous phase liquid (NAPL), but likely contain NAPL in the pore spaces of the soil both above and below the water table.

Seven VOCs were detected at concentrations exceeding NYSDEC Class GA standards in the monitoring well and groundwater grab samples sent to the laboratory for analysis. Of the seven detected VOCs, five chlorinated VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride) were detected at the greatest frequency and at the highest concentrations. The highest levels of contamination were generally found in the shallow overburden zone and within 20 feet south of the back door of the facility. Although the presence of PCE and TCE daughter products (cis-DCE and vinyl chloride) indicate that reductive dechlorination is occurring, geochemical and microbiological analyses of groundwater samples indicate that the potential for anaerobic biodegradation is limited and likely not occurring at a significant rate. More details regarding this determination are provided in the RI report (EEEPC 2012).

Chlorinated VOCs were detected in drain and sump samples, indicating that wastewater containing solvents had likely been discharged to the sanitary sewer. However, the drain and sump do not appear to be current source areas because concentrations in the wastewater samples were relatively low compared to the results of the groundwater samples, and cis-DCE, the only VOC detected in the solid sample, did not exceed the unrestricted SCOs. Therefore, the drain and sump samples do not indicate that a source is currently present in these interior features. Although dry cleaning operations were unlikely to have ever been performed in the attached boiler room, the presence of PCE, TCE, and cis-DCE in the floor drain in this room suggests that waste solvent, spent filters, or raw material may have been stored and spilled in this room at one time.

Thirty-seven VOCs were detected in the soil vapor samples collected around the site, with PCE being the largest contributor to the totals. Although a majority of the total VOCs were chlorinated compounds, a few petroleum-related compounds were also detected, especially in areas of high vehicular traffic.

Vapor intrusion sampling was performed at the 154 Delaware Avenue building to evaluate potential exposure concerns identified during the Phase II investigation. Based on the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006), the vapor intrusion results for the 154 Delaware Avenue building fall into the "monitor/mitigate" category based on the PCE concentrations.

1.3.3 Contamination Fate and Transport

The RI evaluated various modes of contaminant transport at the Roxy Site:

- Lateral migration by surface water flow is not considered a major transport mechanism, since the site is relatively flat and covered by buildings and other paved surfaces, and no surface water bodies or ditches are present at the site.

- Infiltration appears to have been the main mechanism that allowed chlorinated solvent contamination to migrate downward through the soil column and to the groundwater table. However, chlorinated solvents are no longer used at the site, so infiltration is no longer expected to be a significant route of active contaminant migration.

- Although groundwater flow is generally considered to be a significant vertical and lateral transport mechanism for chlorinated VOCs, the groundwater contaminant migration rates at the Roxy Site are low (approximately 2.2 feet per year) due to the high clay content of the soil. A groundwater mound near the southwest corner of the site building appears to be creating a groundwater divide at the site, with the majority of groundwater contamination slowly migrating southeastward across the site.

- VOC contamination can migrate above the groundwater table in the form of vapor. Preferential migration pathways may include utility beddings and building slabs and footers, etc., with ultimate migration to the ambient air at the ground surface or building interiors. Volatilization of site contamination was confirmed by soil vapor and indoor air sampling.

1.3.4 Qualitative Human Health Risk Evaluation

Current and potential future exposure pathways were evaluated to assess the potential for human exposure risks. For contamination to pose a human health risk, there must be a complete pathway of exposure to the contamination, and the magnitude of the exposure to contamination must be sufficient to potentially cause an adverse health effect. Two populations (current site workers and occasional visitors to the site) were considered for the assessment. Exposure pathways considered for this assessment included:

- Exposure to soils via ingestion, dermal contact, and inhalation of particulates;

- Exposure to groundwater via ingestion;
- Exposure to drain water and solids/sediment via ingestion and dermal contact; and
- Exposure to contaminants via inhalation of vapors migrating to indoor air.

Based on the results of the evaluation, the only complete exposure pathway for site workers and site visitors is the inhalation of vapors emitted from contaminated subsurface soil or groundwater. Current and previous indoor air sample data suggest that vapor intrusion is potentially a problem at both the Roxy Site building and the adjacent building at 154 Delaware Avenue. Under existing site conditions, it is possible that site workers in both buildings could potentially be exposed to contaminants via inhalation of vapors, while exposure to site visitors (customers or trespassers) is less of a concern due to the short duration of exposure.

Path: L:\Buffalo\Roxy_Cleaners\maps\MXD\FormerRoxyCleanersFigure.mxd

Figure 1-1
Former Roxy Cleaners Site Location Map
Delmar, NY

2 Identification of Standards, Criteria, Guidelines, and Remedial Action Objectives

This section identifies the site contaminants of concern (COCs) and media of interest, and establishes proposed cleanup goals and specific RAOs for contaminated on-site media. Also presented are estimates of the areal extent and volumes of contaminated on-site media.

2.1 Introduction

The RI identified VOC contamination in soil, groundwater, and soil vapor at the Roxy Site. Based on screening of the analytical results, the RI further identified potential risks posed by site contamination by evaluating contaminant concentrations and identifying potential exposure routes for human receptors. As described in Section 1.3.4, the only complete exposure pathway identified by the human health risk evaluation for current site workers and occasional visitors at the Roxy Site is the inhalation of vapors. An ecological receptor evaluation was not conducted because the site is located in a commercially zoned area and the closest surface water body is located more than 0.3 mile from the site.

RAOs were developed (see Section 2.3) to reduce or eliminate this potential risk by eliminating this route of exposure or reducing the contaminant concentrations in impacted media to meet applicable chemical-specific standards at the site. Chemical-specific cleanup goals were developed for each media at the site to evaluate the areal extent or volume of each medium that must be addressed to meet the RAOs.

SCGs include state requirements used to establish cleanup goals and identify the locations where remedial actions are warranted. The following sections present potentially applicable SCGs and other standards and establish proposed cleanup goals and specific RAOs for contaminated on-site media.

2.2 Potentially Applicable Standards, Criteria, and Guidelines (SCGs) and Other Criteria

SCGs include applicable or relevant and appropriate requirements as well as other criteria.

- **Applicable Requirements** are legally enforceable standards or regulations, such as groundwater standards for drinking water, that have been promulgated under state law.

- **Applicable or Relevant and Appropriate Requirements (ARARs)** include those requirements that have been promulgated under state law that may not be "applicable" to the specific contaminant released or the remedial actions contemplated but are sufficiently similar to site conditions to be considered relevant and appropriate. If a relevant or appropriate requirement is well suited to a site, it carries the same weight as an applicable requirement during the evaluation of remedial alternatives.

- **To Be Considered Criteria (TBCs)** are non-promulgated advisories or guidance issued by state agencies that may be used to evaluate whether a remedial alternative is protective of human health and the environment in cases where there are no standards or regulations for a particular contaminant or site condition. These criteria may be considered along with SCGs when establishing cleanup goals for protection of human health and the environment.

The following sections present the three categories of SCGs: chemical-specific, location-specific, and action-specific.

2.2.1 Chemical-Specific SCGs
Chemical-specific SCGs are typically technology or health-risk-based numerical limitations on the contaminant concentrations in the environment. They are used to assess the extent of remedial action required and to establish cleanup goals for a site. Chemical-specific SCGs may be used as actual cleanup goals or as a basis for establishing appropriate cleanup goals for the contaminants of concern at a site. Chemical-specific SCGs for the Roxy site are presented in Table 2-1.

2.2.2 Location-Specific SCGs
Location-specific SCGs are site- or activity-specific. Examples of location-specific SCGs include building code requirements and zoning requirements. Location-specific SCGs are commonly associated with features such as wetlands, floodplains, sensitive ecosystems, or historic buildings that are located on or close to the site. Location-specific SCGs for the Roxy site are presented in Table 2-2.

2.2.3 Action-Specific SCGs
Action-specific SCGs are usually administrative or activity-based limitations that guide how components of remedial actions are conducted. These may include record-keeping and reporting requirements; permitting requirements; design and performance standards for remedial actions; and treatment, storage, and disposal requirements. Action-specific SCGs for this site are presented in Table 2-3.

2.3 Remedial Action Objectives

The RAOs for on-site remedial actions were developed based on information presented in the RI (EEEPC 2012), including the contaminants identified at the site and existing or potential exposure pathways in which the contaminants may affect human health..

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards;
- Prevent contact with or inhalation of volatiles from contaminated groundwater;
- Prevent ingestion and direct contact with contaminated soil;
- Prevent inhalation of or exposure to contaminants volatilizing from contaminants in soil; and
- Mitigate potential impacts on public health resulting from existing or potential soil vapor intrusion into buildings at the site.

2.4 Cleanup Objectives and Volume of Impacted Media

The following sections describe the process used to select numeric cleanup objectives and estimate the volume of impacted material.

2.4.1 Soil

2.4.1.1 Selection of Soil Cleanup Goals

Standards

Numeric cleanup goals identified for soils at the Roxy site are contained in NYCRR Part 375-6.8 (NYSDEC 2006). This regulation presents soil cleanup objectives for the protection of ecological resources, groundwater, and public health. The soil cleanup objectives for the protection of public health are based on land use criteria, which include:

- **Unrestricted use:** a use without imposed restrictions, such as environmental easements or other land use controls; or
- **Restricted use:** a use with imposed restrictions, such as environmental easements that, as part of the remedy selected for the site, require a site management plan that relies on institutional or engineering controls to manage exposure to contamination remaining at a site. Restricted use is separated into the following four categories:

    1. **Residential Use** is a land use category that allows a site to be used for any use other than raising livestock or producing animal products for human consumption. Restrictions on the use of groundwater are allowed, but no

other institutional or engineering controls relative to the residential soil cleanup objectives, such as a site management plan, would be allowed. This land use category will be considered for single-family housing.

2. **Restricted-Residential Use** is a land use category that shall be considered only when there is common ownership or a single owner/managing entity of the site. Restricted-residential use shall, at a minimum, include restrictions that prohibit any vegetable gardens on a site, although community vegetable gardens may be considered with NYSDEC's approval and single-family housing. Active recreational uses, which are public uses with a reasonable potential for soil contact (such as parks), are also included under this category.

3. **Restricted-Commercial Use** is a land use category for the primary purpose of buying, selling, or trading of merchandise or services. Commercial use includes passive recreational uses, which are public uses with limited potential for soil contact.

4. **Restricted-Industrial Use** is a land use category for the primary purpose of manufacturing, production, fabrication, or assembly processes and ancillary services. Industrial uses do not include any recreational component.

Based on the town of Bethlehem Zoning Map, (Town of Bethlehem 2006a), the site is zoned as CH, Commercial Hamlet. According to the Town of Bethlehem Chapter 128 Zoning Law (Town of Bethlehem 2006b), "Areas of the town designated under [Commercial Hamlet] district are typically original settlement areas along major corridors that contain medium-scale businesses and essential services in close proximity to residential neighborhoods. The commercial hamlets tend to be more oriented to vehicular rather than pedestrian access and are less likely to have mixed use commercial and residential buildings. The adaptive reuse of residential buildings as commercial uses is a common feature of this district. The near proximity to traditional residential neighborhoods distinguishes this district from the General Commercial district. The purpose of this district is to encourage compact commercial development in neighborhood commercial centers throughout the Town." Based on the criteria listed in NYCRR Part 375-1.8(f) (9), the current and anticipated future land use at this site is expected to remain commercial. Therefore, the 6 NYCRR Part 375 – 6.8 SCO selected for the site is Restricted-Commercial, as this closely represents the future use of this site.

The SCOs presented in 6 NYCRR Subpart 375-6.8 for the protection of ecological resources were not considered, as determined in the RI and in accordance with CP-51, as ecological receptors are not potentially impacted by site contamination because the closest surface water body is located more than 0.3 mile from the site.

Pursuant to 6 NYCRR Subpart 375-6.5 (a)(1), the SCOs for the protection of groundwater may not be applicable where (1) the on-site source will be addressed, (2) an environmental easement restricting groundwater use is in place, and (3) if NYSDEC determines that the contaminated groundwater is not likely to migrate off-site and that groundwater quality will improve over time Therefore, SCOs for the protection of groundwater were not applied to this site.

Selection Process

The selected cleanup goals for soil are presented in Table 2-4. These values will be used later in this report to calculate remedial volumes and prepare cost estimates. The following were used as the basis for selecting the preliminary cleanup values:

- 6 NYCRR Part 375-6.8 SCOs for the protection of public health and restricted-commercial use were selected as the cleanup objectives;
- The maximum observed concentration for each compound was then compared to the selected cleanup goal in order to determine which compounds may require cleanup; and
- The contaminants identified for cleanup were reviewed to determine whether they are site-related and whether cleanup is warranted.

