ALTERNATIVES ANALYSIS REPORT (AAR)

FOR

FORMER ZIP ZIP MINI MART
1410 ERIE BOULEVARD EAST
ENVIRONMENTAL RESTORATION PROGRAM (ERP)
NYSDEC SITE NO. B00075

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Acronym List

AA	Alternatives Analysis
BGS	Below Ground Surface
CAMP	Community Air Monitoring Plan
DER	Department of Environmental Remediation
ESA	Environmental Site Assessment
HASP	Health and Safety Plan
IRM	Interim Remedial Measures
IRM WP	Interim Remedial Measures Work Plan
NYSDEC	New York State Department of Environmental Conservation
PAH	Polycyclic Aromatic Hydrocarbons
PPM	Parts per Million
PCB	Polychlorinated Biphenyl
PID	Photo-ionization Detector
RAO	Remedial Action Objective
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RWP	Remedial Work Plan
SCG	Standards, Criteria, Guidance
SCO	Soil Cleanup Objective
Site	1410 Erie Boulevard, Syracuse, New York
SMP	Site management Plan
SVOC	Semi volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TOGS	technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VOV	Volatile Organic Vapor

1 INTRODUCTION AND PROJECT BACKGROUND

1.1 Site Description

The Site is 1.14 acres, identified as tax parcel 031.-08-02.0, and is owned by the City of Syracuse. The property is located at 1410 Erie Boulevard East along the eastern side of the City of Syracuse. The Site is irregularly shaped and less than 100 feet in depth. The Site is located in a dense commercial corridor. Proximate businesses include food establishments, a bank, municipal buildings, truck rental, and other miscellaneous businesses. An expansive residential area is located to the south. The location of the Site is shown on **Figure 1.**

The list below describes the roads located immediately surrounding the Site:

North-	Erie Boulevard
East-	Cherry Street
South-	East Washington Street
West-	South Beech Street

The Site is a flat and vacant gravel parking lot, located along the south side of Erie Boulevard. The building located on the adjacent parcel to the east slightly encroaches onto the western portion of the Site.

1.2 Background / Contamination Concerns

The following is a brief narrative of the investigation and remedial work that has previously been performed at the Site by C&S:

- A site investigation was completed in July 2000. The investigation included the excavation of 21 test pits, the advancement of six soil borings, and installation of four monitoring wells. Soil, groundwater, and floor drain sediments were collected for laboratory analysis. Evidence of up to six underground storage tanks (USTs) was observed.
    - Petroleum contamination was significant in the area of the former UST pump islands located along Erie Boulevard. More than two feet of free product (gasoline) was present in a monitoring well and soil contamination extended to 18 feet below grade in this area.
    - Contamination was also present in the vicinity of the USTs located on the southern portion of the Site, although it was less significant.
    - Petroleum impacts were also noted adjacent to the former service station on the eastern portion of the Site, and extended to eight feet below grade.

  - Total Benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations in groundwater ranged from 70 parts per billion (ppb) to more than 60,000 ppb.

- Interim Remedial Measures (IRMs) were performed in 2005 to address the abandoned USTs and residual soil contamination around the USTs.

- Additional IRMs were completed in 2008 to address the former dispenser area and former repair shop area. The remedial strategy was to excavate and properly dispose of petroleum impacted soils, subsurface structures, piping and equipment associated with previous use of the property as a gasoline service station. Soils that were visibly stained, that exhibited petroleum odors, or with measured levels of volatile organic vapors (VOVs) exceeding 20 parts per million (ppm) by a photoionization detector (PID), were loaded for disposal. Approximately 1,707 tons of petroleum contaminated soils and debris were removed from the site and disposed as non-hazardous industrial solid waste. In addition, a total of 10,422 gallons of petroleum contaminated liquids were collected and disposed off-site, including excavation de-watering fluids, and liquids extracted from a subsurface vault.

- NYSDEC Central Office utilized an on-call environmental consultant to install five permanent groundwater monitoring wells in 2018.

Figure 2 shows the vertical and horizontal extents of the 2005 and 2008 excavation IRMs.

1.3 Remedial Investigation Objectives, Scope, and Results

The objective of the Remedial Investigation was to finish the investigative phase of the Environmental Restoration Program (ERP) so that the City of Syracuse can complete its obligations under the existing State Assistance Contract (SAC). The fieldwork and related reporting are ultimately being completed in order to provide a basis for the New York State Department of Environmental Conservation (NYSDEC) to issue a Record of Decision (ROD) for the site.

The investigation included the following:

- Review of historical environmental reports / documentation;
- Subsurface investigation of the geologic and hydrogeologic conditions of the Site;
- Collection and laboratory analytical testing of soil and groundwater samples;
- Evaluation of the findings of the investigation and analytical testing; and

- Discussion of the observed conditions on the Site

Samples were collected to characterize surface soil, subsurface soil, and groundwater conditions and determine potential contaminant impacts in each medium. The RI activities were completed consistent with NYSDEC Division of Environmental Remediation: Technical Guidance for Site Investigation and Remediation dated May 2010 (DER-10).

Field activities were conducted on January 15, 16, and 18, and February 7 and 8, 2019. The results of the Investigation are fully described in C&S' document titled: *Remedial Investigation Report for Former Zip Zip Mini Mart, 1410 Erie Boulevard East, Environmental Restoration Program (ERP), NYSDEC Site No. B00075*. The results of the Investigation are summarized below.

Surface / Near Surface Soil: VOCs, SVOCs, pesticides, and metals exceeded NYSDEC Part 375 Unrestricted-Use soil cleanup objectives (SCOs) across the Site in the upper one-foot of soil. Exceedances of commercial use SCOs was limited to the northeast portion of the Site. With minor exception, the exceedances were in the same order of magnitude as the respective SCO. The types and concentrations of SVOCs and metals exceeding commercial use SCOs are characteristic of a commercial / industrial area. No physical indications of contamination such as staining or odors were noted. The upper one-foot of soil across the Site occupies a volume of approximately 1,800 cubic yards. However, due to the completion of previous IRMs which included the placement of clean backfill, the volume of soils in the upper one-foot that do not meet Unrestricted-Use SCOs is expected to be less than 1,800 cubic yards.

Subsurface Soil: Physical observations of petroleum impacts (odors and staining) were observed in soil borings SB-1, SB-3, SB-4, and SB-5, all of which were advanced along the perimeter of previous IRM excavations. In these areas, soils emitted low levels of volatile organic vapors (VOV) as measured by a photoionization detector (PID). Readings ranged from negligible to 60 parts per million (ppm). Corresponding lab data for these soils indicates that VOCs and SVOCs are present at levels that exceed their respective Part 375 Unrestricted Use SCOs / Commissioner Policy 51 (CP-51) soil cleanup levels (SCLs). However, the concentrations are less than Residential Use SCOs. Based on the data gathered during this RI and other investigations, it is anticipated that 10 feet of soil would require removal across approximately 60 percent of the Site to meet Unrestricted Use SCOs. That volume is approximately 11,000 cubic yards.

