Feasibility Study
NYSDEC Site #837016

Location:

Former Starlite Dry Cleaners
331 North Main Street
Medina, New York

Prepared for:

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CERTIFICATION

"I Ann Aquilina *certify that I am currently a NYS registered professional engineer and that this Feasibility Study was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10)."*

100521	9/23/19	
NYS Professional Engineer #	Date	Signature

1. Introduction

This Feasibility Study (FS) was developed for the former Starlite Dry Cleaners property located at 331 North Main Street, Orleans County, Village of Medina, Town of Ridgeway, New York, hereinafter referred to as “the Site” (refer to Figure 1). The Site is part of the State Superfund Program (#837016) and is designated as a Class 2 site. This FS was completed in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (“DER-10”).

A 2010 investigation at the Site identified the presence of chlorinated volatile organic compounds (CVOCS) typically utilized in dry cleaning operations, specifically trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene and vinyl chloride, in soil and groundwater. In addition, select semi-volatile organic compound (SVOCs) and metals have been identified at elevated concentrations on the eastern end of the Site. The 2010 investigation was limited to the perimeter of the property due to presence of a building at the time which was later demolished in 2016. A Remedial Investigation (RI) was conducted in 2017 in accordance with DER-10 and the Remedial Investigation Work Plan approved by the NYSDEC and NYSDOH, dated July 2017. The RI defined the nature and extent of contamination at the Site and was utilized to develop this FS. The RI identified three (3) Areas of Concern (AOCs) for the Site. This FS evaluates remedial alternatives for the AOCs defined in the RI.

2. Site Description and History

The Site is located along North Main Street between the street and the Erie Canal in a predominately commercial area (refer to Figure 2). The Site is comprised of one (1) approximately 0.2-acre parcel that was once improved with a one (1) story, 4,332-square foot stone building with a 3,258-square foot addition. The Site building was reportedly heavily damaged by a fire in 2004 and demolished in 2016. Following demolition of the Site building, sand was used for filling and grading at the Site. Due to the elevation change between the road and the canal the sand was used to create a slope downwards toward the east. The Site currently remains unimproved.

The Site is surrounded by the Erie Canal to the east; a vacant former car dealership/auto repair and collision shop to the south; a bank to the north; and, an auto repair facility (formerly a gas station) to the west, across North Main Street.

The Site building was reportedly constructed with stone around 1830 and utilized as a produce warehouse. An addition to the north of the stone building was reportedly constructed around 1910 and initially was utilized as a livery and hitch barn. Based on a Phase I Environmental Site Assessment (ESA) completed in 2006 (refer to Section 3), the entire structure including the addition was utilized as an automobile sales and storage facility from approximately 1927 through 1948 and as a dry cleaning facility from 1953 through 2004.

The dry cleaning operation reportedly utilized PCE from 1953 until the 1990’s, when the business switched to a petroleum-based solvent. A fire heavily damaged the Site building in March 2004 and completely destroyed the dry cleaning facility. The Site building was demolished in 2016 but partial slabs were left in place to act as a cover and backfill was brought in and graded to gradually slope towards the canal.

Although the building has been demolished, the following information has been obtained through the review of historical documentation and prior reports:

- Dry cleaning operations were primarily completed in the west-central portion of the former stone building.
- The stone building had a basement which reportedly had concrete and dirt floors.
- Floor drains were not observed within the building during the 2006 Phase I ESA. However, observations were limited due to the dilapidated nature of the building at that time.
- A boiler room on the lower level of the 1910 addition (presumed to be the eastern side of the building) was reportedly used to service dry cleaning equipment.
- A former "mechanics pit" associated with historical automotive repair operations was previously located in the 1910 addition but had been filled with concrete by the time of the 2006 Phase I ESA. This pit was reportedly 3-feet (ft) wide and 20-ft long.
- Sanborn Fire Insurance mapping depicts various water lines extending under the Site from Main Street to the canal in the late 1800's and early 1900's. In addition, a sanitary sewer line is reportedly located between the Site and the canal, oriented parallel with the canal. A preferential pathway along the sewers has not been identified.

In addition to the historical information associated with the Site, the following information was identified regarding adjacent properties:

- The southern and western adjacent properties were historically utilized for automotive repair. Several closed NYSDEC Spill listings have been identified for these properties. In addition, a former owner of the Site reported the historical surface discharge of automotive repair wastes at the southern adjacent property.
- Sanborn mapping depicts a paper pail manufacturing facility adjacent to the north of the Site in the late 1800's. Paper manufacturing operations have historically utilized potentially hazardous materials including mercury. In addition, a "press room" is depicted on Sanborn mapping extending from the northern adjacent property onto the Site at the time of paper manufacturing operations. The exact nature of pressing operations depicted on the historical mapping is unknown.
- A gasoline filling station was historically located to the southwest of the Site, beyond Main Street.

3. Previous Investigations

3.1 Phase I ESA Completed by Earthworks Environmental, January 2006

A Phase I ESA report completed by Earthworks Environmental ("Earthworks") for the Medina Historical Society in January 2006 identified several Recognized Environmental Conditions (RECs) generally associated with historical operations completed at the Site. Specifically, RECs were identified associated with the following items.

- *Suspected impairment of soil and/or groundwater quality from discharges associated with former dry cleaning operations on the Site*: The Site was reportedly used as a dry cleaning plant from approximately 1953 until 2004 when the facility was destroyed by fire. The previous owner/operator reported that PCE was used as a solvent in dry-cleaning equipment operated on the Site from 1953 until sometime in the 1990's when the dry cleaning system was converted to a petroleum-based solvent. Spent dry cleaning filters, lint and other wastes generated by dry cleaning operations were reportedly disposed of properly and according to appropriate regulation(s) by Safety Kleen, Inc. from the 1970's to the 1990's. However, dry cleaning wastes were also generated during the period from 1953 to the 1970's, before waste disposal regulations were promulgated. As such, Earthworks identified that the potential existed for dry cleaning wastes to have been discharged onto the Site and the soil and/or groundwater quality to have been impaired.
- *Suspected impairment of soil and/or groundwater quality on the Site from discharges associated with automotive repair and collision shop operations on adjoining property to the south*: The adjoining property at 333 Main Street has a history of use as an automotive sales, service and collision repair facility from approximately 1927 to 1971. The former Site owner reported observing wastes from automotive repair operations being discarded on the ground surface at 333 Main Street on several occasions. As such, the potential exists that automotive repair wastes have migrated onto and impacted the soil and groundwater quality on the Site.
- Earthworks identified a REC associated with suspect asbestos containing materials. However, based on the demolition of the building in 2016, this REC is no longer applicable.

Based on the RECs identified, Earthworks recommended that a subsurface investigation be performed to evaluate soil and groundwater for impacts associated with the historical dry cleaning operation on-site, and for impacts associated with the historical use of the southern adjoining property as an automotive mechanical and collision repair shop, specifically due to wastes reportedly discharged to the ground surface.

3.2 Site Characterization Report Completed by NYSDEC, October 2010

A field investigation was conducted by the NYSDEC on November 16, 2009 which included the advancement of five (5) direct push overburden soil borings until equipment refusal (5.2-ft. to 11.1-ft bgs). Two (2) of the borings (GP-4 and GP-5) were advanced at the western Site boundary, physically upgradient from the remainder of the Site. Two (2) borings (GP-2 and GP-3) were advanced at the eastern Site boundary which is physically downgradient from the rest of the Site. One (1) boring (GP-1) was advanced along the southern Site boundary adjacent to the former automotive repair and collision shop property. At the time of the investigation, the Site building was reportedly not investigated due to dangers of the potentially unstable structure. Refer to Figure 2 for testing locations.

Groundwater samples were collected from the two (2) downgradient borings and analyzed for VOCs and SVOCs. Groundwater was reportedly not encountered in the two (2) upgradient borings along the southern property boundary. The following summarizes exceedances in groundwater at the Site.

- Groundwater in the northern boring along the eastern Site boundary (GP-2) detected two (2) compounds above regulatory standards:
  - Cis-1,2-Dichlorethene (cis-1,2-DCE) at 460 ppb (standard of 5.0 ppb)
  - Vinyl Chloride at 330 ppb (standard of 2.0 ppb)

- Groundwater in the southern boring along the eastern Site boundary (GP-3) detected nine compounds above regulatory standards:
  Chlorinated VOCs:
  - PCE at 34 ppb (standard of 5.0 ppb)
  - TCE at 6.6 ppb (standard of 5.0 ppb)
  - Cis-1,2-DCE at 78 ppb (standard of 5.0 ppb)
  - Vinyl chloride at 34 ppb (standard of 2.0 ppb)

  Polyaromatic Hydrocarbons (PAHs):
  - Benz(a)anthracene at 1.0 ppb (standard of 0.002 ppb)
  - Chrysene at 3.0 ppb (standard of 0.002 ppb)
  - Benzo(b)fluoranthene at 2.0 ppb (standard of 0.002 ppb)
  - Benzo(k)fluoranthene at 2.0 ppb (standard of 0.002 ppb)
  - Benzo(a)pyrene at 2.0 ppb (standard of 0.002 ppb)

It should be noted that the groundwater samples were collected via bailers and as such, the presence of PAHs in groundwater sample GP-3 may be the result of high turbidity and not representative of concentrations of dissolved PAHs. This is supported by the fact that PAHs were not identified above laboratory MDLs in overburden groundwater samples collected as part of the 2017 RI.

Soil samples were collected from each of the five (5) borings and compared with the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objective (SCO). Exceedances of Unrestricted Use SCOs were only detected in GP-2. The following compounds were detected in GP-2 at or above Unrestricted Use SCOs:

- Lead at 275 ppm (SCO of 63 ppm)
- Mercury at 0.691 ppm (SCO of 0.18 ppm)
- Benz(a)anthracene at 2.0 ppm (SCO of 1.0 ppm)
- Benzo(b)fluoranthene at 1.0 ppm (SCO of 1.0 ppm)
- Chrysene at 1.0 ppm (SCO of 1.0 ppm)
- Benzo(k)fluoranthene at 1.0 ppm (SCO of 0.8 ppm)
- Acetone at 0.67 ppm (SCO of 0.05 ppm)
- Vinyl Chloride at 0.4 ppm (SCO of 0.02 ppm)

Based on the contaminants detected in the soil and groundwater, the NYSDEC recommended that the Site be listed on the NYS Registry of Inactive Hazardous Waste Sites and that a Remedial Investigation be conducted to define the nature and extent of contamination.

3.3 Remedial Investigation Report, Completed by LaBella, June 2018

This section summarizes the RI work completed and Conceptual Site Model determined based on cumulative investigations completed to date.