2.4.1.2 Selection of Contaminants of Concern

Based on historic site operations and the concentrations detected in environmental media, PCE and its daughter products (TCE, cis-DCE, and vinyl chloride) are the primary contaminants of concern at the Roxy site.

2.4.1.3 Determination of Contaminated Soil Volumes

The RI (EEEPC 2012) identified the primary and secondary contaminant source areas at the site. Figure 2-1 shows the extent of contamination in the primary and secondary source areas, and Figure 2-2 shows a cross section of the contamination at the site.

The primary source area is defined as soil likely to exceed 150 mg/kg of total chlorinated VOCs. This primary source area is located at the back entrance of the facility, is approximately 30 feet wide, and extends approximately 10 feet south from the southern side of the building (Figure 2-1). Based on subsurface soil sample results from the RI, the depth of contamination in the primary source area is estimated to range from 14 to 20 feet bgs (see Figure 2-2). Based on a width of 30 feet, a length of 10 feet, and an average depth of 20 feet, the volume of contaminated soil of the primary source area is estimated to be 6,000 cubic feet (ft^3).

A larger, secondary area of soil contamination (measuring approximately 60 feet wide by 40 foot long), defined as soil exceeding 10 mg/kg of total chlorinated VOCs, is also present around the rear of the facility (see Figure 2-1). The depth of this secondary source area is approximately 20 feet bgs, as little to no contamination was identified below 20 feet bgs in soil borings (see Figure 2-2). Based on a width of 60 feet, a length of 40 feet, and a depth of 20 feet, the volume of the contaminated soil in the secondary area is estimated to be 48,000 ft^3.

As the 6 NYCRR Part 375 6.8 Restricted-Commercial SCO is used to define the extent of the source of contamination at the site, the volume of contaminated soil at the site is approximately 6,000 ft^3.

2.5.1 Soil Vapor Intrusion

2.5.1.1 Selection of Soil Vapor Intrusion Cleanup Goals

The following sections describe the process used to select numeric cleanup objectives for soil vapor intrusion for the two buildings at the Roxy site.

Standards

According to the NYSDOH, New York State "does not have any standards, criteria or guidance values for concentrations of volatile chemicals in subsurface vapors (either soil vapor or sub-slab vapor)" (NYSDOH 2006). However, *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006) presents air guideline values, derived by the NYSDOH, for PCE and TCE in indoor and outdoor air.

Background

Appendix C of NYSDOH's *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York,* presents the Building Assessment and Survey Evaluation (BASE) Database (EPA 2001) for indoor air in office and commercial buildings. The BASE database contains background levels of volatile chemicals in air based on a study of measured concentrations of VOCs from 100 randomly selected public and commercial office buildings.

Selection Process

The selected cleanup goals for soil vapor are presented in Table 2-5. The preliminary cleanup values were selected as follows:

- NYSDOH air guideline values (NYSDOH 2006) were selected as the cleanup objective;
- Where NYSDOH air guideline values were not available, the 90th percentile values from the BASE database were used as background levels for the Roxy site;

- The maximum observed concentration for each compound was then compared to the selected cleanup goal in order to determine which compounds may require cleanup; and

- The contaminants identified for cleanup were reviewed to determine whether they are site-related and whether cleanup is warranted.

2.5.1.2 Selection of Contaminants of Concern

Based on historic site operations and the concentrations detected in environmental media, PCE and its daughter products (TCE, cis-DCE, and vinyl chloride) are the primary contaminants of concern for evaluating soil vapor intrusion at the Roxy site.

2.5.1.3 Determination of the Extent of Soil Vapor Intrusion

Based on the concentrations of PCE detected in the indoor air and sub-slab samples during the Phase II ESA and RI, the RI recommended that SSDS units be installed in the buildings at 154 and 156 Delaware Avenue to minimize vapor intrusion.

The area of the Roxy site building is approximately 4,000 ft^2, and the area of the adjacent building is approximately 6,400 ft^2.

2.6.1 Groundwater

2.6.1.1 Selection of Groundwater Cleanup Goals

Standards

Numeric cleanup goals identified for groundwater quality at the Roxy site are contained in the Division of Water, Technical and Operational Guidance Series (1.1.1) (TOGS 1.1.1) *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. The primary purpose of TOGS 1.1.1 is to provide a compilation of ambient water quality standards and guidance values, including the standards promulgated in 6 NYCRR 703.5 and guidance values for chemicals with no promulgated standard..

Selection Process

The selected cleanup goals for groundwater are presented in Table 2-6. The preliminary cleanup values were selected as follows:

- TOGS 1.1.1 *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* were selected as the cleanup objective;

- The maximum observed concentration for each compound was then compared to the selected cleanup goal in order to determine which compounds may require cleanup; and

- The contaminants identified for cleanup were reviewed to determine whether they are site-related and whether cleanup is warranted.

2.6.1.2 Selection of Contaminants of Concern

Based on historic site operations and the concentrations detected in environmental media, PCE and its daughter products (TCE, cis-DCE, and vinyl chloride) are the primary contaminants of concern at the Roxy site.

2.6.1.3 Determination of the Extent of the Contaminated Groundwater Plume

The results of groundwater sampling performed during the RI were used to determine the approximate lateral and vertical extent of the chlorinated VOC groundwater plume (see Figure 2-3).

Table 2-1 Chemical-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
State Chemical-Specific ARARs					
Groundwater					
NYSDEC	NYSDEC's Derivation and Use of Standards and Guidance Values	6 NYCRR Part 702; also, TOGS 1.1.3, 1.1.4, and 1.1.5	Provides basis for derivation and use of water quality standards. The TOGS series also provide methodologies for deriving site-specific standards and guidance values.	Applicable	Applicable to groundwater cleanup levels.
	New York State Water Classifications and Quality Standards	6 NYCRR Parts 609; 700-704	Applicable	Applicable	Applicable to groundwater treatment. May be applicable if remedial activities include discharge to groundwater or surface water.
	NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	NYSDEC TOGS 1.1.1, June 1998	Provides a compilation of ambient water quality guidance values and groundwater effluent limitations for use where there are no standards (in 6NYCRR 703.5) or regulatory limitations (in 6NYCRR 703.6). For convenience, standards in 6NYCRR 703.5 and groundwater effluent limitations in 6NYCRR 703.6 are also included in TOGS 1.1.1.	Applicable	Applicable to groundwater cleanup levels and groundwater treatment.
	NYSDEC Standards for Raw Water Quality	10 NYCRR 170.4	Provides water quality standards.	Potentially applicable	May be applicable to groundwater cleanup levels.

Table 2-1 Chemical-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Soil					
NYSDEC	New York regulation provides soil cleanup objectives	6 NYCRR Part 375	Provides soil cleanup objectives.	Applicable	Applicable as it provides soil cleanup objectives for the site.
Air					
NYSDEC	NYSDEC, Division of Air, Guidelines for the Control of Toxic Ambient Air Contaminants	DAR-1 (formally Air Guide 1)	Establishes air quality guidelines and standards.	Potentially applicable	May be applicable if remedial alternative(s) include discharge to air.
	New York Ambient Air Quality Standards	6 NYCRR 256-257	Establishes air quality standards.	Potentially applicable	May be applicable if remedial alternative(s) include discharge to air.
Hazardous Waste					
NYSDEC	New York Identification and Listing of Hazardous Wastes	6 NYCRR Part 371: Identification and Listing of Hazardous Waste	Identifies "characteristic" hazardous wastes and "listed" hazardous wastes.	Potentially applicable	May be applicable if hazardous wastes are generated, treated, or disposed during remedial activities.
	NYSDEC Land Disposal Restrictions	6 NYCRR Part 376	Identifies hazardous wastes that are subject to land disposal restrictions.	Potentially applicable	May be applicable if site remedial action includes land disposal.
Federal Chemical-Specific ARARs					
Soils					
EPA	EPA guidance for developing soil screening levels.	EPA Document No. USEPA/540/R-96/018, July 1996; OSWER 9355.4-24, March 2001	Provides non-binding guidance for developing risk-based soil screening levels (SSLs) for protection of human health.	Applicable	Provides basis and procedures to develop soil cleanup objectives and determine soil cleanup levels.

Table 2-1 Chemical-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Air					
Clean Air Act.	Limits emissions to the atmosphere.	42 USC 7401 Section 112	Establishes limits on parameter emissions to the atmosphere.	Potentially applicable	Applicable if pollutants deemed hazardous or non-hazardous based on public health are discharged to air.
	National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR 50	Establishes primary and secondary NAAQS under Section 109 of the Clean Air Act. Primary NAAQS define levels of air quality necessary to protect public health. Secondary NAAQS define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.	Potentially applicable	Applicable to remedial action alternative(s) that may emit pollutants to the atmosphere.
RCRA					
	Hazardous Waste Regulations	40 CFR Part 261	Defines those solid wastes which are subject to regulations as hazardous wastes under 40 CFR Parts 262-265, 268, and Parts 124, 270, 271.	Potentially applicable	An ARAR for soils excavated during remedial activities.

Key:

ARAR = Applicable Relevant and Appropriate Regulation.
CFR = Code of Federal Regulations.
EPA = (United States) Environmental Protection Agency.
MCLs = Maximum Contaminant Levels.
MCLGs = Maximum Contaminant Level Goals.
NAAQS = National Ambient Air Quality Standards.
NYCRR = New York Codes, Rules, and Regulations.
NYSDEC = New York State Department of Environmental Conservation.
OSHA = Occupational Safety and Health Administration.
POTW = Publicly Owned Treatment Works.
RCRA = Resource Conservation and Recovery Act.
USC = United States Code.

Table 2-2 Location-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Local Location-Specific ARARs					
Town Code	Noise	Chapter 81.5	Restricts unnecessary noise and construction equipment noise within the town during certain time frames.	Applicable	Applicable as it requires limiting noise resulting from remedial activities conducted at and in the vicinity of the site.
	Building Construction	Chapter 53.4	Requires procurement of a building permit prior to alteration, removal, improvement, or demolition of any building or structure.	Potentially applicable	Required if remedial actions results in alteration, removal, or demolition of the buildings.
	Solid Waste	Chapter 97.11.	Provides guidance on collection, transport, and disposal of solid waste to the Town's solid waste disposal facilities.	Applicable	Applicable as it relates to placement of municipal waste generated during remedial activities in collection containers.

Key:
ARAR = Applicable Relevant and Appropriate Regulation.
CFR = Code of Federal Regulations.
NYCRR = New York Codes, Rules, and Regulations.

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
State Action-Specific ARARs					
Environmental Conservation Law, Articles 3 and 19	Prevention and Control of Air Contaminants and Air Pollution	6 NYCRR 200-202	Establishes general provisions and requires construction and operation permits for emission of air pollutants.	Potentially applicable	Applicable to remediation activities that result in emissions to air.
Environmental Conservation Law, Article 15; also Public Health Law Articles 1271 and 1276 (Part 288 only)	Air Quality Classifications and Standards	6 NYCRR 256, 257	Part 256: New York Ambient Air quality Classification System; Part 257: Air quality standards for various pollutants, including particulates and non-methane hydrocarbons.	Potentially applicable	Applicable to remediation activities at the site that include a controlled air emission source.
New York Waste Transport Permit Regulations	Permitting Regulations, Requirements, and Standards for Transport	6 NYCRR 364	The collection, transport, and delivery of regulated waste, originating or terminating at a location within New York, will be governed in accordance with Part 364.	Potentially applicable	Applicable if site's wastes fall into regulated categories.

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Environmental Conservation Law, Articles 3, 19, 23, 27, and 70	Hazardous Waste Management System - General	6 NYCRR 370	Provides definition of terms and general standards applicable to 6 NYCRR 370 - 374, 376.	Potentially applicable	
	Identification and Listing of Hazardous Waste	6 NYCRR 371	Identifies characteristic hazardous waste and lists specific wastes.	Potentially applicable	Applies to transportation and all other hazardous waste management practices in New York State. Applicable if hazardous waste is generated during remediation
	Hazardous Waste Manifest System and Related Standards	6 NYCRR 372	Establishes manifest system and record-keeping standards for generators and transporters of hazardous waste and for treatment, storage, and disposal facilities.	Potentially applicable	Applicable to transportation of hazardous material by bulk rail and water shipments for off-site treatment.
	Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements	6 NYCRR 373	Regulates treatment, storage, and disposal of hazardous waste.	Potentially applicable	Applicable to off-site treatment/disposal of hazardous waste.
	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.	6 NYCRR 374	Subpart 374-1 establishes standards for the management of specific hazardous wastes (Subpart 374-2 establishes standards for the management of used oil).	Potentially applicable	Applicable to the management of specific hazardous wastes that may be generated during remedial activities.