Groundwater: BTEX exceeded Technical and Operational Guidance Series 1.1.1 (TOGS) groundwater standards in a well on the northeastern portion of the Site. Methyl tert butyl ether (MTBE) was detected in each well and exceeded TOGS in three wells on the northern and western portion of the Site. Generally, the concentrations were at least an order of magnitude greater than TOGS. The wells

containing petroleum contaminants at concentrations greater than TOGS are located across the Site.

Surface and subsurface soil sample locations and lab data are shown on **Figure 3**. Monitoring wells and lab data are shown on **Figure 4**.

2 QUALITATIVE HUMAN EXPOSURE ASSESSMENT

2.1 Objectives

The purpose of the completion of a Qualitative Human Health Exposure Assessment is to evaluate and document how people might be exposed to site-related contaminants, and to identify and characterize the potentially exposed population now and under reasonable anticipated future se of the site. To evaluate if any exposure exists, the exposure assessment must assess the quality, representativeness and adequacy of the available data which includes the data generated as part of the remedial investigation. The following subsections identify and assess:

- Contaminant sources within soil, groundwater, and vapor at the site:
- Contaminant release and transport mechanisms;
- Evaluation of potential receptors;
- Potential exposure pathways; and
- Qualitative Human and Fish / Wildlife Resources Exposure Assessment.

2.2 Contaminant Sources

2.2.1 Contaminant Sources in Surface Soil

Eight surface soil samples were spatially distributed across the Site during the RI. The samples were analyzed for a combination of VOCs, SVOCs, pesticides, herbicides, PCBs, and metals analaysis. The purpose of the samples was to obtain a general level of information regarding contaminants present in the surface and near-surface soils across the Site. Samples were collected from 0 to 2 inches below grade and 6 to 12 inches below grade at each location. **Figure 3** shows the sampling locations and results.

One VOC, six SVOCs, one pesticide, and two metals exceeded the NYSDEC Part 375 Unrestricted-Use SCOs. Herbicides and PCBs were not detected. The majority of the exceedances are related to the 6" to 12" depth interval at SS-4, located on the northeast portion of the Site. This area is utilized by the adjacent landowner as an ingress / egress area into their building. In that same sample, three SVOCs exceeded their Commercial Use SCOs and one metal exceeded its Residential Restricted Use SCO. With minor exception, the exceedances were in the same order of magnitude as the respective SCO. The types and concentrations of SVOCs and metals identified at SS-4 are characteristic of a commercial / industrial area. No physical indications of contamination such as staining or odors were noted.

The majority of the Site is covered with a layer of crushed stone with a thin strip of vegetation along the rear of the Site. Surface soils generally consist of a heterogeneous mixture of sand and gravel. It is believed that the contaminant

sources in the surface soil are related to the historical urban and commercial uses of the Site and surrounding area.

2.2.2 Contaminant Sources in Sub-Surface Soil

As part of the RI, the soil borings and associated 15 subsurface soil samples were spatially distributed across the Site beyond the extents of the previous IRM areas. The soil samples were analyzed for a combination of VOC, SVOC, pesticides, herbicides, and metals analysis. The purpose of the samples was to obtain a general level of information regarding contaminants that remain in the subsurface soils across the Site. Samples were collected from three to 15 feet below grade. **Figure 3** shows the sampling locations and results.

Physical observations of petroleum impacts (odors and staining) were observed in borings SB-1, SB-3, SB-4, and SB-5, all of which were advanced along the perimeter of previous IRM excavations. In these areas, soils emitted low levels of VOVs as measured by a PID. Readings ranged from negligible to 60 ppm. Corresponding lab data for these soils indicates that VOCs and SVOCs are present at low levels. The benzene, ethylbenzene, methylene chloride, and xylene concentrations at SB-3 exceed their respective Part 375 Unrestricted Use SCOs / CP-51 SCLs in the 10' to 20' depth interval. However, the concentrations are well less than Commercial Use SCOs. No SVOCs exceeded a SCO. Two metals (mercury and nickel) slightly exceeded their Unrestricted Use SCOs at two locations.

2.2.3 Contaminant Sources in Groundwater

During the RI, three temporary groundwater monitoring wells were installed, two previously installed wells were located, and five total wells were sampled and analyzed for VOCs, SVOCs, and metals (total and filtered).

Benzene, toluene, ethylbenzene, and xylenes (BTEX), as well as isopropylbenzene, exceeded TOGS groundwater standards at TW-1. Besides isopropylbenzene, the concentrations were at least an order of magnitude greater than TOGS. The total VOC concentration in TW-1 was approximately 700 ppb. BTEX compounds did not exceed TOGS in the other wells. BTEX compounds are present in the subsurface soil (10' – 20') at TW-1. MTBE was detected in each well and exceeded TOGS at MW-2, TW-2, and MW-4, which are located on the western and central portion of the Site. MTBE concentrations range from 0.70 ppb at TW-3 to 73 ppb at MW-2. MTBE did not exceed the Unrestricted Use / CP-51 SCO / SCL in the Site soil. Monitoring wells and lab data are shown on **Figure 4.**

2.2.4 Contaminant Sources in Soil Vapor

C&S endeavored to collect soil vapor samples as part of the RI. However, the samples were compromised due to uncontrolled access to the Site and high groundwater. At

the time of sample retrieval, both locations had been driven over by vehicles. In addition, the sample vials were frozen into the subsurface because groundwater levels rose to near the surface subsequent to sample deployment.

Due to the presence of BTEX and MTBE in the shallow groundwater, and lack of a confining layer, soil vapor intrusion is possible into future buildings. However, since the Site is currently vacant there are no receptors for soil vapor intrusion.

2.3 Contaminant Release and Transport Mechanisms

The probable fate and transport of contaminants detected on the Site is a function of the properties of the individual contaminants and available pathways for the contaminants to migrate. The degree to which, as well as the route by which, contaminants migrate is dependent on the physical characteristics of the Site and the type and distribution of contaminants. The following sections discuss the probable fate and transport of contaminants in the different types of media at the Site.

Contaminants of concern are associated with historic fill and historical releases on the Site. Constituents primarily include VOCs, SVOCs, and metals. VOCs are present in the soil and groundwater at the Site.

In the soil, several VOC concentrations exceed Unrestricted Use SCOs, but are well less than Commercial Use SCOs. Groundwater sampling indicated that MTBE impacts are present on the western and central portions of the site and BTEX impacts may be limited to the northeast portion of the Site. Groundwater is present within the overburden at a depth of approximately five to ten feet below grade. The VOCs are not strongly sorbed to soil and will transport through the soil into saturated zones. Due to chemical properties of VOCs, a portion of the VOCs will solubilize in water, while the rest will move upward through the water column and soil until to be released as a vapor.

The poly aromatic hydrocarbons (SVOCs / PAHs) detected are characterized by low water solubilities and, therefore, have a tendency to adsorb onto soil particles. Because of their low vapor pressures, compounds with five or more aromatic rings, which include a majority of the detected PAHs, will exist mainly adsorbed to airborne particulate matter, such as fly ash and soot. Those with four or fewer rings, such as benzo(a)anthracene, will occur both in the vapor phase and adsorbed to particles. The detected compounds have relatively low vapor pressures and are expected to remain in a solid or liquid state and undergo degradation via naturally occurring microbes. Due to the low solubility, these contaminants are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of these compounds in the on-site groundwater.

