ENGINEERING DESIGN REPORT

AMERICAN CLEANERS SITE

BINGHAMTON, BROOME COUNTY, NEW YORK

(SITE N0. 7-04-030)

WORK ASSIGNMENT NO. D003600-39

Prepared For

New York State Department of Environmental Conservation

MARCH 2006

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

ENGINEERING DESIGN REPORT

for the

AMERICAN CLEANERS SITE
SITE NO. 7-04-030
CITY OF BINGHAMTON
BROOME COUNTY, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK

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WOODBURY, NEW YORK

MARCH 2006

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TABLE OF CONTENTS

List of Figures

List of Tables

1.0 INTRODUCTION

The American Cleaners Site, located in the City of Binghamton, Broome County, New York (Figure 1-1), is a New York State Class 2 inactive hazardous waste disposal site, Registry Number 7-04-030. The New York State Department of Environmental Conservation (NYSDEC) issued a Remedial Design work assignment to Dvirka and Bartilucci Consulting Engineers (D&B) to address the American Cleaners Site. This Engineering Design Report is a deliverable under the work assignment.

1.1 Project Objective

As part of New York State's program to investigate and remediate hazardous waste sites, the NYSDEC issued a remedial design work assignment for the American Cleaners Site to D&B to provide design services to address contaminated soil resulting from the improper disposal of hazardous waste at the site. In accordance with the Record of Decision (ROD) issued by the NYSDEC in November 2002, the remedial alternative selected for the site includes excavation and off-site disposal of contaminated soil. The purpose of this report is to present a conceptual design for the selected remedial alternative.

1.2 Site Location, Ownership and Access

The American Cleaners Site is located at 48-50 Walnut Street in the City of Binghamton, Broome County, New York. The site is approximately 0.1 acre in size and is bounded on the north by a house and driveway, on the south by Seminary Avenue, on the east by a house and on the west by Walnut Street. The site is occupied by a dilapidated 1-story masonry building that is attached to a 2-story wooden building and a smaller masonry block building. The site layout is shown on Figure 1-2. The site is currently owned by the City of Binghamton.

Access to the site is from either Walnut Street or Seminary Avenue and is unrestricted, although access to the building on the site is restricted by plywood covering over doors and windows.