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Environmental Conservation Law, Articles 1, 3, 27, and 52; Administrative Procedures Act Articles 301 and 305.	Inactive Hazardous Waste Disposal Sites	6 NYCRR 375	Identifies process for investigation and remedial action at state funded Registry site; provides exception from NYSDEC permits. Part 375-6.8 provides the soil cleanup objectives used for this report.	Applicable	
Environmental Conservation Law, Articles 3 and 27.	Land Disposal Restrictions	6 NYCRR 376	Identifies hazardous wastes that are restricted from land disposal. Defines treatment standards for hazardous waste.	Potentially applicable	
Federal Action-Specific ARARs					
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and the Superfund Amendments and Reauthorization Act of 1986	National Contingency Plan	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions.	Potentially applicable	
Occupational Safety and Health Act	Worker Protection	29 CFR 1910 and 1926	Provides enforceable occupational safety and health standards (permissible exposure limits, or PELs) for workers engaged in on-site field activities.	Applicable	These standards regulate employee exposure to air contaminants and provide guidelines for equipment handling and personal protection.

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
Clean Air Act	Limits emissions to the atmosphere.	42 USC 7401	Establishes limits on parameter emissions to the atmosphere.	Potentially applicable	Applicable if pollutants deemed hazardous or non-hazardous based on public health are discharged to air.
	National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes emission limits for six pollutants (sulfur dioxide, particulate matter (PM_{10}), carbon monoxide, ozone, nitrogen dioxide, and lead).	Potentially applicable	Applicable to alternatives that may emit pollutants to the atmosphere; establishes standards to protect public health and welfare.
	Standards of Performance for New Stationary Sources	40 CFR Part 60	Applicable to alternatives that will emit pollutants from new or modified stationary (facility) sources.	Potentially applicable	May be applicable if remedial alternative treatment system or facility generates air emissions.
RCRA	Criteria for Municipal Solid Waste Landfills	40 CFR 258	Establishes minimum national criteria for management of non-hazardous waste.	Potentially applicable	Applicable to remedial alternatives that involve the generation of non-hazardous waste. Non-hazardous waste must be hauled and disposed of in accordance with RCRA.

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	Hazardous Waste Management System - General	40 CFR 260	Provides definition of terms and general standards applicable to 40 CFR 260 - 265, 268	Potentially applicable	Applicable to remedial alternatives that involve generation of a hazardous waste (e.g., contaminated soil). Hazardous waste must be handled and disposed of in accordance with RCRA.
	Identification and Listing of Hazardous Waste	40 CFR 261	Identifies solid wastes that are subject to regulation as hazardous wastes.	Potentially applicable	
	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.	Potentially applicable	
	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards that apply to persons transporting manifested hazardous waste within the United States.	Potentially applicable	
	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes the minimum national standards that define acceptable management of hazardous waste.	Potentially applicable	
	Standards for owners of hazardous waste facilities	40 CFR 265	Establishes interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities.	Potentially applicable	

Table 2-3 Action-Specific ARARs, Roxy Cleaners Site, Delmar, Town of Bethlehem, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Status	Comments
	Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal.	Potentially applicable	
	Hazardous Waste Permit Program	40 CFR 270, 124	EPA administers the hazardous waste permit program for CERCLA/ Superfund Sites; covers basic permitting, application, monitoring, and reporting requirements for off-site hazardous waste management facilities.	Potentially applicable	

Key:

ARAR = Applicable Relevant and Appropriate Regulation.
CFR = Code of Federal Regulations.
EPA = (United States) Environmental Protection Agency.
NYCRR = New York Codes, Rules, and Regulations.
NYSDEC = New York State Department of Environmental Conservation.
OSHA = Occupational Safety and Health Administration.
RCRA = Resource Conservation and Recovery Act.
SPDES = State Pollutant Discharge Elimination System.

Table 2-4 Soil Cleanup Objectives, Former Roxy Cleaners Site

Analyte	6 NYCRR Subpart 375-6.8 Soil Cleanup Objectives (ppm) Restricted - Commercial Use [a]	Maximum Concentration (ppm) [b]	Selected Cleanup Goal (ppm)
acetone	500	0.082	-
cis-1,2-dichloroethene (cis-DCE)	500	20 J	-
tetrachloroethene (PCE)	150	2500	150
trans-1,2-dichloroethene	500	0.011	-
trichloroethene (TCE)	200	15	-
vinyl chloride (VC)	13	4.6	-

Notes:

[a] Cleanup goals obtained from 6 NYCRR Part 375-6.8 Soil Cleanup Objective Tables (NYSDEC December 14, 2006).

[b] Concentrations are the maximum detected value from subsurface soil samples collected during the Roxy Dry Cleaners RI (EEEPC 2012).

Key:

J = Estimated value
NYCRR = New York Codes, Rules and Regulations
ppm = parts per million

Table 2-5 Soil Vapor Cleanup Objectives, Former Roxy Cleaners Site

Analyte	NYSDOH Air Guideline Value (µg/m³) [a]	EPA 2001 BASE database (90th percentile) (µg/m³) [b]	Maximum Indoor Air Concentration (µg/m³) [c]	Selected Cleanup Goal (µg/m³)
Acetone	NS	98.9	65	-
Benzene	NS	9.4	10	9.4
Benzyl chloride	NS	<6.8	ND	-
Bromodichloromethane	NS	NS	ND	-
Bromoform	NS	NS	ND	-
Bromomethane	NS	<1.7	ND	-
1,3-Butadiene	NS	<3.0	ND	-
2-Butanone (MEK)	NS	12.0	14	12
Carbon Disulfide	NS	4.2	64	4.2
Carbon Tetrachloride	NS	<1.3	0.44	-
Chlorobenzene	NS	<0.9	ND	-
Chloroethane	NS	<1.1	0.72 J	-
Chloroform	NS	1.1	1.7	1.1
Chloromethane	NS	3.7	1.5	-
Cyclohexane	NS	NS	3.5	-
Dibromochloromethane	NS	NS	ND	-
1,2-Dibromoethane (Ethylene Dibromide)	NS	<1.5	ND	-
1,2-Dichlorobenzene	NS	<1.2	ND	-
1,3-Dichlorobenzene	NS	<2.4	ND	-
1,4-Dichlorobenzene	NS	5.5	ND	-
Dichlorodifluoromethane (Freon 12)	NS	NS	2.7	-
1,1-Dichloroethane	NS	<0.7	ND	-
1,2-Dichloroethane	NS	<0.9	ND	-
1,1-Dichloroethene	NS	<1.4	ND	-
cis-1,2-Dichloroethylene	NS	<1.9	4.2	-
trans-1,2-Dichloroethene	NS	NS	5.4	-
1,2-Dichloropropane	NS	<1.6	ND	-
cis-1,3-Dichloropropene	NS	<2.3	ND	-
trans-1,3-Dichloropropene	NS	<1.3	ND	-
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	NS	<6.8	ND	-
1,4-Dioxane	NS	NS	ND	-
Ethanol	NS	210.0	140	-
Ethyl Acetate	NS	5.4	4	-
Ethylbenzene	NS	5.7	6.5	5.7
4-Ethyltoluene	NS	3.6	3.4	-
n-Heptane	NS	NS	6.9	-
Hexachlorobutadiene	NS	<6.8	ND	-
n-Hexane	NS	10.2	21	10.2
2-Hexanone (MBK)	NS	NS	ND	-

Table 2-5 Soil Vapor Cleanup Objectives, Former Roxy Cleaners Site

Analyte	NYSDOH Air Guideline Value (µg/m³) [a]	EPA 2001 BASE database (90th percentile) (µg/m³) [b]	Maximum Indoor Air Concentration (µg/m³) [c]	Selected Cleanup Goal (µg/m³)
Isopropanol	NS	NS	4.7	-
Methyl tert-Butyl Ether (MTBE)	NS	11.5	ND	-
Methylene Chloride	60	10.0	2.8	-
4-Methyl-2-pentanone (MIBK)	NS	6.0	1.5	-
Naphthalene	NS	NS	0.73	-
Propylene	NS	NS	ND	-
Styrene	NS	1.9	0.52	-
1,1,2,2-Tetrachloroethane	NS	NS	ND	-
Tetrachloroethene	100	15.9	260	100
Tetrahydrofuran	NS	NS	0.61	-
Toluene	NS	43.0	38	-
1,2,4-Trichlorobenzene	NS	<6.8	ND	-
1,1,1-Trichloroethane	NS	20.6	ND	-
1,1,2-Trichloroethane	NS	<1.5	ND	-
Trichloroethene	5	4.2	10	5
Trichlorofluoromethane (Freon 11)	NS	18.1	1.4	-
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NS	3.5	0.57	-
1,2,4-Trimethylbenzene	NS	9.5	17	9.5
1,3,5-Trimethylbenzene	NS	3.7	16	3.7
Vinyl Acetate	NS	NS	ND	-
Vinyl Chloride	NS	<1.9	1.8 J	-
m&p-Xylene	NS	22.2	24	22.2
o-Xylene	NS	7.9	7.8	-

Notes:

[a] Air guideline values were obtained from the "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006)"

[b] EPA 2001 BASE database values were presented in Appendix C of the "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006).

[c] Concentration listed is the maximum detected value from soil vapor samples collected during the Roxy Dry Cleaners RI phase (EEEPC 2012).

Key:

BASE = Building Assessment and Survey Evaluation
µg/m³ = micrograms per cubic meter
NS = Guidance Value not specified
NYSDOH= New York State Department of Health

Table 2-6 Groundwater Cleanup Objectives, Former Roxy Cleaners Site

Analyte	NYS Ambient (Class GA) Water Quality Standard (µg/L) [a]	Maximum Concentration (µg/L) [b]	Selected Cleanup Goal (µg/L)
benzene	1	1.9	1
1,1,1,2-tetrachloroethane	5	3.5	-
1,1,2-trichloroethane	1	1.3	1
1,1-dichloroethene	5	8.4	5
cis-1,2-dichloroethene (cis-DCE)	5	6800	5
ethylbenzene	5	1.1	-
naphthalene	10	12	10
tert-butyl methyl ether (MTBE)	10	1.3	-
tetrachloroethene (PCE)	5	190000	5
trans-1,2-dichloroethene	5	44	5
trichloroethene (TCE)	5	2700 J	5
vinyl chloride (VC)	2	1100	2

Notes:

[a] New York State Department of Environmental Conservation, Technical and Operational Guidance No.1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 Table 1, Class GA Groundwater and Guidance Values.

[b] Concentration listed is the maximum detected value from groundwater samples collected during the Roxy Dry Cleaners RI phase (EEEPC 2012).