Heavy metals, such as nickel, lead, and zinc are non-biodegradable pollutants that are generally transported through anthropogenic activities. In contaminated soils, they tend to persist for many years in the surface layers of soil. In aquatic systems, heavy metals may become blocked as sinks in bottom sediments, where they may remain for many years. Metals can be remobilized in water if the pH falls increasing heavy metal solubility increases. Due to the low solubility, these contaminants are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of these compounds in the on-site groundwater.

2.4 Evaluation of Potential Receptors

The Site is located in the City of Syracuse and located within a corridor where the land use is generally commercial or industrial in nature. Proximate businesses include food establishments, a bank, municipal buildings, truck rental, and other miscellaneous businesses. An expansive residential area is located to the south. The Site and surrounding area is serviced by the municipal water supply system from Onondaga County Water Authority (OCWA).

The Site currently is a 1.14-acre vacant lot covered with stone subbase material. Based on current zoning, likely redevelopment of the Site will be for commercial purposes. However, due to the Site's small size and irregular shape, the commercial uses may be limited to parking, exterior storage, or other similar use. Access to the Site is not currently restricted by perimeter fencing. However, the neighboring commercial business utilizes the site for parking and monitors activities at the Site.

Under current conditions, potential human receptors include persons working or trespassing on the Site; persons living and working in the area surrounding the Site; and persons involved in utility work on and adjacent to the Site. In addition, potential environmental receptors include wildlife living on and migrating through the Site (e.g., rodents, birds, etc.).

The likely future use of the Site is for commercial purposes. The redevelopment of the Site will likely need to be controlled through the implementation of engineering and institutional controls.

2.5 Potential Exposure Pathways

2.5.1 Surface Soil

Under the current use, persons living and working in the vicinity of the Site and / or persons trespassing on the Site could be exposed to SVOCs and metals in the surface soil via inhalation of airborne particles, incidental ingestion of, or dermal contact with the contaminated media.

Construction workers, site visitors and persons living, working and traveling through the area near the project Site could be exposed to the SVOCs and metals in the surface soil during excavation of the contaminated soil in connection with Site redevelopment. Potential exposure routes for these receptors include inhalation of contaminated dust and incidental ingestion of, and / or dermal contact with the contaminated soil. However, the use of appropriate personal protective equipment, dust suppression techniques and personal / air monitoring, and the development and implementation of a Health and Safety Plan (HASP) would minimize the risk of exposure during this stage of the project.

No complete exposure pathways to the chemical contaminants in the surface soil have been identified in connection with the post-redevelopment period.

2.5.2 Sub-Surface Soil

The presence of VOCs, SVOCs, and metals in subsurface fill is not interpreted to represent a human or environmental exposure risk because no complete exposure pathways were identified under the current use scenario for the Site. This is a function of the subsurface disposition of the contamination, which effectively minimizes the potential for the incidental ingestion of, or dermal contact with the contaminated media. These factors also reduce the potential for the emission of vapors and particulates that could pose an exposure risk via inhalation. This applies to persons living, working and traveling through the area surrounding the Site, as well as persons visiting, working or trespassing on the Site.

During excavation of the contaminated soil in connection with potential Site redevelopment activities, environmental receptors, construction workers, Site visitors and persons living, working and traveling through the project Site could be exposed to VOCs, SVOCs, and metals in the subsurface soil. Potential exposure routes for these receptors include inhalation of contaminated dust and incidental ingestion of and / or dermal contact with the contaminated soil. However, the use of appropriate personal protective equipment, dust suppression techniques and personal / air monitoring, and the development of a HASP would minimize the risk of exposure during this stage of the project.

2.5.3 Groundwater

Groundwater is not considered a relevant mechanism for exposure due to the municipal water servicing the Site and requirement for an Environmental Easement that will restrict the use of groundwater. There is also a ban on groundwater use as a public drinking water supply in the City of Syracuse.

2.5.4 Soil Vapor

The Site is currently vacant. As such, the vapor intrusion pathway is not relevant under current conditions.

2.5.5 Exposure Assessment Summary

The human health exposure assessment identified exposure scenarios for the Site.

- Exposed soil during construction presents a potential route of exposure to construction or remediation workers via contact, fugitive dust and surface water. Upon completion of construction activities, the Site will be encapsulated with a cover system that may include buildings, paved parking lots, and vegetation. The proposed structures / features will prevent direct human exposure to any materials that may be left in-place.

- Groundwater is not considered a relevant mechanism for exposure due to the municipal water servicing the Site and requirement for an Environmental Easement that will restrict the use of groundwater. There is also a ban on groundwater use as a public drinking water supply in the City of Syracuse.

- Soil vapor intrusion will require assessment if a building is constructed on the Site.

2.6 Qualitative Human and Fish / Wildlife Resources Exposure Assessment

The Site is a vacant property located in a dense urban area with limited wildlife exposure. The Site and surrounding area within several miles of the Site consists of urban land adjacent to Route 690 and Erie Boulevard. A review of information concerning endangered and threatened species in Onondaga County, available via the NYSDEC Environmental Resource Mapper indicated that rare plants and rare animals are not located on the Site. There are no ecological resources present on or in the vicinity of the site and, consequently, no fish and wildlife resource impacts have been identified.

3 ALTERNATIVES ANALYSIS

3.1 Objectives

The objectives of this AA Report, are to evaluate remedial alternatives to address the contamination presented above and select remedial actions to be implemented. As defined in NYSDEC DER-10 (Section 4.0), remedial alternatives will be evaluated based on the following criteria:

a. Overall Protection of Public Health and the Environment: This criterion evaluates exposure and residual risks to human health and the environment during or subsequent to implementation of the alternative.

b. Compliance with SCGs: This criterion evaluates whether the remedial alternative will ultimately result in compliance with SCGs, to the extent practicable.

c. Long-Term Effectiveness and Permanence: This criterion evaluates if the remedy is effective in the long-term after implementation (e.g., potential rebound). 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.

d. Reduction of Toxicity, Mobility, or Volume with Treatment: This criterion evaluates the reduction of contaminant toxicity, mobility or volume as a result of the remedial alternative. In addition, the reversibility of the contaminant destruction or treatment is evaluated.

e. Short-Term Effectives: This criterion evaluates if the remedial alternative protects the community, workers and the environment during implementation.

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

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

h. Community Acceptance: This criterion takes into account concerns of the community regarding the proposed remedy. Any public comments and overall public perception are addressed as part of the criterion.

i. Land Use: This criterion evaluates the proposed remedial approach against

the current, intended, and reasonably anticipated future use of the land and its surroundings.

3.2 Remedial Action Objectives

Remedial Action Objectives (RAOs) are medium-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific standards, criteria, and guidance (SCGs) established by NYSDEC and / or NYSDOH. The site-specific RAOs are based on the anticipated use of the site for commercial use.

Soil RAOs

The RAOs for fill used in this AA are:

- RAOs for Public Health Protection
  - Prevent ingestion/direct contact with contaminated fill.
  - Meet the NYCRR Subpart 375-6 Remedial Program SCOs for Commercial Use.
  - Reduce the toxicity, mobility, or volume of contaminants at the Site.
  - Prevent inhalation exposure to contaminants volatilizing from soil.
- RAOs for Environmental Protection
  - Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater RAOs

The RAOs for groundwater used in this AA are:

- RAOs for Public Health Protection
  - Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards; and
  - Prevent contact with, or inhalation of, volatiles from contaminated groundwater.
- RAOs for Environmental Protection
  - Restore groundwater aquifer to pre-disposal / pre-release conditions, to the extent practicable;
  - Prevent the discharge of contaminants to surface water; and
  - Remove the source of groundwater contamination.