The RI generally consisted of the following:

- Advancement of nineteen (19) soil borings (including two (2) completed as part of the bedrock well installation);

- Installation of six (6) overburden groundwater monitoring wells;
- Installation of three (3) shallow bedrock groundwater monitoring wells;
- Installation and sampling of four (4) soil gas points;
- Collection of two (2) sediment samples from the adjacent Erie Canal;
- Collection of two (2) surface water samples from the adjacent Erie Canal;
- Collection of three (3) shallow off-site soil samples immediately east (and downgradient) of the Site.

The 2017 RI identified two (2) areas of concern (and associated sub-areas) remaining at the Site. These areas are listed below:

- AOC #1 – Former Dry Cleaner Impacts
- AOC#2 – Miscellaneous Historical Impacts
    - AOC #2A – Miscellaneous Groundwater Impacts
    - AOC #2B – Miscellaneous Soil Impacts

The primary contaminants of concern at the Site are PCE and breakdown products including TCE, cis-1,2-DCE, and vinyl chloride. These compounds are addressed in AOC #1. Their presence appears to be the result of former dry cleaning operations on-site and present a risk to human health and the environment. VOCs appear to be traveling off-site to the east via groundwater but do not appear to be impacting the Erie Canal, based on the results of the RI.

Secondary contaminants of concern include metals, SVOCs and pesticides. These compounds are addressed in AOC#2. The exact sources of these impacts are uncertain but may be related to urban fill and/or the historical, industrial use of the Site and surrounding area. These impacts do not appear to be traveling off-site.

Findings of the RI and Conceptual Site Model are further detailed in Section 5.

4. Geology & Hydrogeology

Seventeen (17) soil borings and three (3) bedrock borings were advanced at the Site between September 12, and October 19, 2017 as part of the 2017 RI. Soil borings extended to depths ranging from 7.7 to 17-ft bgs and generally encountered refusal on bedrock. Equipment refusal in the northwestern and southeastern portions of the Site was generally encountered at depths less than 9-ft bgs and on the remainder of the Site refusal was generally greater than 11-ft bgs. Equipment refusal depths increased from south to north at test borings located off-site to the east of the property boundary. The site surface is generally flat to slightly sloping on the western half of the site with a steep downward slope near the eastern Site boundary then returning the generally flat or slightly sloping topography at the eastern edge of the property and just off-site. The Erie Canal is located approximately 25-feet east of the Site.

Soils encountered along the southwestern portion of the Site consisted mainly of brown fine Sand with trace amounts of subrounded to rounded gravel. This material was reportedly imported to the Site for fill and grading purposes following the 2016 building demolition. A demarcation layer of poly sheeting was observed underlying the brown fine sand in several soil borings. The depth of the demarcation layer ranged from 5.5 to 15.6 feet below ground surface.

Below the demarcation layer, soils generally consisted of fine brown Sand, little wood and ash (urban fill), and gravel or broken pieces of bedrock. Soils encountered on the remainder of the Site and the three (3) borings off-site consisted mainly of the imported layer of brown fine Sand with little to some subrounded to subangular gravel in the first 1.5-ft below ground surface underlain by brown to gray Silt, Clay, and coarse to fine sand and gravel. Urban fill and construction debris consisting of coal, coke, ash, cinders, brick, asphalt, glass, concrete, and wood were observed in several testing locations (SB-03, SB-04, SB-05, SB-07, SB-08, SB-09, SB-10, SB-12, SB-14, SB-15, SB-16, and SB-17) ranging in depths from 0.5-ft to 15.8-ft bgs. The greatest volume of urban fill appears to be located in the northern portion of the Site.

The top of bedrock was encountered during bedrock drilling at depths ranging from 9 to 19-ft bgs with bedrock encountered at shallower depths in the western portion of the Site and deeper in the eastern portion of the Site. Bedrock was cored in three (3) locations (BW-01, BW-02, and BW-03). Based on observation of recovered cores, bedrock appeared to consist of red Medina sandstone with gray mottling. The USGS indicates the Medina sandstone is of Early Silurian (Llandoverian) age. Bedrock wells extended to depths ranging from 19 to 29-ft bgs. Rock Quality Designation (RQD) values in the top 10-ft generally ranged from 74.1% to 92% which corresponds to moderately weathered rock to hard rock. The RQD from 10-20-ft bgs in one location (BW-02) was recorded at 96.6% which corresponds to hard rock.

Overburden groundwater was encountered at the Site at depths ranging from 5.70 to 7.30-ft below the top of PVC riser. Six (6) 1-inch diameter overburden groundwater wells were installed as part of the remedial investigation. Four (4) of the six (6) wells were found to be dry during development and field sampling activities and two of the wells (MW-05 and MW-06) located off-site to the east were found to produce sufficient groundwater for sampling. Groundwater in bedrock was encountered at depths ranging from 14.13-19.52-ft below the top of steel casing. All bedrock wells produced enough groundwater for sampling. Based on bedrock groundwater contours, the direction of groundwater flow appears to be east northeast towards the Erie Canal.

5. Conceptual Site Model

This section summarizes the Conceptual Site Model determined based on cumulative investigations completed to date.

5.1 Conceptual Site Model

The nature and extent of impacts have been evaluated based on the field observations and analytical data collected as part of the 2017 RI and 2010 Site Characterization Report. A total of ten (10) soil samples collected during the RI and one (1) soil sample collected as part of the previous Site Characterization exceed Site-specific SCGs (i.e., Commercial and Unrestricted Use SCOs). Six (6) of the soil samples collected during the RI were located on-site and identified exceedances of Unrestricted Use SCOs only. Four (4) of the soil samples collected during the RI were located off-site and identified exceedances of Unrestricted Use SCOs in all four (4) and exceeded Commercial Use in two (2) or the four (4) locations. A total of five (5) groundwater samples collected during the RI exceed Site-specific SCGs as well as two (2) groundwater samples from the previous Site characterization. Three (3) of the 5 groundwater samples collected during the RI were from bedrock wells on-site, while the other two (2) were located off-site to the east.

<u>AOC #1 Former Dry Cleaner Impacts:</u>
PCE and its breakdown products were discovered in two (2) bedrock groundwater samples, in two (2) off-site overburden wells, and in two (2) overburden groundwater samples collected as part of the Site Characterization at concentrations that exceed NYSDEC TOGS 1.1.1 Groundwater Standards. According to the Phase I ESA, the previous owner/operator of the Site reported that PCE was used as a solvent in dry-cleaning equipment operated on the Site from 1953 until sometime in the 1990's when the dry cleaning system was converted to a petroleum based solvent. Spent dry cleaning filters, lint and others wastes generated by dry cleaning operations were reportedly disposed of properly and according to regulations from the 1970's until the 1990's. However, dry cleaning wastes were also generated during the period from 1953 to the 1970's before disposal regulations were promulgated. Based on the past reported site use, the source of PCE contamination appears to be a result of the dry cleaning operations that were conducted on-site, specifically, improper disposal, leaking equipment, or leaking sewer lines could result in subsurface contamination. Highest concentrations of PCE were located in the northeastern portion of the site, in an area directly behind the building footprint. The northeastern portion of the former dry cleaner site building was reportedly historically used as the equipment maintenance area for the dry cleaner.

Based on concentrations of PCE throughout the Site, it appears the source location of these subsurface impacts was likely near the location of SB-08 and BW-01 which based on historical mapping would be proximate to the equipment maintenance area of the dry cleaning facility and close to the back of the building footprint. PCE has a higher specific weight than water which appears to have attributed to the elevated concentrations identified in bedrock groundwater at the Site. Groundwater contours indicate groundwater travels to the east, which explains why concentrations of PCE are detected in groundwater in wells east of BW-01 in wells BW-03, MW-05, and MW-06 but at lower concentrations than in BW-01. No PCE or associated breakdown products were detected in BW-02 to the west of BW-01.

The presence of PCE breakdown products (e.g. TCE, cis-1,2 DCE, etc.) are likely due to degradation of PCE over time. Depending on the subsurface environment, PCE can be more or less likely to naturally degrade overtime. Groundwater parameters collected as part of low-flow groundwater sampling during RI site activities provide indicators for the type of subsurface environment that exists within the saturated zone. One of the parameters recorded is oxidation reduction potential (ORP) which indicates if there is a reducing or oxidizing environment. Negative ORP measurements collected during bedrock and overburden groundwater sampling indicate the saturated zone at the Site is a reducing environment. Stabilized ORP values ranged from -48.2 millivolts (mV) to -110.6 mV. Dissolved oxygen (DO) is also measured during groundwater sampling and can indicate whether conditions in the saturated zone are aerobic or anaerobic. DO ranged from 3.94 mg/L to 0.01 mg/L during overburden and bedrock groundwater monitoring. The higher value of DO recorded in MW-06 may be due to malfunction of the DO meter during sampling or an air bubble trapped on the meter. All other wells had DO readings below 0.5 mg/L. Levels of oxygen in the saturated zone below 1 mg/L typically indicate an anaerobic subsurface environment. The conditions identified above may indicate why breakdown products of PCE have been identified in groundwater at the Site.

PCE detected in on-site soils during the remedial investigation and vinyl chloride detected in soil during the 2009 Site Characterization report are likely a result of past dry cleaning operations on-site and degradation of dry cleaning chemicals. Leaking equipment, improper disposal to the ground surface, or leaking sewer lines can all result in impacted soils. The potential exists for these compounds to migrate into groundwater by dissolving in water infiltrating the subsurface or they may stay in place adsorbed to soils.

PCE and associated breakdown products appear to be moving to the east in the dissolved phase in overburden and bedrock groundwater. The extent of bedrock groundwater impacts may be greater than what was identified during the remedial investigation.

AOC #2A: Miscellaneous Groundwater Impacts

Contaminants were identified in multiple locations across the site above TOGS 1.1.1 Groundwater standards with different potential sources.

Methyl tert-butyl ether (MTBE) was identified in BW-02 on the western side of the Site above TOGS 1.1.1 Groundwater Standards but it was not detected above standards elsewhere on-site. MTBE was utilized as a component in gasoline generally from the 1980's to early 2000's and tends to be found on the leading edge of gasoline groundwater plumes. It should be noted that NYSDEC PBS listings 8-393401 and 8-393436 associated with upgradient properties 320 North Main Street and 334 North Main Street, respectively, indicate gasoline USTs were present at these facilities until at least the 1990s. As such, potential residual impacts from a spill or leak may have impacted the subsurface at these adjacent properties and migrated to the Site. Additional migration to the Site may occur.