Key:

µg/L = micrograms per liter
NYS = New York State

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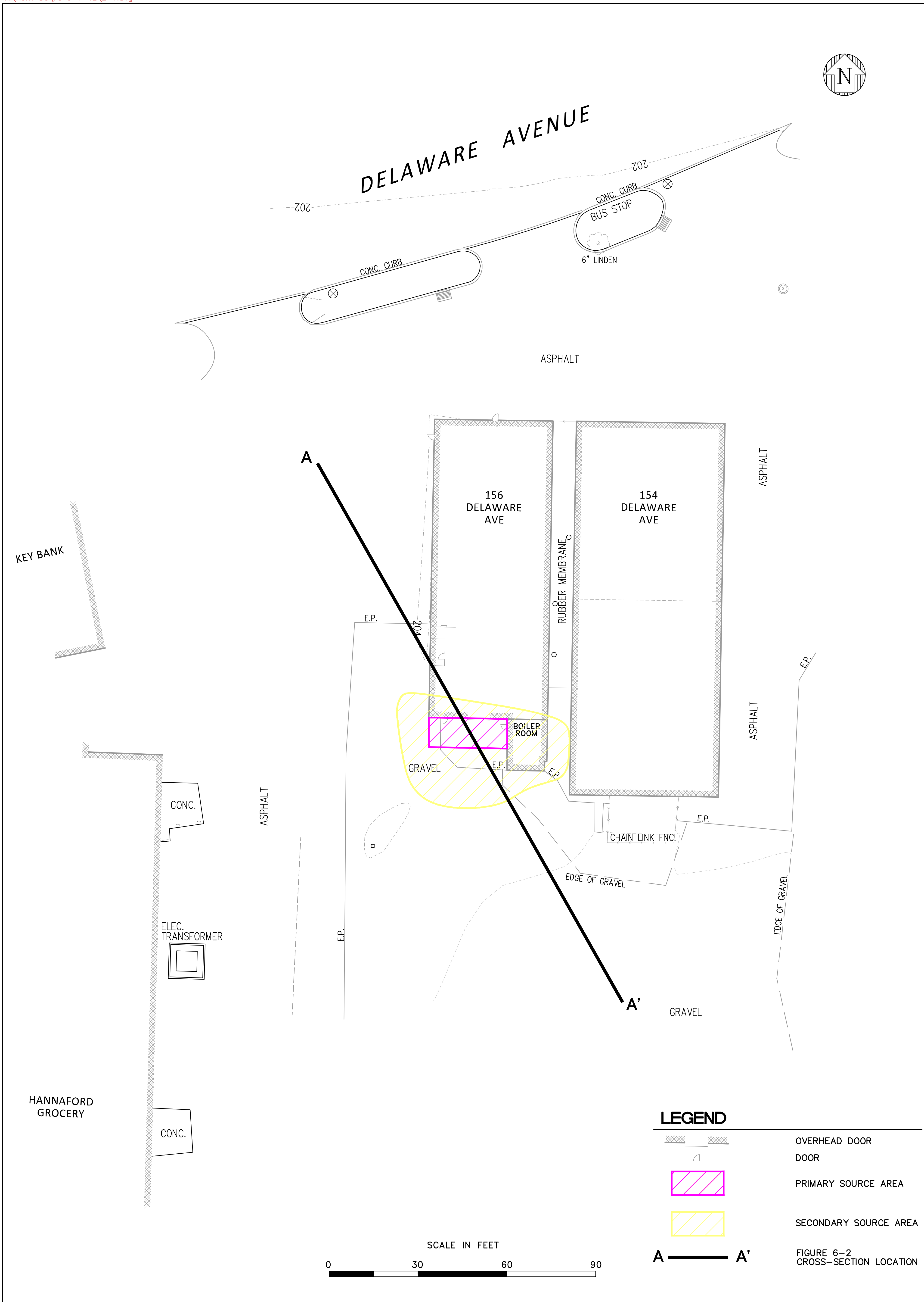

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FIGURE 2-1: SITE CONTAMINATION SOURCE AREAS
FORMER ROXY CLEANERS

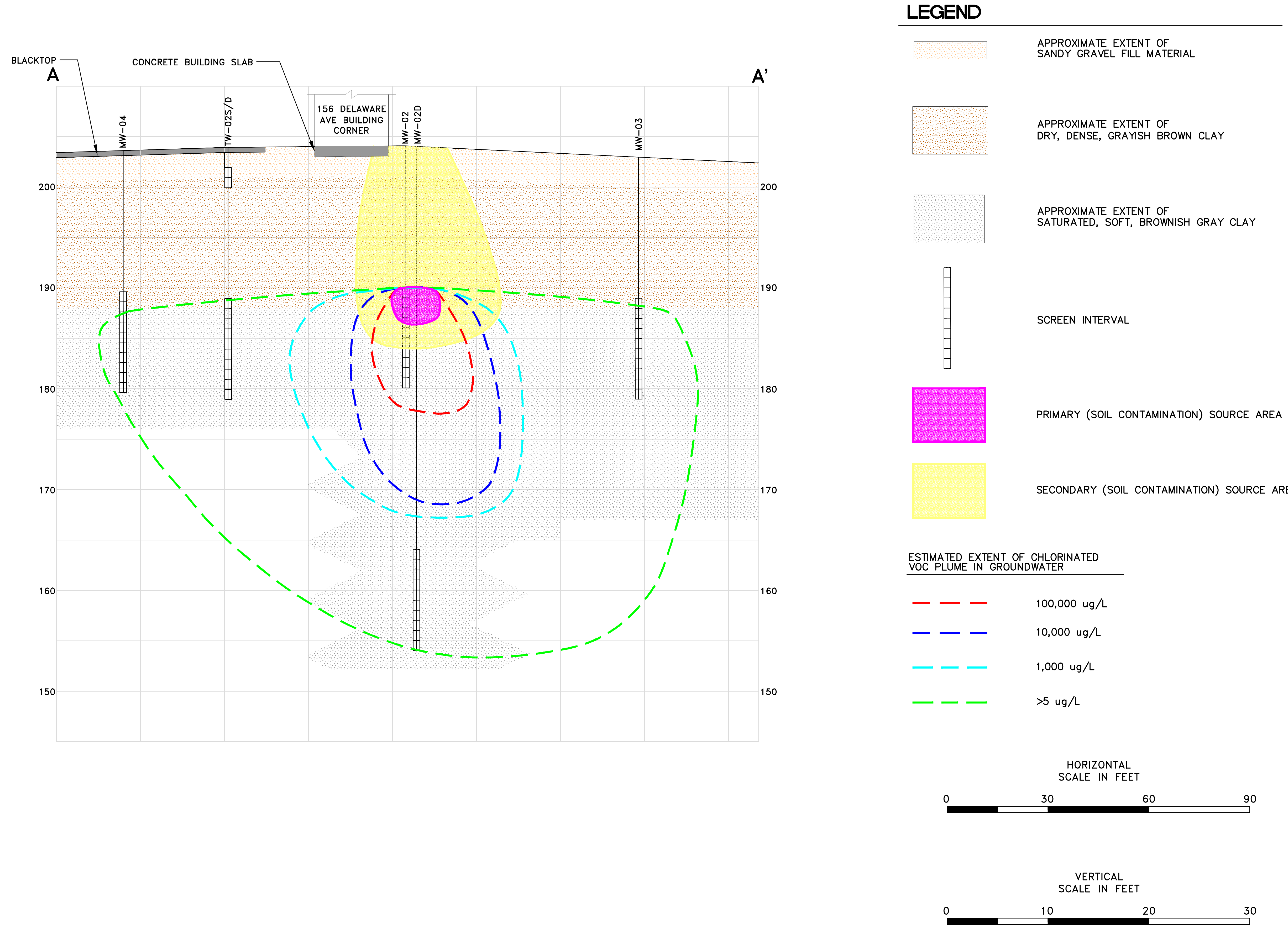

FIGURE 2-2: SITE CONTAMINATION CROSS-SECTION A – A' FORMER ROXY CLEANERS

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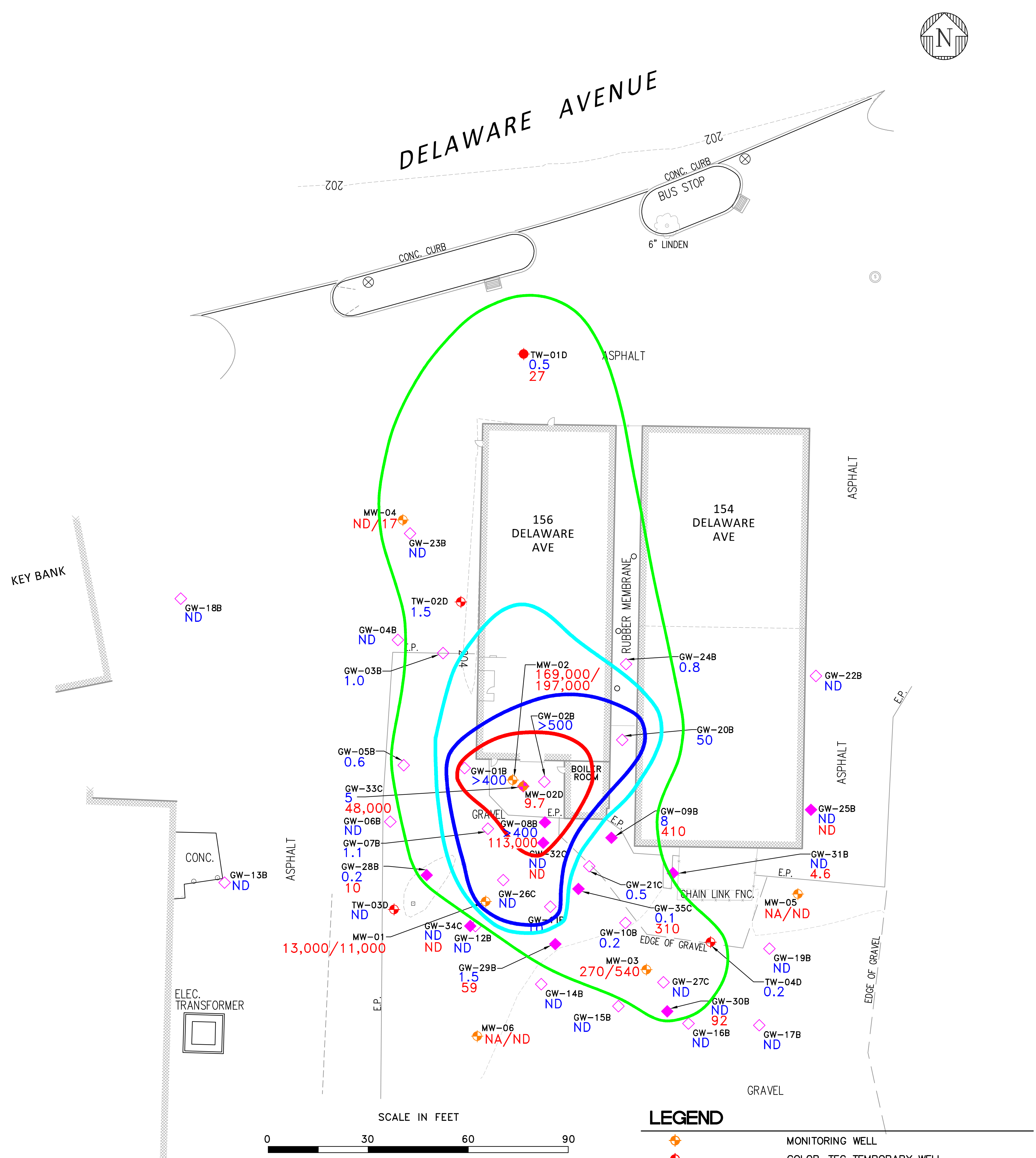

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NOTES

1. "B" SAMPLES WERE FROM THE SHALLOW OVERBURDEN ZONE (15'–20' BGS). "C" SAMPLES WERE FROM THE MIDDLE OVERBURDEN ZONE (25'–35' BGS).
   THE TEMPORARY WELL "D" SAMPLES WERE COLLECTED FROM THE SHALLOW OVERBURDEN ZONE (15'–20' BGS), WHILE THE MW-02D SAMPLE WAS COLLECTED FROM THE DEEPER OVERBURDEN ZONE (40'–50' BGS).
   ALL MONITORING WELLS (EXCEPT FOR MW-02D) ARE SCREENED IN THE SHALLOW OVERBURDEN ZONE.
2. MONITORING WELL MW-02D WAS BUILT USING THE GW-33C BOREHOLE.
3. ALL MONITORING WELLS EXCEPT FOR MW-02D, MW-05, AND MW-06 WERE SAMPLED TWICE. WHEN TWO RESULTS ARE SHOWN (NA/ND), THE FIRST IS FROM JUNE 2011 AND THE SECOND IS FROM OCTOBER 2011.
4. ug/L = MICROGRAMS PER LITER.
5. ND = NOT DETECTED.
6. NA = NOT SAMPLED.

LEGEND

	MONITORING WELL
	COLOR-TEC TEMPORARY WELL
	LAB SAMPLE TEMPORARY WELL
	COLOR-TEC GROUNDWATER GRAB LOCATION
	LAB SAMPLE GROUNDWATER GRAB LOCATION
	OVERHEAD DOOR
	DOOR
ND	COLOR-TEC RESULTS
0.001	LAB TOTAL CHLORINATED VOC RESULTS (MICROGRAMS PER LITER)

ESTIMATED EXTENT OF CHLORINATED VOC PLUME IN GROUNDWATER

Red	100,000 ug/L
Blue	10,000 ug/L
Cyan	1,000 ug/L
Green	>5 ug/L

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FIGURE 2-3: OVERBURDEN GROUNDWATER ZONE COLOR-TEC AND TOTAL CHLORINATED VOC RESULTS FORMER ROXY CLEANERS

3 Identification of Alternatives

3.1 Introduction

This section identifies the alternatives that may be used at the Roxy site to achieve the RAOs. At the direction of NYSDEC, this Third Phase Feasibility Study follows the streamlined format for an alternative analysis (AA) report presented in NYSDEC's DER-10. Therefore, the First Phase Feasibility Study (Development of Remedial Alternatives) and Second Phase Feasibility Study (Preliminary Screening of Alternatives) are not required. Table 3-1 presents a summary of the results of a brief preliminary screening of remedial technologies. Remedial technologies that cannot be implemented at the site or that may not be effective based on anticipated on-site conditions were not considered further in this FS.

