REMEDIAL INVESTIGATION WORK PLAN

700 Outparcel

701-709 East Water Street
Syracuse, New York

Brownfield Site # C734111

September 10, 2008

Prepared for:

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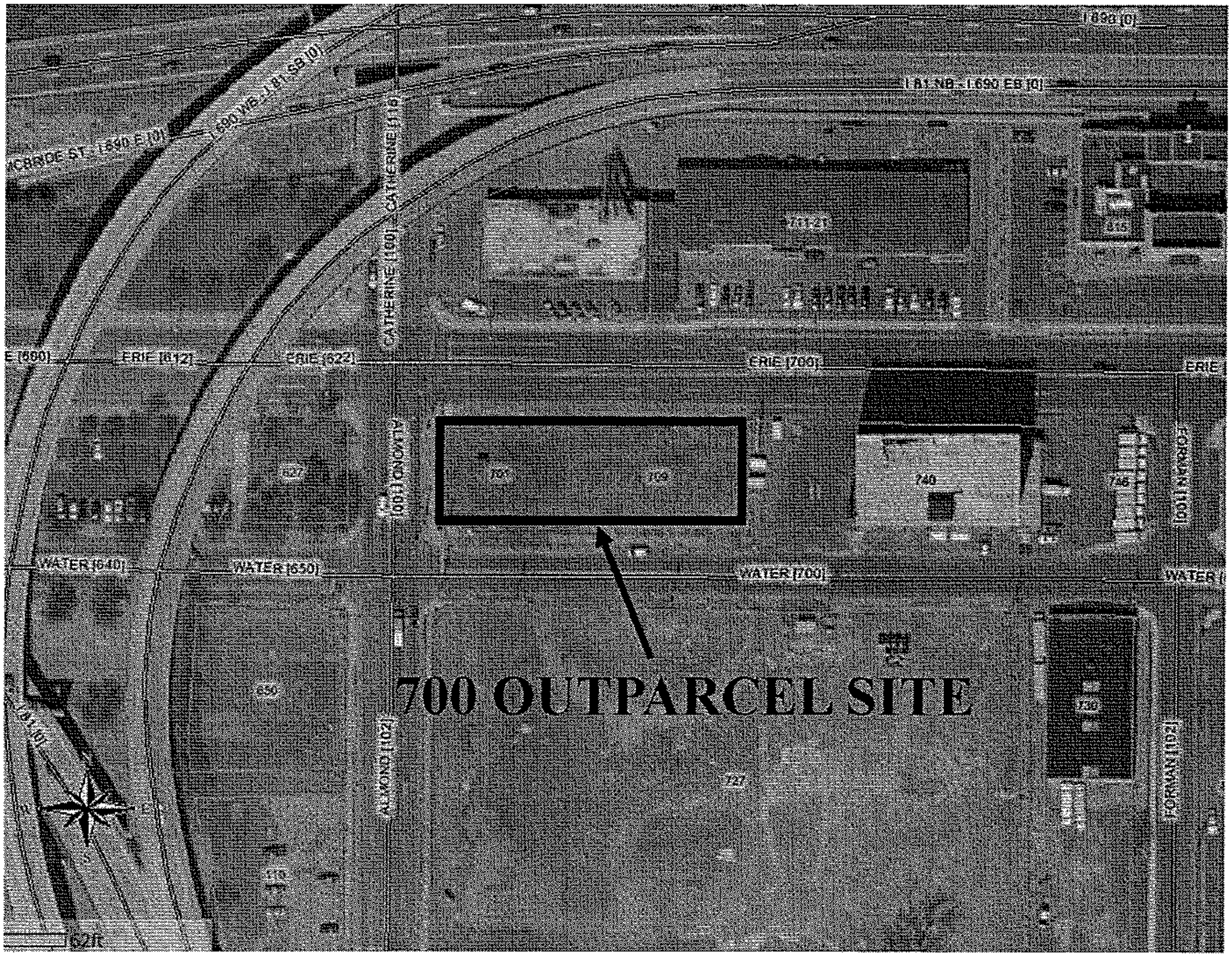
SECTION 1.0 – SITE BACKGROUND

1.1 INTRODUCTION

1.1.1 Site Location and Description

The subject property, currently owned by 700 Out Parcel, LLC, consists of two parcels of land totaling 0.43 acres located at the northeast corner of East Water and Almond Streets in the City of Syracuse, New York (see Figures 1 and 2, and embedded figure below). The parcels, which have addresses of 701 and 709 East Water Street, are identified by Tax Map Identification numbers 030-14-01.0 (Parcel No. 1) and 030-14-02.0 (Parcel No. 2), respectively. The site is bordered to the north by Erie Boulevard East, to the east by a commercial facility, to the south by East Water Street, and to the west by Almond Street



The subject property is currently flat with asphalt pavement covering approximately two-thirds of the surface.

1.1.2 Site Background and History

As part of a December 1997 Phase I Environmental Site Assessment (ESA) of the property, C&H Engineers, P.C. reviewed historic records related to the subject property and surrounding area in order to develop an understanding of previous site use and ownership. Detailed information regarding the property history was included within the Phase I ESA Report submitted to the NYSDEC as an attachment to the property's Brownfield Cleanup Program application. Tables 1 and 2 reveal the approximate tenure of past occupants at the site, based on information reported in the 1997 Phase I ESA:

TABLE 1 - HISTORICAL OWNERSHIP

Owner/Lessee	**From**	**To**
The Markert Manufacturing Co.	Unknown	12/30/1948
Robert, Herbert & Zetta Markert	12/30/1948	11/29/1962
Shell Oil Company, Inc. (Lessee)[1]	6/1/1949	5/31/1964
Marine Midland Trust Company (currently HSBC Bank USA, N.A.)	11/29/1962	2/9/1968
701 East Washington Realty Corp.	2/9/1968	2/10/1968
NYS Teachers' Retirement System	2/10/1968	12/31/1975
Alpha Collateral, Ltd.	12/31/1975	2/9/1979
NYS Teachers' Retirement System	2/09/1975	6/17/1981
Tygate Towers, Inc.	6/17/1981	4/12/1983
Charles Square, Ltd.	4/12/1983	8/4/1989
700 Outparcel Corp.	8/4/1989	12/1997
Swanson Fayette Associates, LLC[2]	12/1997	4/2007
700 Out Parcel, LLC[2]	4/2007	Present

[1] This entry in the Abstract of Title, describing the terms and conditions of said Lease, refers to "...gasoline filling and automobile service station equipment and apparatus..." including "4-1,000 gallon, 1-4,200 gallon, and 2-550 gallon underground storage tanks" on the property.

[2] Swanson Fayette Associates, LLC and 700 Out Parcel, LLC are both subsidiaries of the parent company Woodbine Group.

TABLE 2 - HISTORICAL OCCUPANTS

Occupant	**From**	**To**
Kenneth Murdock Gasoline Service Station	1940	1942
Warren Everson Gasoline Service Station	1943	1944
Chas. Jones Gasoline Service Station	1945	1945
Anton Zarachowicz Gasoline Service Station	1946	1946
Anton Zarachowicz Gasoline Service Station and Daniel Morris Used Cars	1947	1947
Anton Zarachowicz Gasoline Service Station and Fix Fred Used Cars	1948	1949
Anton Zarachowicz Gasoline Service Station and Reynolds Motors, Inc.	1950	1952
A.F. Zarach & Sons Gasoline Service Station and Reynolds	1953	1960

TABLE 2 - HISTORICAL OCCUPANTS		
Occupant	**From**	**To**
Motors, Inc.		
George's Shell Gas Station	1961	1961
George C. Macks, Inc. Gasoline Service Station and B&S Used Cars	1962	1963
Ed and Bob's Shell Gasoline Service Station	1964	1964
Shell Oil Company, Inc. (Lessee)	6/1/1949	5/31/1964
Vacant	1964	2007

1.2 PROPERTY ENVIRONMENTAL HISTORY

The property is known to have petroleum impacts, which were released to the subsurface from leaky underground storage tanks (USTs) and associated distribution lines of a former gasoline service station that operated at the site during the period 1949-1964. Upon discovery of petroleum-impacted soil, the New York State Department of Environmental Conservation (NYSDEC) Spill Hotline was called, and spill ID numbers 01-11549 and 06-10014 were assigned to the site.

1.2.1 Phase I Environmental Site Assessment

A Phase I Environmental Site Assessment (ESA) of the subject property was prepared for the City of Syracuse Industrial Development Agency by C&H Engineers, P.C. in December 1997. The ESA was prepared in accordance with ASTM Standard E1527-97, *Standard Practice for Environmental Site Assessments*. Based on the results of the Phase I ESA, C&H Engineers cited the following conclusions:

1. During the site reconnaissance, C & H Engineers observed two (2) holes in the asphalt surface at the subject property which appeared to be UST fill ports.
2. The Abstract of Title and the Sanborn Fire Insurance Maps identified four (4) 1,000-gallon and one (1) 550-gallon UST at the site.
3. Historical records also indicated that the subject property was a gasoline filling station from 1949 to 1964, which may have exposed the site to activities of environmental concern in addition to the presence of the USTs.

1.2.2 Limited Phase II Environmental Site Assessment

A Limited Phase II ESA of the subject property was prepared for the Woodbine Group by Beardsley Design Associates (BDA) in May 2002. Based on the results of the Limited Phase II ESA, BDA cited the following conclusions:

1. Four 2,000-gallon (approximate) USTs were encountered during the advancement of test pit TP-3. The backfill material surrounding the USTs, consisting of pea stone gravel, was determined to be significantly impacted. The backfill material was contained within an approximate 40-foot by 20-foot area. The surrounding native silt soils did not appear to be significantly impacted. Based on the information provided to the NYSDEC Spill Hotline, a spill file number (01-11549) was assigned to the subject parcel.

Conclusion: Although some contamination of the adjacent native silt/glacial till material was expected, these types of soils exhibit minimal permeability, and as such, only limited contaminant migration beyond the backfill materials was anticipated. Since groundwater was not encountered during the exploratory excavations, however, the vertical extent of gasoline contaminated soils was unknown. It is also possible that some contaminant migration to the adjacent utility trench (gas main) backfill materials extending along the eastern side of Almond Street (western property boundary) may have occurred. It is estimated that 400 to 500 cubic yards of contaminated backfill material and native soils existed in the vicinity of the gasoline USTs.

2. An approximate 550-gallon UST was encountered during the advancement of test pit TP-1. The UST, which had apparently been utilized for the storage of oil product, was found to be holding water. No staining, odors, or sheens were observed on the soils in the vicinity of the 550-gallon UST. Although parameter-specific concentrations of one VOC (acetone) and two SVOCs (fluoranthene and pyrene) were detected within the subsurface soil sample collected from the bottom of test pit TP-1, the concentrations did not exceed relative TAGM 4046 recommended soil cleanup objectives.

Conclusion: Potentially petroleum-impacted soils in the vicinity of the 550-gallon UST appeared to be limited to approximately 50 cubic yards.

1.2.3 UST Closure and Supplemental Subsurface Investigation

In November/December 2006 and March 2007, BDA performed a UST closure, soil remedial excavation activities, and supplemental subsurface investigation at the subject property (see Figures 3, 4, and 5). The site activities were performed in accordance with NYSDEC guidelines regarding UST removals and in general accordance with ASTM Standard E1903-97. The following conclusions were drawn from this investigation:

Site Subsurface Geology

Subsurface soil units underlying the subject property were interpreted as:

1. The basal soil unit (GC) that occurs at approximately 14.5-16 ft bgs is interpreted as a highly compact, clay-rich gravelly lodgement till with a predicted very low hydraulic conductivity.
2. The middle soil units (lower ML, GP, upper ML, and Peat/ML) that occur at approximately 4-14 ft bgs are collectively interpreted as a glacio-lacustrine sequence of fine-grained lake deposits. The lower ML/GP subsequence is a coarsening-upward package possibly representing a small lake delta. This interpretation is consistent with the description of Pleistocene glacio-lacustrine deposits published on the Surficial Geologic Map of New York State (Cadwell and Pair 1991). Corresponding hydraulic conductivities of the peat and ML subunits are predicted to be low. However, the hydraulic conductivity of the GP subunit is predicted to be high and potentially capable of allowing subsurface petroleum impacts in soil and groundwater to migrate.