Methylene chloride was detected in BW-03 and is likely a lab contaminant as it was not detected in any other groundwater sample collected. It was also detected in preliminary lab reports at very low levels at varying depths in multiple soil samples; however, the compound was qualified as undetected in the DUSR because of it was also detected in the soil method blank which would indicate the contaminant is a laboratory artifact. The concentration detected is unlikely representative of the subsurface groundwater conditions and thus contaminant migration is not expected to occur.

SVOCs, specifically PAH's, were detected in the 2009 Site Characterization Report in groundwater sample GP-3, although no PAHs were detected in groundwater during the 2017 RI. Groundwater samples from the 2009 Site Characterization Report were collected using bailers and as such, the presence of PAHs in groundwater may be a result of high turbidity and not representative of concentrations of dissolved PAHs. In addition, PAHs generally are not very soluble in water and tend to adsorb to soils which limits their mobility and migration.

PFCs were detected on-site exceeding the USEPA CARE Technical Report No. 38 guidance value for total PFCs. PFC impacts could be from a number of sources but may also have come from cross contamination with PFC related products or materials.

AOC # 2B: Miscellaneous Soil Impacts

Soil samples with concentrations of VOCs, metals, pesticides, and SVOCs above Commercial and/or Unrestricted SCOs are present in AOC #2.

Acetone was detected above Unrestricted Use SCOs in on-site soils. Acetone was also detected above Unrestricted Use SCOs off-site. Acetone is also a common laboratory contaminant and the low level concentrations do not appear to be representative of subsurface conditions at the Site.

Metals are present at concentrations above Unrestricted Use SCOs across much of the northern portion of the Site and generally consisted of lead, mercury, and arsenic. Historical fill material, which is often associated with elevated metals or SVOC concentrations, was identified in several and is anticipated as the likely source of metal impacts. A paper pail manufacturing facility was reportedly adjacent to the north of the Site in the late 1800's. Paper manufacturing operations have historically utilized potentially hazardous materials including mercury. Some metals found off-site to the northeast include cadmium and lead which were detected above commercial use SCOs and mercury above Unrestricted Use SCOs. Off-site detections of metals may not be related to on-site sources. Metals generally sorb to soils and are unlikely to migrate unless erosion or wind moves the contaminated soils.

SVOCs were detected in samples collected during the RI at off-site locations to the east and on-site locations to the north above Unrestricted Use SCOs and Commercial Use SCOs. One location from the previous site characterization also detected SVOCs above Unrestricted Use SCOs on-site. The highest concentrations of SVOCs on-site appeared to be associated with historical fill material. Concentrations of SVOCs off-site at the lowest elevation of the study area may be the result of stormwater runoff from surrounding asphalt pavement (which contains SVOCs) and/or roofing material which may contain SVOCs. These sources could be either off-site or (historically) on-site. SVOCs tend to adsorb to soils which limits their mobility and migration.

One or more of the Pesticides 4,4-DDT, 4,4-DDE, and 4,4-DDD were detected in the soils in SB-08 (on-site) and SB-14 (off-site) at depths ranging from 5-ft bgs to 11.2-ft bgs above Unrestricted Use SCOs. The two localized hits of pesticides may be due to past regional use of these products. Their presence could also be from fill imported to the Site and/or windborne or erosion migration from off-site. These pesticides do not appear to be Site related, and are unlikely to migrate unless erosion or future development exposes the contaminated soils.

Soil Gas:
PCE was detected at its greatest concentrations in soil gas hydraulically down gradient of the highest concentrations of PCE in groundwater. As such, it appears that PCE in soil gas is a result of the former dry cleaning operations on-site that have impacted groundwater and soils. SDC-SV-03 also had elevated levels of hexane, cyclohexane and benzene. These compounds are common constituents of gasoline. Several gasoline constituents were also detected in sample SDC-SV-01, although at lower levels. Gasoline constituents along the southern edge of the Site could be a result of former use of the Site as an automotive repair facility. Constituents may also be residual soil gases from a former gasoline filling station located west of the Site.

There are no SCGs for soil gas; however, given the current Site conditions and VOC impacts, actions should be taken to address potential SVI prior to constructing a building on-site (i.e., install/activate SSDS components or SVI evaluation). A SSDS will mitigate SVI in all regularly occupied spaces. It is possible that soil gas could find a preferential pathway towards neighboring site buildings; however, site groundwater flow towards the east, and higher concentrations detected in the soil gas to the east would likely indicate the vapors will travel in a similar direction and soil gas impacts below slabs of adjacent properties is unlikely.

5.2 Exposure Assessment

An on-Site and off-Site exposure assessment was conducted as part of the 2017 RI. The findings are summarized below.

On-Site: Based on the lack of a receptor population at the Site, an on-Site exposure pathway does not currently exist. The Site is currently vacant and surrounded by fencing and barriers to prevent unauthorized access. Based on the evidence observed of erosion during field activities the potential exists for shallow impacts to become exposed at the surface in the near future which could present a point exposure to site workers or trespassers. In addition, the potential exists for Site workers, trespassers or future site occupants to be exposed to Site contaminants during construction/development or shallow soil intrusive activities. Site activities are currently limited to site workers with work plans detailed with how to handle site contaminants (e.g., CAMP monitoring, proper PPE, etc.). The potential for soil vapor intrusion would need to be addressed if a structure was to be constructed on-site in the future.

Off-Site: Exposure pathways exist for contaminants to be encountered off-site, due to the movement of site related compounds (specifically, chlorinated VOCs associated with dry cleaning) with groundwater. Although exposure pathways exist, it is unlikely for contaminants in groundwater or soil to be encountered unless ground intrusive activities are performed just off-site to the east. Soil vapor intrusion in buildings surrounding the site is unlikely due to the general eastward movement of groundwater on-site and evidence of the eastward movement of PCE and associated breakdown products. The highest soil gas concentrations for PCE were detected in soil gas sample SDC-SV-04 along the eastern property boundary.

6. Standards, Criteria and Guidelines

This section identifies the Standards, Criteria and Guidance (SCGs) for the Site. The SCGs identified are used in order to quantify the extent of contamination at the Site that may require remedial work. The SCGs for soil and groundwater are provided below. It should be noted that these SCGs are applied based on the past Site use (Commercial).

Soil:

- New York Codes, Rules, and Regulations (NCYRR) Part 375 Commercial Use Soil Cleanup Objectives (SCOs);
- NYCRR Part 375 Unrestricted Use SCOs; and
- NYCRR Part 375 Protection of Groundwater SCOs.

Groundwater:

- NYCRR Part 703 Groundwater Standards; and
- NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values.

Sediment:

- NYSDEC Screening and Assessment of Contaminated Sediment (June 24, 2014)

Soil Gas

There are currently no SCGs for soil gas. Soil gas sampling is used as part of the overall Site evaluation.

7. Remedial Action Objectives

The primary Remedial Action Objectives (RAOs) are as follows:

Groundwater RAOs:

a. Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards;
b. Prevent contact with, or inhalation of volatiles, from contaminated groundwater; and
c. Prevent off-Site migration of contaminants in groundwater at levels exceeding drinking water standards.

Soil RAOs:

a. Prevent ingestion/ direct contact with contaminated soil;
b. Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil; and
c. Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor RAOs

a. Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

8. Preliminary Screening of Alternatives

The following alternatives were initially screened for implementation at the Site. Several options were ruled out and others were selected for further evaluation.

Initial Screening of Remedial Alternatives

General Remedial Scenario	Remedial Technology	Selected for Further Evaluation	Explanation
In-Situ Biological Treatment	Enhanced Bioremediation	No	Source material will take decades to naturally degrade.
	Monitored Natural Attenuation	No	Source material will take decades to naturally degrade.
In-Situ Chemical/	Chemical Oxidation	No	High chemical oxidant

General Remedial Scenario	Remedial Technology	Selected for Further Evaluation	Explanation
Physical Treatment			demand. Source material will require multiple injections.
	Chemical Reduction	Yes	Zero valent iron proven to reduce CVOCs in groundwater.
	Thermal Treatment	No	Costly to implement.
Ex-Situ Chemical/ Physical Treatment	Excavation	Yes	Source removal option.
	Pump and Treat	Yes	Treat contaminated groundwater over time and provide hydraulic control of the plume.
Containment	Grout Wall	No	Will not provide source treatment.
	Cap/ Cover	No	The Site was regraded with imported sand after building demolition. No cover required.
Management	On-Site Management with ICs and ECs	Yes	Manage residual impacts on Site.
No Further Action	No action	Yes	Used as a baseline to compare alternatives.

9. Description of Selected Alternatives

Alternatives retained for a detailed evaluation are presented in this section.

A) <u>Excavation:</u> This technology would involve excavation of the worst-case overburden impacts. This technology is being evaluated for RAOC #1 and #2B. For RAOC #1, chemical injections would also be completed. For RAOC #2B, only excavation would be conducted.

RAOC #1: An approximate 300 square foot (sq ft) area would be excavated to depths up to 8-ft bgs. Based on the previous data, the worst-case impacts were identified in boring SB-08 with the greatest PID readings (112 to 177 ppm) identified in SB-08 at approximately 1.5-5-ft bgs. An estimated 90 cubic yards (CY) (150 tons) of material would be disposed of off-Site as non-hazardous via a contained-in determination. The excavation would be benched to prevent cave in of the sidewalls.

Up to eleven (11) injection wells would be installed and screened approximately 10-ft above and 10-ft below the top of bedrock within the area of RAOC #1 as shown on Figure 4A. Well locations are subject to change based on Site topography. It is assumed BW-01 will be removed. BW-03 may be used as an injection well. Up to approximately 5,000 lbs of ZVI (1,100 gallons slurry) would be injected per injection point with an assumed radius of influence of 10-ft.

A design phase investigation would be completed to identify the vertical and horizontal extent of the excavation and chemical injections warranted. The design phase investigation would consist of installation and sampling of up to six (6) bedrock wells within the area of CVOC impacts in groundwater installed to depths up to 10-ft into rock; these wells may also later be used for ZVI injections. In addition, up to eight (8) overburden soil borings would be advanced within the anticipated excavation area to define the vertical and horizontal extent of overburden excavation warranted. Worst-case impacts have been identified in SB-08 from approximately 1.5-5-ft bgs; as such, the design phase investigation will determine the final excavation depth and may exceed the currently anticipated 8-ft terminal depth.

Up to 1,000 lbs of ZVI may be added to the excavation backfill to promote biodegradation in the overburden. Note that a portion of the anticipated excavation area is off-Site. Refer to Figure 4A for a representation of this alternative.