In collaboration with NYSDEC, three alternatives were identified for the soil, groundwater, and soil vapor contamination at the Roxy site. These alternatives are briefly described below, and detailed descriptions and evaluations of the alternatives are presented in Section 4.

3.2 Alternative No. 1: No Action

The no action alternative was carried through the FS for comparison purposes, as required by the National Contingency Plan (NCP). This alternative would be acceptable only if it is demonstrated that the contamination at the site is below the RAOs, or that natural processes will reduce the contamination to acceptable levels. This alternative does not include institutional controls.

3.3 Alternative No. 2: Sub-Slab Depressurization System, Long-term Monitoring, and Institutional Controls

This alternative consists of long-term monitoring to assess the mobility of the contamination in soil and groundwater. In addition, SSDSs would be installed in two buildings to minimize the infiltration of vapors into the buildings. The Institutional controls included in this alternative would consist of access/use and deed restrictions at the site to limit the potential for human exposure to contaminated site soils and groundwater.

3.4 Alternative No. 3: Excavation and Off-Site Disposal, Chemical Oxidation, SSD Systems, Long-Term Monitoring, and Institutional Controls

This alternative consists of excavation and off-site disposal of contaminated soils that exceed the SCGs. The excavated material would be stockpiled, sampled, and disposed of accordingly. This alternative includes the removal of two wells that are located within the excavation limits. One well will require in-place decommissioning of the portion that extends below the excavation limit prior to excavation. As a polishing step, a chemical oxidation amendment would be spread at the bottom of the excavation pit before backfilling. In addition, a new long-term monitoring well would be installed. SSDSs, long-term monitoring, and institutional controls as described in Section 3.3 are also included in this alternative.

Table 3-1 Summary of Remedial Technologies, Former Roxy Cleaners Site, Delmar, New York

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Feasible Technology
No Action			
	No further action to remedy soil conditions at the site.	Ineffective for the protection of human health and the environment.	No
Monitored Natural Attenuation (MNA)			
	Ongoing physical, chemical, and/or natural biological processes to reduce the concentrations of contaminants at the site. Includes monitoring of existing groundwater wells to provide documentation that these processes are occurring.	MNA may be appropriate if ongoing physical, chemical, and/or natural processes would achieve the RAOs in a reasonable time frame compared to active remedial measures. However, geochemical and microbiological analyses of groundwater samples at this site indicate that the potential for anaerobic biodegradation is limited and likely not occurring at a significant rate.	No
Long Term Monitoring			
	Monitoring of existing groundwater wells to provide documentation that the remedial measure is reducing contaminants at the site.	Provides evidence to verify if a remedial activity is working or not.	Yes
Institutional Controls			
	Includes public notification, deed restrictions, fencing, and signs.	Does not reduce contamination concentrations but can reduce potential exposure to the contaminated media.	Yes
In-Situ Treatment			
Thermal			
Thermally Enhanced Soil Vapor Extraction (SVE)	Uses electrical resistance/electromagnetic/radio frequency heating, or hot-air steam injection to facilitate volatilization and extraction of the contaminant vapors.	Based on the current site conditions and limited area (approx. 300 ft^2), this technology is likely cost prohibitive.	No

Table 3-1 Summary of Remedial Technologies, Former Roxy Cleaners Site, Delmar, New York

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Feasible Technology
Thermal Desorption (thermal blankets and wells)	Thermal blankets and thermal wells are placed on contaminated ground surface. A majority of contaminants are vaporized out by thermal conduction. Vapors are drawn out by a vacuum system, oxidized, cooled, and passed through activated-carbon beds.	Based on the current site conditions and limited area (approx. 300 ft^2), this technology is likely cost prohibitive.	No
Physical/Chemical			
SVE	A negative pressure gradient is created by the application of a vacuum to contaminated soils through extraction wells that strips volatile constituents from the soil in the vadose zone, causing movement of vapors toward the wells.	This technique is not effective in the saturated zone or in low permeability soils such as those observed at this site.	No
Chemical Oxidation	Commonly used oxidizing agents include ozone, hydrogen peroxide, permanganate, hypochlorite, chlorine, and chlorine dioxide.	Low permeability of the soil is not conducive for injection due to inability to distribute material; however, an oxidizing agent may be spread on the inside of excavation pit as polishing step.	Yes
Pump-and-Treat System	Contaminated groundwater is pumped out of the ground and treated with methods such as granulated activated carbon, chemical reagents, or air stripping.	Not effective in very low permeability aquifers such as exist at this site.	No
Solidification/Stabilization	Solidification/stabilization treatment systems, sometimes referred to as fixation systems, seek to trap or immobilize contaminants within their "host" medium using chemical reactions instead of removing them through chemical or physical treatment.	Stabilization technologies have not been successfully demonstrated on a full-scale basis for treating organics. Solidified material may hinder future site use. Treatability studies would be required prior to implementing this technology.	No

Table 3-1 Summary of Remedial Technologies, Former Roxy Cleaners Site, Delmar, New York

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Feasible Technology
Biological			
Biological Treatment	Uses indigenous or selectively cultured microorganisms to reduce hazardous organic compounds into water, carbon dioxide, and chlorinated hydrogen chloride.	This technology involves a relatively longer remediation period compared to other treatment technologies, but can enhance natural attenuation. Site does not contain sufficient quantities of native bacteria. Addition of microorganisms and required electron donor material would be limited due to the low permeability of soils at the site.	No
Soil Excavation			
On-Site Disposal	Requires construction of a secure landfill that meets RCRA and state requirements.	Containment of the waste material in an on-site landfill is not possible at this small commercial facility.	No
Off-Site Disposal	Involves the excavation and hauling of contaminated material to appropriate commercially licensed disposal facilities. The non-hazardous spoils would go to a non-hazardous/solid waste facility, while the hazardous spoils would go to a RCRA-permitted facility.	Excavation and disposal of contaminated soil at a permitted landfill is an effective method of removing the source of site contamination. Backfill materials would need to be imported to fill the site.	Yes

Table 3-1 Summary of Remedial Technologies, Former Roxy Cleaners Site, Delmar, New York

General Response Actions and Remedial Technology	Brief Description	Preliminary Screening Evaluation	Feasible Technology
Building Soil Vapor Treatment			
Sub-slab Depressurization System (SSDS)	A suction pit is created below the concrete floor slabs by drilling a hole through the slab and hand excavating to form a void in the soil. A fan-powered vent draws air from beneath the slab to above the surface of the roof through a PVC pipe.	Inexpensive; easy to install and effectively mitigates vapor intrusion, thereby disrupting this exposure pathway. Can also be used in source area for source mass reduction. Not typically intended as sole remedial measure; used as interim mitigation until selected site remedy is implemented.	Yes

Key:
RCRA = Resource Conservation and Recovery Act.
SVE = Soil vapor extraction.
MNA = Monitored Natural Attenuation

4 Detailed Analysis of Alternatives

4.1 Introduction

The purpose of the detailed analysis of remedial action alternatives is to present the relevant information for selecting a remedy for the site. In the detailed analysis, the alternatives identified in Section 3 are described in detail and evaluated on the basis of environmental benefits and costs using criteria established by NYSDEC in Final Commissioner Policy CP-51/Soil Cleanup Guidance (CP-51) , Draft DER-10, and 6 NYCRR Part 375. This approach is intended to provide the information needed to compare the merits of each alternative and select an appropriate remedy that satisfies the RAOs for the site.

4.1.1 Detailed Evaluation of Criteria

This section presents a summary of the 10 evaluation criteria that were used to evaluate the alternatives.

Overall Protection of Human Health and the Environment

This criterion provides an overall assessment of protection of human health and the environment and is based on a composite of factors assessed under the evaluation criteria, especially short-term effectiveness, long-term effectiveness and performance, and compliance with cleanup goals.

Compliance with SCGs

This criterion is used to evaluate the extent to which each alternative may achieve the proposed cleanup goals. The proposed cleanup goals were developed based on the SCGs presented in Section 2.

Short-Term Impacts and Effectiveness

This criterion addresses the impacts of the alternative during the construction and implementation phase until the RAOs are met. Factors to be evaluated include protection of the community during the remedial actions; protection of workers during the remedial actions; and the time required to achieve the RAOs. Several alternatives described in the following sections may not be effective in meeting the RAOs in less than 30 years. Therefore, references to short-term impacts and effectiveness may include discussions of impacts/effectiveness over a period of 30 years.

Long-Term Effectiveness and Permanence

This criterion addresses the long-term protection of human health and the environment after completion of the remedial action. It assesses the effectiveness of the remedial action to manage the risk posed by untreated wastes and/or the residual contamination remaining after treatment and the long-term reliability of the remedial action.

Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion addresses NYSDEC's preference for selecting "remedial technologies that permanently and significantly reduce the toxicity, mobility, and volume" of the contaminants of concern at the site. It assesses the extent to which the treatment technology destroys toxic contaminants, reduces mobility of the contaminants using irreversible treatment processes, and/or reduces the total volume of contaminated media.

Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation. Technical feasibility refers to the ability to construct and operate a remedial action for the specific conditions at the site and the availability of the necessary equipment and technical specialists. Technical feasibility also considers construction and operation and maintenance (O&M) difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor effectiveness. Administrative feasibility refers to compliance with applicable rules, regulations, and statutes and the ability to obtain permits or approvals from government agencies or offices.

Cost

This criterion evaluates the estimated capital costs, long-term O&M costs, and environmental monitoring costs. The estimates included herein (unless otherwise noted) assume engineering and administrative costs would equal 10% of the capital costs and contingency costs would equal 15% of the capital costs. A present-worth analysis is completed to compare the remedial alternatives on the basis of a single dollar amount (total cost) for the base year. For the present-worth analysis, assumptions are made regarding the interest rate applicable to borrowed funds and the average inflation rate. According to the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, the Superfund program recommends that a discount rate of 5% before taxes and after inflation be assumed. In addition, CERLA guidance states that, in general, the period of performance for costing purposes should not exceed 30 years for the purpose of the detailed analysis. Therefore, the following detailed analysis of remedial alternatives follows this guidance. The comparative cost estimates are intended to reflect actual costs with an accuracy of +50% to -30%.

State Acceptance

This criterion evaluates the technical and administrative issues and concerns the state may have regarding each alternative. This criterion will be addressed in the

Record of Decision (ROD) once comments on the proposed plan have been received. Therefore, state acceptance will not be discussed further in this report.

Community Acceptance

This criterion evaluates the issues and concerns the public may have regarding each alternative. This criterion will be addressed in the ROD once comments on the proposed plan have been received. Therefore, community acceptance will not be discussed further in this report.

Detailed descriptions of the alternatives listed in Section 3 and the evaluation criteria are described below. Cost estimates for each alternative are presented in Tables 4-1 through 4-2. Table 4-3 presents a summary of these costs.

4.2 Remedial Alternatives

4.2.1 Alternative No. 1: No Action

4.2.1.1 Description

The No Action alternative involves taking no further action to remedy site conditions. The NCP at 40 CFR §300.430(e) (6) provides that the No Action alternative be considered at every site as a baseline for comparison with other alternatives. This alternative does not include remedial action, institutional or engineering controls, or long-term monitoring.

4.2.1.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is not protective of human health and the environment, because the site would remain in its present condition. VOC contamination in the soil would remain at the site and continue to be a source of soil vapor contamination in the buildings on site. Uncontrolled excavations could lead to VOC exposure and, therefore, risk to human health. The risk to ecological receptors was not evaluated because the site is located in a commercial zoned area and the nearest surface water body is more than 0.3 mile from the site.

Compliance with SCGs

Site contaminants (VOCs) are not expected to decrease appreciably over time. Therefore, this alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness

No short-term impacts (other than those currently existing) are anticipated during the implementation of this alternative since no remedial activities are involved.