Gasoline UST Excavations

1. On December 4 and December 12, 2006, seven USTs were decommissioned and removed from the site (see Figure 3). These USTs included:
   - Four 1,000-gallon gasoline USTs
   - Two 550-gallon USTs (one fuel oil and one waste oil)
   - One 4,200-gallon gasoline UST
2. Upon discovery of petroleum-impacted soil, the NYSDEC Spill Hotline was called by Seabird personnel on December 4, 2006 and spill ID #06-10014 was assigned to the site.
3. Upon completion of post-excavation soil sampling and laboratory analysis, residual gasoline-impacted soil above NYSDEC guidance values persists along the north, east, and south sidewalls of the north excavation pit of the gasoline UST field (see Figure 4 and Attachment A).
4. The highest headspace concentrations of total volatile organic compounds (VOCs) in soil appear to be confined to the sand and gravel unit (GP) at approximately 10-12 ft bgs, with the exception of the footprints of petroleum releases in the upper silt and fine sand unit (ML) emanating from the gasoline USTs and associated distribution line piping. A total of approximately 1,810 tons of gasoline-impacted soil was excavated and stockpiled from these areas pending transport and disposal to a sanitary landfill. Mr. Richard Brazell of NYSDEC Region 7 has granted 700 Out Parcel, LLC an extension for disposal of the stockpile pending further investigation and remedial actions at the subject property. Concentrations of residual gasoline-impacted soil remain on site, especially beneath the former distribution line piping along the eastern sidewall of the north excavation pit of the gasoline UST field.
5. Gasoline impacted soil extends to and potentially beyond the north property boundary.
6. Upon completion of post-excavation soil sampling and laboratory analysis within the south excavation pit of the gasoline UST field, no VOCs or semi-volatile organic compounds (SVOCs) were detected above NYSDEC guidance values (see Attachment B).

Fuel Oil UST Pit

1. Upon completion of post-excavation soil sampling and laboratory analysis, no concentrations of VOCs and SVOCs were detected above the laboratory detection limit or NYSDEC guidance values in the subsurface soil samples (see Figure 4 and Attachment B).

Waste Oil UST Pit

1. Upon completion of post-excavation soil sampling and laboratory analysis, concentrations of VOCs were detected in the sidewall composite and excavation bottom samples, but were well below the NYSDEC guidance values, with the exception of total xylenes detected in the sidewall composite sample above the NYSDEC guidance value (see Figure 4 and Attachment B).
2. Concentrations of SVOCs were detected in the sidewall composite sample, but were well below the NYSDEC guidance values. No concentrations of SVOCs were detected above the laboratory detection limit in the remaining subsurface soil samples (see Figure 4 and Attachment B).

Limited Subsurface Investigation

1. PID measurements of soils excavated from 13 test pits advanced in the central and western portions of the site indicate that residual gasoline-impacted soil extends to and potentially beyond the northern property boundary (see Figure 5). Gasoline-impacted soil extends to within 35 ft of the eastern property boundary and to the fence line at the southern and western property boundaries. Soil analytical results of samples collected from the south and west sidewalls within the former UST excavation indicate that contamination has not likely migrated off-site. However, based on test pit soil screening results, it is inconclusive whether or not petroleum subsurface impacts have migrated off-site to the south from on-site areas to the east of the former UST excavation.
2. An extensive area of elevated VOC concentrations in TP-1 (maximum of 1,439 ppm at 11 ft bgs), TP-2 (maximum of 1,732 ppm at 12.7 ft bgs), and TP-4 (maximum of 1,970 ppm at 12.5 ft bgs) located at the eastern portion of Parcel No. 1 suggests a source of petroleum contamination from former pump islands and distribution lines in this area.
3. An anomaly of elevated VOC concentrations in TP-11 located at the north-central portion of Parcel No. 2 (maximum of 2,000+ ppm at 10 ft bgs) suggests that there may be a secondary source of petroleum contamination in this area.
4. A section of concrete uncovered in the vicinity of TP-3 is believed to be a remnant of a former pump island, which suggests that former distribution line piping may have released petroleum to the subsurface from this area as well.
5. A section of former brick foundation and concrete footers uncovered in the vicinity of TP-11 and TP-12 is a potential remnant of a former automobile dealership and service center building, which is known to have existed concurrently on Parcel No. 2 during operations of the gasoline service station on Parcel No. 1.
6. A rectangular wooden subsurface structure with a wooden plank floor and localized visual evidence of congealed used motor oil beneath the wooden planks was uncovered in TP-13, which is believed to be a former automobile service pit for changing motor oil in vehicles. Although congealed used motor oil was observed, no headspace concentrations of total VOCs were detected in soil samples collected from this horizon, which may be indicative of degradation of SVOC constituents over an extended period of time.
7. The limited subsurface investigation further supports the earlier statement that gasoline impacted soil extends to and potentially beyond the northern property boundary in the vicinity of the north sidewall of the remedial investigation and test pits TP-2 and TP-11. In addition, gasoline-impacted soil extends to and potentially beyond the southern property boundary in the vicinity of test pits TP-1, TP-4 and TP-6.
8. The extent of the VOC plume does not appear to have impacted the southeastern portion of Parcel No. 2 in the vicinity of TP-7, TP-8, TP-10, and TP-13. However, since the soils were merely screened for volatile vapors, SVOC and metals contaminants may exist within this area.

1.2.4 Interim Remedial Measure

Approximately 1,800 tons of contaminated soil was staged on site during the removal of the former USTs (see Section 2.3). On May 14-16, 2008, these soils were removed from the site and disposed at a regulated landfill.

1.3 AREA CHARACTERISTICS

1.3.1 Geography

The subject property is located in an urbanized area on the near northeast side of downtown Syracuse (see Figure 1). The site is positioned immediately adjacent to the overpass interchange of Interstate Highways I-81 and I-690. At street level beneath the highways, the site is located at the intersection of East Water Street and Almond Street. Onondaga Creek is the nearest water body located approximately 0.5 miles to the west.

1.3.2 Topography

A United States Geologic Survey (USGS) map of the area (Syracuse East, NY, Photorevised 1978) indicates that the site is at an elevation of approximately 404 feet (see Figure 1). The topography of the landscape is generally flat with a gentle slope toward the west-southwest.

1.3.3 Geology

Regional and Local Geology

The site is located near the border of two physiographic provinces within New York State known as the Erie-Ontario Plain to the north and the Allegheny Plateau to the south. The Erie-Ontario Plain slopes toward the north and represents the southern extension of the Lake Ontario drainage basin, while the northern margin of the Allegheny Plateau includes the Finger Lakes troughs. The geology of the area in which the site is located consists of bedrock and overburden deposits. Bedrock in Central New York is dominated by flat-lying Sulurian-age and Devonian-age sedimentary strata, which exhibit a regional southward dip of approximately 20 feet to 30 feet per mile.

The Onondaga Lake Valley is underlain by a soft shale known as the Vernon Formation. The Vermon Formation is overlain by the Syracuse and Camillus Formations. The Syracuse Formation consists of shales, dolostones, gypsum, and rock salt. The Camillus Formation consists of soft, dolomitic shales and thin, gypsiferous shales. Bedrock at the site consists of the Syracuse Formation.

The pre-glacial bedrock beneath the site was modified by overriding Pleistocene glaciers. Deepening of the Onondaga Valley by glacial ice, in a manner similar to that which formed the Finger Lakes and surrounding valleys, produced a bedrock basin extending below sea level. Glacial sculpting of the area has produced a pronounced north-northwest to south-southeast orientation of hills and valleys. This orientation is partly the result of erosion of the underlying bedrock by glacial ice and the deposition of glacial till into elliptical hills known as drumlins.

Till is typically a compact, unsorted, and poorly stratified mixture of sands, silt, clay, gravel, and boulders deposited by glacial ice. A layer of till generally 10 to 15 feet thick overlies bedrock in this area. During glacial retreat in the Onondaga Valley, pre-glacial drainage to the north was blocked by an ice front producing a proglacial lake in which significant quantities of glaciolacustrine sediments were deposited. Drainage in adjacent north-south valleys, to the east and west of the Onondaga Valley, were also blocked by the ice front producing a series of lakes standing against the ice.

As the level of the lakes rose, surface water flow was predominantly to the south, over relatively high spillways or to the east or west over inter-valley divides. The large volumes of melt-water from the ice, spilling from one basin to another, cut numerous east-west trending channels into the valley divides. With the decay of the ice, lower spillways opened resulting in drainage of the proglacial lakes and the establishment of the existing system of lakes and surface drainage in the area.

During the time the proglacial lakes existed, they accumulated large volumes of sediment washed out from the ice and from the channels crossing the valley divides. These sediments consist primarily of fine sand and silt. Gravel, sand, and clay, however, are also present in some locations. Surficial soil near the site, however, has been mapped as urban land, which consists of built-up areas that have been so altered or obscured by urban works and structures that specific identification of the soils is not feasible

Site Geology

During previous subsurface investigations conducted by BDA, native soil was classified using the Unified Soil Classification System (USCS) in accordance with the American Society for Testing and Materials (ASTM) Standard D 2487-83 (ASTM, 1985). A generalized cross-section of the surficial geologic units encountered is summarized in Table 3 below:

TABLE 3 - GENERALIZED CROSS-SECTION OF SUBSURFACE GEOLOGIC UNITS

Depth (feet below ground surface)	USCS Unit Designation	Lithologic Description of Soil
0-4	FILL (GM/GC)	Asphalt/Macadam (0-0.5 ft) then FILL; Medium Gray-Brown SILT; Some Clay and f-c Gravel; Little vf-c Sand (Slightly moist; Brick, concrete, and glass fragments present)
4-5.5	PEAT/ML	PEAT with Dark Gray to Black SILT; Little vf-f Sand (Slightly moist; Abundant wood, reeds, and organic matter)
5.5-10	ML	Light Gray-Brown SILT and vf-f SAND with thin alternating lenses of pure vf-m sand, silt, and clay (Moist; Laminations and bedding present; Abundant root casts and decayed root matter; Localized clay intervals exhibit moderate plasticity)
10-12	GP	Light Greenish Brown m-c SAND and f GRAVEL; Trace vf-f Sand (Very moist; Wet at approximately 10.5-11 feet; subangular to subrounded clasts)
12-14.5	ML	Light Brown vf-f SAND; Some Silt and Clay (Wet; Sand, silt, and clay occurs in alternating thin beds and lenses)
14.5-16	GC	Reddish Brown f-m GRAVEL and CLAY; Little Silt and vf-c Sand (Slightly moist to dry; Very stiff and compact; High plasticity; Difficult digging with excavator)

The subsurface soil units are interpreted as:

- The basal soil unit (GC) that occurs at approximately 14.5-16 ft bgs is interpreted as a highly compact, clay-rich gravelly lodgement till with a predicted very low hydraulic conductivity.
- The middle soil units (lower ML, GP, upper ML, and Peat/ML) that occur at approximately 4-14 ft bgs are collectively interpreted as a glacio-lacustrine sequence of fine-grained lake deposits. The lower ML/GP subsequence is a coarsening-upward package possibly representing of a small lake delta. This interpretation is consistent with the description of Pleistocene glacio-lacustrine deposits published on the Surficial Geologic Map of New York State (Cadwell and Pair 1991). Corresponding hydraulic conductivities of the peat and ML subunits are predicted to be low. However, the hydraulic conductivity of the GP subunit is predicted to be high and potentially capable of allowing subsurface petroleum impacts in soil and groundwater to migrate.

1.3.4 Hydrology

Regional and Local Hydrology

The site is situated within the 230-square-mile Onondaga Lake drainage basin and within the larger Eastern Oswego River drainage basin, which covers approximately 2,500 square miles. Surface water drains north from the Onondaga Lake drainage basin into the Seneca River, into the Oswego River, and finally into Lake Ontario. Surface water in the area of the site is influenced by Onondaga Lake and its tributaries. The tributary nearest to the site is Onondaga Creek, which is located approximately 0.8 miles west of the site (see Figure 1).

Onondaga Creek, which flows from south to north through the Onondaga Valley and the City of Syracuse into Onondaga Lake, drains a watershed of approximately 100 square miles and has an average annual flow rate of approximately 190 cubic feet per second, before it discharges into the south end of Onondaga Lake. Onondaga Creek has been relocated from its former discharge point, which was once located at the southeast corner of Onondaga Lake.

The geology of the Onondaga Valley has a significant impact on the movement of groundwater in the valley and its tributaries. The pre-development groundwater flow patterns and water quality have been changed by construction projects, waste disposal, and groundwater pumping. Groundwater flow in Onondaga Valley and its tributaries is primarily driven by topography. Water flows from the valley divides into the surface and groundwater systems within each tributary valley. Surface and groundwater then flow towards Onondaga Lake. The flow patterns, velocities, and the groundwater/surface water ratio in each tributary valley are dependent on the local geologic conditions within each valley.