This alternative assumes quarterly post-remedial groundwater monitoring for 2 years, semi-annual monitoring for an additional 3 years, annual monitoring for an additional 5 years (10 years total) followed by 20 years of annual inspections. Up to 9 wells would be sampled for TCL VOCs via passive diffusion bags (PDBs).

RAOC #2B: An approximate 1,400 sq ft area would be excavated to 8-ft bgs. An estimated 415 CY (705 tons) of material would be disposed of off-Site as non-hazardous via contained-in determination. Chemical injections would not be completed for RAOC #2B.

Excavations would be dewatered and water would be stored in temporary holding tanks prior to sampling and treatment via carbon, and discharged to the sanitary sewer via a permit. Sidewall confirmatory samples would be collected for analysis of VOCs, SVOCs, pesticides and metals at a rate of 1 sample per 30-ft of excavation perimeter. Excavations would extend to bedrock; as such, bottom confirmatory soil samples will not be collected. Imported backfill would consist of crushed recycled concrete/ crushed stone/ and or other material that meets Commercial Use SCOs. Due to the steep slope at the Site, silt fence will be placed on the eastern edge of the excavation area and the Site as needed to prevent runoff towards the east.

The cost to implement this alternative for RAOC #1 would be approximately $272,000 with 30 year operation and maintenance costs including periodic review reports, annual inspections, and groundwater monitoring, totaling approximately $144,000. Refer to Figure 4A for a representation of this alternative and Table 1A for a cost analysis.

The cost to implement this alternative for RAOC #2B would be approximately $119,000 with 30 year operation and maintenance costs including periodic review reports and annual inspections, totaling approximately $30,000. It should be noted that while there is no current development plan for the Site, an evaluation of soil vapor intrusion (SVI) will be required for future on-Site buildings and sub-slab vapor mitigation systems may be required. Costs included herein do not include an SVI evaluation or mitigation systems as there are currently no development plans. Refer to Figure 4B for a representation of this alternative and Table 1B for a cost analysis.

B) Pump and Treat- Pump and treat is being evaluated for RAOC #1 and RAOC #2A. This technology would consist of a pump and treat system that would continuously pump groundwater to an on-Site treatment system and treat the contaminated groundwater via activated carbon, air strippers, etc. This approach would rely on long-term hydraulic containment of the plume. Back diffusion (i.e., continued release of CVOCs from the bedrock matrix into groundwater) would continue to occur and pose a continuing source of CVOCs to groundwater. A treatment system building would be constructed and the necessary utilities would be installed at the Site (e.g., electric, sewer, communication, etc.). It is assumed up to 3 pumping wells would be installed approximately 25-feet apart to depths up to 10-ft below top of rock. It should be noted the expected radius of influence for the pumping wells is approximately 15-feet and the Canal is located approximately 30 feet to the east of the nearest well.

This alternative assumes quarterly post-remedial groundwater monitoring for 5 years and semi-annual sampling for an additional 25 years (30 years total). Up to 9 wells would be sampled for TCL VOCs via PDBs. The cost to implement this alternative would be approximately $618,000 with 30 year operation and maintenance costs including monthly discharge sampling, periodic system checks and maintenance, equipment repairs as needed, periodic review reports, annual inspections, and groundwater monitoring, totaling approximately $1,311,000. It should be noted that while there is no current development plan for the Site, an evaluation of soil vapor intrusion (SVI) will be required for future on-Site buildings and sub-slab vapor mitigation systems may be required. Costs included herein do not include an SVI evaluation or mitigation systems as there are currently no development plans. Refer to Figure 5 for a representation of this alternative and Table 2 for a cost analysis.

C) On-Site Management- On-Site Management is being evaluated for all RAOCs. On-Site Management would consist of institutional controls (ICs) and engineering controls (ECs) with no active remediation. ICs and ECs will be detailed in a Site Management Plan and are anticipated to include an environmental easement with restrictions on the property as well as requirements for evaluating soil vapor intrusion in buildings constructed at the Site in the future. The cost to implement this alternative for RAOC #1, #2A and #2B would be approximately $10,000 with 30 year operation and maintenance costs including periodic review reports and annual inspections, totaling approximately $30,000. Refer to Table 3 for a cost analysis. It should be noted that while there is no current development plan for the Site, an evaluation of soil vapor intrusion (SVI) will be required for future on-Site buildings and sub-slab vapor mitigation systems may be required. Costs included herein do not include an SVI evaluation or mitigation systems as there are currently no development plans.

D) No Further Action- The no further action alternative is being evaluated for RAOC #2A and #2B. Under the no further action alternative, no remedial actions would be implemented and no costs would be incurred. RAOC #1 represents source material associated with historical dry cleaning operations; as such, no further action is not being considered for RAOC #1.

10. Evaluation Criteria

Technologies were initially evaluated based on criteria in accordance with NYSDEC DER-10 (Section 4.0) and DER-31. Remedial alternatives were evaluated based on the following criteria:

1) Overall Protection of Public Health and the Environment: This criterion evaluates the ability of each remedial alternative to protect public health and the environment during or subsequent to implementation of the alternative.

2) Compliance with SCGs: This criterion evaluates whether each remedial alternative will ultimately result in compliance with the applicable, relevant or appropriate SCGs, to the extent practicable.

3) Long-Term Effectiveness and Permanence: This criterion evaluates if each remedial alternative is effective and permanent in the long-term after implementation (e.g., potential rebound of groundwater contamination). In the event that residual impacts will remain as part of the alternative, then the risks and adequacy/reliability of the controls are also evaluated.

4) Reduction of Toxicity, Mobility, or Volume with Treatment: This criterion evaluates of the ability of each remedial alternative to reduce the toxicity, mobility and volume of site contamination. In addition, the reversibility of the contaminant destruction or treatment is evaluated.

5) Short-Term Impact and Effectiveness: This criterion evaluates the potential short-term adverse environmental impacts and human exposures during construction and/or implementation of an alternative or remedy.

6) Implementability: This criterion evaluates each remedial alternative based on its suitability, implementability at the specific site, and availability of services and materials that will be required.

7) Cost: This criterion evaluates the capital, operation, maintenance, and monitoring costs for each remedial alternative. The estimated costs are presented on a present worth basis.

8) Land Use: This criterion evaluates of the current, intended and reasonably anticipated future use of the Site and its surroundings, as it relates to an alternative or remedy, when unrestricted levels would not be achieved.

9) Community Acceptance: This criterion will be evaluated after the public review of the remedy selection process.

10) Green Remediation: This criterion considers all environmental effects of remedy implementation and incorporates alternatives that minimize the environmental footprint of cleanup actions.

11. Evaluation of Selected Alternatives

This section provides an evaluation of alternatives using the evaluation criteria listed in Section 10. Cost analyses are summarized below and further detailed in the attached tables. A public comment period will be implemented for the selected remedy; as such, the community will provide input on the final remedy at a later date and community acceptance is not evaluated herein.

11.1 Excavation (RAOC #1 & #2B):

Overall Protection of Public Health and the Environment:
This alternative will be protective to human health and the environment following implementation; however, there is potential for exposure to contaminated soil, groundwater, and bedrock during the remedial work. Risks to workers and the public can be reduced by implementing dust and VOC monitoring and suppression techniques. Risks can be reduced for workers by implementing the appropriate level of personal protective equipment (PPE).

Compliance with SCGs:
This alternative would comply with SCGs as it would remove source material contributing to groundwater. In addition, ZVI injections (RAOC #1 only) would continue to reduce CVOCs in groundwater overtime and meet SCGs.

Long-Term Effectiveness and Permanence:
The excavation alternative would be effective in the long-term as it would permanently remove the source material and eliminate back-diffusion from occurring. In the long-term, concentrations of contaminants in groundwater would decline. This alternative would be permanent in that concentrations would not return to pre-excavation conditions.

Short-Term Impact and Effectiveness:
There may be short term impacts to the surrounding area due to nuisance conditions associated with the excavation (e.g., dust, noise, truck traffic, etc.). Dust and odor control will be implemented as needed to reduce effects to the surrounding area. This alternative would be effective in the short term because source material would be removed and disposed of at a landfill.

Reduction of Toxicity, Mobility, or Volume with Treatment:
Toxicity, mobility, and volume of contaminants would be reduced because the source of contaminants would be removed and disposed of off-Site. Mobility of contaminated groundwater would be further reduced for RAOC #1 by the ZVI.

Implementability:

The excavation alternative would be more difficult to implement than some of the other alternatives; however, it is able to be implemented safely and effectively.

Cost:
The excavation alternative would be more costly to implement than some of the alternatives but is not the most costly option. Estimated costs to implement this alternative for RAOC #1 would be $273,000 with a 30 year operation and maintenance cost of $144,000. Estimated costs to implement this alternative for RAOC #2B would be $119,000 with a 30 year operation and maintenance cost of $30,000.

Land Use:
This alternative would be consistent with anticipated land use which is commercial.

Green Remediation:
The excavation alternative would not be green due to the volume of impacted material that would contribute to landfills and due to increased truck traffic.

11.2 Pump and Treat (RAOC #1 and #2A)

Overall Protection of Public Health and the Environment:
This alternative would be protective to public health and the environment because there would be limited for potential exposure to impacted material. An on-site treatment building would be constructed and the building would be secured to prevent public access.

Compliance with SCGs:
This alternative would comply with SCGs; however, source material would not be removed. Back diffusion would continue to pose a source of CVOCs to groundwater. The plume would be contained and off-Site concentrations of CVOCs may be reduced.

Long-Term Effectiveness and Permanence:
In the long term, this alternative would be effective as long as the treatment system remains in operation. If the treatment system ceases operation, the alternative may no longer be effective.

Short-Term Impact and Effectiveness:
In the short term, this alternative would be effective in reducing CVOCs. There would be limited truck traffic and limited dust; as such, there are no significant short term impacts to the surrounding area.

Reduction of Toxicity, Mobility, or Volume with Treatment:
Mobility of contaminants would be reduced because the treatment system would provide hydraulic control of the plume and prevent further off-Site migration. Toxicity and volume of contaminants may be reduced in the long term after several years of operation.

Implementability:
This alternative would be easy to implement; however, the necessary infrastructure including the treatment system components, building, and utilities would need to be constructed.

Cost:

The pump and treat alternative would be relatively costly to implement. Estimated costs to implement this alternative for RAOC #1 would be $618,000 with a 30 year operation and maintenance cost of $1,311,000.

Land Use:
This alternative would be consistent with anticipated land use which is commercial.

Green Remediation:
The pump and treat alternative would not be green due to the electricity requirements and energy required to operate the system.