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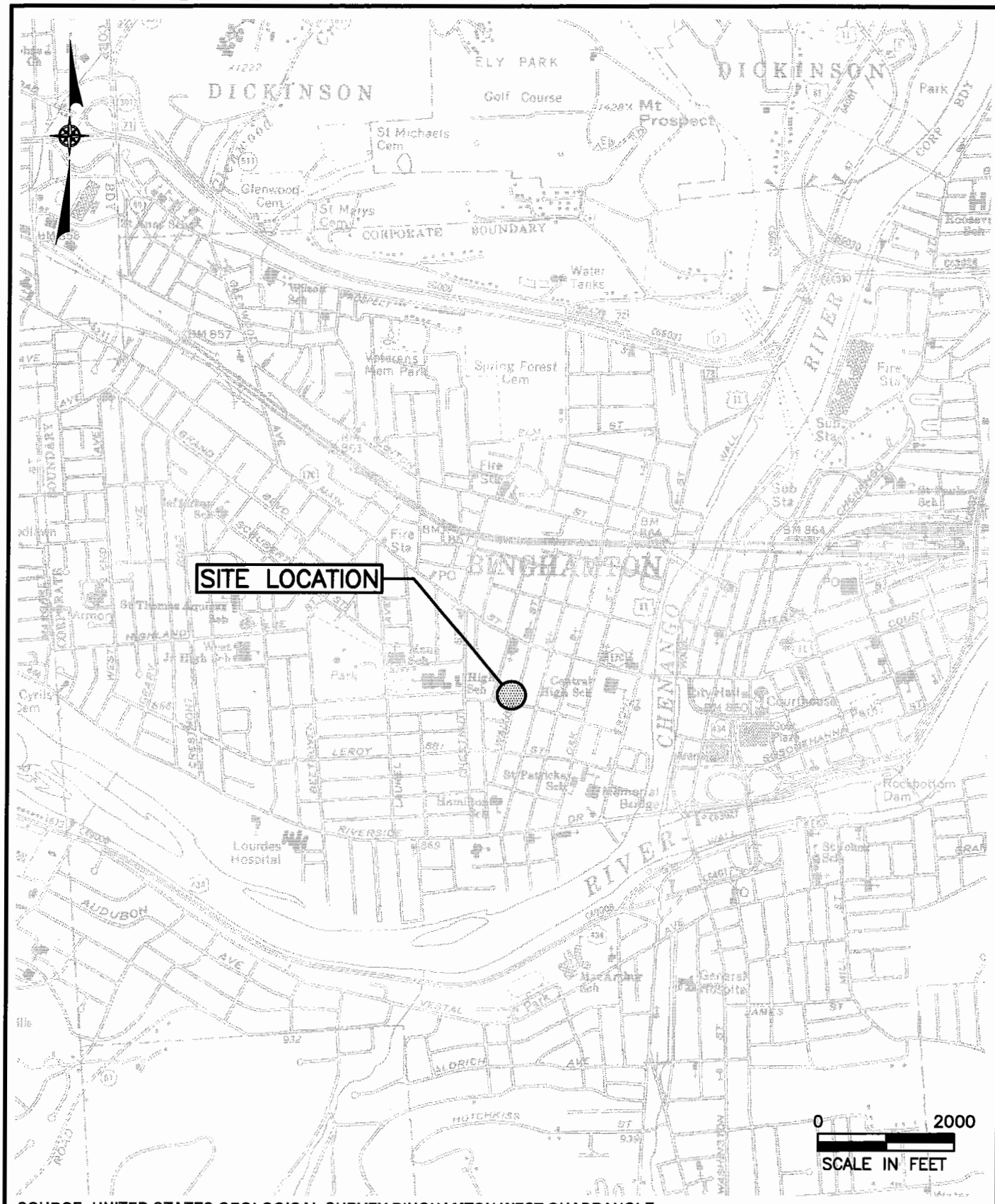

SOURCE: UNITED STATES GEOLOGICAL SURVEY BINGHAMTON WEST QUADRANGLE

AMERICAN CLEANERS SITE REMEDIAL DESIGN
BINGHAMTON, NEW YORK

Dvirka and Bartilucci CONSULTING ENGINEERS
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SITE LOCATION MAP