Site Hydrology and Groundwater Vulnerability

According to NYSDEC, groundwater beneath the site is classified as class GA groundwater. The site does not appear to directly overlie any aquifers and does not appear to be located near any primary or principal water supply aquifers as classified by NYSDEC. A surficial (unconfined) aquifer is located approximately six miles south of the site.

The approximate depth to groundwater, as measured during field activities, is approximately 11 feet. An interpretation of the topographic expression shown on the 1978 USGS 7.5-minute topographic map (Syracuse West Quadrangle) suggests that predicted groundwater flow beneath the subject property is to the west-southwest. However, based on conversations with contractors constructing the Center of Excellence site to the south, the local groundwater has more of a southerly component than the topographic map would suggest. In addition, local construction projects, especially the former Erie Canal, are likely to have impacted site groundwater flow.

Groundwater vulnerability from contamination sources is defined as the tendency or likelihood for contaminants to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Since the City of Syracuse supplies public potable water throughout the entire city, properties in the vicinity of the subject property are not used for the extraction of potable groundwater. Furthermore, there are no wellhead protection areas, groundwater recharge areas, residential wells, or commercial wells within a one-mile radius of the site. Therefore, the potential vulnerability of groundwater from hazardous substances or petroleum products dissolved in groundwater that emanate from the site is considered to be low. It is also important to note that it appears unlikely that the groundwater system in the vicinity of the subject property will be used in the future as a potable groundwater supply.

SECTION 2.0 – WORK PLAN

2.1 INTRODUCTION

The objective of this Work Plan is to describe the steps associated with the Remedial Investigation (RI) activities to further characterize the extent of impacted soil and groundwater in specific areas both on and off the subject property. The previous assessments and investigations conducted by BDA serve as the basis for conducting the RI activities as described in the following sections of this Work Plan. The purposes of the RI activities are to further delineate the limits of impacted soil and groundwater that were identified during previous environmental investigations (see Figures 1 through 5), and to assess the potential for off-site migration of constituents from the subject property. Please note that approximately 1,800 tons of contaminated soil were previously excavated and removed as part of the underground storage tank (UST) removal and subsequent interim remedial measure (IRM).

2.2 REMEDIAL INVESTIGATION (RI) ACTIVITIES

Based on prior explorations, grossly-contaminated soils are generally located in a gravel layer approximately 10 to 12 feet below grade (see Figure 5). The result of prior test pit exploration revealed four "hot spots" at the site (see Figure 6):

Area #1:	Former UST Area
Area #2:	North-Central Area
Area #3:	South-Central Area
Area #4:	Northeast Corner

These areas were found to contain grossly-contaminated soils, and will be assumed to require remediation unless proved otherwise. Therefore, the goal of the site investigation will be to determine the limits of these grossly-contaminated areas, and define which areas of the site will not require remediation. Note that soils from Area #1 have been excavated and disposed at a regulated landfill as part of the previously-completed IRM.

In general, the RI activities will include exploratory excavations consisting of 17 on-site test pits, seven off-site soil borings, and the installation of a total of nine on-site and off-site groundwater monitoring wells. In addition, up to an additional six contingent off-site soil borings and two contingent off-site groundwater monitoring wells may be warranted based on the results of the investigation. These excavations will be progressed in a three-phase approach:

1. Advance 17 on-site test pits
2. Based on field conditions identified during advancement of the test pits and/or laboratory results received, advance seven off-site soil borings, install two on-site groundwater monitoring wells, and install seven off-site groundwater monitoring wells
3. If deemed necessary based on field conditions identified during advancement of the test pits/borings/wells and/or laboratory results received, advance up to six contingent off-site soil borings and install up to two contingent off-site groundwater monitoring wells

The Sampling and Analysis Plan, Community Air Monitoring Plan, and Site-Specific Health and Safety Plan (Sections 3, 4, and 5 of this Work Plan) will remain in effect for all soil-intrusive activities. BDA will utilize a hand-held photoionization detector (PID) to screen the exposed and excavated soils for volatilized vapors. Based on visual observations and PID readings, one soil sample will be collected from each test pit for laboratory analysis. In addition, subsurface soil samples will be collected from the area adjacent to the former waste oil UST and former wooden structure for PCB analysis (see Figure 6); and three subsurface soil samples will be collected from the southern property border for Total Petroleum Hydrocarbon (TPH) analysis. As a contingency, a budget for a maximum of 10 additional miscellaneous soil samples has been included within the investigation scope. One subsurface soil sample and one groundwater sample will be collected for laboratory analysis from each of the eight monitoring wells. Two rounds of groundwater monitoring will be performed.

Upon completion of the investigations, the locations of the test trenches, test pits, monitoring wells, and sample locations will be field surveyed in order to provide accurate mapping and plans. Following laboratory analysis of the soil and groundwater samples, BDA will prepare an RI Report summarizing the RI activities. The on-site and off-site investigation activities are discussed below.

2.2.1 Test Pits

In general, the scope of the soil investigation effort includes the collection of 17 subsurface soil samples, and up to 10 miscellaneous samples (where necessary based on field conditions encountered). Based on the dimension of the site and proposed test pit locations, it is estimated that the maximum separation distance between the proposed soil sampling locations will range from 20 to 65 feet.

It is anticipated that 17 test pits will be advanced to a depth of approximately 14 feet below grade for various reasons:

TEST PIT	**REASON FOR EXPLORATION**
TP-1	Verify that soils are "clean" in southwest corner of site, collect TPH sample
TP-2	Determine if backfill has become contaminated
TP-3	Determine if backfill has become contaminated
TP-4	Verify that soils are "clean" east of Area #1, collect sample for PCB analysis
TP-5	Verify that soils are "clean" beneath former building slab
TP-6	Determine level of contamination in soils north of Area #2
TP-7	Determine nature of contamination near southern property border including TPH sample (for comparison to contamination at Center of Excellence site)
TP-8	Determine level of contamination in soils east of Area #2
TP-9	Verify that soils are "clean" between Area #2 and Area #3
TP-10	Determine level of contamination between prior test pits, collect TPH sample
TP-11	Determine level of contamination in soils northwest of Area #4
TP-12	Verify that soils are "clean" between Area #3 and Area #4
TP-13	Determine level of contamination east of Area #3
TP-14	Determine level of contamination in soils southeast of Area #4
TP-15	Collect sample for PCB analysis
TP-16	Verify that soils are "clean" in northeast corner of site
TP-17	Verify that soils are "clean" in southeast corner of site

The bottom and sidewalls of the open excavation, and the excavated soils, will be continuously observed for characteristics of gross contamination (stains, odors, etc.). Excavated soils will be screened at periodic intervals for volatile vapors using a PID. One soil sample will be collected during the advancement of each test pit where soils exhibit gross contamination or the highest PID readings, set aside for headspace analysis, and packaged for laboratory analysis (see Section 3). Excavated soils exhibiting characteristics of gross contamination (stains, odors, etc.) or PID readings above 50 parts per million (ppm) will be staged on and covered with polyethylene (poly) sheeting for subsequent removal and disposal as an interim remedial measure. Metal stakes with labels (on dirt-covered areas) or spray paint (on asphalt surfaces) will be used to mark sample locations.

The ten miscellaneous samples will generally be collected at locations with identified gross contamination or elevated PID readings outside of the gravel layer (near former fuel lines, etc), or to verify that layers above or below the gravel layer are not contaminated.

Following the sampling activities, the “clean” excavated soil will be backfilled into the test pits. If necessary, clean backfill will be delivered to the site to bring excavations to grade.

Collection and analysis of surface soils is not warranted at this site for the following reasons:

- The native surface soils within Area #1 were removed during the prior tank removals and replaced with clean fill.
- The remainder of the site is currently covered with asphalt.
- The planned redevelopment of the property includes underground parking, which will require excavation and removal of a vast majority of surface soils.
- Deed restrictions, covers, etc. can adequately address any surface soils remaining after site development excavations.

2.2.2 On-Site Groundwater Investigations

Based on the observations and field screening results of the exploratory excavations to be conducted on the subject property, it is anticipated that two groundwater monitoring wells will be installed at the property to a depth of 20 feet. The locations of the monitoring wells will be dependent upon the on-site and off-site subsurface investigations. Data obtained as part of the groundwater investigations will be utilized to evaluate site-specific groundwater flow directions and groundwater quality impacts.

Soil borings for the monitoring well installations will be advanced using 4¼" hollow stem augers, while continuous split spoon sampling and standard penetration testing will be performed with a 2" split barrel sampler in accordance with ASTM Standard D1586. The split spoon samples at 2-foot intervals will be classified, logged, and screened for volatilized vapors using a portable PID. One soil sample will be collected during the advancement of each boring where soils exhibit gross contamination or the highest PID readings, set aside for headspace analysis, and packaged for laboratory analysis (see Section 3). Excavated soils exhibiting characteristics of gross contamination (stains, odors, etc.) or PID readings above 50 parts per million (ppm) will be staged on and covered with poly sheeting for subsequent removal and disposal.

Due to the fine-grained nature of the site soils, each monitoring well will be constructed of 2-inch schedule 40 PVC well riser with a 10-foot length of no. 10 slotted well screen, vertically centered at the encountered groundwater level, and secured with a flush-mounted protective cover and lockable well cap.

Following the installation and development of the monitoring wells, BDA will record the static groundwater surface elevation in each monitoring well. The recorded depth to groundwater will be utilized to calculate and compare groundwater contours and flow directions. Prior to the collection of the groundwater samples, each well will be purged of at least five well volumes by peristaltic pump to allow for collection of a representative groundwater sample. After each well volume purged, temperature, pH, and conductivity will be measured. The well will be considered properly purged when these measurements stabilize. After purging, one groundwater sample will be collected from each monitoring well for laboratory analysis.

2.2.3 Off-Site Investigation Activities

The purpose of the off-site investigation activities is to identify the approximate nature and extent of off-site migration, if any, of contaminants from the subject site. Prior to advancement of the exploratory excavations on the adjoining properties, 700 Out Parcel, LLC, with the assistance of the NYSDEC and NYSDOH, will submit a written request to the City of Syracuse for permission to conduct the proposed exploratory excavations on streets owned by the municipality.

Based on the results of prior investigations at the site and the adjacent property to the south, BDA will advance three soil borings and install monitoring wells at an additional three locations along East Water Street (see Figure 6). In addition, based on field screening and laboratory analytical results of the investigation conducted on the subject property, BDA will:

- Advance soil borings at a total of four locations on Almond Street and Erie Boulevard East.
- Install groundwater monitoring wells at an additional three locations on Almond Street and Erie Boulevard East.
- Install one on-site groundwater monitoring well adjacent to the eastern property border (to serve as an off-site location for the adjacent commercial property).

If deemed necessary, advancement of up to six contingent off-site soil borings and installation of up to an additional two contingent off-site groundwater monitoring wells may be warranted (see Figure 6). If field conditions encountered during installation of the planned off-site wells/borings indicate gross contamination, the contingent borings/wells will be advanced immediately (locations will be discussed with NYSDEC and NYSDOH). Otherwise, a determination of the necessity of contingent borings/wells will be discussed with NYSDEC and NYSDOH after receipt of the laboratory analyses from the planned off-site wells/borings.

Based on the observations and field screening results of the exploratory excavations to be conducted on the subject property, it is anticipated that the groundwater monitoring wells will be installed to a depth of 18 to 20 feet. A groundwater monitoring well will be positioned hydraulically downgradient from Area #1 and Area #3, respectively. Data obtained as part of the groundwater investigations will be utilized to evaluate site-specific groundwater flow directions and groundwater quality impacts.

Soil borings for the monitoring well installations will be advanced using 4¼" hollow stem augers, while continuous split spoon sampling and standard penetration testing will be performed with a 2-inch split barrel sampler in accordance with ASTM Standard D1586. The split spoon samples at 2-foot intervals will be classified, logged, and screened for volatilized vapors using a portable PID. The excavated soils will be observed for evidence of gross contamination and will be screened at periodic intervals for volatile vapors using a PID. One soil sample will be collected during the advancement of each boring where soils exhibit gross contamination or the highest PID readings, set aside for headspace analysis, and packaged for laboratory analysis (see Section 3). Excavated soils exhibiting characteristics of gross contamination (stains, odors, etc.) or PID readings above 50 parts per million (ppm) will be staged on and covered with polyethylene (poly) sheeting for subsequent removal and disposal.