11.3 On-Site Management (RAOC #1, #2A, & #2B)

Overall Protection of Public Health and the Environment:
On-Site management would be protective to public health for the soil because it will prevent exposure to impacted soil and groundwater; however, groundwater impacted with CVOCs may migrate off-Site which could impact public health. In addition, this alternative will require that future buildings constructed on the Site are required to be evaluated for SVI and mitigated if warranted. On-Site management would not be protective to the environment because it would not reduce the contaminants in the subsurface.

Compliance with SCGs:
On-Site management would not comply with SCGs because impacted media would not be affected.

Long-Term Effectiveness and Permanence:
In the long term, this alternative is effective as long as the SMP is followed and ICs and ECs remain in place.

Short-Term Impact and Effectiveness:
There are no short term impacts associated with this alternative. In the short term, this alternative is effective as long as the SMP is followed and ICs and ECs remain in place.

Reduction of Toxicity, Mobility, or Volume with Treatment:
This alternative would not reduce toxicity, mobility or volume of impacts because impacted media will not be affected. Migration of VOCs via groundwater would be a concern in the long-term.

Implementability:
This alternative would be consistent with anticipated land use which is commercial.

Cost:
The on-Site management alternative is cost effective. Estimated costs to implement this alternative is $10,000 with a 30 year operation and maintenance cost of $30,000.

Land Use:
This alternative would be consistent with land use as long as the SMP is followed and ICs and ECs remain in place.

Green Remediation:

This alternative would be green because there would be no energy requirements and no truck traffic.

11.4 No Further Action (RAOC #2A & #2B)

Overall Protection of Public Health and the Environment:
The no further action alternative is not protective to public health and the environment because there are no ICs or ECs in place to prevent public exposure to contaminants.

Compliance with SCGs:
The no further action alterative would not comply with SCGs because impacted media would not be affected.

Long-Term Effectiveness and Permanence:
The no further action alternative is not effective in the long term because impacted media would not be affected.

Short-Term Impact and Effectiveness:
The no further action alternative is not effective in the short term because impacted media would not be affected. There would be no effects to the public in the short term.

Reduction of Toxicity, Mobility, or Volume with Treatment:
The no further action alternative would not reduce toxicity, mobility, or volume of contaminants because impacted media would not be affected.

Implementability:
The no further action alternative would be easy to implement.

Cost:
The no further action alternative is cost effective. Estimated costs to implement this alternative is $0 with no operation and maintenance fees.

Land Use:
The no further action alternative is not consistent with land use.

Green Remediation:
The no further action alternative is green because there would be no energy requirements and no truck traffic.

11.5 Overall Comparison of Alternatives

A cost comparison of the alternatives is provided in the following table.

Alternative	Capital Cost	Operation and Maintenance Cost (30 Year present value)	Total 30 Year Cost
Excavation and In-Situ Chemical Treatment (RAOC #1)	$273,000	$144,000	$417,000
Excavation (RAOC #2B)	$119,000	$30,000	$149,000
Pump and Treat (RAOC #1 and #2A)	$618,000	$1,311,000	$1,929,000

Alternative	Capital Cost	Operation and Maintenance Cost (30 Year present value)	Total 30 Year Cost
On-Site Management (RAOC #1, #2A, & #2B)	$10,000	$30,000	$40,000
No Further Action (RAOC #2A & #2B)	$0	$0	$0

A table representing the evaluation of each alternative is provided on the following page.

Summary of Evaluation of Alternatives

Alternative	Protection of Human Health and the Environment	Compliance with SCGs	Long-Term Effectiveness	Short-Term Effectiveness	Reduction of Toxicity, Mobility or Volume	Ease of Implementation	Cost-Effective	Appropriate based on Future Anticipated Land Use	Green
1A. Excavation (RAOC #1)		X	X	X	X		X	x	
1B. Excavation (RAOC #2B)		X	X	X	X		X	x	
2. Pump and Treat (RAOC #1 & #2A)	X	X	X	X	X			X	
3. On-Site Management (RAOC #1, #2A and #2B)	X		X	X		X	X	X	X
4. No Further Action (RAOC #2A & #2B)						X	X		X

Bold font indicates selected alternatives.

12. Recommended Alternatives

The recommended alternatives for implementation at the Site are excavation with on-Site management. The excavation alternative will treat impacts associated with RAOC #1 which represents source material associated with historic dry cleaning operations. Residual impacts associated with RAOC #1 as well as impacts associated with RAOC #2A and RAOC #2B would be managed on-Site in accordance with a SMP and environmental easement. The SMP would detail ICs and ECs required for the Site. A summary of the anticipated ICs and ECs are provided in the following subsections. Refer to Table 4 for total costs to implement the recommended alternatives.

12.1 Institutional Controls

An environmental easement for the controlled property is required which will:

- Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- Allow the use and development of the controlled property commercial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- Require compliance with a Site Management Plan.

The SMP will include monitoring and inspection requirements to assess the performance and effectiveness of the remedy. The plan will include groundwater monitoring requirements and frequency, inspection frequency and period reporting requirements.

12.2 Engineering Controls

A SSDS will be installed in any buildings constructed at the Site. Alternatively, a SVI evaluation may be conducted to evaluate the need for mitigation. If a SSDS is installed, the SMP will be updated with operation and maintenance procedures.

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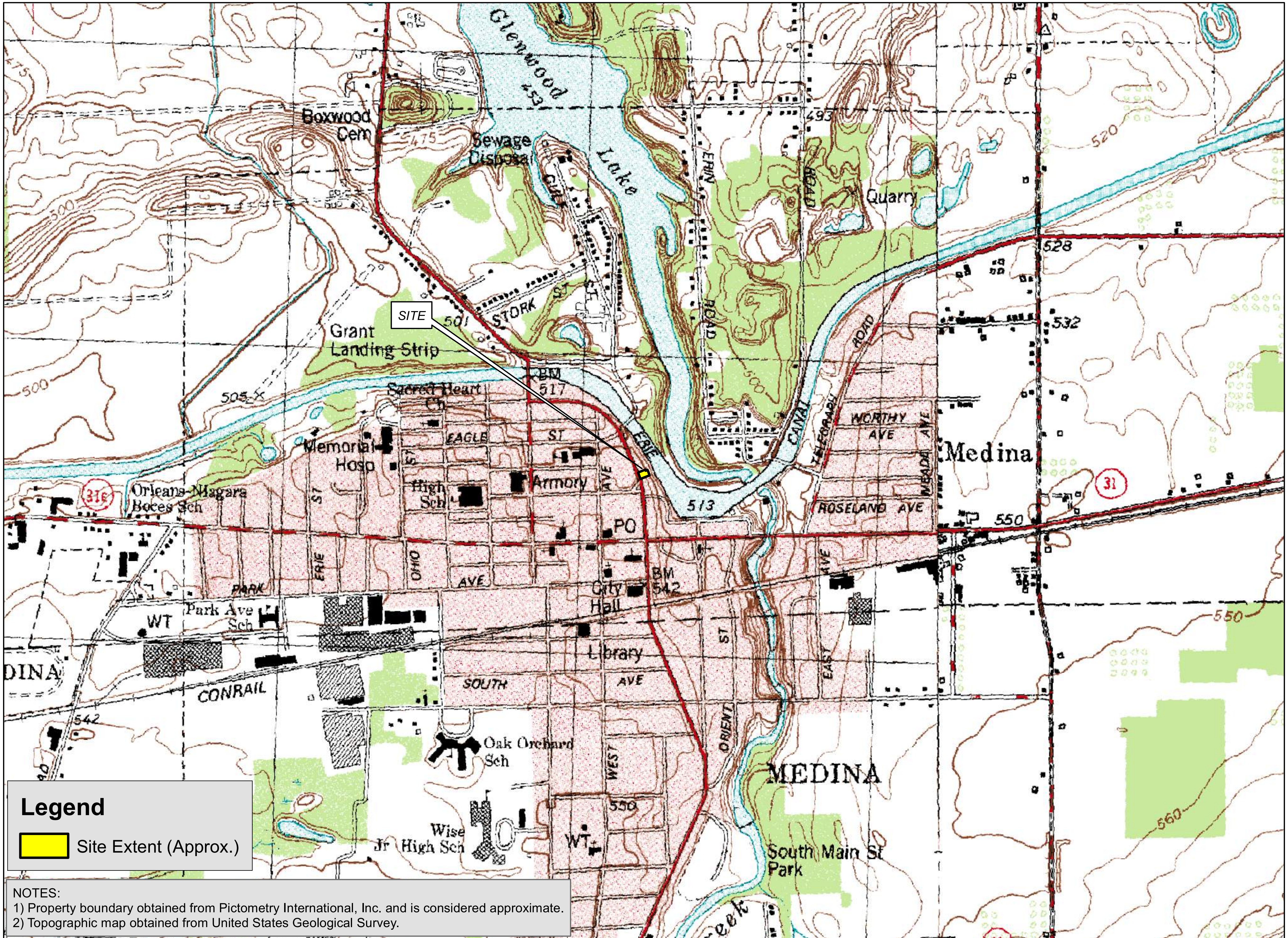
FIGURES



Legend

Site Extent (Approx.)

NOTES:
1) Property boundary obtained from Pictometry International, Inc. and is considered approximate.
2) Topographic map obtained from United States Geological Survey.