FIGURE 1-1

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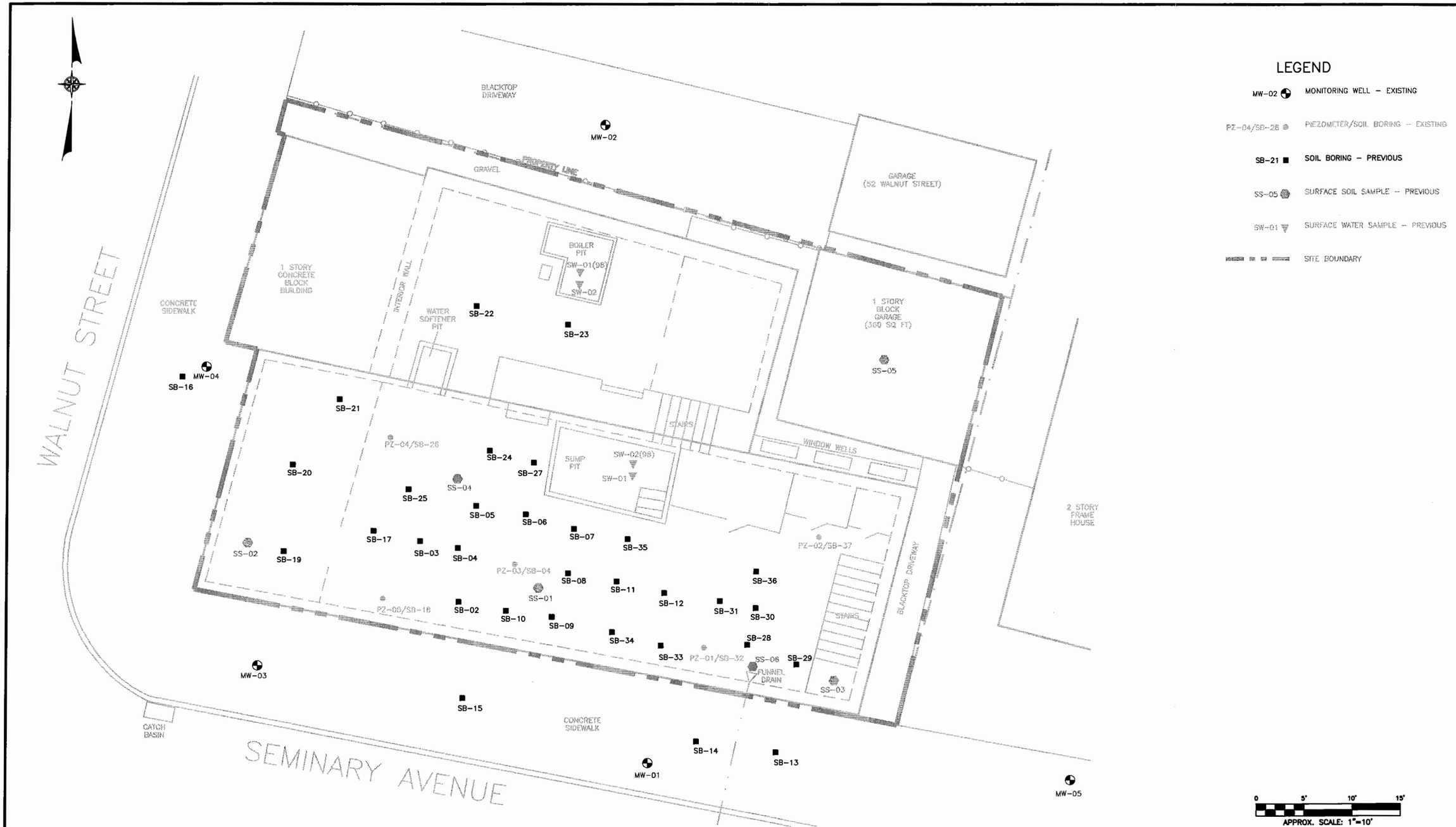

AMERICAN CLEANERS SITE REMEDIAL DESIGN
BINGHAMTON, NEW YORK

SITE LAYOUT

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FIGURE 1-2

1.3 Site History

The American Cleaners Site is an abandoned dry cleaner that closed in 1991, and the site has been vacant since that time. In 1998, a records search conducted by the NYSDEC revealed that tetrachloroethene (PCE) was stored and disposed at the site. The PCE was stored in a 275-gallon tank in the basement of the main building for use as the dry cleaning solvent. Based on a site visit by D&B in March 2004, it appears that all solvent storage tanks have been removed from the site. Substantial amounts of dry cleaning solvents were spilled, reportedly due to poor housekeeping practices. The spilled solvents contaminated soil and groundwater underlying the building, apparently through three sumps identified in the building basement.

According to information from the NYSDEC, other dry cleaning equipment and solvents were also stored in the small masonry building at the site. The specific materials and quantities that were stored in this building are unknown.

1.4 Previous Investigations

To date, five environmental investigations have been conducted at the site. The first of these was an environmental assessment conducted in April 1995. As part of this assessment, a composite soil sample was found to contain PCE at a concentration exceeding 200 milligrams per kilogram (mg/kg). The NYSDEC Recommended Soil Cleanup Objective (RSCO) for PCE is 1.4 mg/kg.

In May 1995, five soil samples were collected for analysis of PCE only. Detected concentrations ranged from 1.4 mg/kg to 410 mg/kg.

A subsurface investigation was conducted at the site by a prospective buyer in July 1995. Since soil contamination had previously been identified at the site, the purpose of this investigation was to evaluate groundwater quality. PCE and toluene were detected in soil vapor samples collected from four direct push sample locations. The detected concentrations were not reported. Since the direct push rig could not penetrate deeper than 6 feet below ground surface,

no groundwater samples could be collected. The reported depth to groundwater at the site is approximately 12 feet below ground surface.