Due to the fine-grained nature of site soils, each monitoring well will be constructed of 2-inch schedule 40 PVC well riser with a 10-foot length of no. 10 slotted well screen vertically centered at the encountered groundwater level and secured with a flush-mounted protective cover and lockable well cap.

Following the installation and development of the monitoring wells, BDA will record the static groundwater surface elevation in each monitoring well. The recorded depth to groundwater will be utilized to calculate and compare groundwater contours and flow directions. Prior to the collection of the groundwater samples, each well will be purged of at least five well volumes by peristaltic pump to allow for collection of a representative groundwater sample. After each well volume purged, temperature, pH, and conductivity will be measured. The well will be considered properly purged when these measurements stabilize. After purging, one groundwater sample will be collected from each monitoring well for laboratory analysis.

Since the off-site areas of investigation are covered with asphalt, collection and analysis of surface soils is not warranted.

2.2.4 Soil-Vapor Intrusion Evaluation

A soil-vapor intrusion (SVI) evaluation will be performed in accordance with NYSDOH requirements and procedures. However, the evaluation will not occur until the remedial phase of the project because the planned redevelopment of the property includes underground parking, which will require excavation and removal of a substantial amount of soil throughout a majority of the property.

2.3 INTERIM REMEDIAL MEASURES

Prior to and/or upon completion of one or more of the previously listed investigation tasks, Interim Remedial Measures (IRM) may be completed at the site. Examples of IRMs include removal/disposal of USTs/piping or remediation of free product. The scope of an IRM would be based upon the results of preliminary and/or subsequent investigations and would include the following primary tasks:

- IRM Preparation: BDA would assist 700 Out Parcel, LLC in the completion of preliminary IRM evaluation efforts and IRM contract document preparation. Depending upon the needs of 700 Out Parcel, LLC, BDA would be available to prepare technical plans and specifications. BDA would also be available to procure IRM subcontractors, attend IRM pre-bid and pre-construction meetings, respond to contractor requests for information, and prepare addenda as required.

- IRM Field Engineering Services: BDA would be available to provide on-site documentation and oversight of field IRM activities, field management of contaminated soils/media, and verification/ confirmation sampling and analysis.
- IRM Closure Documentation: Following the completion of the IRM field efforts, BDA would prepare a close-out report identifying the observations noted during the IRM, field screening data, and the results of verification/confirmation sampling/analysis. Applicable site mapping and interpretations/conclusions regarding the IRM would also be provided within the report.

2.4 QUALITATIVE HEALTH RISK ASSESSMENT AND DATA USABILITY

In an effort to assess potential site impacts on human health and the environment, a qualitative human health risk assessment will be completed. This risk assessment will include a contaminant exposure and toxicity assessment.

The results of this focused qualitative risk assessment will be used to develop an overall characterization of risk to humans and the environment. The focused risk assessment will assess the following aspects, based on current and historic site specific analytical data:

- Identification of potential receptors
- Contaminant identification and selection of indicator compounds and chemicals of concern
- Exposure assessment to identify actual or potential exposure pathways and the extent or amount of exposure
- Toxicity assessment and dose response information
- Risk characterization of the potential risks or adverse health or environment effects for each of the exposure scenarios

2.5 DATA USABILITY

A data usability review effort shall be completed for the analytical data generated as part of the investigation, consistent with NYSDEC-DUSR Guidance for this type of project. As part of this effort, a general evaluation of field records and analytical data will be performed to assess whether the data are accurate and defensible.

2.6 REPORT PREPARATION

Upon completion of the RI activities and following receipt of laboratory analysis of the soil and groundwater samples collected from the site, BDA will prepare a report summarizing the RI activities and the results of the laboratory analyses. The RI sections of the report will identify or otherwise address the following:

1. The amount, concentration, persistence, mobility, state, and other relevant characteristics of the contaminants identified at the site

2. Extent to which natural or manmade barriers currently contain the contaminants identified at the site
3. Extent to which the identified contaminants have migrated or could have migrated
4. Potential routes of contaminant exposure
5. Populations and environmental receptors at risk
6. Hydrogeologic factors
7. Groundwater characteristics and current and potential groundwater use
8. Potential for the site's contribution to air, land, water, biota, and/or food chain contamination problems
9. Extent to which contaminant levels on and off site pose a risk to public health and/or the environment.

BDA will initially prepare a draft report, which will be submitted to NYSDEC and NYSDOH for review. Following receipt of comments, BDA will submit a final report.

2.7 PROJECT SCHEDULE

700 Out Parcel, LLC shall use all best efforts to move forward with the project according to the following approximate timeline:

Submit Site Investigation Work Plan	September 2008
Receive comments, final Work Plan	October 2008
Procure contractors	October 2008
Field Investigation Work	October - November 2008
Submit draft Site Investigation Report	January 2009
Receive NYSDEC/NYSDOH comments, final Report	February 2009
Submit draft Work Plan	March 2009
NYSDEC/NYSDOH approve alternatives analysis	April 2009
Public 45-day comment period	April - May 2009
Receive comments, final Work Plan	May 2009
Procure contractors	May 2009
Field work	June - October 2009
Submit draft Engineering Report	December 2009
Receive NYSDEC/NYSDOH comments, final Report	January 2010

If possible, site development will occur concurrently with remedial activities.

Note that the timeframes for completion of the key components of the project are dependent on several factors, including the time needed for regulatory review and subcontractor procurement, and weather conditions.

SECTION 3.0 – SAMPLING AND ANALYSIS PLAN

3.1 FIELD SAMPLING PLAN

3.1.1 Introduction

This Field Sampling Plan discusses the sampling procedures and methods to be used on the project for the collection of soil and groundwater samples for laboratory analysis. As described in Section 2.0, the RI activities will include the advancement of subsurface test pits, soil borings, and the installation of groundwater monitoring wells. Prior to conducting the test pit excavations, the location of each test pit as shown on Figure 6 will be marked at the site using metal stakes (on soil) or spray paint (on asphalt) and clearly labeled. Once the approximate limits of impacted soil have been identified through the exploratory excavations, BDA, 700 Out Parcel, LLC, and NYSDEC will agree upon the location of off-site soil borings and on-site and off-site groundwater monitoring wells, if necessary. Figure 6 shows the anticipated locations of the borings and groundwater monitoring wells. These locations will be marked with metal stakes (on soil) or spray paint (on asphalt) and clearly labeled. Soil and groundwater samples that are collected for laboratory analysis will be delivered to the laboratory on a daily basis during the RI activities. The soil and groundwater sampling procedures are described in more detail below.

3.1.2 Sampling Objectives

Field sampling at the site will be designed to obtain representative samples of environmental media in an effort to assess the impact that the site may have upon human health and the environment. The field sampling plan will include media sampling for groundwater and subsurface soils in areas of potential environmental concern.

3.1.3 Soil Sampling Procedures

Soil sampling at the site will be conducted in accordance with SOP #2012, “Soil Sampling” (see Attachment C). During advancement of test pits, the existing asphalt layer will be removed and subsurface soil samples will be collected from test pits. In general, the following steps will be followed for the collection of subsurface soil samples.

1. Following the selection of each soil sample location as discussed in Section 2.0, a 2-6 inch layer of soil will be removed from the collection area or excavator bucket using a stainless steel spoon.
2. To minimize the volatilization of VOCs, soil will first be placed into a dedicated jar and sealed. Additional soils will then be placed into dedicated jars for SVOCs and sealed. The soil samples will then be appropriately labeled for analysis (though it might not be analyzed based on results).
3. Thereafter, the remaining portion of the extracted soil will be placed into a glass jar, sealed with aluminum foil, and allowed to warm to ambient temperature. The seal on the jar will then be broken and the headspace in the jar will be measured with the PID. The jar will then be properly sealed and the PID results may be recorded. This soil sample will be appropriately labeled and submitted for metals analysis (though it might not be analyzed based on results).
4. The label on each glass sample jar will identify the sample location, sample depth range, sampling date and time, and parameters to be analyzed.

The sampling procedure for soil borings will follow the same procedure, except that a representative sample of cuttings will be collected for placement into dedicated jars.

3.1.4 Groundwater Sampling Procedures

BDA will collect one groundwater sample from each monitoring well for laboratory analysis. In general, the following steps will be followed for the collection of the groundwater samples:

1. Using a peristaltic pump, each monitoring well will be purged of a minimum of five well volumes in accordance with the procedures stated in Section 2. Thereafter, the representative will collect representative groundwater sample. Purged groundwater removed from each monitoring well will be dispensed into 5-gallon buckets, which will be subsequently transferred to 55-gallon drums, labeled corresponding to each monitoring well number. The drums will be temporarily stored at the site until the laboratory analyses have been completed to determine the appropriate discharge or disposal method.
2. A sufficient volume of groundwater will be collected from each monitoring well to fill dedicated vials/jars.
3. The label on each sample jar will identify the sample location, sampling date and time, and parameters to be analyzed.

3.1.5 Sample Handling & Chain-of-Custody

Upon completion of the soil and groundwater sampling for a particular day or period of time, the following procedures will be followed:

1. The sealed, labeled samples of soil and groundwater will be carefully packed into a cooler refrigerated with ice or ice packs for delivery to the laboratory for analysis.
2. Packing material may be placed around the sample jars inside the cooler to minimize the potential for sample container breakage that could occur during sample handling and delivery to the laboratory.
3. A chain-of-custody form will be properly completed, signed, and dated by all persons responsible for collection and delivery of the soil and groundwater samples.
4. The chain-of-custody form will be placed into a zip-loc plastic bag, sealed, and placed inside the cooler to accompany the soil and groundwater samples from the time of collection until delivery to the laboratory within 24 hours from the time of collection.

3.1.6 General Decontamination

The following procedures will be performed to decontaminate exploration equipment, sampling equipment, and personnel after each drilling/sampling event:

Drill rig, backhoe, and excavator - The drill rig, backhoe, and/or excavator will be steam-cleaned prior to their entrance and exit of the site. Greases and oils will not be used on any down-hole equipment during drilling or exploration activities.

Exploration equipment - To avoid cross-contamination, cleaning between each sampling site will be employed on backhoe arms, buckets, hollow stem augers, casing drill rods, and appurtenant equipment.

Split spoon sampler - The split spoon sampler will be scrubbed, cleaned, and put through a series of rinses between each sampling event. A number of split spoon samplers will be used so that one can be utilized for sampling while the others are being cleaned.

Reusable equipment – The sampling equipment will be properly disposed or decontaminated in accordance with SOP #2006, "Sampling Equipment Decontamination" (see Attachment D). The following steps will be employed to decontaminate other reusable equipment:

- Rinse equipment of soil or foreign material with potable water.
- Immerse and scrub equipment with bio-degradable phosphate-free detergent and potable water.
- Immerse and scrub in a potable water rinse without detergent.
- Immerse and scrub in deionized/distilled water.
- Saturate by spraying or immersion in laboratory-grade hexane.
- Air dry and wrap cleaned equipment in foil before transfer to next monitoring site to prevent contamination of equipment during transfer.
- The decontamination wash and rinse water will not be considered hazardous unless visual inspection or monitoring by the PID indicate that significant concentrations of contaminants may be present. The rinse waters can be discharged on site if they are not contaminated. If significant concentrations of contaminants are expected to be present, the rinse waters will be placed in sealed 55-gallon drums or 5-gallon buckets and stored on site.

Disposable equipment - Disposable equipment will be placed in a dedicated container for contaminated solids.

Sample containers - upon filling and capping sample bottles, the outside of the bottle will be wiped off with a clean paper towel. These towels will be disposed of in a dedicated container for contaminated solids.

Personnel decontamination - Personnel will be required to follow procedures outlined in the Health and Safety Plan.

3.1.7 Sample Identification

Samples of soil and groundwater will be identified and labeled to include the site name, the sample location, and the sampling time and date. The following alphanumeric system will be used to identify each sample and will correspond with the sample location to be identified on a field-generated sampling diagram:

Sample Type	+	Location No.	+	Sample No.	+	Depth(s)	Label/I.D.
Soil - Test Pit		TP-01, 02...		N/A		(#-#')	TP-02 (4-6')
Soil – Boring		SB-01, 02...		N/A		(#-#')	SB-02 (4-6')
Groundwater		MW-2		N/A		N/A	MW-2

Duplicate samples of soil and groundwater will include an upper-case letter "D" as a suffix to the sample number (i.e., 01D, 02D, 03D, etc.). Duplicate samples of the examples shown above would be identified as TP-02D (4-6'), SB-02D (4-6'), and MW-2D, respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROCEDURES

3.2.1 Project Team

Members of the Project Team, to meet the SI/RAR objectives as described in this Work Plan, include the following:

Project Team

Team Member	Organization	Telephone	Role/Title
Brian St. Laurent	700 Out Parcel, LLC	471-7400	Owner Contact
Christopher Mannes	NYSDEC	426-7515	NYSDEC Contact
Richard Jones	NYSDOH	477-8154	NYSDOH Contact
Raymond Cudney	BDA	472-6980	Project Coordinator
Richard McKenna	BDA	472-6980	Project Manager
Douglas Hurlbut	BDA	472-6980	Project Engineer and QA/QC Officer

On behalf of 700 Out Parcel, LLC, BDA will be responsible for coordination and performance of the RI activities, interpretation of the analytical data, and evaluation of the need for Interim Remedial Measures (IRMs). Project direction and related assistance will be provided by 700 Out Parcel, LLC, NYSDEC, and NYSDOH.