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1 inch = 1,000 feet

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CLIENT:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT:

FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:

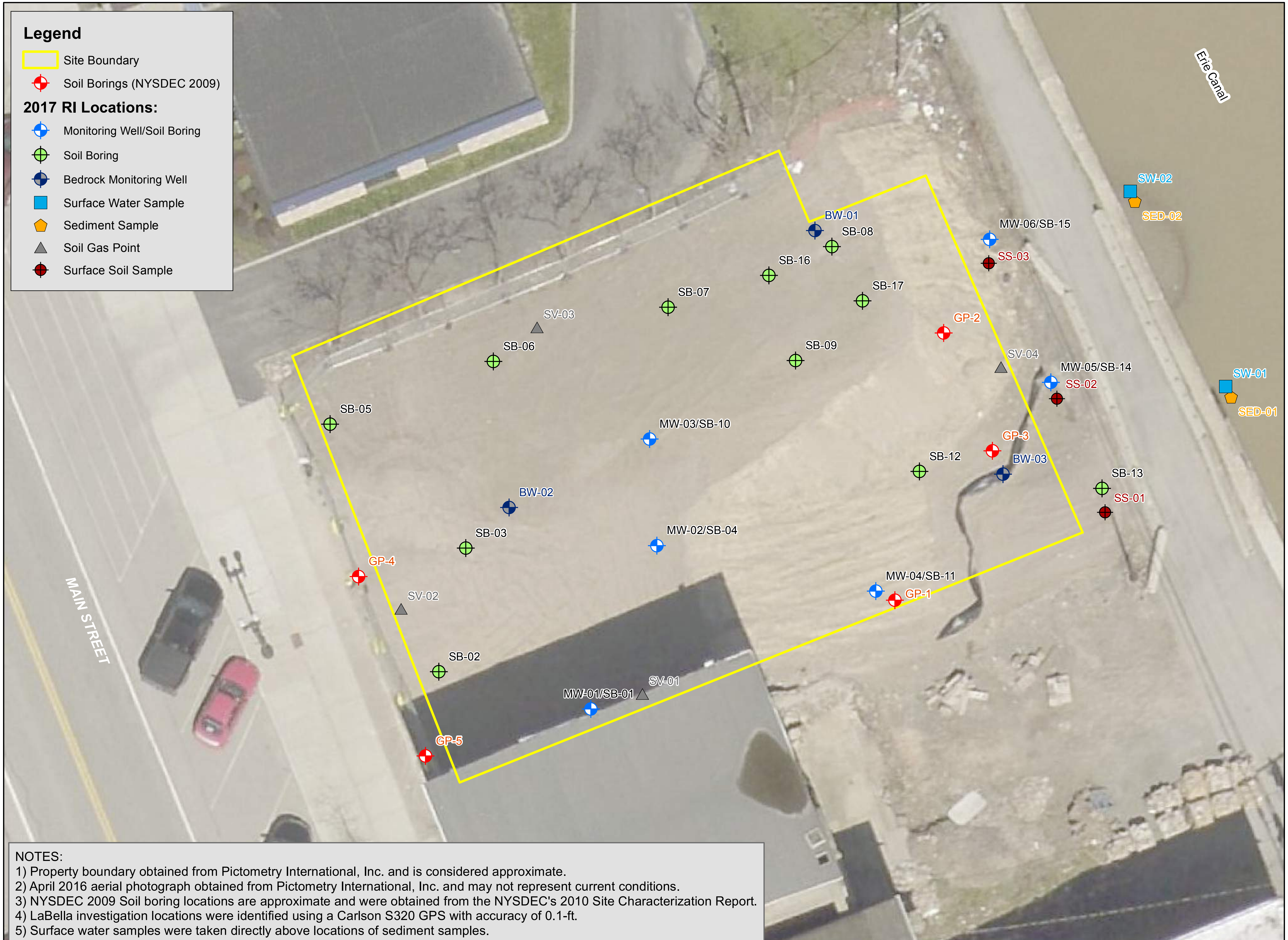
SITE LOCATION

PROJECT/DRAWING NUMBER:

2161937.016

FIGURE 1

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 1 Site Map.mxd



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CLIENT:

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PROJECT:

FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:

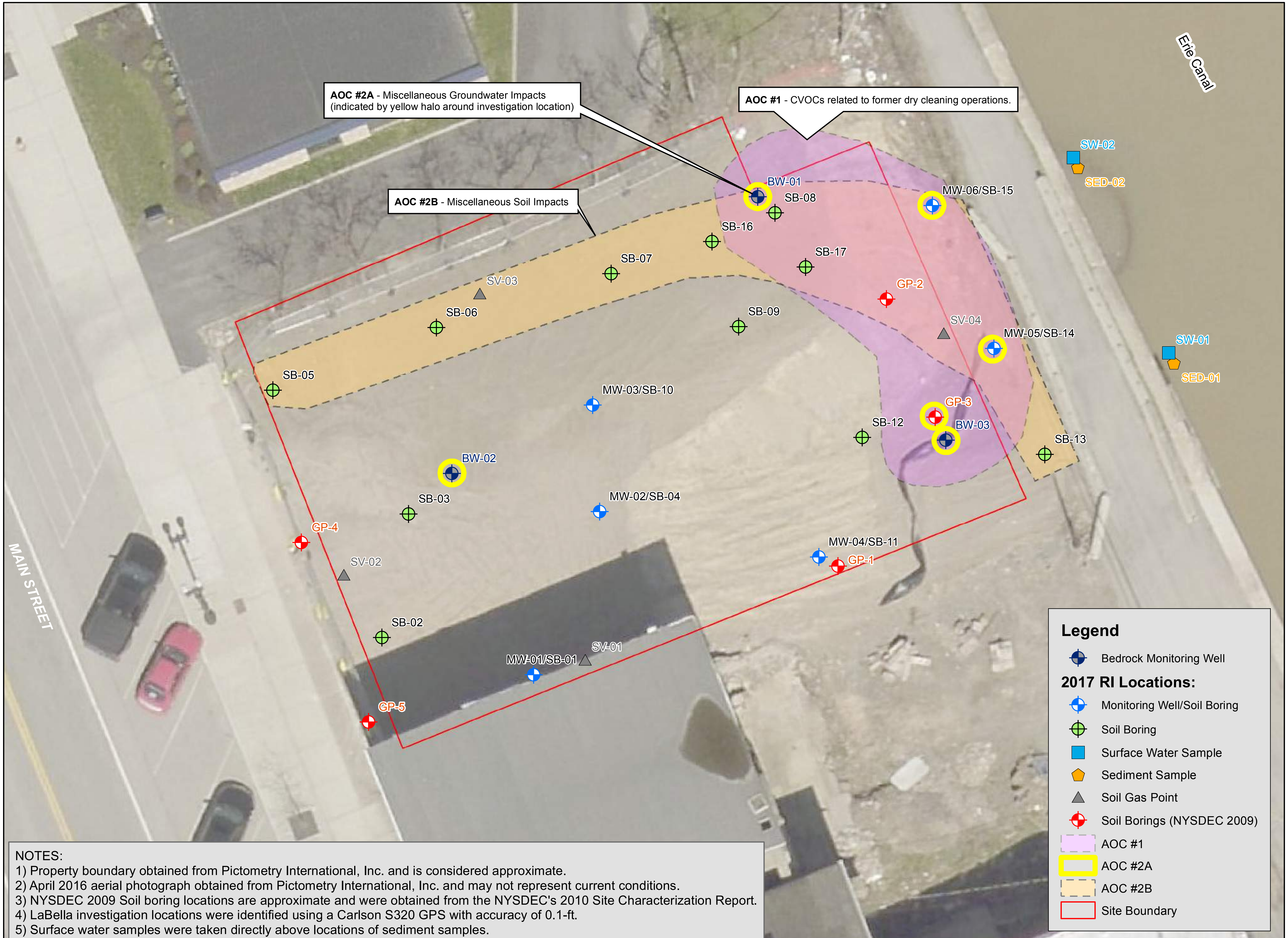
PREVIOUS INVESTIGATION LOCATIONS

PROJECT/DRAWING NUMBER:

2161937.016

FIGURE 2

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 2 Investigation Locs.mxd



NOTES:
1) Property boundary obtained from Pictometry International, Inc. and is considered approximate.
2) April 2016 aerial photograph obtained from Pictometry International, Inc. and may not represent current conditions.
3) NYSDEC 2009 Soil boring locations are approximate and were obtained from the NYSDEC's 2010 Site Characterization Report.
4) LaBella investigation locations were identified using a Carlson S320 GPS with accuracy of 0.1-ft.
5) Surface water samples were taken directly above locations of sediment samples.

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1 inch = 15 feet

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PROJECT:

FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:

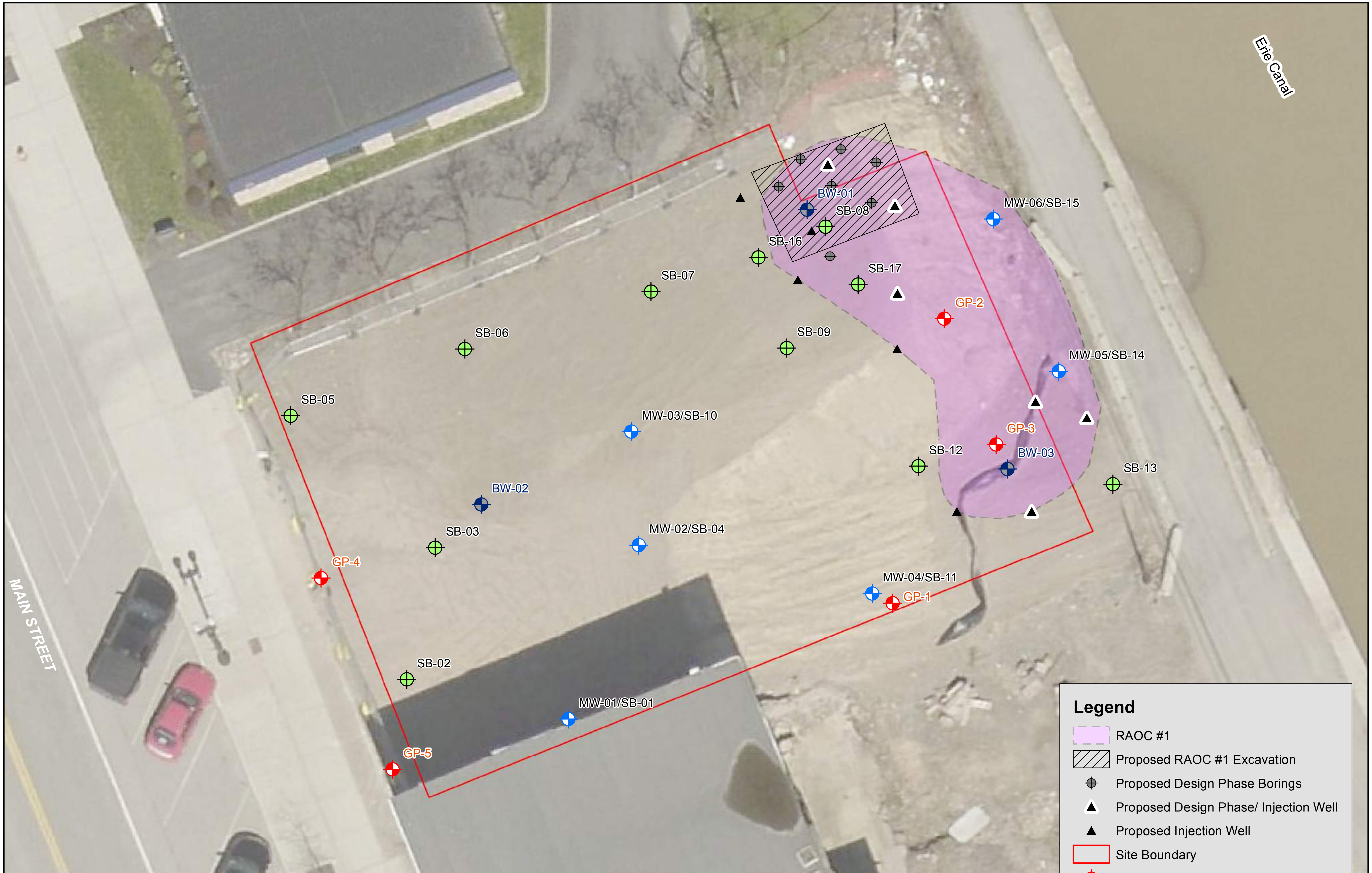
REMEDIAL AREAS OF CONCERN (RAOCS)

PROJECT/DRAWING NUMBER:

2161937.016

FIGURE 3

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 3 AOCs.mxd



Legend

- RAOC #1
- Proposed RAOC #1 Excavation
- Proposed Design Phase Borings
- Proposed Design Phase/ Injection Well
- Proposed Injection Well
- Site Boundary
- Soil Borings (NYSDEC 2009)

2017 RI Locations:

- Monitoring Well/Soil Boring
- Soil Boring
- Bedrock Monitoring Well

NOTES:
1) Property boundary obtained from Pictometry International, Inc. and is considered approximate.
2) April 2016 aerial photograph obtained from Pictometry International, Inc. and may not represent current conditions.
3) NYSDEC 2009 Soil boring locations are approximate and were obtained from the NYSDEC's 2010 Site Characterization Report.
4) LaBella investigation locations were identified using a Carlson S320 GPS with accuracy of 0.1-ft.
5) Surface water samples were taken directly above locations of sediment samples.
6) Proposed excavation and injection well locations are approximate and subject to change.