This alternative does not include source removal or treatment and would not meet the RAOs (as defined in Section 2.3) in a reasonable or predictable time frame.

Long-Term Effectiveness and Permanence

Because this alternative does not involve the removal or treatment of contaminated soil, or a decrease in the volume of contamination, the risks associated with the migration of contaminants to groundwater and indoor air would remain essentially the same. This alternative is, therefore, not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative does not involve removal or treatment of contaminated soil, and, therefore, the toxicity, mobility, and volume of contamination would not be reduced.

Implementability

There are no actions to implement under this alternative.

Cost

There are no costs associated with this alternative.

4.2.2 Alternative No. 2: Sub-Slab Depressurization System, Long-Term Monitoring, and Institutional Controls

4.2.2.1 Description

This alternative involves long-term monitoring, institutional controls, and the installation of an SSDS within the two buildings at the site. Figure 4-1 identifies the locations of the monitoring wells and the SSDS systems at the site. Long-term monitoring of existing groundwater wells will be performed to determine whether migration of the contamination is occurring. Long-term monitoring using seven existing groundwater monitoring wells would be performed to observe VOC levels in groundwater.

Monitoring wells MW-01 through MW-06 and MW-02D are located at different locations on the site, within and outside of the plume. Two additional contingent wells have been included in the alternative and may be installed if, based on analysis of the existing wells, any unanticipated post-remedy or long-term changes occur in the plume configuration. For costing purposes, it is assumed that these wells would be sampled semiannually for the first year and annually for four years thereafter. After that, the wells would be sampled every five years for a total duration of 30 years. The samples would be analyzed for VOCs by Method SW8260 at an off-site laboratory. Because the migration of contamination at the site is slow (2.2 feet/year or less per the RI report [EEEPC 2012]), frequent groundwater monitoring is not warranted. Institutional controls, including access/use and deed restrictions, would be applied at this site. Deed restrictions would be filed to control future use/activities at the site.

An SSDS would be installed in the Roxy site building and the adjacent pet center building. An SSDS uses a fan-powered vent and piping to draw vapors from the soil beneath the building’s slab and discharge the vapors to the atmosphere. Depressurizing the area beneath the basement slab relative to indoor air pressure essentially creates a vacuum, or negative pressure, which minimizes or prevents the infiltration of sub-slab vapors into the building.

The SSDSs are typically radon-type mitigation systems adapted for soil vapor intrusion. The system would include an exhaust fan sized to create enough negative pressure in the sub-slab area to minimize infiltration of vapors into the building. The fan and exhaust stack would be installed either outside the building or, if permitted by the property owner, in vented attic spaces of the building. PVC piping would extend throughout the basement and penetrate below the floor slab at suction points. Ancillary equipment (e.g., manometers and throttling gate valves) would be installed to provide for monitoring and future adjustment of the SSDS. To achieve the desired results, impermeable barriers may be installed in crawlspaces and on permeable foundation walls (e.g., dry-stacked, fractured concrete) and floor and wall penetrations, etc., may be sealed.

The final configuration of the suction holes and pipe runs would be determined by conducting a pilot test during the design phase. For costing purposes, an SSDS would be installed in both buildings, and it was assumed that each SSDS would be inspected annually for a period of 30 years and the fan would be replaced every 5 years.

In accordance with CERCLA 121(c), five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in VOC concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objectives, five-year reviews would be required at the site.

4.2.2.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

Installation of an SSDS in each of the two buildings at the site would provide protection of human health from the risk due to soil vapor intrusion. The implementation of institutional controls such as deed restrictions to control future use/activities at the site would provide some long-term protection of human health. The risk to ecological receptors was not evaluated because the site is located in a commercial zoned area and the nearest surface water body is located more than 0.3 mile from the site.

Compliance with SCGs

Based on the results of the evaluation performed during the RI for the presence of daughter products (cis-DCE and vinyl chloride), oxygen, nitrate, ferrous/total iron, sulfate, sulfide, chloride, pH, and ORP in the source area, it was determined that there is limited evidence of anaerobic biodegradation at the site. Based on the geochemical and microbiological results from the RI, reductive dechlorination of PCE and TCE is occurring; however, the process is slow, incomplete, and likely not an effective means of reducing contaminant concentrations to regulatory levels within an acceptable time period. Therefore, this alternative would not comply with the chemical-specific SCGs for the site.

Short-Term Impacts and Effectiveness

The installation of an SSDS in each of the two buildings at the site alternative would provide some short-term protection to current site workers and occasional visitors to the site. Controlling future use and activities on the site through the use of institutional controls would ensure that the site workers' health is protected.

Long-Term Effectiveness and Permanence

This alternative would not be effective in the long term (in terms of protecting human health and the environment) because this alternative does not involve removal or treatment of contaminated soil. The risks associated with the inhalation of indoor air containing vapors emitted from contaminated subsurface soil and groundwater would be mitigated by the installation of SSDSs. However, SSDSs are not typically intended to be a long-term remedial measure. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, not modified by future site users, and enforced.

Reduction in Toxicity, Mobility, or Volume through Treatment

This alternative does not involve the removal or treatment of contaminated soil. Therefore, the toxicity, mobility, and volume of contamination would not be expected to decrease.

Implementability

This alternative can be readily implemented on a technical and administrative basis using typical institutional control practices and procedures. SSDSs are relatively inexpensive and easy to install and effectively mitigate vapor intrusion, thereby disrupting the indoor inhalation exposure pathway.

Cost

The 2012 total present-worth cost of this alternative based on a 30-year period is $427,900. Table 4-1 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Cost estimating information was obtained from RS Means Cost Data series and engineering judgment. Groundwater sampling and renewal of institutional controls are assumed with this alternative.

4.2.3 Alternative No. 3: Excavation and Off-Site Disposal, Chemical Oxidation, Sub-Slab Depressurization System, Long-Term Monitoring, and Institutional Controls

4.2.3.1 Detailed Description

This alternative involves excavation of the primary source area using conventional construction equipment (e.g., backhoes) and off-site disposal. The excavation includes the removal of MW-2 and the upper 20 feet of MW-2D. The bottom 30 feet of MW-2D would be decommissioned in place (filled with cement/bentonite grout) prior to excavation. MW-2 and the upper portion of MW-2D would be removed during excavation. The type of disposal facility would depend on whether the waste is considered hazardous or non-hazardous. Waste material classified as hazardous may be disposed of only in a RCRA-permitted facility. In accordance with New York State hazardous waste regulations and the Toxic Substances Control Act (TSCA), materials containing PCE at or above 0.7 ppm, TCE at or above 0.5 ppm, and/or vinyl chloride at or above 0.2 ppm that are excavated and removed from a site are subject to regulation as both hazardous waste and TSCA waste. Such waste materials containing less than 0.7 ppm PCE, 0.5 ppm TCE, and 0.2 ppm vinyl chloride are considered non-hazardous waste, and can be disposed of in a non-hazardous/solid waste facility. Because the maximum PCE concentration detected in the site soils is 150 ppm, the waste material excavated from this site would be disposed of at a licensed hazardous waste disposal facility.

The extent of the proposed excavation is a rectangular area adjoining the building (see Figure 4-2). The maximum depth of excavation within the excavation area would be approximately 20 feet bgs. Based on the groundwater elevations collected during the RI (EEEPC 2012), it appears that the contamination extends a couple of feet below the groundwater elevation at the site. As the soil encountered at the site is dense, lean clay, it was assumed that only limited excavation dewatering would be necessary at this site, such as might occur during a precipitation event during excavation.

Because the excavation would extend to 18 feet bgs and be located adjacent to the foundation of the building, it is likely that a shoring system would be required during the excavation activities. Considering the limited accessibility and space, and to ensure safe working conditions in the excavation area, it was assumed that "braced excavation" would be the appropriate excavation method However, it is recommended that soil conditions be evaluated during the design phase to select the appropriate shoring system for the site.

Following initial excavation, a sampling grid would be developed over the excavation area, and confirmatory sampling would be performed to determine whether the VOC levels in the remaining soil are above the cleanup criteria, thus requiring additional excavation, or below the cleanup criteria. The sampling grid and sample results would have to be approved by NYSDEC's construction oversight inspector.

Following the excavation and removal of designated soil from the site, a chemical oxidation amendment (such as Regenesis PersulfOX) would be applied to the bottom of the excavation pit as a polishing step prior to backfilling the pit with clean fill. Imported clean fill would be used to restore the excavation site to the original grades. Once backfilling operations are completed, the site would be restored to preconstruction conditions, include paving.

In addition to excavation, SSDSs, long-term monitoring, and institutional controls as described in Alternative 2 are included in this alternative.

Under CERCLA 121 (c), five-year reviews should be conducted for sites that implement remedial actions that, upon completion, would leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative would result in VOC concentrations above the 6 NYCRR Part 375 unrestricted use cleanup objectives, five-year reviews would be required at the site.

4.2.3.2 Detailed Evaluation of Criteria

Overall Protection of Human Health and the Environment

This alternative is considered protective of human health and the environment, since the source area would be excavated and disposed of in an environmentally acceptable facility. As the primary source of the soil vapor intrusion in the on-site buildings would be removed, exposure risks associated with the inhalation of soil vapor would be minimized.

The application of the oxidation amendment as a polishing step would provide for further protection of human health, as it is expected to oxidize low-level residual contamination at the bottom of the excavation.

Installation of an SSDS in each of the two buildings would further provide protection of human health by mitigating soil vapor intrusion. Placement of institutional controls such as deed restrictions that would control future uses/activities at the site would provide some long-term protection of human health. The risk to ecological receptors was not evaluated because the site is located in a commercial zoned area and the nearest surface water body is located more than 0.3 mile from the site.

Compliance with SCGs

This alternative would meet the SCGs since VOC-contaminated site soils would be removed and disposed of in an environmentally acceptable facility. During implementation, this alternative would also meet the action- and location-specific SCGs, including noise limitations and Occupational Safety and Health Act (OSHA) regulations.

Short-Term Impacts and Effectiveness

Several short-term impacts on the community and site workers may arise during excavation of contaminated site soils. These potential impacts include dust, noise, and spills during the handling and transportation of contaminated soils. In addition, during excavation, impacts on workers may result due to potential inhalation of soil vapor from exposed contaminated soils. Other short-term impacts (e.g., noise) would be mitigated by the use of engineering controls (e.g., noise barriers). Health and safety measures, including air monitoring, use of appropriate personal protective equipment (PPE), and decontamination of equipment leaving the site, would be in place to protect the workers and surrounding community.

The installation of SSDSs in the two buildings would provide short-term protection to current site workers and occasional visitors to the site. Controlling future uses and activities on the site through the use of institutional controls would protect workers' health.

Long-Term Effectiveness and Permanence

This alternative is considered to be an effective remedy in the long term, since contaminants in site soils above the SCGs would be excavated and disposed of off-site. The removal of the primary source area would decrease the levels of VOC contamination in the groundwater and reduce the risks associated with the inhalation of indoor air containing vapors emitted from contaminated subsurface soil and groundwater.

In addition, installation of the SSDSs at the site would further minimize the risks associated with the inhalation of indoor air containing vapors emitted from contaminated subsurface soil and groundwater. Deed or other restrictions would be effective in the long term as long as they are interpreted correctly, not modified by future site users, and enforced.

Reduction in Toxicity, Mobility, or Volume through Treatment

The volume of contamination would be reduced at the site because this alternative includes the excavation of site soils contaminated above the SCGs. Consequently, the toxicity and mobility of the contaminants would also be reduced.

Implementability

This alternative can be readily implemented using standard construction means and methods for excavation, and the SSD systems are relatively inexpensive and easy to install.

Cost

The 2012 total present-worth cost of this alternative based on a 30-year period is $683,500. Table 4-2 presents the quantities, unit costs, and subtotal costs for the various work items in this alternative. Cost estimating information was obtained from RS Means Cost Data series and engineering judgment. Groundwater sampling and renewal of institutional controls are assumed with this alternative.

4.3 Comparative Evaluation of Alternatives

Overall Protection of Human Health and the Environment

Since Alternative 1 employs no action, contaminated site soils would remain on site, providing no protection of human health and the environment. Alternatives 2 and 3 are more protective of human health and the environment, each at a different level.

By using only institutional controls and SSDSs in Alternative 2, inadequate enforcement could lead to potential health risks. Alternative 3 would provide a higher level of protection than Alternative 2 because the site-wide contaminated soils would be excavated and properly disposed of off-site.