3.2.2 Key Personnel

Key personnel anticipated for the project will include the following:

1. *Raymond Cudney, P.E. - Principal*: Mr. Cudney will be responsible for administrative tasks.
2. *Richard McKenna. - Project Manager*: Mr. McKenna will serve as the primary point of contact for the project and will be responsible for overall project management, risk assessment evaluations, and implementation of the health and safety plan (HASP) at the site.
3. *Douglas Hurlbut - Project Engineer*: Mr. Hurlbut will be responsible for coordination of field sampling activities, delivery of soil and groundwater samples to the laboratory, and QA/QC Officer duties.

3.2.3 Subcontractors

Subcontractor services to be procured for this project include a geotechnical subcontractor to advance the exploratory excavations and to install the groundwater monitoring wells, an environmental laboratory to analyze the soil and groundwater samples, a data usability reviewer, and a surveyor to prepare field and "as built" surveys of test pit, monitoring well, and sample locations.

3.2.4 Data Quality Objectives

Data Quality Objectives (DQOs) are statements that describe the desired quality of data necessary to meet the objectives of the sampling program. The DQOs for the sampling program were formulated during the scoping effort and developed as part of this Sample and Analysis Plan. DQO Forms have been completed for each type of sampling media and are located in Attachment E. The general steps followed in preparation of the DQOs were as follows:

- Identification of the media to be sampled
- Identification of the data uses
- Identification of the data types
- Identification of the data quality needs
- Identification of the data quantity needs
- Identification the sampling and analysis procedure
- Review data for completeness

3.2.4.1 Sampled Media

This section identifies the media being investigated with one form filled out for each media to be sampled.

3.2.4.2 Data Use

This section identifies the intended use(s) of the data according to the following:

Site Characterization - Data are used to determine the composition, nature, and extent of contamination.
Risk Assessment - Data are used to evaluate the actual or potential risks posed by contaminants determined to be present on site. Particular attention is given to sampling at locations where human exposure is possible.
Health and Safety Plan (HSP) - Data are used to establish the level of protection needed for on-site workers during site characterization activities.
Monitoring - Data are used during the monitoring of the remedial action to access the effectiveness of such action.
PRP Enforcement - Data are used to help establish potentially responsible parties (PRPs).
Evaluation of Alternatives - Data are used to evaluate various proposed remedial technologies and assist in proper design of alternatives.

3.2.4.3 Data Types

This section identifies what types of analyses are to be performed.

3.2.4.4 Sample Collected

This section describes the sample collected.

Environmental - Refers to a specific media sampled such as water, soil, air, or biological.
Source - Refers to sampling an actual contamination source.
Grab - Refers to a discrete sample representative of a specific location.
Composite - Refers to a sample that represents a mixture of a number of grab samples that represents the average properties over the extent of areas sampled.
Biased - Refers to sampling that focuses on a specific area of expected contamination or uncontaminated area (background).

3.2.4.5 Analytical Support Levels

This section identifies the analytical options available to support data collection activities, identified as follows:

Level I: Field Screening. This level is characterized by the use of portable type instruments that provide real-time data. This section identifies the field monitoring equipment to be used and the manufacturers specified detection limits when available.
Level II: Field Analysis. This level is characterized by the use of portable analytical instruments in an on-site lab or transported to the site. This section identifies the field analysis to be used.
Level III: Standard Analytical Protocols. This level may include standard analytical protocols without the NYSDEC ASP (2005) Category B QA/QC and deliverables/reportables documentation. This level is often used to support remediation requirements.
Level IV: NYSDEC ASP Reportables/Deliverables. This level is characterized by rigorous QA/QC 2005 ASP protocols and Category B reportables/deliverables documentation.

3.2.4.6 Sampling Procedures

This section references the section of the Field Sampling Plan that describes the sampling procedures. If appropriate, this section also describes crucial samples that must be collected in order for this sampling event to be successful.

3.2.4.7 Data Quality Factors

This section describes factors that influence the quality or quantity of data to be collected. Primary contaminants and associated levels of concern are identified concerning ARARs or potential risks. The required detection limits are also given or referenced.

3.2.4.8 QA/QC Samples

This section indicates additional samples to be collected to support Quality Assurance/Quality Control (QA/QC) procedures. Additional samples to be collected include:

Matrix Spike/Matrix Spike Duplicates - Matrix spike duplicate samples are collected as a duplicate sample, to which the analytical laboratory will add known amounts of analyte. These QA/QC samples are intended to assess the extraction procedure used by the laboratory.

Field Blanks - Field (equipment) blanks are samples that are obtained by running analyte-free water through the sample collection equipment in a way that is identical to the sample collection procedures. Field blanks may be used during QA/QC procedures to evaluate if sampling equipment has contributed contaminants to the samples.

Trip Blanks - Trip blanks are samples that are prepared prior to the sampling event in the same type of sample container and are kept with the collected samples throughout the sampling event unit analysis. Trip blank vials are not opened in the field and are analyzed for volatile organics only.

3.2.5 Sampling Procedures

All sampling objectives, locations, and procedures have been included within the Project Work Plan and Field Sampling Plan.

3.2.6 Laboratory Coordination

All chemical analyses for soils and waters will be completed by a laboratory capable of performing project-specific analyses as indicated in this QA/QC plan and approved by the NYSDOH/NYSDEC as having the appropriate standard operating procedures, QA/QC programs, current resumes, and organizational structure to complete analytical work as specified in this Work Plan. The laboratory will have current certification for stated methodologies and QA/QC, and will be required to remain certified as such throughout the project. The project-specific Quality Assurance/Quality Control (QA/QC) Officer will also be responsible for all project related laboratory coordination.

3.2.7 Analytical Methodologies

Subsurface soil and groundwater samples collected as part of the RI will be analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-VOCs (SVOCs), TAL metals (including mercury and cyanide), and polychlorinated biphenyls (PCBs). The exception to this will be that soil samples collected from off-site borings will be analyzed for lead (only) instead of TAL metals.

The following criteria will describe the appropriate methodologies for extraction, digestion, and analysis of the previously listed matrices. The specific VOCs, SVOCs, and TAL metals to be identified, along with the Contract Required Quantitation Limits, are listed in Attachment F.

Parameter Group	*Analytical Method*
TCL VOCs	USEPA Method 8260B + MTBE + TBA
TCL SVOCs	USEPA Method 8270C
TAL metals	USEPA Method 6010, 7470/7471 (Hg), 9014 (CN)
Lead	USEPA Method 6010
PCBs	USEPA Method 8082
TPH	NYSDOH Method 310-13

All analyses will be performed SW-846 methodologies with QA/QC guidelines of 2005 ASP Category B, except PCBs and TPH which will not require Category B guidelines.

3.2.7.1 Subsurface Soil Samples

During the completion of on-site subsurface investigations, soil samples will be collected for TCL VOCs, TCL SVOCs, and TAL metals analysis. During the completion of off-site subsurface investigations, soil samples will be collected for TCL VOCs, TCL SVOCs, and lead analysis. Two additional on-site soil samples will be collected for PCB analysis only, while an additional three soil samples will be collected for TPH analysis only.

3.2.7.2 Groundwater Samples

Groundwater samples will be analyzed for TCL VOCs, TCL SVOCs, and TAL metals. Groundwater samples will also be analyzed for a select, limited group of field parameter analyses, including pH, specific conductance, and turbidity.

3.2.7.3 Trip Blanks

Trip blanks will accompany each shipment of aqueous samples for VOC analysis. Trip blanks are not necessary for soil samples. If several samples are collected for VOC analysis on any one day, all VOC samples will be packed in the same cooler with the trip blank.

3.2.7.4 Matrix Spike/Matrix Spike Duplicates

Duplicate samples will be obtained from groundwaters or (aqueous) and soil samples (solids). A general guideline of one matrix spike/matrix spike duplicate (MS/MSD) sample for each 20 samples of each matrix will be followed. With the present sampling schedule and sample quantities, one MS and MSD sample will be collected from groundwater sampling locations and up to two MS and MSD samples will be collected from test pit sampling locations.

3.2.8 Analytical Quality Control

Analytical quality control for this project shall be in accordance with 2005 ASP Category B. The following holding times, calculated from the validated time of sample receipt (VTSR), will be required from the contracted analytical laboratory, regardless of sample matrix:

Parameter	*Task*	*Holding Time from VTSR*
VOCs	Analysis	12 days
SVOCs	Extraction	5 days
	Sample Clean-Up(s)*	5 days
	Analysis	40 days
Metals	Analysis	180 days
Mercury	Analysis	26 days
Cyanide	Analysis	12 days

* = If sample cleanup performed during the 5-day period does not provide acceptable samples, these holding times may be extended to accomplish additional clean-up(s). If sample clean-up is required because of sample matrix interference, samples may be diluted by no more than a 1:5 dilution in order to compensate for that interference. Any further dilution to compensate for interferences, or other factors other than concentration, will require consultation and permission from BDA.

3.2.9 Reportables and Deliverables Documentation

The analytical data will be presented in 2005 ASP Category B reportables/deliverables format.

3.2.10 Data Usability and Acceptability

Because the investigation will produce data to be utilized to determine site-specific remedial alternatives, it is important that an evaluation of the validity of the data generated be completed. In an effort to provide adequate, compliant, and defensible data consistent with NYSDEC Guidance, the analytical data generated as part of the investigations shall be reviewed by a data usability subcontractor. It will be the responsibility of the reviewer to determine the usability and acceptability of the data. A general evaluation of field records and analytical data will be performed to assess whether the data are accurate and defensible. The data usability review effort shall be consistent with NYSDEC-DUSR Guidance for this type of project. A Data Usability Summary Report (DUSR) will be signed by the person completing the review.

SECTION 4.0 – GENERAL SITE-SPECIFIC HEALTH AND SAFETY PLAN

4.1 INTRODUCTION

The General Site-Specific Health and Safety Plan (HASP) applies to the activities of this Remedial Investigation (RI) Work Plan, and sets forth requirements for maintaining the health and safety of persons at the site. This General Site-Specific HASP is provided for informational purposes only. It addresses general health and safety issues related to the presence of specific chemical and physical hazards that may be encountered during performance of the work activities at the site. The Contractor is required to prepare and maintain their own site-specific HASP that incorporates the minimum requirements of this General Site-Specific HASP.

An Emergency Response Plan is included in Section 9, which presents the procedures to be followed in the event of an emergency situation. The HASP has been prepared in accordance with applicable Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) standards. In addition, procedures designed to account for the potential for human exposure to unknown substances are included in the HASP.

The HASP will be periodically reviewed by the Contractor's Health and Safety Officer (HSO) during the project to verify that it is in accordance with the operations conducted at the site. Changes in site conditions or changes in the work tasks at the site will necessitate a review and modification of the HASP. The Contractor's HSO shall contact the Owner and Engineer if site conditions change that warrant modifications to the HASP. Changes, modifications, and amendments to the HASP will be made in the form of addenda, and will be attached to the HASP.

4.2 GENERAL DEFINITIONS

The following definitions shall apply to and are used throughout the HASP:

- **Contamination Reduction Zone** - Area between the Exclusion Zone and Support Zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- **Exclusion Zone** - Any portion of this site where hazardous substances are, or may reasonably be suspected to be, present in the air, water, or soil.
- **HSO** – The Health & Safety Officer is a qualified professional designated by the CONTRACTOR who is responsible for the execution and maintenance of the HASP.
- **Monitoring** - The use of field instrumentation to measure the levels of contaminants. Monitoring will be conducted, if deemed necessary (i.e., excessive airborne dust and particulates), to evaluate potential exposures to chemical and physical hazards.
- **On-site personnel** - All personnel and subcontractors' personnel involved.
- **PPE** – Personal Protective Equipment; clothing/gear worn by personnel within the work area that is designed to reduce exposure to chemical and/or physical hazards.
- **Project** - All on-site work performed at the site as described in the Remedial Investigation Work Plan (RIWP).
- **Site** - The Proposed Elizabeth Crossings Apartments property where the soil excavation work is to be performed.
- **Subcontractor** - All subcontractors to the Contractor hired to work on this project.