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1 inch = 15 feet

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PROJECT:

FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:

EXCAVATION AND IN-SITU CHEMICAL TREATMENT - RAOC #1

PROJECT/DRAWING NUMBER:

2161937.016

FIGURE 4A

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 4A Excavation and Injections.mxd

NOTES:
1) Property boundary obtained from Pictometry International, Inc. and is considered approximate.
2) April 2016 aerial photograph obtained from Pictometry International, Inc. and may not represent current conditions.
3) NYSDEC 2009 Soil boring locations are approximate and were obtained from the NYSDEC's 2010 Site Characterization Report.
4) LaBella investigation locations were identified using a Carlson S320 GPS with accuracy of 0.1-ft.
5) Surface water samples were taken directly above locations of sediment samples.
6) Proposed excavation area is approximate and subject to change.

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1 inch = 15 feet

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PROJECT:

FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:

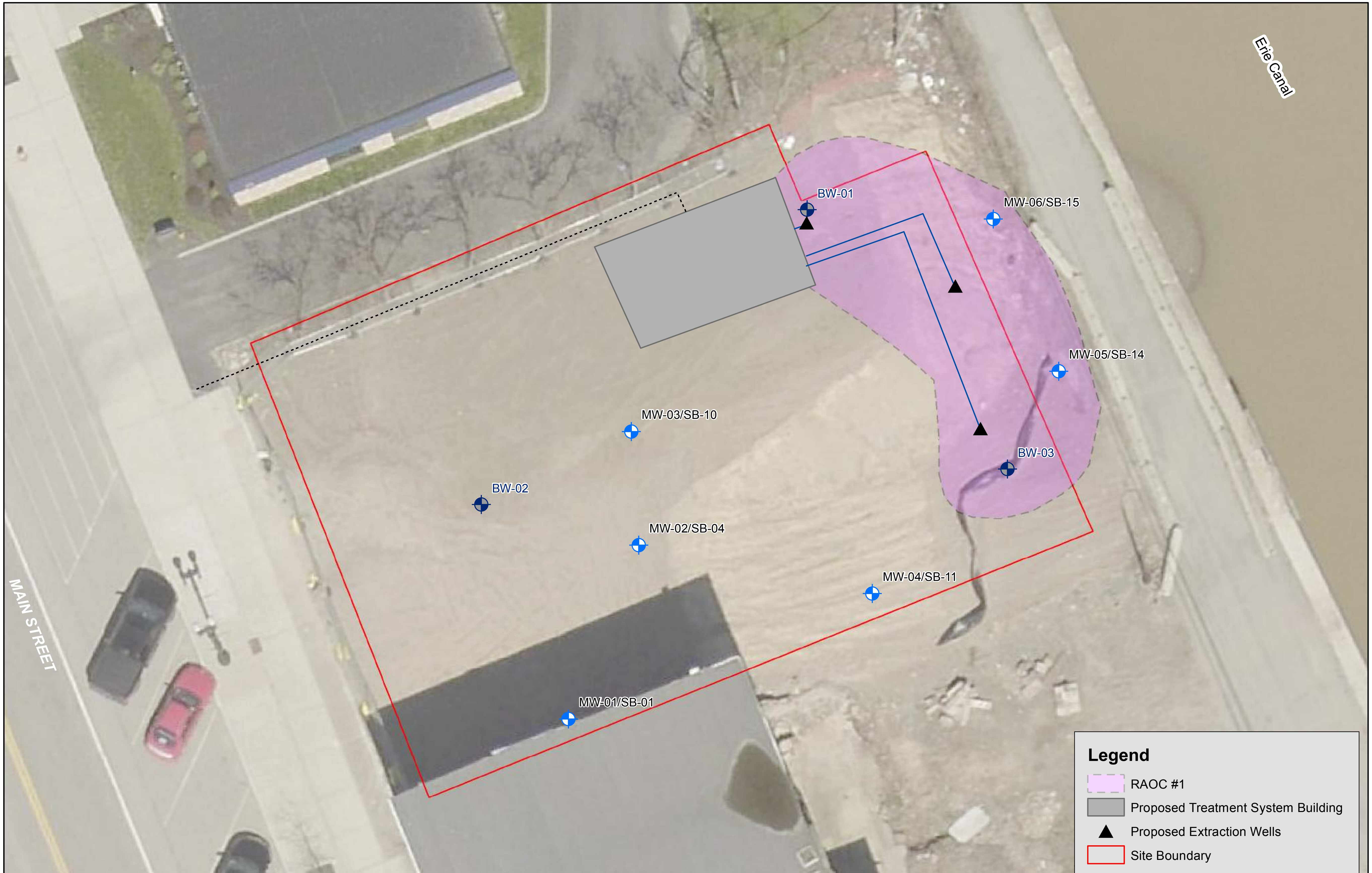
EXCAVATION - RAOC #2B

PROJECT/DRAWING NUMBER:

2161937.016

FIGURE 4B

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 4B Excavation and Injections.mxd



NOTES:
1) Property boundary obtained from Pictometry International, Inc. and is considered approximate.
2) April 2016 aerial photograph obtained from Pictometry International, Inc. and may not represent current conditions.
3) NYSDEC 2009 Soil boring locations are approximate and were obtained from the NYSDEC's 2010 Site Characterization Report.
4) LaBella investigation locations were identified using Carlson S320 GPS with acuracy of 0.1-ft..
5) Surface water samples were taken directly above locations of sediment samples.
6) Treatment system building and extraction wells are approximate and subject to change.

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N W E S

0 15 Feet
1 inch = 15 feet
INTENDED TO PRINT AS: 11" X 17"

CLIENT:
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PROJECT:
FEASIBILITY STUDY
FORMER STARLITE DRY CLEANERS
NYSDEC #837016
331 MAIN STREET, MEDINA, NEW YORK

DRAWING NAME:
PUMP AND TREAT - RAOC #1 & #2A

PROJECT/DRAWING NUMBER:
2161937.016

FIGURE 5

J:\NYSDEC\2161937 - Investigation & Remediation\016 - Starlite Dry Cleaners CallOut ID 129705\Drawings\FS\FIGURE 5 Pump and Treat.mxd

TABLES

Starlite Dry Cleaners
Feasibility Study
NYSDEC Site 837016
Table 1A - Excavation and In-Situ Chemical Treatment (RAOC #1)

	Unit Cost	Units	Quantity	Subtotal	
Professional Services					
Design Phase Investigation Report	$ 1,000	LS	1	$ 1,000	
Remedial Action Work Plan	$ 5,000	LS	1	$ 5,000	
Contained-In Determination	$ 1,000	LS	1	$ 1,000	
Final Engineering Report	$ 7,000	LS	1	$ 7,000	
Fieldwork					
Project Manager	$ 53.70	hr	36	$ 1,933	
Geologist	$ 39.38	hr	360	$ 14,177	
Subcontractor					
Design Phase Investigation Overburden Drilling	$ 2,500	LS	1	$ 2,500	
Excavation (Equipment and Operators)	$ 5,006.89	LS	1	$ 5,007	
Transportation and Disposal (non-hazardous)	$ 40	ton	150	$ 6,000	
Dewatering, Water Treatment and Disposal	$ 5,000	LS	1	$ 5,000	
Silt fence	$ 1,000	LS	1	$ 1,000	
Demarcation Layer	$ 500	LS	1	$ 500	
Backfill	$ 15	ton	150	$ 2,250	
ZVI	$ 1	lb	61,000	$ 61,000	
Shipping	$ 6,100	LS	1	$ 6,100	
Installation injection wells (bedrock)	$ 7,500	each	11	$ 82,500	
Chemical Injections	$ 5,006.89	LS	1	$ 5,007	
Survey	$ 1,000	LS	1	$ 1,000	
Laboratory					
Design Phase Soil (VOCs)	$ 75	sample	16	$ 1,200	
Design Phase Groundwater (VOCs)	$ 75	sample	9	$ 675	
Waste Characterization (TCLP)	$ 550	sample	2	$ 1,100	
Waste Characterization (totals)	$ 400	sample	2	$ 800	
Confirmatory Soil (VOCs)	$ 75	sample	7	$ 525	
Confirmatory Soil (SVOCs)	$ 165	sample	7	$ 1,155	
Confirmatory Soil (Pesticides)	$ 65	sample	7	$ 455	
Confirmatory Soil (Metals)	$ 150	sample	7	$ 1,050	
DUSR	$ 25	sample	53	$ 1,325	
EQUIS Submittals	$ 80	hr	27	$ 2,120	
Equipment					
Groundwater Sampling Equipment	$ 500	day	5	$ 2,500	
CAMP equipment	$ 1,120	week	5	$ 5,600	
PID	$ 20.79	day	36	$ 748	
Contingency (20%)				*$ 45,445*	
Total				*$ 272,673*	
Operation and Maintenance					Present Value
Years 1-2					
Groundwater Monitoring Years 1-2-Quarterly					
Equipment	$ 500	event	4	$2,000	
Professional Services	$ 2,500	event	4	$10,000	
Laboratory Fees	$ 900	event	4	$3,600	
Data Validation	$ 600	event	4	$2,400	
Annual Inspections and Annual Reporting	$ 3,000	year	1	$3,000	
		Annual Cost Years 1-2		$21,000	$19,795
Years 3-5					
Groundwater Monitoring Years 3-5-Semi-Annual					
Equipment	$ 500	event	2	$1,000	
Professional Services	$ 2,500	event	2	$5,000	
Laboratory Fees	$ 900	event	2	$1,800	
Data Validation	$ 600	event	2	$1,200	
Annual Inspections and Annual Reporting	$ 3,000	year	1	$3,000	
		Annual Cost Years 3-5		$12,000	$10,982
Years 6-10					
Groundwater Monitoring Years 6-10-Annual					
Equipment	$ 500	event	1	$500	
Professional Services	$ 2,500	event	1	$2,500	
Laboratory Fees	$ 900	event	1	$900	
Data Validation	$ 600	event	1	$600	
Annual Inspections and Annual Reporting	$ 3,000	year	1	$3,000	
		Annual Cost Years 6-10		$7,500	$5,581
Years 11-30					
Annual Inspections and Annual Reporting	$ 2,000	year	1	$2,000	
		Annual Cost Years 11-30		$2,000	$955
30 Year O&M Cost					*$119,541.87*
Contingency (20%)					*$23,908*
Present Value O&M (30 Years)					**$143,450**
Average Annual O&M Cost					**$4,782**
		Estimated Remedial Cost 30 Years:		*$416,123*	

Includes excavation and disposal of 300 square foot area to 8-ft bgs (150 tons). Assumes non-hazardous via contained-in determination.