Compliance with SCGs

Alternatives 1 and 2 do not comply with SCGs because the contaminated soils would remain on site. Alternative 3 complies with SCGs since soil contamination would be properly disposed of off-site.

Short-Term Impacts and Effectiveness

Short-term impacts are not anticipated under Alternatives 1 and 2, since no remediation activity would occur. Under Alternative 3, several short-term impacts may affect the community during remedial activities, such as dust and noise due to excavation of the contaminated soil. In addition, dump trucks would need to visit the site daily, and spills of contaminated soils could occur during the off-site transport of soils by trucks.

Long-Term Effectiveness and Permanence

Since Alternative 1 employs no action, contaminated soil would remain on site, providing no protection of human health and the environment. Alternative 2 would be effective in the long term provided it is properly enforced and the SSDSs are maintained. Alternative 3 has a higher level of long-term effectiveness and permanence than Alternative 2, because contaminated site soils would be properly disposed of.

Reduction in Toxicity, Mobility, or Volume through Treatment

Alternatives 1 and 2 would not treat contaminated soils; therefore, toxicity, mobility, and volume would not be reduced. Alternative 3 would essentially eliminate concerns regarding the toxicity, mobility, and volume of contaminated soil at the site through off-site disposal at a permitted disposal facility.

Implementability

There are no actions to implement for Alternative 1. Alternatives 2 and 3 are readily implemented using standard construction means and methods.

Cost

Alternative 1 would involve no action and thus would incur no costs. Alternative 2 has a lower total present worth and O&M cost than Alternative 3 because no soil excavation would be required for this alternative.

Table 4-1 Cost Estimate for Alternative 2, Long-Term Monitoring, Institutional Controls, and Sub-Slab Depressurization Systems, Former Roxy Cleaners Site, Delmar, NY

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital Costs					
Institutional Controls		1	LS	$10,000	$10,000
Subtotal					$10,000
SSDS System					
Pilot Test	To evaluate the depressurization requirements for the building, 2 buildings	2	Each	$3,000	$6,000
Engineering Design	Design Drawings	1	LS	$15,000	$15,000
SSDS System	1 fan, 2 draw points (includes piping), 2 buildings	2	Each	$12,000	$24,000
SSDS Electric Installation		2	LS	$1,000	$2,000
Subslab Monitoring Points	For O&M inspections, sampling, etc. (5/building)	10	Each	$1,000	$10,000
System Startup	Assume 4 visits (1 person @ 8 hrs/day)	32	HR	$100	$3,200
Subtotal					$60,200
Groundwater Well Installation					
Groundwater well Installation	Two contingency wells, Includes mobilization/demobilization and installation costs	1	LS	$7,000	$7,000
Installation Oversight	2 people @ 8 hours/day, 1 day	16	HR	$100	$1,600
Subtotal					$8,600
				Capital Cost Subtotal:	$78,800
				Location Factor Adjustment for Delmar, New York (0.977):	$76,988
				15% Project Administration:	$11,548
				30% Contingency:	$23,096
				15% Legal and Engineering Costs:	$11,548
				10% Prime Contractor Profit:	$7,699
				Total Capital Cost:	**$130,900**
Annual SSDS O&M Costs (30 years)					
SSDS Electric Costs	Yearly operating costs for the SSDS system	2	Each	$100	$200
O&M Inspection	Assume 1 site visit (one person, 8 hrs/trip)	8	HR	$100	$800
O&M Materials		1	LS	$200	$200
Subtotal					$1,200
				Annual O& M Costs Subtotal:	$1,200
				Location Factor Adjustment for Delmar, New York (0.977):	$1,172
				15% Project Administration:	$176
				30 % Contingency:	$352
				15% Legal and Engineering Costs:	$176
				Total Annual Cost:	**$1,876**
				30-Year Present Value of Annual Costs:	**$42,100**

Table 4-1 Cost Estimate for Alternative 2, Long-Term Monitoring, Institutional Controls, and Sub-Slab Depressurization Systems, Former Roxy Cleaners Site, Delmar, NY

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Annual Groundwater Monitoring (Years 1 through 4)					
Year 1					
Groundwater Sampling	9 wells, assume 3.5 wells/day, 2-persons, 10 hr/day	120	HR	$98	$11,760
Analytical Costs (VOCs)	15 VOC samples per round including 9 wells, 1 duplicate sample, 1 MS, 1 MSD and 3 trip blanks, 2 rounds	30	Each	$104	$3,113
Data Evaluation and Reporting		80	HR	$98	$7,840
Subtotal					$22,713
Years 2 through 4					
Groundwater Sampling	9 wells, assume 3.5 wells/day, 2 persons, 10 hr/day	60	HR	$98	$5,880
Analytical Costs (VOCs)	15 VOC samples per round, including 9 wells, 1 duplicate sample, 1 MS, 1 MSD, and 3 trip blanks	15	Each	$104	$1,556
Data Evaluation and Reporting		40	HR	$98	$3,920
Subtotal					$11,356
				Groundwater Monitoring Subtotal:	$34,069
				Location Factor Adjustment for Delmar, New York (0.977):	$33,285
				15% Project Administration:	$4,993
				30 % Contingency:	$9,986
				15% Legal and Engineering Costs:	$4,993
				Total Annual Groundwater Monitoring (Year 1 through 4) Cost:	**$53,256**
				Present Value of Annual Groundwater Monitoring (Year 1 through 4) Costs:	**$86,700**
5-Year Groundwater Monitoring and Peridoic Maintenance Costs (Year 5 through 30)					
SSDS System Fan	Replace fan every 5 years.	2	Each	$300	$600
5-Year Performance Review		1	LS	$5,000	$5,000
Institutional Control Administration		1	LS	$5,000	$5,000
Groundwater Sampling	9 wells, assume 3.5 wells/day, 2 persons, 10 hr/day	60	HR	$98	$5,880
Analytical Costs (VOCs)	15 VOC samples per round, including 9 wells, 1 duplicate sample, 1 MS, 1 MSD, and 3 trip blanks	15	Each	$104	$1,556
Data Evaluation and Reporting		40	HR	$98	$3,920
Subtotal					$21,956
				5-Year Monitoring Cost Subtotal:	$21,956
				Location Factor Adjustment for Delmar, New York (0.977):	$21,451
				15% Project Administration:	$3,218
				30% Contingency:	$6,435
				15% Legal and Engineering Costs:	$3,218
				Total 5-Year Costs:	**$34,322**
				30-Year Present Value of 5-Year Costs:	**$147,800**
				2012 Total Present Value Cost:	**$407,500**
				5% Construction Management	**$20,375**
				Total Cost:	**$427,900**

Table 4-1 Cost Estimate for Alternative 2, Long-Term Monitoring, Institutional Controls, and Sub-Slab Depressurization Systems, Former Roxy Cleaners Site, Delmar, NY

Item	Description	Quantity	Unit	Unit Cost	Total Cost

Key:

LS: Lump Sum

SF: Square Foot

BCY: Cubic Yard

CF: Cubic Foot

Notes/Assumptions:

1. Contingency assumed at: 30%

2. Project Administration assumed at: 15%

3. Legal and Engineering Costs assumed at: 15%

4. Prime Contractor costs assumed at: 10%

5. Total Monitoring Time: 30 years

6. Long-Term Monitoring occurs semi-annually for 1 year, annually for 4 years, and every 5 years after that.

Total number of groundwater monitoring wells to be sampled: 7 wells

7. Present value costs assumes annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 July 2000) and the Office of Management and Budget Real Discount Rates for the year 2011 (http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html) at Annual interest rate: 2.0%

8. Institutional controls include: environmental easements, deed restrictions, etc.

9. SSDS system based on square footage of building and soil vapor/air sampling results.

10. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

Table 4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY

Item		Quantity	Unit	Unit Cost	Total Cost
Capital Costs					
Institutional Controls		1	LS	$10,000	$10,000
Subtotal					$10,000
Excavation/Off-site Disposal/Chemical Oxidation/Backfill					
Mob/Demob		1	LS	$15,000	$15,000
Decommision wells	Monitoring wells MW-02 and MW-02D need to be decommisioned prior to excavation.	2	EA	$6,000	$12,000
Community/Exclusion Zone Air Monitoring	Rent Particulate meter (Qty 2)	2	each	$1,000	$2,000
Site Safety Officer	10 hrs/day, 5 days/wk, $105/hr, 100% of project duration	1	Manweeks	$5,250	$5,250
Surveying	2-person crew @$105/hr, 8 hr/day, assume 50% of project duration	2	days	$1,680	$3,360
Building Inspection	1 site visit, (8 hrs) + report (20 hrs)	28	HR	$100	$2,800
Building Shoring		1	LS	$5,000	$5,000
Dewatering	Pumping 8 hrs, attended 8 hours, 20 LF suction hose, 100-ft discharge hose, 2-inch' diaphragm pump	2	days	$860	$1,720
Shoring	Weekly rental rate for braces. Includes delivery costs. Minimal rental of 1 week	1	Week	$6,750	$6,750
Shoring Installation/Removal	Includes 2 operators, 2-CY excavator, dozer, and laborers	2	days	$5,055	$10,111
Excavation	Includes 2-CY hydraulic excavator, 165 CY/hour, assume 25% efficiency	0	BCY	$7	$0
Transport		0	Ton	$45	$0
Disposal		0	Ton	$100	$0
Backfill	Includes material and transportation costs	0	LCY	$29	$0
Compaction	Vibrating plate	200	BCY	$17	$3,410
Analytical Testing	Post-excavation sampling	6	Each	$104	$624
Oxidant Materials	300 sq ft requires 331 lbs Regenses PersulfOX, including material and delivery costs.	331	LBS	$3	$828
Oxidant Application	Spread by excavator (5 ft below excavation bottom)	4	HR	$84	$337
Site Restoration	Hauling (asphalt)	4	CY	$6	$24
Site Restoration	Replace Paving at the site	33	SY	$19	$635
Subtotal					$69,848

Table 4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY

Item		Quantity	Unit	Unit Cost	Total Cost
SSDS System					
Pilot Test	To evaluate the depressurization requirements for the building	2	LS	$3,000	$6,000
Engineering Design	Design Drawings	1	LS	$15,000	$15,000
SSDS System	1 fan, 2 draw points (includes piping)	2	Each	$12,000	$24,000
SSDS Electric Installation		2	LS	$1,000	$2,000
Subslab Monitoring Points	For O&M inspections, sampling, etc. (5/building)	10	Each	$1,000	$10,000
System Startup	Assume 4 visits (1 person @ 8 hrs/day)	32	HR	$100	$3,200
Subtotal:					$60,200
Groundwater Well Installation					
Groundwater Well Installation	Two contingency wells and one replacement well, includes mobilization/demobilization and installation costs	1	LS	$10,000	$10,000
Installation Oversight	2 people @ 8 hours/day, 1 day	16	HR	$100	$1,600
Subtotal					$11,600
				Capital Cost Subtotal:	$151,648
				Location Factor Adjustment for Delmar, New York (0.977):	$148,160
				15% Project Administration	$22,747
				30% Contingency	$45,495
				15% Legal and Engineering Costs	$22,747
				10% Prime Contractor Profit	$15,165
				Total Capital Cost:	**$254,400**
<u>Annual SSDS O&M Costs</u>					
SSDS Electric	Yearly operating costs for the SSDS system	2	Each	$100	$200
O&M Inspection	Assume 1 site visit (1 person, 8 hrs/trip)	8	HR	$100	$800
O&M Materials		1	LS	$200	$200
Subtotal:					$1,200
				Annual O & M Costs Subtotal:	$1,200
				Location Factor Adjustment for Delmar, New York (0.977):	$1,172
				15% Project Administration	$180
				30% Contingency:	$360
				15% Legal and Engineering Costs	$180
				Total Annual Cost:	**$1,892**
				30 Year Present Value of Annual Costs:	**$42,400**