In February and March 1998, the NYSDEC conducted an Immediate Investigation Work Assignment (IIWA) at the site. The activities of the IIWA included:

- construction of four soil borings;
- collection of four subsurface soil samples for laboratory analysis;
- collection of five soil samples from beneath the foundation of the main building;
- collection of a surface soil sample from the floor of the smaller building;
- collection of one sediment sample and two water samples from two of the three sumps in the basement of the main building;
- construction of four piezometers to determine the site-specific groundwater flow direction; and
- construction and sampling of three groundwater monitoring wells.

The soil beneath the basement foundation was found to contain PCE at concentrations up to 4,400 mg/kg. PCE concentrations in groundwater ranged up to 24,000 micrograms per liter (µg/l). The NYSDEC Class GA groundwater standard for PCE is 5 µg/l.

Based on the results from these investigations, the American Cleaners Site was listed on the NYSDEC Registry of Hazardous Waste Sites (Site No. 7-04-30) in January 1999.

In November 2000, the NYSDEC conducted the initial phase of a remedial investigation (RI) at the site. The second phase of the RI was conducted in January and February 2001. The field activities conducted during the RI included subsurface soil sampling to delineate the horizontal and vertical extent of contamination, construction of piezometers and monitoring wells to define the site-specific groundwater flow direction and characterize groundwater quality, and collection of indoor air samples from the main building to evaluate whether the volatile organic compounds (VOCs) detected beneath the building were impacting air quality within the

building. The results of the RI were presented in a Remedial Investigation Report, dated July 2001. Based on the RI results, the contaminants of concern identified for this site are VOCs, in particular PCE, trichloroethene (TCE) and 1,2-dichloroethene (1,2-DCE). TCE and 1,2-DCE are breakdown products of PCE.

Potential remedial alternatives were identified, screened and evaluated in a Feasibility Study (FS) Report, dated May 2002. In November 2002, the NYSDEC issued a ROD which identified the selected remedy for the site. The selected remedy includes the following elements:

- remedial design program;
- demolition of all aboveground and below-ground structures;
- excavation and off-site disposal of contaminated soil; and
- site restoration, including backfill of open excavations and foundation areas, grading placement of 6 inches of topsoil and seeding.

A pre-design investigation has been completed by D&B as part of the remedial design work assignment issued by the NYSDEC. The purpose of the pre-design investigation was to evaluate existing conditions on-site and collect information required for the design of the selected remedial alternative. Field activities associated with the pre-design investigation were conducted from July 2004 through September 2004. The results of the pre-design investigation were presented in a report prepared by D&B, dated November 18, 2004.

2.0 PRE-DESIGN INVESTIGATION

As mentioned above, a pre-design investigation was conducted by D&B in 2004 as part of the remedial design work assignment issued by the NYSDEC. The purpose of the pre-design investigation was to evaluate existing on-site and off-site conditions, as well as to collect information required to advance the design of the selected remedial alternative for the American Cleaners Site. Presented below is a summary of the pre-design investigation results.

The field program was completed in three phases. The first phase was conducted in July 2004 and consisted of asbestos and lead-based paint surveys along with the collection of soil samples from beneath the concrete basement floor of the American Cleaners building. The second phase of the investigation was completed in August 2004 and consisted of a property boundary survey, and the existing wells were surveyed. The third phase of the investigation was conducted in September 2004 and consisted of the collection of soil vapor samples beneath the basement floor slabs of residences adjacent to the site.

2.1 Geology

Unconsolidated deposits at the site have been mapped as outwash and kame sand and gravel and glacial till (Muller, et. al., 1986). Outwash deposits consist of coarse- to fine-grained gravel with sand and proglacial fluvial silts and sands. Sediment textures are generally finer further from the glacial ice border during deposition. Glacial till consists of dense compacted unsorted silt, clay and gravel.

The description of site geology is based on observations made during the RI and are summarized here from information presented in the RI Report (URS, 2001). An uppermost unit consists of fill, which is underlain by stratified silts, sands and gravels and the lowermost unconsolidated deposit of clay and silt with boulders and gravel. A thin veneer of fill was reportedly present at some boring locations during the RI. A 2- to 5-foot thick layer of silt and sand was present beneath the fill layer. A wedge of permeable sand and gravel was identified at the northern and eastern portions of the site, however, that unit was absent directly beneath the

site. A very dense silt layer was observed beneath the silt and sand unit and it is reported that this unit underlies the basement of the building at the site. The dense silt layer was estimated to be between 6 and 9 feet thick. A sand and gravel unit was identified beneath the dense silt layer and was estimated to be approximately 18 feet thick. A very dense clay and silt with shale fragments underlies the sand and gravel unit and was interpreted to be glacial till.