Soil Vapor RAOs

The RAOs for soil vapor used in this AA are:

- RAOs for Public Health Protection

- Mitigate impacts to public health resulting from the potential for, soil vapor intrusion into future buildings at a Site.

3.3 Future Use Evaluation

When evaluating remedial alternatives, reasonableness of the anticipated future land use should be considered. The Site is located along Erie Boulevard with a commercial use corridor. The Site is currently zoned for commercial use. Therefore, the remedial alternatives assume the future use of the Site will be for commercial use. However, the Site is small (less than 1.25 acres) and is irregularly shaped, which limits the types of commercial uses. Site use is anticipated to be restrained because of the available development footprint and zoning limitations, such as property line setbacks. A likely future use of the Site is a parking lot.

3.4 Development of Alternatives

This section identifies potential remedial alternatives being considered to address the Site. The remedial alternatives evaluated are summarized below:

3.4.1 No Action

3.4.1.1 Description

The No Action Alternative is included as a procedural requirement and as a baseline to evaluate other alternatives. Under this alternative, no further remedial or monitoring activities would occur and no environmental easement would be recorded. The soil at the Site would remain virtually as is and change in use would not be limited except by existing land use controls such as zoning.

3.4.1.2 Assessment

Overall Protection of Public Health and the Environment

The No Action Alternative is not protective of public health and the environment because the Site is not fully covered with an appropriate cover system and exposure pathways would exist.

Compliance with SCGs

The No Action Alternative does not comply with the SCGs for soils because contaminants in the surface soils are present at concentrations above Commercial Use SCOs.

Short-term Impacts and Effectiveness

The No Action Alternative is not effective in the short-term because it would leave the Site with petroleum impacted soil and groundwater with no long term monitoring or treatment. During future construction, this alternative would increase potential exposure to contamination by workers excavating the contaminated soil and groundwater.

Long-term Effectiveness and Permanence

The No Action Alternative is not effective in the long-term or a permanent basis because it would leave the Site with petroleum contaminated soil and groundwater in the subsurface in perpetuity.

Reduction of Toxicity, Mobility and Volume

Four methodologies must be evaluated relative to reduction of toxicity, mobility and volume:

- Destruction, on / off-site
- Separation or treatment
- Solidification or chemical fixation
- Control or Isolation

The No Action Alternative would not employ any additional methodologies and will not reduce the toxicity, mobility or volume of contamination. Therefore, this alternative would not be in compliance with the RAOs for the fill materials and contaminated soil.

Implementability

The No Action Remedial Alternative can be implemented with no technical or cost concerns.

Cost Effectiveness

There are no costs associated with this alternative. A No Action Alternative would not take any steps to reduce contamination and therefore, would not incur future remedial costs for the Site.

Community Acceptance

The public will likely not accept when invasive activities associated with site redevelopment begin, if no action is taken to reduce contamination prior to development.

Land Use

The No Action Alternative would not allow the use of the Site for commercial use.

3.4.1.3 Summary

The No Action Alternative would be the least expensive alternative. However, this alternative would not limit direct human interaction with contamination in the surface soil, subsurface soil, or groundwater. The alternative would leave the soil in place and potentially impact site workers and those in areas surrounding the Site during redevelopment. Therefore, the No Action Alternative is not the preferred alternative.

3.4.2 Track 4 – ISCO Injection and Cover System

3.4.2.1 Description

Under this Track 4 – In-situ Chemical Oxidation (ISCO) Injection and Cover System Alternative, groundwater would be treated by ISCO and soil would be managed by a cover system.

Prior to the ISCO injection, the following would be completed:

- Completion of a groundwater sampling event to obtain critical groundwater quality data to be utilized for the formulation and selection of an ISCO product.
- Completion of a pilot injection test to determine the ability for the subsurface to accept the injection of an ISCO product.

In general, the types and concentrations of contaminants in the surface soil across the Site are typical of a dense urban area and include SVOCs and metals. These compounds exceed Unrestricted Use SCOs across the Site and Commercial Use SCOs in certain areas. Subsurface soils are physically impacted by petroleum (staining and odors). The petroleum compound concentrations in the subsurface exceed Unrestricted Use SCOs, but do not exceed Commercial Use SCOs. Therefore soil RAOs can be achieved by a cover system. This will consist of impervious cover (asphalt or concrete surface) and / or the placement of a one-foot soil cover in areas without an impervious cover.

Groundwater is mildly impacted by common petroleum compounds (BTEX and MTBE) and can readily be treated by ISCO. Treatment of groundwater will prevent further detriment to site soil and limit the possibility of vapor intrusion into future buildings onsite. It is anticipated that multiple ISCO injections will be required. Post-ISCO groundwater monitoring will be performed to assess the effectiveness of the

treatment and the need for additional rounds of injections.

Long term environmental protection and control can be managed with a Site Management Plan (SMP), environmental easement, deed restrictions, annual monitoring and other such institutional and engineering controls.

3.4.2.2 Assessment

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment. Contaminated groundwater would be treated in-situ to eliminate groundwater as a mechanism to mobilize contaminants across groundwater or from groundwater to vapor. Contaminated surface and subsurface soil will be isolated by the cover system.

Compliance with SCGs

The alternative complies with the SCGs, as soil with contaminant concentrations above the SCOs would be isolated beneath at least one feet of a clean soil cover. ISCO injections are not intended to cause groundwater contaminant concentrations to comply with TOGS, rather the injections are intended to reduce groundwater contaminant concentrations to levels that would control vapor intrusion into future buildings.

Short-term Impacts and Effectiveness

This alternative increases the short-term risks for the community and the workers implementing the alternative (i.e., through the surficial disturbance of impacted soil), However, these risks would be minimized through the implementation of appropriate soil handling procedures, air monitoring, and dust suppression techniques. Furthermore, this alternative would be effective in the long-term.

Long-term Effectiveness and Permanence

This alternative would be a permanent remedy to address the contaminant concentrations in the groundwater across the Site. Treatment of the groundwater would also mitigate or reduce the potential for subsequent indoor air quality issues for a future building.

Reduction of Toxicity, Mobility and Volume

This alternative would result in the reduction of the toxicity, mobility, and volume of contaminants in the soil and groundwater. Therefore, treatment of the groundwater would be in compliance with the SCGs.

Implementability

This alternative is implementable using existing construction methods and equipment. The expected duration is one or two construction seasons. This alternative would result in a Site suitable for redevelopment for commercial use.

Cost Effectiveness

The estimated cost of this alternative at $555,000 requires a greater investment than the No Action Alternative. However, the alternative eliminates exposure to the contaminations through treatment of groundwater and installation of a cover system and prepares the Site for its intended use. This alternative is considerably less expensive that the Track 1 cleanup.

Community Acceptance

Based on the findings of the studies performed to date, it is anticipated that the results of this alternative would be acceptable to the community.