- **Support Zone** - The remainder of the site outside of the Contamination Reduction Zone and Exclusion Zone. Support equipment is located in this zone.
- **Visitor** - All other personnel, excluding the on-site personnel.

4.3 RESPONSIBILITIES

Implementation of the HASP will be accomplished through an integrated team effort. The following key personnel will be involved with this project:

Contractor's HSO	To Be Determined
Contractor's Project Manager	To Be Determined
Project Engineer (Beardsley Design Associates)	Richard McKenna (315) 472-6980
Owner's representative	Brian St. Laurent (315) 471-7400
DOH representative	Richard Jones (315) 477-8148
DEC representative	Christopher Mannes (315) 426-7515

All parties to the project will perform their duties in a manner consistent with generally accepted practices, and will be responsible for the following (of their own employees) during the project:

- Verification that medical examinations and training requirements for all personnel are current
- Providing the HASP to all on-site personnel
- Implementation and maintenance of the HASP
- Providing all on-site personnel with proper PPE
- Compliance with the applicable state and federal health and safety standards
- Maintaining a Daily Sign-In/Sign-Out Log of on-site personnel and visitors who enter the site

The HSO for this project is designated with the following responsibilities:

- Maintain a daily log book for recording all significant health and safety activities
- Have authority to suspend work due to health or safety-related concerns
- Provide on-site technical assistance and conduct health and safety briefings at the site
- Verify that first aid kits, eye wash kits, and fire extinguishers are at the site
- Verify that on-site personnel have received the necessary training and physical examinations
- Verify that on-site personnel have been provided with and are using the required PPE
- Review of the adequacy of the HASP and amend the HASP as necessary during the project
- Prepare addenda to the HASP and maintain required documents for recordkeeping purposes

4.4 SITE HAZARDS EVALUATION

4.4.1 Chemical Hazards

Soils grossly-contaminated with oil and gasoline compounds were identified during the removal of underground storage tanks (USTs) at the site. A total of approximately 1,810 tons of soil was excavated, stockpiled, transported, and disposed at a regulated landfill in May 2008. Laboratory analysis of the grossly-contaminated soils from the excavated areas revealed that the material does not meet the criteria for hazardous waste. During a subsequent subsurface investigation, additional impacted soils were identified via staining, odors, and measurement of volatile vapors utilizing a photo-ionization device (PID). Known and assumed contaminants in site soils and groundwaters are as follows:

- Petroleum, including oil (fuel and waste) and gasoline compounds
- Heavy metals
- Polycyclic aromatic hydrocarbons (PAH)

Waste oil was also identified as sludge. The presence of chlorinated solvents, pesticides, and PCBs are not anticipated.

Material Safety Data Sheets (MSDSs) for gasoline, diesel, and used oil, and fact sheets for PAH, mercury, lead, cyanide, and arsenic are presented in Attachment F.

4.4.2 Chemical Routes of Exposure

The chemicals of concern outlined in Section 4.1 may enter the human body in a variety of ways. The chemical routes of exposure anticipated from remedial activities at this site include:

- **Absorption**- Dermal (skin) contact with impacted soil/groundwater on site resulting in absorption of chemicals of concern through the skin and into the blood stream. Proper use of PPE as specified in Section 5 will minimize risks of exposure at the site.
- **Ingestion**- Chemicals of concern come in direct contact with the mouth from soil or other contaminated areas (PPE, skin, tools, etc.) and enter the bloodstream through the stomach lining. Proper care in handling PPE and tools and refraining from eating and drinking at the site will minimize risks of exposure.
- **Inhalation**- Chemicals of concern, both volatilized and attached to dust and particulates, are entrained by wind and become airborne across the site and are subsequently inhaled through the nose and/or mouth. This exposure route is the most likely way for worker exposure to occur on site. The Contractor shall employ excavation methods that minimize the creation of dust and utilize dust suppression techniques to minimize continued entrainment of dust and particulates. The Contractor is responsible for any personal air monitoring of his employees.

4.4.3 Physical Hazards

Based upon the field activities described in this work plan, the following potential hazard conditions may be anticipated:

- The use of typical mechanical equipment such as backhoes, trackhoes, bulldozers, and jack hammers can create a potential for crushing and pinching hazards due to movement and positioning of the equipment, movement of lever arms and hydraulics, and entanglement of clothing and appendages in exposed drives and tracks. Mechanical equipment can also create a potential for impact of steel tools, masts, and cables should equipment rigging fail, or other structural failures occur during hydraulic equipment operation. Heavy equipment work must be conducted only by trained, experienced personnel. If possible, personnel must remain outside the turning radius of large, moving equipment. At a minimum, personnel must maintain visual contact with the equipment operator. When not operational, equipment must be set and locked so that it cannot be activated, released, dropped, etc. The mechanical equipment stated above represents typical equipment that is ordinarily used during this scope of work, but is not meant to be an all-inclusive list. Similar precautions should be used around other mechanical equipment deployed to the site that is not listed above.
- Equipment can be energized due to contact with overhead or underground electrical lines, utilities impaired by excavation of communication or potable/wastewater lines, or a potential for fire or explosion may occur due to excavation of below ground propane/natural gas lines. The Contractor is responsible for contacting Dig-Safely New York to inspect and flag the construction area prior to commencement of invasive operations. Personnel should be aware that although an area may be cleared, it does not mean that unanticipated hazards will not appear. Mechanical equipment will maintain a safe minimum distance of 10 feet from live electrical equipment. Workers should always be alert for unanticipated events such as snapping cables, unearthing unmarked underground utilities, etc. Such occurrences should prompt individuals to halt work immediately and take appropriate corrective measures to gain control of the situation.
- Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; cause pain, physical damage to the ear, and temporary and/or permanent hearing loss; and can interfere with communication. If workers are subjected to noise exceeding an 8-hour time-weighted average sound level of 85 dBA, hearing protection will be required with an appropriate noise reduction rating to comply with 29 CFR 1910.95 and to reduce noise levels below levels of concern.
- Personnel may be injured during physical lifting and handling of heavy equipment, construction materials, or containers. Additionally, personnel may encounter slip, trip, and fall hazards associated with excavations, manways, and construction debris and materials. Precautionary measures should be taken by identifying and removing slip, trip, and fall hazards prior to commencing work. In the event slip, trip, and fall hazards can not be removed or minimized, site workers will be shown the location of the physical hazard and be asked to avoid it during work activities.
- The potential for fire and/or explosion emergencies is always present on the site. Field vehicles will be equipped with a fire extinguisher. Employees must be trained in the proper use of fire suppression equipment. However, large fires that cannot be controlled with a fire extinguisher should be handled by professionals. The proper authorities should be notified in these instances.

In addition, heat stress can result from a number of contributing factors, including environmental conditions, clothing, and workload as well as the physical condition of the individual. Since heat stress is one of the most common injuries/symptoms associated with outdoor work conducted with direct solar load, and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Signs and symptoms of heat-related illnesses which all on-site personnel should be aware, include the following:

1. Heat rash may result from continuous exposure to heat or humid air.
2. Heat cramps are caused by heavy sweating and may include muscle spasms and pain in the hands, feet, and abdomen.
3. Heat exhaustion is indicated by pale, cool, and moist skin; heavy sweating; dizziness; nausea; and fainting.
4. Heat stroke is indicated by red, hot, and unusually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; rapid pulse; and coma. Immediate action must be taken to cool the body before serious injury or death occurs.

Furthermore, persons working outdoors in temperatures at or below freezing may be subject to frostbite. Extreme cold for a short time may cause injury to exposed body surfaces or result in a profound generalized cooling which can cause death. Areas of the body such as fingers, toes, and ears, are the most susceptible to cold stress. Ambient air temperature and wind velocity are two factors which influence the development of a cold weather injury. Local injury resulting from exposure to cold temperatures is known as "frostbite." There are several degrees of damage in which frostbite of the extremities can be categorized, as follows:

1. Frost nip or incipient frostbite is characterized by sudden bleaching or whitening of the skin.
2. Superficial frostbite occurs when the skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
3. Deep frostbite is characterized by tissues that are cold, pale, and solid; this is an extremely serious injury.

4.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personnel will be required to wear Level D and Modified Level D PPE ensembles, at a minimum. The following PPE ensembles shall be worn by on-site personnel for the following tasks:

Level D Protection, as listed below, shall be worn by on-site personnel at all times when tasks are performed which DO NOT INVOLVE dermal exposure or contact with chemical hazards:

- Standard outer garments (i.e. long pants and long-sleeve shirt)
- Durable leather steel-toed work boots
- Durable leather gloves
- Eye protection
- Hard hat
- Hearing protection

Modified Level D Protection, as listed below, shall be worn by on-site personnel at all times when tasks are performed which INVOLVE dermal exposure or contact with chemical hazards:

- Disposable coveralls worn over standard outer garments. Personnel will frequently verify the integrity of their coveralls by checking for holes or tears.
- Durable leather steel-toed work boots.
- Disposable nitrile gloves. Personnel will frequently verify the integrity of their gloves by checking for holes or tears.
- Rubber boots worn over work boots.
- Eye protection.
- Hard hat.
- Hearing protection.

Respirator use is not anticipated for use on this project. If respiratory protection becomes necessary, a determination shall be made regarding each person's physical ability to wear a respirator. Consequently, persons required to wear respirators must provide the Contractor's HSO with current documentation (not older than 6 months) regarding their physical condition and ability to wear a respirator, as certified by a qualified physician. Failure to provide current, complete respirator certification documentation will be sufficient grounds to preclude personnel from conducting RI activities where respiratory protection is required.

4.6 PERSONNEL TRAINING

4.6.1 Requirements and Responsibilities

All on-site personnel and visitors will be trained commensurate with their job responsibilities and in accordance with Occupational Safety and Health Administration (OSHA) training and medical surveillance requirements as specified in 29 CFR 1910.120. The Contractor is responsible for providing such training prior to personnel being allowed to engage in site activities that could expose them to health and safety hazards. The HSO has the responsibility to assure that this training is provided for the site conditions and such training is updated, as needed. The HSO and Contractor's Project Manager will be trained in basic first aid, and at least one of these individuals will be present during each work shift while personnel are at the site.

4.6.2 Site Orientation Meeting

The Contractor will be responsible for notifying all on-site personnel of required attendance at a site orientation meeting, which will be organized by the Contractor's HSO. Any subcontractor personnel will be required to attend the site orientation meeting as well as any other periodic health and safety meeting specified by the HSO. Personnel attending the site orientation meeting are to sign a Site Orientation Meeting Attendance Acknowledgment Form. The following is a listing of general site orientation training topics:

- Names and responsibilities of key personnel
- Safe work practices
- Personal protective equipment
- Chemical and physical hazards
- Site equipment

- Medical surveillance
- Site hazards
- Site control measures
- Decontamination procedures
- Standard operating procedures
- Emergency response plan

4.6.3 Documentation/Recordkeeping

OSHA regulations require medical surveillance in the form of annual medical examinations for certain types of work involving exposure to hazardous or toxic substances. All on-site personnel, visitors, and subcontractors are required to have documented proof on file of OSHA training and medical surveillance requirements as specified in 29 CFR 1910.120 to demonstrate compliance with the training requirements specified in this Section. The HSO is responsible to check all personnel to ensure training is kept current during the project.

4.7 MEDICAL CLEARANCE

Medical clearance refers to OSHA requirements for annual physical reports performed by a licensed physician, which document a worker's physical ability to perform specific job duties. Medical clearance is not required for on-site personnel or visitors at the site, except for OSHA medical surveillance requirements for workers within the Exclusion Zone, Contamination Reduction Zone, or Loading Zone.

4.8 STANDARD OPERATING PROCEDURES

Potential chemical and physical hazards exist at the site. This Section presents Standard Operating Procedures (SOPs) that will be followed during the project. Specific precautions to avoid the potential hazards for each task are presented herein.