Bedrock geology in the vicinity of the site has been mapped as the Sonyea Group which are Lower Devonian in age and consist of shales, siltstones and limestones (Rickard, et. al., 1970).

2.2 Hydrogeology

Based on water table elevation measurements recorded during the pre-design investigation, depth to groundwater ranges from 9 to 16 feet below ground surface at the site. The predominant direction of groundwater flow in the study area was determined to be to the north. Hydraulic conductivity values for the site range from 1.6×10^{-3} centimeters per second (cm/sec) to 2.9×10^{-4} cm/sec (URS, 2001). The hydraulic gradient for the site was estimated to be 0.055 feet per feet (URS, 2001).

2.3 Lead and Asbestos

Asbestos and lead-based paint surveys were conducted and included the collection and analysis of twenty-one (21) suspect asbestos-containing materials (SACM) for asbestos content and the collection and analysis of thirty-one (31) paint chip samples for lead-based paint. In addition, painted surfaces were visually inspected to note their equivalence to the samples collected.

Asbestos containing material is any material or product, which contains more than 1% asbestos by weight. Eight samples analyzed contained more than 1% asbestos. Detailed descriptions of these materials are presented in a report entitled "*Inspection for Asbestos Containing Materials and Lead-Based Paint,*" prepared by YEC, Inc. Based on the asbestos

investigation, 2,297 square feet and 82 linear feet of asbestos containing material were found on site.

Lead-based paint is defined as paint or other surface coatings that contain lead equal to or in excess of 1.0 milligram per square centimeter or more than 0.5 percent by weight. Ten samples analyzed contained more than 0.5 percent lead by weight. Detailed descriptions of confirmed lead-based paint and paint equivalents are also presented in the report entitled "*Inspection for Asbestos Containing Materials and Lead-Based Paint,*" prepared by YEC, Inc.

2.4 Soil Sampling

Three subsurface soil samples (CS-1, CS-2 and CS-3) were collected from beneath the concrete floor in the basement as part of the pre-design investigation for waste disposal characterization. The samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP semivolatile organic compounds (SVOCs), TCLP pesticides/herbicides, TCLP metals, PCBs, reactivity and ignitability. In addition the samples were subjected to a paint filter test to determine if they contained any free liquid. Tetrachloroethene was detected above regulatory limits (700 µg/l) in one soil sample (CS-2) at a concentration of 920 µg/l. There were no other VOCs detected above regulatory limits in the soil samples. SVOCs, pesticides, herbicides, PCBs, metals, flashpoint, cyanides and sulfides were not detected above regulatory limits in the soil samples. In addition, free liquids were not present in the samples.

2.5 Site Survey

As part of the pre-design investigation a base map and certified property survey of the site were prepared. The survey for the site was compiled from an on-site ground control survey. Site features on the map include roads, buildings and monitoring wells. Monitoring wells were surveyed to the nearest 0.01 feet for location and elevation. The survey was prepared in the New York State Plane (NYSP) coordinate system (NAD 1983 and NAVD 1988).

2.6 Sub-Slab Soil Vapor Sampling

Sub-slab soil vapor sampling was conducted during the pre-design investigation, as requested by the New York State Department of Health (NYSDOH). Sub-slab soil vapor samples were collected beneath the houses adjacent to the north and east of the American Cleaners Site in order to evaluate the need for mitigation systems. Samples were collected with 6-liter Summa® canisters set up to collect air samples for one hour and analyzed for chlorinated VOCs, benzene, toluene, ethylbenzene and xylene (BTEX) and methyl-tert-butyl ether (MTBE) by Method TO-15 using selective ion monitoring.