Table 4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY

Item		Quantity	Unit	Unit Cost	Total Cost
Annual Groundwater Monitoring (Year 1 through 4)					
Year 1					
Groundwater Sampling	8 wells, assume 3.5 wells/day, 2 persons, 10 hr/day	120	HR	$98	$11,760
Analytical Costs (VOCs)	14 VOC samples per round, including 8 wells, 1 duplicate sample, 1 MS, 1 MSD, and 3 trip blanks, 2 rounds	28	Each	$104	$2,905
Data Evaluation and Reporting		80	HR	$98	$7,840
Subtotal:					$22,505
Year 2 through 4					
Groundwater Sampling	8 wells, assume 3.5 wells/day, 2 persons, 10 hr/day	40	HR	$98	$3,920
Analytical Costs (VOCs)	14 VOC samples per round including 8 wells, 1 duplicate sample, 1 MS, 1 MSD, and 3 trip blanks	14	Each	$104	$1,453
Data Evaluation and Reporting		40	HR	$98	$3,920
Subtotal:					$9,293
				Groundwater Monitoring Subtotal:	$31,798
				Location Factor Adjustment for Delmar, New York (0.977):	$31,066
				15% Project Administration	$4,770
				30% Contingency:	$9,539
				15% Legal and Engineering Costs	$4,770
				Total Annual Groundwater Monitoring (Years 1 through 4) Cost:	**$50,145**
				Present Value of Annual Groundwater Monitoring (Years 1 through 4) Costs:	**$77,100**

Table 4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY

Item		Quantity	Unit	Unit Cost	Total Cost
5-Year Groundwater Monitoring and Peridoic Maintenance Costs (Year 5 through 30)					
SSDS System Fan	Replace fan every 5 years.	2	Each	$300	$600
Performance Review		1	LS	$5,000	$5,000
Institutional Control Administration		1	LS	$5,000	$5,000
Groundwater Sampling	8 wells, assume 3.5 wells/day, 2 persons, 10 hr/day	60	HR	$98	$5,880
Analytical Costs (VOCs)	14 VOC samples per round, including 8 wells, 1 duplicate sample, 1 MS, 1 MSD, and 3 trip blanks	14	Each	$104	$1,453
Data Evaluation and Reporting		40	HR	$98	$3,920
Subtotal:					$21,853
				5-Year Monitoring Cost Subtotal:	$21,853
				Location Factor Adjustment for Delmar, New York (0.977):	$21,350
				15% Project Administration:	$3,278
				30% Contingency:	$6,556
				15% Legal and Engineering Costs:	$3,278
				Total 5-Year Costs:	**$34,461**
				30-Year Present Value of 5-Year Costs:	**$148,400**
				2012 Total Present Value Cost:	**$522,300**
				5% Construction Management	**$26,115**
				Total Cost:	**$548,500**

Table 4-2 Cost Estimate for Alternative 3: Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems and Chemical Oxidant, Former Roxy Cleaners Site, Delmar, NY

Item	Quantity	Unit	Unit Cost	Total Cost

Key:

LS: Lump Sum

SF: Square Foot

BCY: Cubic Yard

CF: Cubic Foot

HR: Hour

Notes/Assumptions:

1. Excavation assumes an aerial extent of: 300 SF
   and an overburden depth of: 20 LF
   for a overburden volume of: 6000 CF
   or (in BCY): 230 BCY
2. Site restoration assumes paving over excavated area.
3. Oxidant Costs include product and delivery system.
4. Contingency assumed at: 30%
5. Project Administration assumed at: 15%
6. Legal and Engineering Costs assumed at: 15%
7. Prime Contractor costs assumed at: 10%
8. Total Monitoring Time: 30 years
9. Long-Term Monitoring occurs semi-annual for 1 year, annual for 4 years, and every 5 years after that.

Total number of groundwater monitoring wells to be sampled: 7 wells

10. Present value costs assumes annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 July 2000) and the Office of Management and Budget Real Discount Rates for the year 2011 (http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html) at

Annual interest rate: 2%

11. Institutional Controls include: Environmental Easements, Deed restrictions, etc.
12. SSDS system based on square footage of building and soil vapor/air sampling results.
13. Unit costs listed were obtained from 2012 RS Means Cost Data and engineering judgement.

13. In-situ bulk density of site soils was assumed to be 2 Tons/BCY

Table 4-3 Summary of Total Present Values of Remedial Alternatives at the Former Roxy Cleaners Site

Description	Alternative 1 No Action	Alternative 2 Long-Term Monitoring, Institutional Controls, and Sub-Slab Depressurization Systems	Alternative 3 Excavation and Off-Site Disposal, Institutional Controls, Sub-Slab Depressurization Systems, and Chemical Oxidant
Estimated Total Project Duration (years)	0	30	30
Capital Cost	$0	$130,900	$254,400
Annual O&M[1]	$0	$128,800	$119,500
Periodic O&M[2]	$0	$147,800	$148,400
2012 Total Present Value of Alternative[3]	**$0**	**$427,900**	**$548,500**

Notes:

1 Annual costs would typically include electrical costs and maintenance costs for SSD systems, groundwater monitoring, and reporting.

2 Periodic costs would typically include maintaining/replacing SSDS system fans, maintaining/updating institutional controls, and groundwater monitoring and reporting.

3 The total present value of the alternative represents the estimated present value of the capital costs and 30 years of annual and periodic costs.

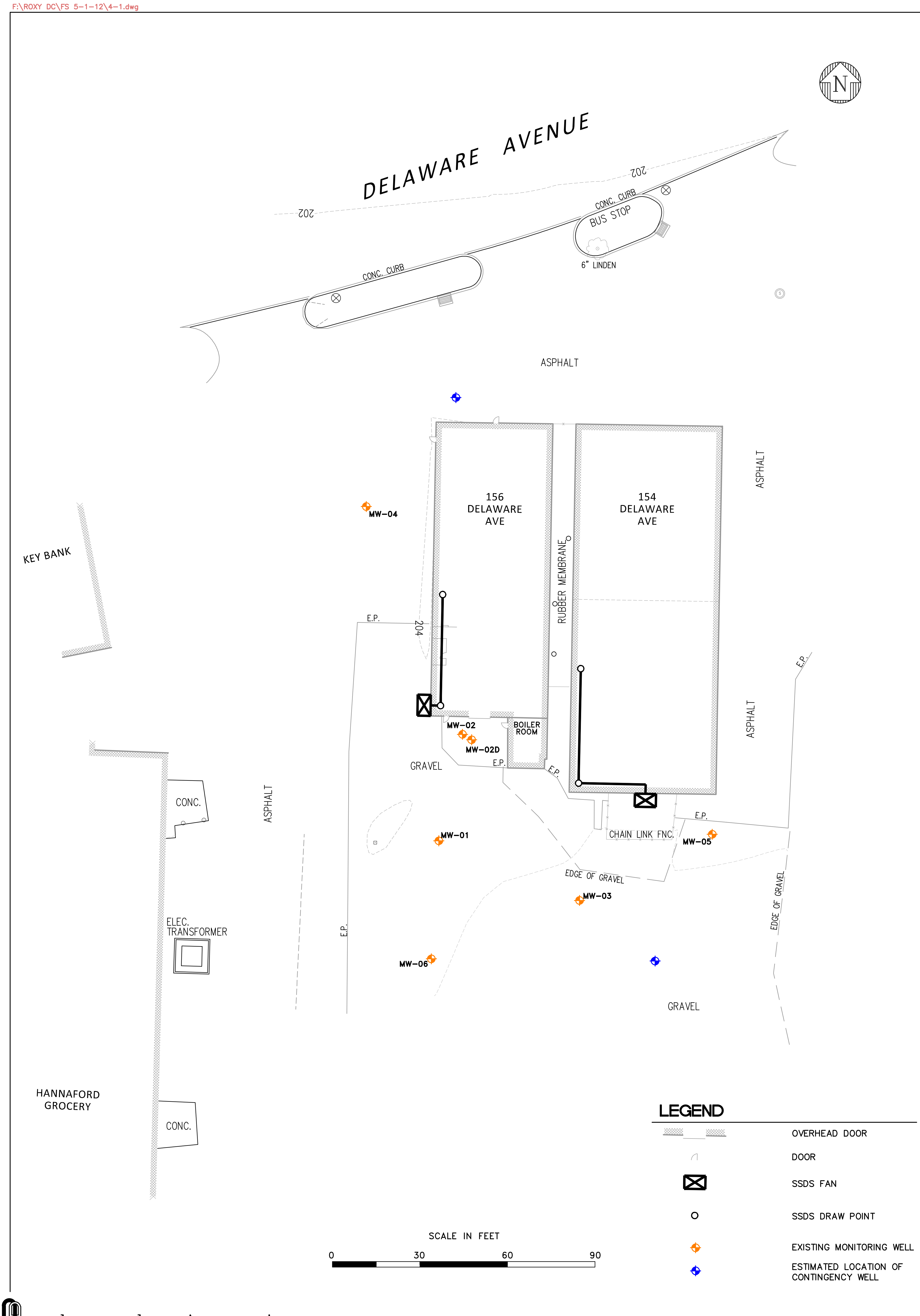

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FIGURE 4-1: ALTERNATIVE 2
FORMER ROXY CLEANERS

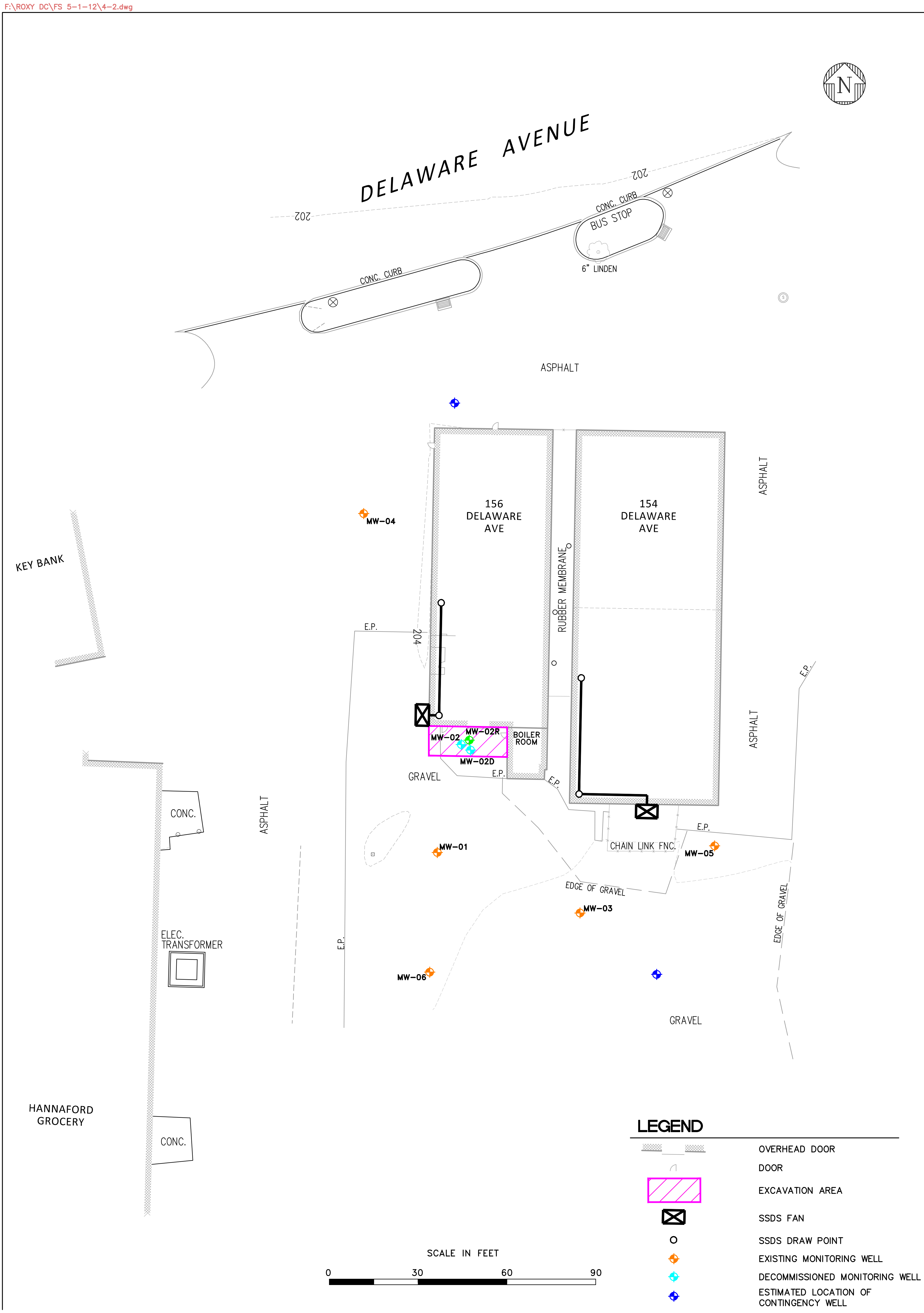

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FIGURE 4-2: ALTERNATIVE 3
FORMER ROXY CLEANERS

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