Land Use

This alternative would allow for the use of the parcel for commercial, which conforms to the City of Syracuse's development plans for the area. Therefore, this alternative would allow for the highest and best use of the land.

3.4.2.3 Summary

The Track 4 – ISCO Injection and Cover System Alternative was designed to remediate the Site to a meet Commercial Use Soil SCOs and prepare the Site for redevelopment for commercial uses.

3.4.3 Track 4 – Cover System

3.4.3.1 Description

Under this Track 4 – Cover System Alternative, soil would be managed by a cover system. Groundwater would not be addressed due to the prohibition of groundwater for drinking water in the City of Syracuse and the likelihood of the Site being developed as a parking lot.

In general, the types and concentrations of contaminants in the surface soil across the Site are typical of a dense urban area and include SVOCs and metals. These compounds exceed Unrestricted Use SCOs across the Site and Commercial Use SCOs in certain areas. Subsurface soils are physically impacted by petroleum (staining and odors). The petroleum compound concentrations in the subsurface exceed

Unrestricted Use SCOs, but do not exceed Commercial Use SCOs. Therefore soil RAOs can be achieved by a cover system. This will consist largely of an impervious cover (asphalt or concrete surface) and minor use of at least a one-foot soil cover in areas without an impervious cover. Groundwater is mildly impacted by common petroleum compounds (BTEX and MTBE). The potential for groundwater to affect indoor air quality could be addressed in the future with the construction of a sub-slab depressurization system (SSDS). However, the likelihood of constructing a building for occupancy is remote.

Long term environmental protection and control can be managed with a Site Management Plan (SMP), environmental easement, deed restrictions, annual monitoring and other such institutional and engineering controls.

3.4.3.2 Assessment

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment. Contaminated surface and subsurface soil will be isolated by the cover system. Eliminating public contact with contaminated groundwater could be controlled with engineering controls such as the cover system and institutional controls such as site use limitations (e.g. commercial use only). In addition, the City of Syracuse has a prohibition on using groundwater for drinking water.

Compliance with SCGs

The alternative complies with the SCGs, as soil with contaminant concentrations above the SCOs would be isolated beneath a cover system. Natural attenuation is also effective in the reduction in concentration of BTEX and MTBE in groundwater over time. At the time of the 2000 RI, BTEX compounds in the groundwater were an order of magnitude or greater than current concentrations.

Short-term Impacts and Effectiveness

This alternative increases the short-term risks for the community and the workers implementing the alternative (i.e., through the surficial disturbance of impacted soil), However, these risks would be minimized through the implementation of appropriate soil handling procedures, air monitoring, and dust suppression techniques. Furthermore, this alternative would be effective in the long-term.

Long-term Effectiveness and Permanence

The soil cover system is a permanent alternative to isolate soil contamination. Its permanence can be verified as part of annual SMP inspections. Natural attenuation is also effective in the reduction in concentration of BTEX and MTBE in groundwater

over time.

Reduction of Toxicity, Mobility and Volume

This alternative would result in the reduction of the toxicity, mobility, and volume of contaminants in the soil and groundwater. The installation of an impervious cover system would reduce infiltration which may reduce the mobility of contaminants in groundwater. Due to source removal efforts (soil and groundwater excavation / extraction) during previous IRMs, the toxicity and volume of contamination has already been significantly reduced. Previous IRMs included the removal of multiple USTs, excavation and disposal of approximately 1,707 tons of petroleum contaminated soils and debris, and extraction and disposal of 10,422 gallons of petroleum contaminated liquids.

Implementability

This alternative is implementable using existing construction methods and equipment. The expected duration is less than one construction season. This alternative would result in a Site suitable for redevelopment for commercial use.

Cost Effectiveness

The estimated cost of this alternative at $256,000 requires a greater investment than the No Action Alternative. However, the alternative eliminates exposure to the contaminations through the installation of a cover system and prepares the Site for its intended use. This alternative is considerably less expensive that the Track 1 cleanup.

Community Acceptance

Due to the volume of soil and groundwater contamination already addressed during previous IRMs, it is anticipated that the results of this alternative would be acceptable to the community.

Land Use

This alternative would allow for the use of the parcel for commercial, which conforms to the City of Syracuse's development plans for the area. Therefore, this alternative would allow for the highest and best use of the land.

3.4.3.3 Summary

The Track 4 – Cover System Alternative was designed to remediate the Site to a meet Commercial Use Soil SCOs and prepare the Site for redevelopment for commercial uses.

3.4.4 Unrestricted Use – Complete Fill Removal and Groundwater Treatment

3.4.4.1 Description

Under this Unrestricted Use Alternative, soil impacted at concentrations greater than the Unrestricted Use SCOs would be excavated and disposed of off-site in accordance with applicable regulations. A significant portion of petroleum impacted soils were excavated / removed as part of previous IRMs. However, it is conservatively estimated that soil across 60 percent of the Site requires removal to meet Unrestricted Use SCOs. If an average of 10 feet of soil requires removal across this area, the total will be 11,000 cubic yards. Assuming a conversion rate of 1.62 tons per cubic yard, the weight of this soil material is estimated at 18,000 tons.

Following contaminated soil removal, the subsurface would be injected with an ISCO product to treat groundwater. The effectiveness of the ISCO would be verified by four rounds of groundwater sampling and analysis.

3.4.4.2 Assessment

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment. All soil with contaminant concentrations above RAOs on-site would be removed and disposed of off-site. Groundwater would be treated in-situ to meet TOGS Standards.

Compliance with SCGs

The alternative complies with the SCGs, as all on-site soil with contaminant concentrations above the SCOs would be removed and disposed of off-site. Groundwater would be treated in-situ to meet TOGS Standards.

Short-term Impacts and Effectiveness

This alternative increases the short-term risks for the community and the workers implementing the alternative (i.e., through the disturbance of impacted soil), because the Site will undergo complete removal of contaminated soil. However, these risks would be minimized through the implementation of appropriate soil handling procedures, air monitoring, and dust suppression techniques. Furthermore, this alternative would be effective in the long-term.

Long-term Effectiveness and Permanence

The Unrestricted Use Alternative would be a permanent remedy to address the contaminant concentrations in the soil and groundwater throughout the Site.

Reduction of Toxicity, Mobility and Volume

This alternative would result in the reduction of the toxicity, mobility, and volume of contaminants in the soil and groundwater. Therefore, the removal of contaminated soil and treatment of groundwater would be in compliance with the SCGs.

Implementability

This alternative is implementable using existing construction methods and equipment. The expected duration is one construction season. This alternative would result in a Site suitable for redevelopment for any use.

Cost Effectiveness

The estimated cost of this alternative at $2,700,000 requires a greater investment than the ISCO Injection and Cover System Alternative but the alternative eliminates the contamination concentrations in the soil and groundwater at the Site and prepares the Site for redevelopment for any use

Community Acceptance

Based on the findings of the studies performed to date, it is anticipated that the results of this alternative would be acceptable to the community.

Land Use

This alternative would allow for the use of the parcel for redevelopment for any use, Therefore, this alternative provides the City of Syracuse with additional flexibility to determine the highest and best use of the land.