The results of the pre-design investigation showed that VOCs were detected in sub-slab soil vapor samples collected from houses adjacent to the American Cleaners Site. As a result of elevated levels of tetrachloroethene detected in the sub-slab soil vapor samples, the NYSDOH and NYSDEC have requested that additional sub-slab soil vapor samples as well as indoor air samples be collected from several houses in the area of the site. The additional soil vapor and air sampling is ongoing at this time.

2.7 Underground Storage Tank

A potential underground storage tank (UST) vent pipe was observed along the east side of the site building during initial pre-design investigation site activities. Subsequent discussions with Broome County Department of Health personnel suggested that a UST had been used at the American Cleaners Site for gasoline storage for use with delivery vehicles during the operation of the site.

The vent pipe was hand excavated from the east side of the site building to the eastern property line in August 2004. Observations suggested that the UST was potentially located on the residential property to the east of the American Cleaners Site. In an attempt to verify the presence of the UST while limiting disruption to the residential property east of the site, a geophysical survey was performed in February 2005. The geophysical survey was inconclusive regarding the presence of the UST due to the inability to access the suspected location of the

UST because of hedge located to the south of the porch at the residential property. Further hand excavating and hand augering was performed in March 2005. This additional excavating uncovered a 2-inch diameter fill port located under the hedge, which confirmed the presence of the UST. Measurements of the UST indicate that the tank is 4 feet in diameter and that the fill pipe is 2.65 feet in length (i.e., the top of the UST is situated 2.65 feet below grade). Approximately 0.2 feet of liquid was observed in the UST and there was no discernable petroleum odor.

3.0 BASIS OF DESIGN

3.1 Introduction

As discussed in Section 1.0, the objective of this work assignment is to provide design services for the excavation and off-site disposal of contaminated soil present at the American Cleaners Site. The zone of contamination has been defined as the zone of unsaturated soil exhibiting tetrachloroethene at greater than 1.4 mg/kg. In addition, a limited volume of saturated soil potentially exhibiting tetrachloroethene contamination greater than 1.4 mg/kg may also require remediation. Using the plume delineation presented in the FS Report (URS, 2002) remedial activities are designed to address the contaminated soil present at the American Cleaners Site. Presented below is the conceptual design for the soil remediation. Basic design data, permits and approvals required for construction and site constraints are also addressed in this section.

3.2 Removal of Lead-Based Paint and Asbestos

Results of the pre-design investigation indicate that 2,297 square feet and 82 linear feet of asbestos containing material are present at the site. In addition, ten paint-chip samples analyzed during the pre-design investigation contained more than 0.5 percent lead by weight indicating that lead-based paint is present.

Lead-based paint and asbestos will require removal prior to other site remediation activities. The lead-based paint and asbestos removal activities will need to be performed by New York State Department of Labor-approved personnel. It is anticipated that lead-based paint will be removed by scraping painted areas that contain more than 0.5 percent lead by weight. The asbestos containing material identified during the pre-design investigation will be removed under a negative pressure atmosphere and disposed of properly at an off-site location.

3.3 Underground Storage Tank Removal

The planned remediation activities for the site will include the decommissioning of the UST and associated piping present at the site. Tank decommissioning will be performed in accordance with NYSDEC regulations, American Petroleum Institute (API) Recommended Practice 1604, Removal and Disposal of Used Underground Petroleum Storage Tanks, and API Publication 2015, Cleaning Petroleum Storage Tanks. The following presents the activities that will be performed to decommission the UST.

The City of Binghamton fire department will be notified in advance of UST removal activities. Dig Safely New York (Underground Facilities Protective Organization) will be contacted at least three days prior to initiating any excavating at the site to have underground utilities located. The hedge over the tank location will be excavated and removed from the site.

Subsurface soil will be excavated and the UST will be exposed. Soil excavated from around the UST will be loaded into trucks for transportation and disposal off-site. Following exposure of the top of the UST, any existing pipe runs from the UST will be followed from the tank to the terminus of the pipes. The pipes will be emptied, removed and staged for disposal. Any product contained within the piping runs will be containerized for proper disposal. The UST will be opened prior to removal from the excavation and any product remaining in the UST will be pumped out and containerized for transport offsite for disposal. The UST will then be inerted according to proper procedures. The UST will then be removed from the ground. Subsequent to removal the UST will be cut open and cleaned of residual product. Once cleaned, the UST will be certified clean and removed from the site for disposal as scrap metal. Labeling will indicate that the UST is not suitable for reuse and the date of removal. Labeling will be in legible letters at least 2-inches high.