Assumes confirmatory sampling in accordance with NYSDEC DER-10 for VOCs, SVOCs, pesticides and metals.

Assumes 1 round of injections, up to 12 injection wells with 5,000 lbs ZVI per point plus 1,000 lbs ZVI in backfill.

Post-remedial monitoring to include groundwater monitoring quarterly for 2 years, semi-annually for 3 years, and annually for 5 years (10 years total).

Post-remedial monitoring to include sampling up to 9 wells for TCL VOCs via passive diffusion bags

Present value assumes 3% annual discount rate

Costs include current contract rates. Long-term monitoring rates subject to change.

Laboratory analytical rates include typical rates for the parameters listed. Lab costs will be billed directly to the client.

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Table 1B - Excavation (RAOC #2B)

	Unit Cost	Units	Quantity	Subtotal	Present Value
Professional Services					
Remedial Action Work Plan	$ 5,000	LS	1	$ 5,000	
Contained-In Determination	$ 1,000	LS	1	$ 1,000	
Final Engineering Report	$ 7,000	LS	1	$ 7,000	
Fieldwork					
Project Manager	$ 53.70	hr	14	$ 752	
Technician	$ 39.38	hr	140	$ 5,513	
Subcontractor					
Excavation (Equipment and Operators)	$ 10,013.78	LS	1	$ 10,014	
Transportation and Disposal (non-hazardous)	$ 40	ton	705	$ 28,200	
Dewatering, Water Treatment and Disposal	$ 5,000	LS	1	$ 5,000	
Demarcation Layer	$ 1,000	LS	1	$ 1,000	
Backfill	$ 15	ton	705	$ 10,575	
Decommission Wells within Excavation	$ 500	each	3	$ 1,500	
Survey	$ 1,000	LS	1	$ 1,000	
Laboratory					
Waste Characterization (TCLP)	$ 550	sample	3	$ 1,650	
Waste Characterization (totals)	$ 400	sample	3	$ 1,200	
Confirmatory Soil (VOCs)	$ 75	sample	11	$ 825	
Confirmatory Soil (SVOCs)	$ 165	sample	11	$ 1,815	
Confirmatory Soil (Pesticides)	$ 65	sample	11	$ 715	
Confirmatory Soil (Metals)	$ 150	sample	11	$ 1,650	
DUSR	$ 25	sample	44	$ 1,100	
EQUIS Submittals	$ 80	hr	22	$ 1,760	
Equipment					
CAMP equipment	$ 1,120	week	10	$ 11,200	
PID	$ 20.79	day	10	$ 208	
Contingency (20%)				*$ 19,735*	
Total				***$ 118,412***	
Operation and Maintenance					**Present Value**
Years 1-30					
Annual Inspections and Annual Reporting	$ 2,000	year	1	$2,000	
		Annual Cost Years 6-30		$2,000	$824
30 Year O&M Cost					*$24,719*
Contingency (20%)					*$4,944*
Present Value O&M (30 Years)					**$29,663**
Average Annual O&M Cost					**$989**
		Estimated Remedial Cost 30 Years:		***$148,075***	

Includes excavation and disposal of 1,400 square foot area to 8-ft bgs (705 tons). Assumes non-hazardous via contained-in determination.
Assumes confirmatory sampling in accordance with NYSDEC DER-10 for VOCs, SVOCs, pesticides and metals.
Assumes no post-remedial groundwater monitoring required associated with RAOC #2B.
Present value assumes 3% annual discount rate
Costs include current contract rates.
Laboratory analytical rates include typical rates for the parameters listed. Lab costs will be billed directly to the client.

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Table 2 - Pump and Treat (RAOC #1 and #2A)

	Unit Cost	Units	Quantity	Subtotal	Present Value
Professional Services					
Design Phase Investigation & Report	$ 10,000	LS	1	$ 10,000	
Remedial Action Work Plan	$ 5,000	LS	1	$ 5,000	
Final Engineering Report	$ 7,000	LS	1	$ 7,000	
Fieldwork					
Project Manager	$ 53.70	hr	15	$ 806	
Technician	$ 39.38	hr	150	$ 5,907	
Subcontractor					
Mobilization/ Demobilization	$ 5,000	LS	1	$ 5,000	
Extraction Well Installation	$ 10,000	well	3	$ 30,000	
Trenching, Piping	$ 20,000	LS	1	$ 20,000	
System Building and Utility Connections	$ 200,000	LS	1	$ 200,000	
System Components (pumps, carbon, tanks)	$ 75,000	LS	1	$ 75,000	
Sewer Connection and Permitting	$ 20,000	LS	1	$ 20,000	
Electrical Connection	$ 50,000	LS	1	$ 50,000	
Water Connection	$ 50,000	LS	1	$ 50,000	
System Startup	$ 30,000	LS	1	$ 30,000	
Equipment					
CAMP equipment	$ 1,120	week	2	$ 2,240	
PID	$ 20.79	day	10	$ 208	
Waste Disposal					
Containerize, transport and dispose of soil	$ 5,000	LS	1	$ 5,000	
Contingency (20%)				*$ 101,232*	
Total				***$ 617,392***	
Operation and Maintenance					**Present Value**
Year 1-5					
Groundwater Monitoring Years 1-5- Quarterly					
Equipment	$ 500	event	4	$2,000	
Professional Services	$ 2,500	event	4	$10,000	
Laboratory Fees	$ 900	event	4	$3,600	
Data Validation	$ 600	event	4	$2,400	
Periodic System Checks/ Maintenance	$ 25,000	year	1	$25,000	
Water Discharge Sampling	$ 1,950	month	12	$23,400	
Electrical Costs	$ 10,000	year	1	$10,000	
Misc. Equipment Repairs	$ 5,000	year	1	$5,000	
Annual Inspections and Annual Reporting	$ 3,000	year	1	$3,000	
		Annual Cost Years 1-5		$84,400	$72,804
Years 6-30					
Groundwater Monitoring Years 6-30 Semi-Annual					
Equipment	$ 500	event	2	$1,000	
Professional Services	$ 2,500	event	2	$5,000	
Laboratory Fees	$ 900	event	2	$1,800	
Data Validation	$ 600	event	2	$1,200	
Periodic System Checks/ Maintenance	$ 25,000	year	1	$25,000	
Electrical Costs	$ 10,000	year	1	$10,000	
Misc. Equipment Repairs	$ 5,000	year	1	$5,000	
Annual Inspections and Annual Reporting	$ 3,000	year	4	$12,000	
		Annual Cost Years 6-30		$61,000	$29,134
30 Year O&M Cost					*$1,092,369.40*
Contingency (20%)					*$218,474*
Present Value O&M (30 Years)					**$1,310,843**
Average Annual O&M Cost					**$43,695**
		Estimated Remedial Cost 30 Years:		***$1,928,236***	

Assumes required utilities will be brought onto the Site and a treatment building would be constructed

Post-remedial monitoring to include groundwater monitoring quarterly for 2 years, semi-annually for 3 years, and annually for 25 years

Post-remedial monitoring to include sampling up to 9 wells for TCL VOCs via passive diffusion bags

Present value assumes 3% annual discount rate

Includes monthly effluent sampling

Costs include current contract rates. Long-term monitoring rates subject to change.

Laboratory analytical rates include typical rates for the parameters listed. Lab costs will be billed directly to the client.

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Table 3 - On-Site Management (RAOC #1, #2A & #2B)

	Unit Cost	Units	Quantity	Subtotal	Present Value
Professional Services					
Site Management Plan / Environmental Easement	$ 10,000	LS	1	$ 10,000	
Total				***$ 10,000***	
Operation and Maintenance					**Present Value**
Years 1-30					
Annual Inspections and Annual Reporting	$ 2,000	year	1	$2,000	
		Annual Cost Years 6-30		$2,000	$824
30 Year O&M Cost					*$24,719.21*
Contingency (20%)					*$4,944*
Present Value O&M (30 Years)					**$29,663**
Average Annual O&M Cost					**$989**
		Estimated Remedial Cost 30 Years:		***$39,663***	

Present value assumes 3% annual discount rate

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Table 4 - Recommended Alternatives Total Costs

	RAOC #1 Excavation and In-Situ Chemical Treatment	RAOC #2A & RAOC #2B On-Site Management	Total Remedial Cost (RAOC #1, RAOC #2A, & RAOC #2B)
Capital Costs			
Remedy Construction (Subcontractor Costs)	$ 213,437	$ -	$ 213,437
Remedy Implementation (Professional Services, Analytical, etc.)	$ 59,236	$ 10,000	$ 69,236
Total Capital Costs	$ 272,673	$ 10,000	$ 282,673
O&M Costs			
Total 30 year O&M, present value	$ 143,450	$ 29,663	$ 173,113
Average Annual O&M, present value	$ 4,782	$ 989	$ 5,770
Capital Costs with 30 Years O&M, present value	$ 416,123	$ 39,663	$ 455,786

Costs include contingency.

Average annual O&M cost represents the total 30 year O&M cost divided by 30 years. Annual costs may vary based on groundwater monitoring frequency. Refer to Tables 1-3 for anticipated monitoring frequency.