4.8.1 General SOPs

Workers shall adhere to the established SOP for their respective specialties. Work at the site will be conducted according to established procedures and guidelines for the safety and health of all involved. General SOPs at the site include the following:

- All questions should be referred to the Contractor's HSO or Project Manager.
- All on-site personnel will be trained and briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.
- Inspections of the site will be conducted to ensure compliance with the HASP, and if any change in operation occurs, the HASP will be modified to reflect any change.
- Be observant of not only one's own immediate surrounding but also that of others.
- On-site personnel in the work zone will act as safety backup to each other, and on-site personnel outside the work zone will provide emergency assistance when necessary.
- Use extra precautions when working near heavy equipment.
- Communications using hand signals or other means will be maintained between on-site personnel, the HSO, and the Project Manager at all times.
- Breaks should be planned to prevent heat, cold, stresses, accidents, and fatigue.
- Work Areas for various operational activities will be established.

- Strict pedestrian and vehicular traffic control will be maintained on site.
- Entrance/exit locations and emergency escape routes will be designated and delineated.
- On-site personnel and equipment in each Work Area will be minimized to maintain effective site operations.
- Required PPE ensembles must be worn by all on-site personnel entering work areas designated for wearing PPE.
- Work Areas and decontamination procedures will be established based on expected site conditions.
- Plan work procedures and decontamination areas to minimize contamination exposure.
- Contaminated equipment shall not be placed on unprotected surfaces.
- Procedures for leaving a Work Area will be planned prior to entering the site.
- All electrical equipment (power tools, extension cords, instruments, etc.) will conform to 29 CFR 1926.400 Subpart K.
- Fire prevention and protection (appropriate signs for flammable liquids, smoking areas, storage areas of combustible or flammable materials, etc.) will be in accordance with OSHA 29 CFR 1926.150 Subpart F

Violation of these SOPs will result in immediate dismissal from the site.

4.8.2 Site Control Measures

Site control measures will minimize potential contamination of on-site personnel, protect the public from potential on-site hazards, and prevent vandalism of equipment and materials. Site control measures also enhance response in emergency situation.

Prior to commencement of soil excavation activities, a site perimeter boundary will be established using yellow construction tape along the property lines surrounding the parcel for the duration of the project. Portions of the site will be routinely divided into three distinct areas: an Exclusion Zone, a Contamination Reduction Zone (CRZ), and a Support Zone.

Exclusion Zone

The Exclusion Zone will be designated as the area where the highest potential for exposure by dermal or inhalation routes exists. The Exclusion Zone coincides with areas being excavated. PPE is required and a daily log will be kept of all personnel entering this zone. The Exclusion Zone will be marked off by barricades or barrier tape which will be placed a minimum of 20 feet from the edge of the active operation. Some situations may necessitate distances of less than 20 feet; these situations will be reviewed by the HSO. Approval for entry into the Exclusion Zone will require compliance with OSHA training and medical surveillance requirements (29 CFR 1910.120). Subcontractor and vendor equipment will not be permitted to enter the Exclusion Zone without prior authorization and will be subject to site decontamination procedures. All personnel and equipment shall be decontaminated when leaving the Exclusion Zone. No eating, drinking, or smoking will be permitted in the Exclusion Zone.

Contamination Reduction Zone (CRZ)

The Contractor will establish the CRZ in an area between the Exclusion Zone and Support Zone. Approval for entry into the CRZ will require compliance with OSHA training and medical surveillance requirements (29 CFR 1910.120). Access to the Exclusion Zone will be through the CRZ. The CRZ will be designated as the area immediately adjacent to and surrounding the Exclusion Zone. The probability of dermal and inhalation exposure is lower in the CRZ than in the Exclusion Zone. The CRZ includes facilities for personnel and equipment decontamination. PPE worn in the Exclusion Zone may not be worn outside the CRZ, except during emergencies. No eating, drinking, or smoking will be permitted in the CRZ.

Support Zone

The Support Zone includes all areas outside the CRZ and Loading Zone. The exposure potential in the Support Zone is minimal. The Support Zone provides a changing area for personnel entering the CRZ and Exclusion Zone, as well as an area for the storage of clean equipment and materials. Protective clothing worn in the Exclusion Zone will not be allowed to be worn in the Support Zone, except in emergencies. It is the responsibility of the Project Manager to control access to the site and to assure proper security. Any evidence of unauthorized entry will be noted in the daily log.

Under no circumstances will the general public be permitted to access the property. All pre-approved site visitors will be briefed on the HASP, and shall sign the Daily Site Sign-In/Sign-Out Log. Pre-approved visitors will be permitted in the immediate area of active operations only with approval from the Contractor's HSO or Project Manager. All personal vehicles are restricted to the Support Zone.

4.8.3 Communication Procedures

Personnel in the Exclusion Zone will remain within sight of other project personnel. The commonly used international hand and arm signals are listed below, and will be used when necessary:

Signal	**Meaning**
Right hand thumbs up	OK, I'm All Right
Right hand thumbs down	No, Negative
Rotating both hands at sides	Situation Under Control
Rotating both hands above head	Need Assistance
Hand gripping throat	Out of Air, Cannot Breathe
Both hands placed on hips	Leave Area Immediately
Rotating both hands at knees	Situation Grave, Evacuate Immediately
Both hands placed on top of head	Returning to Support Zone

4.8.4 Decontamination Procedures

On-site personnel performing remediation tasks under the Modified Level D PPE ensemble will perform decontamination operations in accordance with the following steps:

- Remove and discard boot covers if worn.
- Wash boots brushed with a liquinox solution and rinse with potable or distilled water.
- Remove coveralls first (if applicable), then remove nitrile gloves and place in the disposal container staged in the CRZ. All disposable PPE (gloves, coveralls), rags, cloths, etc. will be containerized separately from general site refuse, and disposed of in accordance with the applicable regulations.
- Remove and discard inner gloves in a 55-gallon drum.
- Proceed to the Support Zone bringing decontaminated tools and sampling containers.
- Wash hands, face, and other exposed skin with soap and water. Shower and shampoo as soon as possible at the end of the work day, before any social activities.
- Place non-disposable coveralls in plastic bags prior to leaving the site and prior to entering any vehicle.
- Launder non-disposable clothing worn in Exclusion Zone prior to reuse, separately from other laundry items.

4.8.5 Periodic Health & Safety Meetings

The HSO will conduct weekly health and safety meetings. These meetings will be a review of existing protocols as well as a means to update personnel on new site conditions. The meetings will also provide an opportunity for on-site personnel to discuss health and safety concerns. Topics for discussion may include, but are not limited to, the following:

- Review of the type and frequency of environmental and personal monitoring
- Task-specific levels of protection and anticipated potential for upgrading
- Review of existing and new health and safety issues
- Review of emergency procedures

4.9 ACCIDENT AND EMERGENCY RESPONSE PLAN

This Section includes procedures and methods of evaluating and addressing medical, fire, and other emergency situations which may occur at the site. In any unknown situation, always assume the worst conditions and plan responses accordingly. All emergency situations require concise and timely actions conducted in a manner that minimizes the health and safety risks to on-site personnel and to the public. All on-site personnel shall be familiar with the Emergency Response Plan.

4.9.1 Responsibilities

The Contractor's HSO and Project Manager have the shared responsibility for directing response activities in the event of an emergency or accident, and will be responsible for the following:

1. Assess the situation
2. Determine required response measures
3. Notify appropriate response teams
4. Direct on-site personnel during the emergency

The Contractor's HSO or Project Manager will coordinate the response activities of on-site personnel with those of public agencies. A list of agencies to be contacted and who may, depending on the nature of the situation, assume authority for emergency response is presented in Section 9.6. This table includes names and telephone numbers of local hospitals, health department, ambulance service, fire and police departments, and other applicable agencies. The HSO will notify emergency response agencies and establish emergency procedures prior to commencing remedial activities at the site.

4.9.2 Emergency Procedures

Due to the nature of the tasks to be conducted at the site, the emergency situations that may occur are most likely limited to personnel accidents (i.e., slip, trip, and fall accidents; equipment-related accidents, etc.) requiring first aid. The following procedures shall be followed in the event of an emergency:

1. On-site personnel shall report all accidents and unusual events to the HSO.
2. The HSO will assess the situation. If off-site assistance and medical treatment is required, the HSO will designate a person to call the proper authorities.
3. First-aid or other applicable treatment will be provided by properly trained individuals.
4. The HSO will inform the Project Manager of the injury/accident, and an Accident Report Form detailing the causes and consequences of the injury/accident will be submitted to the Project Manager within 48 hours of the incident. The Accident Report Form shall include:
   a. Names and social security numbers of accident victims and witnesses
   b. Date and time of accident
   c. Location, cause, and duration of accident
   d. A description of corrective actions implemented
   e. Off-site persons and agencies notified and time of arrival at the site

Personnel shall make all reasonable attempts to conduct themselves in a calm manner in the event of an accident.

4.9.3 Accidents & Injuries

Every accident is a unique event that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk. Several types of emergencies are outlined in the following subsections. These are not intended to cover all emergency situations.

If a person working on the site is physically injured, basic first-aid procedures will be followed. Depending on the severity of the injury, outside medical assistance may be sought. If the person can be moved, the person will be taken outside of the Work Area, PPE will be removed, and first aid administered. If necessary, transportation to a medical facility will be provided. If the person can only be moved by emergency medical personnel, the HSO will decide what type of PPE (if any) will be required to be worn by emergency personnel.

If the injury to on-site personnel involves chemical exposure, the following first aid procedures will be initiated as soon as possible:

> *Eye Exposure* - If solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash station using water and lifting the lower and upper lids occasionally. This emergency eyewash station shall be a portable station provided by the Contractor and set up within the CRZ. If an acute exposure is identified, then obtain medical attention immediately. Otherwise, consultation with a doctor shall be discretionary based on the severity of the incident.
>
> *Skin Exposure* - If solid or liquid gets on the skin causing irritation or pain, wash skin immediately at the emergency eyewash station using water. If an acute exposure is identified, then obtain medical attention immediately. Otherwise, consultation with a doctor shall be discretionary based on the severity of the incident.
>
> *Inhalation* – In the rare event that a person inhales large amounts of organic vapor or dust and is overcome, move the person to fresh air at once. Obtain medical attention immediately. If breathing has stopped, appropriately trained personnel and/or medical personnel should perform cardiopulmonary resuscitation. Keep the affected person warm and at rest.
>
> *Ingestion* - If solid or liquid is swallowed, medical attention must be obtained immediately and the Poison Control Center consulted.

4.9.4 Fire

On-site personnel will be knowledgeable in fire-extinguishing techniques. They will be instructed in proper use and maintenance of the fire extinguishers supplied at the work sites. Fire extinguishers should be used only for small fires which are in the early stages of development. Where the fire cannot be controlled through extinguisher use, the area should be evacuated immediately. The local fire department should be called to extinguish the fire. Fire extinguishers shall be provided by the Contractor.

4.9.5 Emergency Evacuation

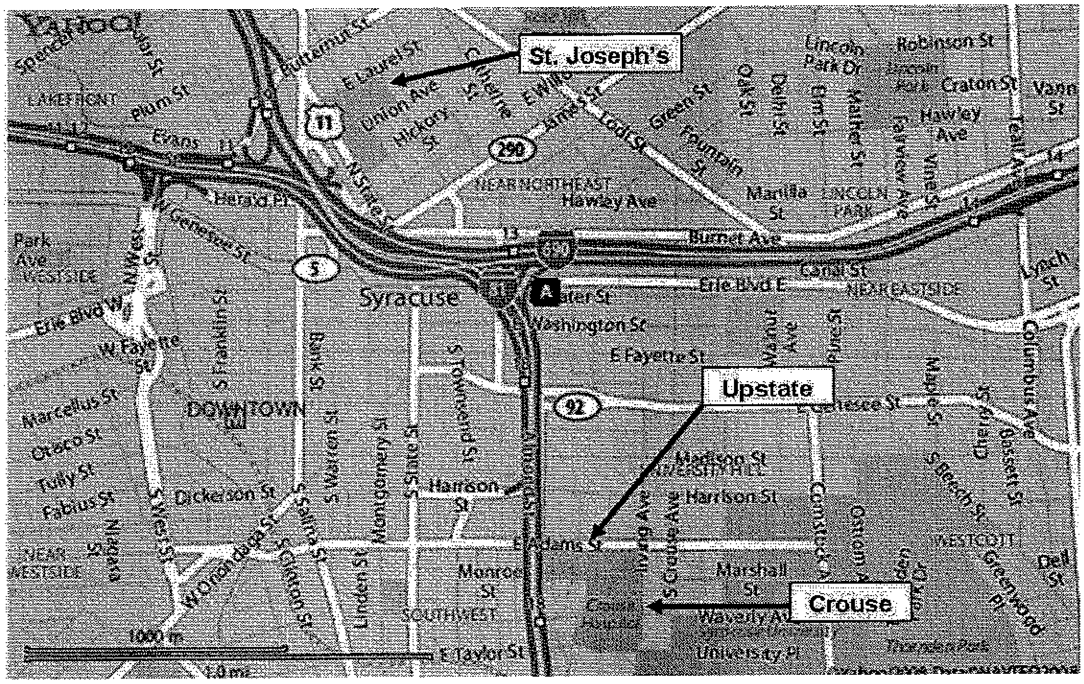
In extraordinary circumstances, emergency evacuation of the site may be necessary. On-site personnel will be notified of the need to evacuate verbally or by signaling with an air horn. If the situation is deemed an emergency, personnel will be instructed to leave the site immediately, using the closest available evacuation route; otherwise, personnel will be expected to go through normal decontamination procedures before leaving the site. In either case, on-site personnel will be instructed to meet at a central location. A head count will be made to ensure that all personnel are safe and accounted for. The HSO will contact other appropriate response agencies, as warranted. Motorized equipment and machinery will be shut off before the site is evacuated.