It is anticipated that groundwater will be encountered at a depth of approximately 9 feet below grade at the site. Background information indicates that the UST at the site is a 500-gallon capacity tank. Based on typical dimensions for a 500-gallon UST, the diameter of the UST is anticipated to be 4.0 feet. Therefore, the UST appears to be situated above the water table.

During the implementation of the UST removal activities confirmation soil sampling will be performed. Confirmatory soil samples will be collected from the excavation and will include each of the four excavation walls and one from the excavation bottom. Samples from the sidewalls of the excavation will be collected from the midpoint of the length of the wall and approximately one third from the bottom. Soil samples will be obtained using the excavator and will be collected by exposing "undisturbed" soil from within the excavator bucket. Confirmatory samples will be analyzed for Target Compound List (TCL) VOCs and TCL semi-volatile organic compounds (SVOCs).

3.4 Building Demolition

Following the removal of lead-based paint and asbestos from the site building, the building will be demolished and removed. Removal of the approximately 50 foot by 75 foot building will provide work space and a staging area for the remediation activities.

3.5 Excavation

Subsequent to the demolition of the site building, contaminated soil will be excavated from the site. Based on the results presented in the RI Report (URS, 2001), the area of contaminated soil is estimated to be 18 feet by 55 feet. According to the responsiveness summary to the Record of Decision, glacial till encountered at approximately 3 feet below the basement floor slab serves to contain/confine the contamination vertically. Based on this information, the remedial construction in this area will consist of excavation and off-site disposal of 4 feet of soil beneath the basement floor slab (extending approximately 1 foot into the glacial till). Post-excavation sample results will determine if additional excavation is required.

In the event that post-excavation soil sampling indicates that contamination is still present below the 4-foot depth, additional soil excavation activities will be performed. These activities will consist of excavating an additional 2 feet only in areas where the site-specific remediation

objectives have not been met, as determined by the NYSDEC. In order to accomplish this activity dewatering of the excavation may be required.

Dewatering activities, if required, will be performed in accordance with all applicable federal, state and local requirements. The selected remedial Contractor will be required to submit a dewatering plan, signed and sealed by a Professional Engineer licensed in New York State, for review and approval prior to the onset of excavation activities.

3.6 Backfilling

The UST and site excavations will be backfilled with clean fill material obtained from an offsite source. Backfill will be compacted with a walk behind compactor during placement and will consist of compacting lifts of 12-inches. The excavation will be backfilled to an elevation consistent with the grade prior to the remediation activities. Asphalt is not planned for site restoration at this time, however, topsoil is planned for the top 6-inches of backfill at the site and the UST location on the residential property to the east.

3.7 Final Site Restoration

Final site restoration will consist of placement of topsoil for the top 6-inches of backfill at the site and the UST location on the residential property to the east. Backfilled areas will be seeded and mulched following completion of backfilling. All equipment and materials utilized during the site remediation will be removed from the site prior to contractor demobilization.

3.8 Permits and Approvals

Several permits and approvals will be required for the implementation of the selected remedy, including the following:

- Approvals will be required from the City of Binghamton for activities within City roads (street work permits), including the placement of a construction trailer, staging

of equipment and trucks utilized for disposal of demolition material and excavated soil.

- Groundwater from dewatering activities, if required, will be discharged to the existing City of Binghamton sanitary sewer system via a designated sanitary sewer manhole. The discharge of groundwater from dewatering operations will be in accordance with the Binghamton-Johnson City Joint Sewage Board requirements and approval.

3.9 Site Constraints

The intent of this section is to provide a description of potential site constraints, i.e., access and utilities associated with the implementation of the selected remediation for the site.

The American Cleaners Site is relatively small, is located in a densely populated residential neighborhood and is situated at the intersection of two roads. Access to the site will be constrained by the goal to maintain traffic flow along the roads that bound the site. In addition, due to the limited size of the site and the presence of the structure at the site, access for equipment staging will be limited. However, construction activities will be conducted near or on the streets. As a result, special consideration will be given to vehicle and pedestrian traffic during the remediation. Construction vehicles and equipment may be temporarily staged on the street. It may be necessary to temporarily close one or more of the streets to through traffic and a flagman may be required.