3.4.4.3 Summary

The Unrestricted Use Alternative was designed to remediate the Site to its most restrictive level – Unrestricted Use Soil SCOs – and prepare the Site for redevelopment for any use.

3.5 Comparative Evaluation of Alternatives and Recommended Actions

This section of the report compares the remedial alternatives proposed for each of the impacted media and presents the recommended action for each media group.

3.5.1 No Action Alternative

The No Action Alternative will not be protective of human health and the environment and would likely not be acceptable to the community in the long term. In addition, development of the Site is anticipated to take place and, as such, impacts are likely to be encountered, which indicates a level of risk in relation to exposure to on-site workers and those working and living in the vicinity of the Site. Therefore, this alternative is not the recommended remedy for the Site.

3.5.2 Track 4 – ISCO Injection and Cover System Alternative

The Track 4 – ISCO Injection and Cover System Alternative would be a long-term remedy and is anticipated to be acceptable to the community. This alternative reduces the toxicity, mobility, and volume of impacted media through: a) the in-situ treatment of groundwater and b) installation of a cover system across the Site. This alternative was designed to:

- Remediate the Site to a reasonable level that protects human health and the environment.
- Provide a cost effective effort that meets SCGs and the future land use of the Site.
- Prepare the Site for redevelopment for commercial use.

3.5.3 Track 4 – Cover System Alternative

The Track 4 – Cover System Alternative would be a long-term remedy and is anticipated to be acceptable to the community. This alternative reduces the toxicity, mobility, and volume of impacted media through: installation of a cover system across the Site. This alternative was designed to:

- Remediate the Site to a reasonable level that protects human health and the environment.
- Provide a cost effective effort that meets SCGs and the future land use of the Site.
- Prepare the Site for redevelopment for commercial use.

3.5.4 Unrestricted Use Cleanup Alternative

The Unrestricted Use Alternative would be a long-term remedy and is anticipated to be acceptable to the community. This alternative effectively reduces the toxicity, mobility, and volume of impacted media through groundwater treatment and the removal of all contaminated soil from the Site and replacement with clean material. However, this alternative will negatively impact the redevelopment because of increased complexity of the remediation due to multiple actions to reestablish the Site, increased time-frame to conduct the remediation and a significantly higher remedial cost.

3.6 Recommended Remedial Alternative

Based on the alternative analysis evaluation, the Track 4 – ISCO Injection and Cover System remedy is the recommended final remedial approach for the Site. This alternative is fully protective of public health and the environment; significantly less disruptive to the community; consistent with current and future land use; and represents a more cost effective approach that the Track 1 only remedy, while fully satisfying the RAOs.

The recommended remedial alternative would involve:

- ISCO injections to reduce petroleum compound concentrations in groundwater to levels that limit the possibility of vapor intrusion into future buildings. Prior to injections, a groundwater sampling event will be performed to obtain critical groundwater quality data, and a pilot injection test will be performed to determine the ability for the subsurface to accept the injection of the product. Post-injection groundwater sampling will be completed to determine the effectiveness of the injections and assess the need for additional injections.

- A cover system, which includes:

    - The installation of asphalt or concrete pavement across the majority of the Site.
    - The placement of at least a one-foot soil cover system in future pervious areas.

- Future sampling events required to perform the remedy (e.g. supplemental investigations, confirmatory sampling, import of backfill) will require testing for 1,4-dioxane and per- and Polyfluoroalkyl substances (PFAS).

- Implementation of the CAMP during site work involving the disturbance of contaminated fill.

- Engineering Control: Site Cover (hardscape and a soil cover system).

- Institutional Controls:
  - Deed restrictions
  - Environmental Easement
  - SMP
  - Provision for evaluation of the potential for soil vapor intrusion for new occupied buildings developed on Site.

This remedy is protective of human health and the environment, and is implementable in a construction season. This remedy utilizes a soil cover system and ISCO injections and fully satisfies the RAOs for the Site. As such, this remedy is significantly less expensive than the Track 1 only remedy but is as effective in eliminating potential exposure to contaminated soil and groundwater.

The estimated costs for the cleanups are shown in the tables on the following pages.

Table 3-1: Summary of Track 1 Remedial Alternative Costs

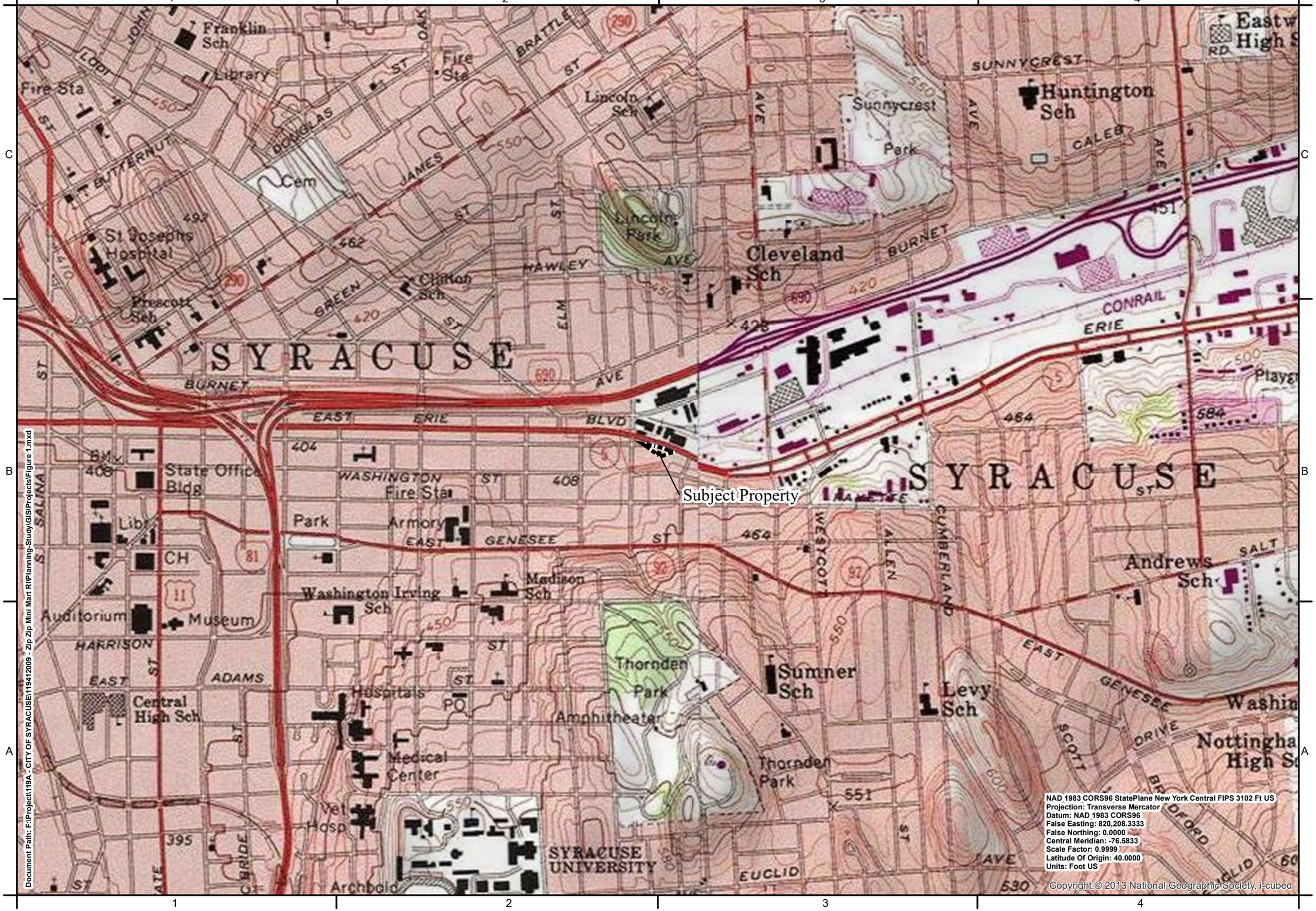
Item	Unit Rate	Number	Units	Cost
Remedial Design and Bidding	$ 25,000	1	LS	$25,000
Site Mobilization and Control Measures	$ 25,000	1	LS	$25,000
Clearing and Grubbing	$ 5,000	1	LS	$5,000
Shoring	$ 300,000	1	LS	$300,000
Fill / Soil Excavation	$ 25	18000	ton	$450,000
Transportation and Disposal	$ 40	18000	ton	$720,000
Confirmatory Soil Sampling	$ 500	50	sample	$25,000
Waste Characterization Sampling	$ 750	15	sample	$11,250
Dewatering	$ 30,000	1	LS	$30,000
Backfill Characterization Sampling	$ 750	15	sample	$11,250
Backfill Procurement and Placement	$ 15	18000	ton	$270,000
Groundwater Injection Pilot Study	$ 15,000	1	LS	$15,000
Full-Scale Groundwater Treatment	$ 100,000	2	round	$200,000
Groundwater Monitoring	$ 5,000	4	round	$20,000
Engineering-Construction and Reporting	$ 75,000	1	LS	$75,000
Legal Assistance	$ 10,000	1	LS	$10,000
Site Surveying	$ 20,000	1	LS	$20,000
Health and Safety	$ 5,000	1	LS	$5,000
Community Air Monitoring	$ 15,000	1	LS	$15,000
Subtotal				**$2,232,500**
Contingency	20 Percent			$446,500
Grand Total				**$2,679,000**

Table 3-2: Summary of Track 4 Remedial Alternative Costs
ISCO and Cover System

Item	Unit Rate	Number	Units	Cost
Remedial Design and Bidding	$ 25,000	1	LS	$25,000
Site Mobilization and Control Measures	$ 25,000	1	LS	$25,000
Clearing and Grubbing	$ 5,000	1	LS	$5,000
Backfill Characterization Sampling	$ 750	5	sample	$3,750
Backfill Procurement and Placement	$ 15	3000	ton	$45,000
Groundwater Injection Pilot Study	$ 15,000	1	LS	$15,000
Full-Scale Groundwater Treatment	$ 100,000	2	round	$200,000
Groundwater Monitoring	$ 5,000	4	round	$20,000
Engineering-Construction and Reporting	$ 25,000	1	LS	$25,000
Legal Assistance	$ 20,000	1	LS	$20,000
Site Surveying	$ 20,000	1	LS	$10,000
Health and Safety	$ 5,000	1	LS	$5,000
Community Air Monitoring	$ 10,000	1	LS	$10,000
Site Management Plan	$ 10,000	1	LS	$10,000
Environmental Easement	$ 10,000	1	LS	$10,000
Subtotal				$428,750
Contingency	20 Percent			$85,750
Construction Subtotal				**$514,500**
Annual Certification-Present Worth	$ 2,000	30	year	$39,201
Grand Total				**$553,701**

Table 3-3: Summary of Track 4 Remedial Alternative Costs
Cover System

Item	Unit Rate	Number	Units	Cost
Remedial Design and Bidding	$ 15,000	1	LS	$25,000
Site Mobilization and Control Measures	$ 20,000	1	LS	$25,000
Clearing and Grubbing	$ 5,000	1	LS	$5,000
Backfill Characterization Sampling	$ 750	5	sample	$3,750
Backfill Procurement and Placement	$ 15	3000	ton	$45,000
Engineering-Construction and Reporting	$ 20,000	1	LS	$20,000
Legal Assistance	$ 20,000	1	LS	$20,000
Site Surveying	$ 10,000	1	LS	$10,000
Health and Safety	$ 5,000	1	LS	$5,000
Community Air Monitoring	$ 10,000	1	LS	$10,000
Site Management Plan	$ 10,000	1	LS	$10,000
Environmental Easement	$ 10,000	1	LS	$10,000
Subtotal				$188,750
Contingency	15 Percent			$28,313
Construction Subtotal				**$217,063**
Annual Certification-Present Worth	$ 2,000	30	year	$39,201
Total Cost				**$256,263**



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N

0 1,000 Feet

1 inch = 1,000 feet

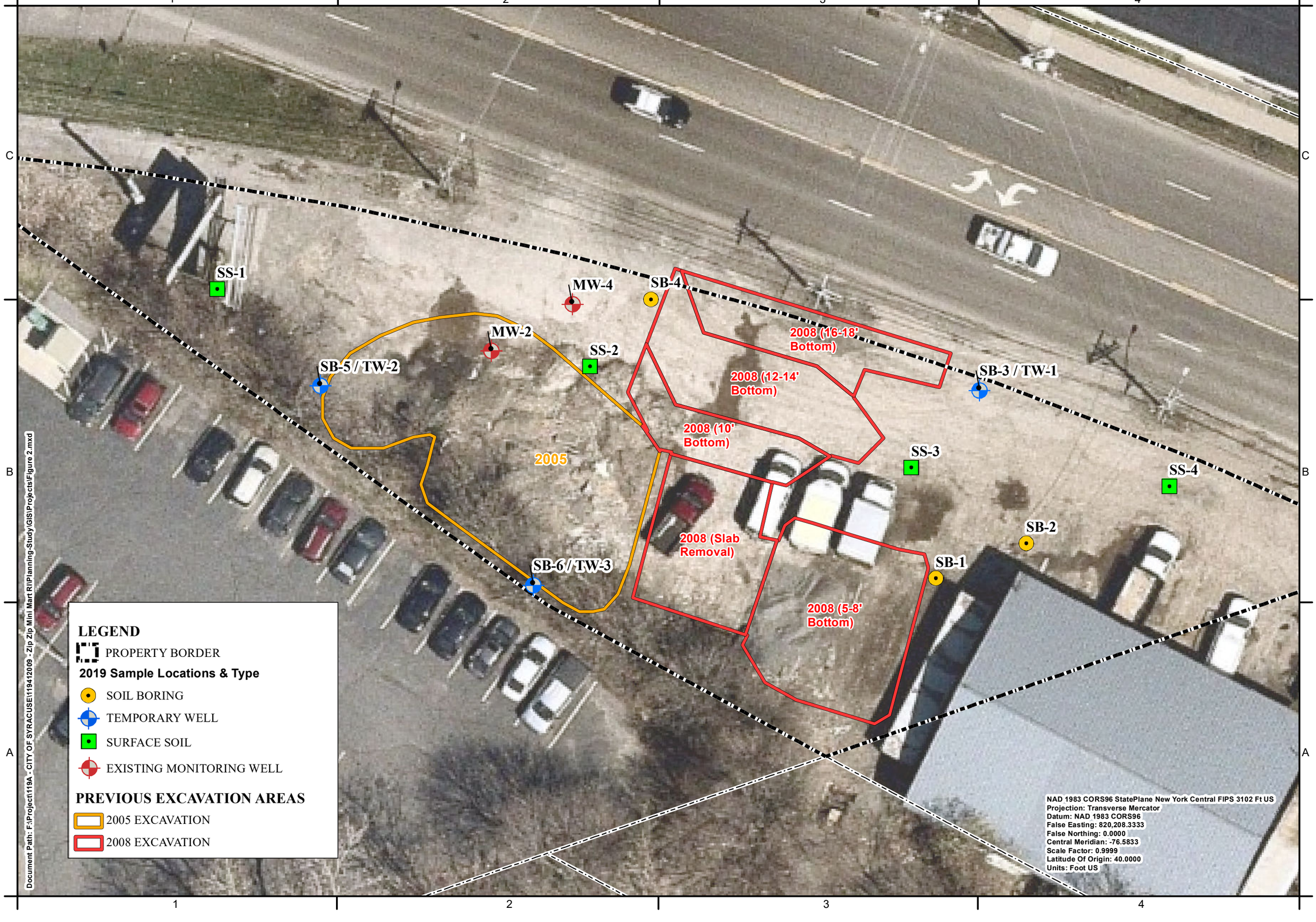
Zip Zip Minimarket ERP Site
NYSDEC Site No. B00075
City of Syracuse, Onondaga County, New York