The UST removal will be conducted primarily on a residential parcel located to the east of the project site. A porch located along the south side of the house at that parcel will present potential constraint issue due to the proximity of the UST to the porch. Observations during the pre-design investigation indicate that there is 2 feet of clearance between the UST and the edge of the porch, however, structural integrity of the porch will need to be maintained during the removal of the UST.

In addition, a buried natural gas line is located along the western portion of the residential property to the east of the project site. It appears that the vent and dispenser pipes associated with

the UST are situated above the natural gas line and the gas line should not pose an issue during the removal of the UST piping, however, protection of the gas line is a potential site constraint.

4.0 COST EVALUATION

4.1 Purpose

The purpose of this cost estimate is to provide a budgetary value for funding the proposed remedial construction at the American Cleaners Site.

4.2 Cost Estimate

This cost estimate presents capital costs based on the conceptual design developed and presented in this report. The unit costs are based on values contained in RS Means, as well as data from recently completed projects. Table 4-1 summarizes the costs of the proposed remedial construction at the American Cleaners Site. As can be seen in Table 4-1, the estimated cost of the proposed remedial construction is approximately $440,000. Please note that the estimated cost does not include implementation of an annual post-construction groundwater-monitoring program.

TABLE 4-1
AMERICAN CLEANERS SITE
ENGINEERING COST ESTIMATE

Description	Unit	Estimated Quantity	Total Amount ($)
Submittals, Bonds and Insurance, Mobilization, Site Preparation, Temporary Facilities and Utilities, Restoration and Demobilization	L.S.	1	$67,000
Site Security	L.S.	1	$36,000
Removal of Drums of Investigative-Derived Waste	L.S.	1	$3,100
Removal of Liquid Hazardous Waste (Including Off-site Transportation and Disposal)	Gallon	2,300	$7,100
Structural Demolition and Removals	L.S.	1	$38,600
Asbestos Removal and Disposal	L.S.	1	$16,100
Lead Paint Abatement	L.S.	1	$5,100
UST Removal	L.S.	1	$2,200
Excavation 0 to 4 Feet Below Basement Floor Slab	C.Y.	180	$8,400
Excavation Greater Than 4 Feet Below Basement Floor Slab	C.Y.	90	$5,100
Dewatering	L.S.	1	$22,800
Post-Excavation Sample Collection and Analysis	Each	32	$8,100
Transportation and Disposal of Hazardous Soil	Ton	410	$115,600
Backfill	C.Y.	1,200	$47,400
Topsoil	C.Y.	90	$2,700
Seeding	S.Y.	480	$1,000
Planting	L.S.	1	$1,800
Pollution Liability Insurance	L.S.	1	$10,000

SUBTOTAL:	**$398,100**
10% CONTINGENCY:	**$39,810**
TOTAL:	**$437,910**

5.0 REFERENCES

D&B, 2004. Remedial Design Project Management Work Plan – American Cleaners Site. Site Registry No. 7-04-030. June 2004.

D&B, 2004. Pre-Design Investigation Report – American Cleaners Site. Site Registry No. 7-04-030. November 3, 2004.

Muller, et. al., 1986. Surficial Geologic Map of New York, Finger Lakes. New York State Museum – Geological Survey, Map and Chart Series #40.

NYSDEC, 1994. Determination of Soil Cleanup Objectives and Cleanup Levels. Division of Hazardous Waste Remediation Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046. January 24, 1994.

NYSDEC, 2001. Record of Decision, American Cleaners Site, Binghamton (C), Broome County, New York, Site Registry No. 7-04-030. November 2002.

Rickard and Fisher, 1970. Geologic Map of New York, Finger Lakes Sheet. New York State Museum and Science Service, Map and Chart Series #15.

URS, 2001. Remedial Investigation Report, American Cleaners Site. Site Registry No. 7-04-030. July 2001.

URS, 2002. Feasibility Study Report, American Cleaners Site. Site Registry No. 7-04-030. May 2002.