PROJECT NO:	119.412.009
DATE:	March 2019
SCALE:	AS SHOWN
DRAWN BY:	JTB
DESIGNED BY:	MLW
CHECKED BY:	MLW

Modified: 3/7/2019 @ 4:51:46 PM

SITE LOCATION

Figure 1



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N

0 20 Feet

1 inch = 20 feet

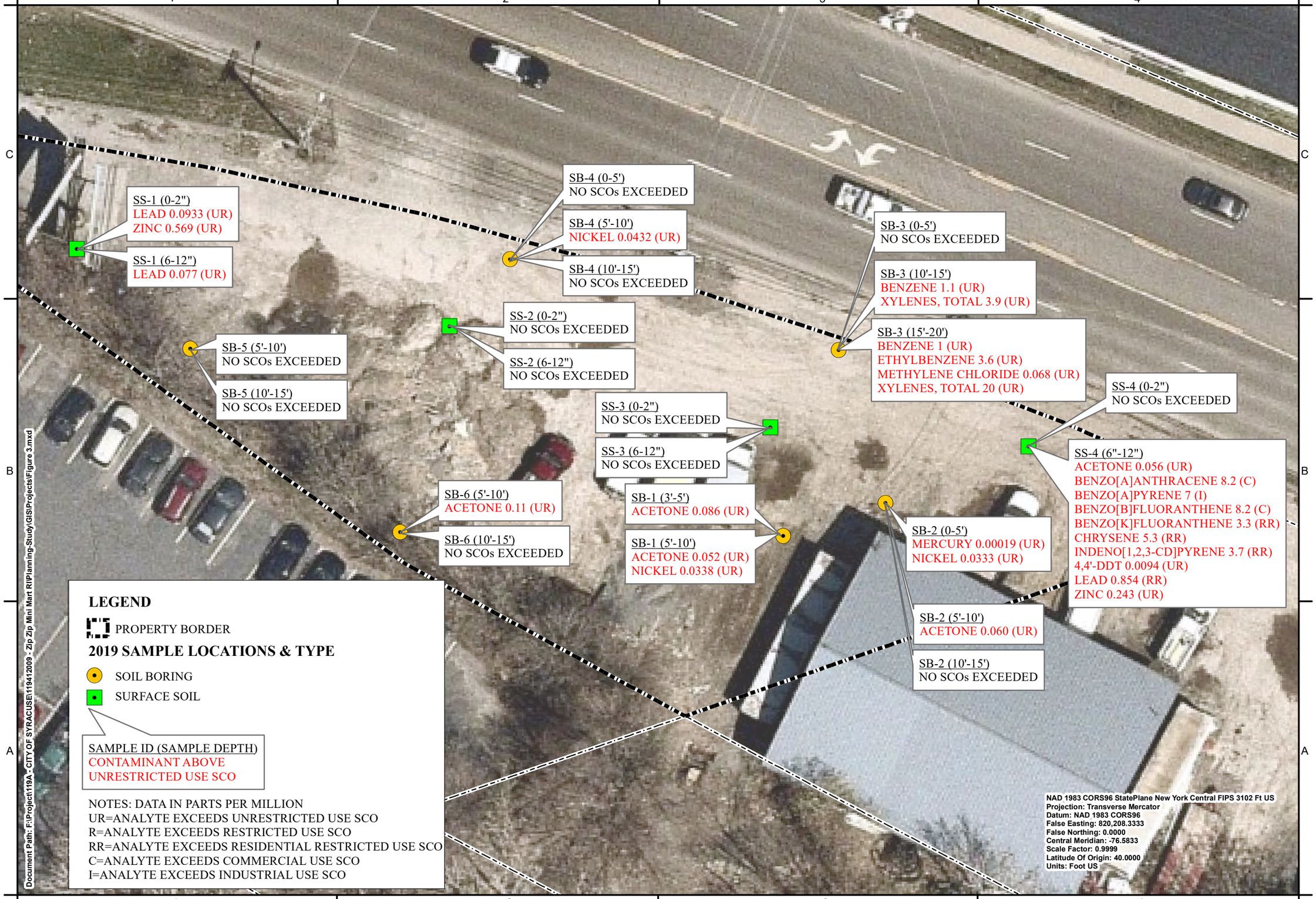
Zip Zip Minimarket ERP Site
NYSDEC Site No. B00075
City of Syracuse, Onondaga County, New York

PROJECT NO:	119.412.009
DATE:	April 2019
SCALE:	AS SHOWN
DRAWN BY:	JTB
DESIGNED BY:	MLW
CHECKED BY:	MLW

Modified: 4/26/2019 @ 8:33:41 AM

SITE MAP

Figure 2



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SOIL SAMPLING LOCATIONS

Figure 3

MW-4
MTBE 35

MW-2
MTBE 73

TW-2
MTBE 14

TW-1
BENZENE 120
ETHYLBENZENE 83
ISOPROPYLBENZENE 6.4
TOLUENE 48
XYLENES, TOTAL 440
2,4-DIMETHYLPHENOL 6.4
NAPTHALENE 17
PHENOL 3.2

TW-3

LEGEND

PROPERTY BORDER

2019 SAMPLE LOCATIONS & TYPE

EXISTING MONITORING WELL

TEMPORARY WELL

SAMPLE ID
CONTAMINANT ABOVE
TOGS 1.1.1 STANDARD

NOTES: DATA IN PARTS PER BILLION

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Projection: Transverse Mercator
Datum: NAD 1983 CORS96
False Easting: 820,208.3333
False Northing: 0.0000
Central Meridian: -76.5833
Scale Factor: 0.9999
Latitude Of Origin: 40.0000
Units: Foot US

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GROUNDWATER SAMPLING LOCATIONS

Figure 4