4.9.6 Emergency Response and Area Hospitals

In case of emergency call **911** or the appropriate individual authority:

Emergency Contact Name	Location	Telephone
Police, Fire, Ambulance	**Syracuse**	**911**
New York State Police	**Lafayette**	**(315) 457-2600**
Poison Control Center	**Syracuse**	**(800) 222-1222**

The locations of the three nearest hospitals in relation to the subject site [A] are shown below:



SECTION 5.0 – COMMUNITY AIR MONITORING PLAN

5.1 INTRODUCTION

A Community Air Monitoring Plan (CAMP) requires real-time observation/monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels will be collected during the Remedial Investigation (RI) activities. Since the scope of work is limited to advancement of test pits and borings, and the installation and sampling of groundwater monitoring wells, the creation of air-borne VOCs and dust is not anticipated to be of significant concern.

5.2 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs will be monitored at the excavation on a continuous basis. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring of VOCs for will be performed using a photo-ionization detector (PID). The equipment will be calibrated daily. Instantaneous readings used for decision purposes, if any, will also be noted and available for State (DEC and DOH) personnel to review.

- If the ambient air concentration of total organic vapors at the excavation sporadically exceeds 5 parts per million (ppm) above background, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume.
- If total organic vapor levels at the excavation persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level half the distance to the nearest potential receptor or residential/commercial structure (not less than 20 feet) is below 5 ppm over background.
- If the organic vapor level is above 25 ppm at the excavation, activities will be temporarily shut down. VOCs will be monitored continuously at the downwind perimeter of the property at a temporary monitoring station using a PID. The device will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.
  - If the ambient air concentration of total organic vapors at the downwind perimeter of the property exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring

continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the property persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level half the distance to the nearest potential receptor or residential/commercial structure (not less than 20 feet), is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

All 15-minute readings will be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

5.3 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the property at temporary particulate monitoring stations. The particulate monitoring will be performed using a DUSTTRAK™ Aerosol Monitor Model 8520 (or similar). The device will be capable of measuring particulate matter less than 10 micrometers in size (PM-10), integrating over a period of 15 minutes for comparison to the airborne particulate action level, and equipped with an audible alarm to indicate exceedence of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

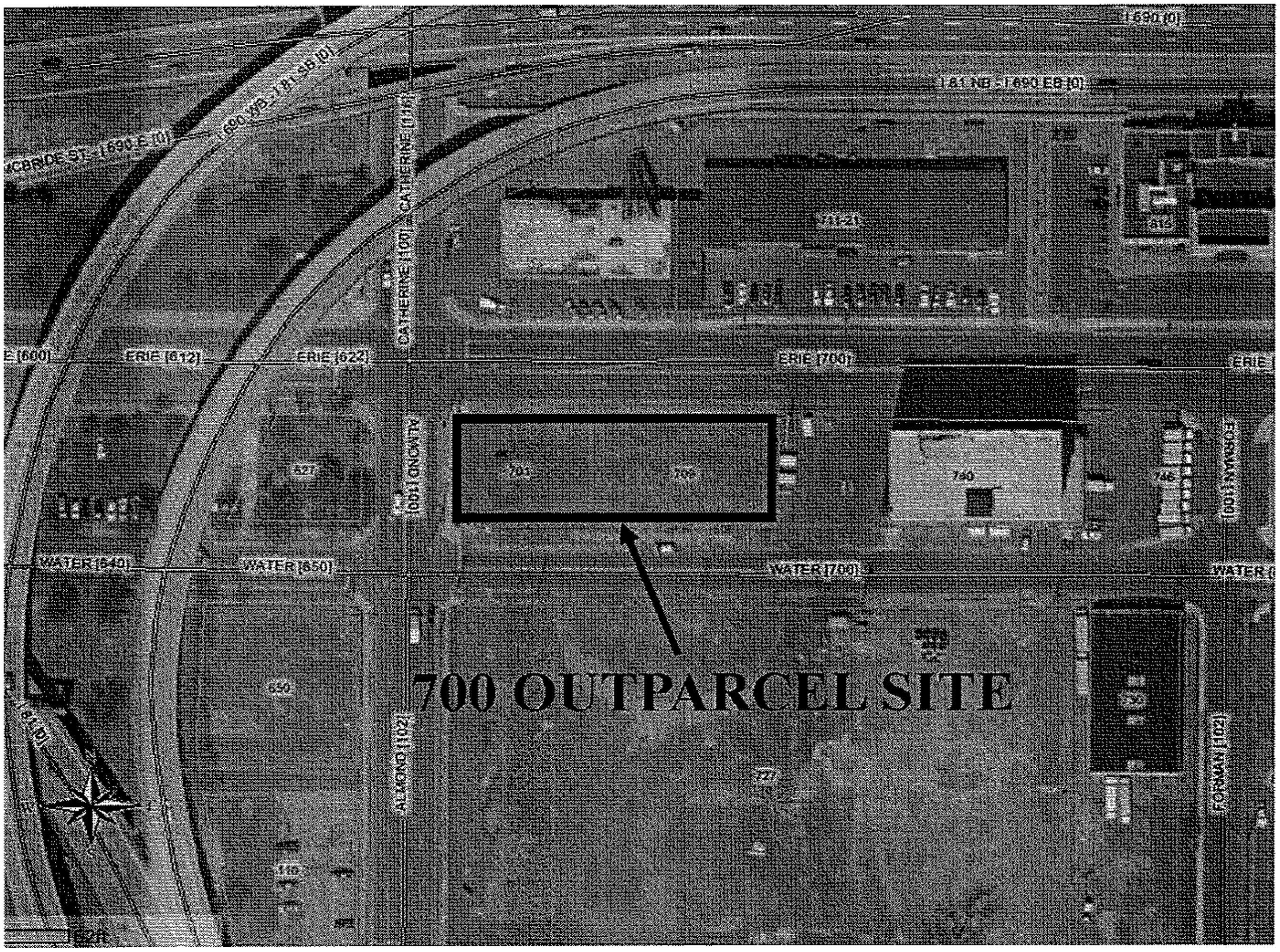
- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and are-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for State (DEC and DOH) personnel to review.

SECTION 6.0 – CITIZEN PARTICIPATION PLAN

6.1 INTRODUCTION

This citizen participation plan describes the program to be implemented by 700 Out Parcel, LLC and the New York State Department of Environmental Conservation (NYSDEC) during the Site Investigation of the two parcels of land at 701-709 East Water Street (known as the 700 Outparcel property) located at the northeast corner of East Water and Almond Streets in the City of Syracuse, New York.



This plan is designed to encourage communication between 700 Out Parcel, LLC, NYSDEC, the Project Engineer for the site, and the community during the site investigation and to provide interested and concerned citizens with accurate and timely information about the alternatives for the site cleanup. Citizen participation will promote public understanding of 700 Out Parcel, LLC and NYSDEC responsibilities, planning activities, and remedial activities for the site. It will provide the opportunity for 700 Out Parcel, LLC and the NYSDEC to learn from the public, information that will enable both entities to develop a comprehensive remedial program that is protective of public health and the environment.

This plan is intended to be a working document that will be periodically reviewed and updated to reflect changes which may occur during the course of site remediation efforts.

6.2 PLAN OBJECTIVES

700 Out Parcel, LLC and the Engineer will work closely with county, State, and other local officials and organizations to meet the principal objectives of the Citizen Participation Plan:

- Provide area occupants and property owners with a clear understanding of the Brownfields program as it applies to this site. This will provide area occupants and other concerned members of the community with a realistic expectation of the activities, complexities, and time involved with the site investigation, evaluation, and remediation.
- Identify and fulfill the information needs of the community and provide accurate, understandable information concerning the site investigation program to interested members of the public.
- Distribute information via several media sources including press releases, direct mailing of newsletters or fact sheets, and through the project's document repositories.
- Maintain good relations with local media to ensure accurate reports of site investigation activities. An important goal of the citizen participation plan is to keep the media informed about the project and to obtain accurate newspaper, television, and radio coverage of the project.

6.3 PROPERTY ENVIRONMENTAL HISTORY

Phase I Environmental Site Assessment

A Phase I ESA of the subject property was prepared by C&H Engineers, P.C. in December 1997. C&H Engineers cited the following conclusions:

- C&H Engineers observed two holes in the asphalt surface which appeared to be fill ports for underground storage tanks (USTs).
- Historical documents identified four 1,000-gallon and one 550-gallon tanks at the site.
- Historical records also revealed the property was a gasoline filling station from 1949 to 1964.

Limited Phase II Environmental Site Assessment

A Limited Phase II ESA was prepared by BDA in December 1997. BDA cited the following conclusions:

- Four 2,000-gallon (approximate) tanks were encountered during the digging of test pits. The backfill material surrounding the tanks had a strong petroleum odor and sheen. The backfill material was contained within an approximate 40-foot by 20-foot area. The surrounding soils did not appear to be significantly contaminated. Spill file number 01-11549 was assigned by the NYSDEC.

Conclusion: Although some contamination of the adjacent soils is expected, only limited contamination beyond the backfill materials is anticipated. Since groundwater was not encountered during the digging of test pits, however, the depth of gasoline contamination is unknown. It is also possible that some contaminants have migrated to the utility trench along the eastern side of Almond Street. It is estimated that 400 to 500 cubic yards of contaminated backfill material and soils exist in the vicinity of the gasoline tanks.

- An approximate 550-gallon tank was encountered during digging of another test pit. The tank, which had apparently been utilized for the storage of oil product, was found to be holding water. No staining, odors, or sheens were observed on the soils in the vicinity of the tank. Although minor concentrations of three chemicals were detected within the soil sample collected from the bottom of the test pit, the concentrations did not exceed State soil cleanup objectives.

Conclusion: Potentially petroleum-contaminated soils in the vicinity of the 550-gallon tank appear to be limited to approximately 50 cubic yards.

Tank Closure and Supplemental Subsurface Investigation

In November/December 2006 and March 2007, BDA oversaw removal of the tanks including removal of some contaminated soils, and another test pit investigation to determine the extent of unanticipated contamination. The following conclusions were drawn from this investigation:

Site Subsurface Geology

- Soils primarily consist of compact, fine-grained former lake deposits. Groundwater does not easily flow through these dense "tight" soils. However, a layer of sand and gravel was observed more than 10-12 feet below the surface. This "loose" material may be a pathway for petroleum to migrate away from the source of contamination.

Gasoline Tank Excavations

- In December 2006, seven tanks were removed from the site (UST-1 through UST-7). These tanks included:
  - Four 1,000-gallon gasoline tanks
  - Two 550-gallon tanks (one fuel oil and one waste oil)
  - One 4,200-gallon gasoline tanks
- Upon discovery of petroleum contamination, spill file number 06-10014 was assigned by the NYSDEC.
- Petroleum-contaminated soil above State guidance values exists along the walls of the northern portion of the excavation pit. No petroleum contamination was detected above State guidance values within the southern portion of the excavation pit.

- The highest concentrations of petroleum vapors appear to be confined to the sand and gravel layer, and in upper soils near the former gasoline tanks and associated distribution line piping. A total of approximately 1,810 tons of gasoline-contaminated soil was excavated and stockpiled from these areas pending transport and disposal to a sanitary landfill (removal of this soil will occur in May 2008). Some gasoline-contaminated soil remains on site, especially beneath the distribution line piping.
- Gasoline-contaminated soil extends to and potentially beyond the north property boundary. Soil analytical results of samples collected from the south and west sidewalls within the former tank excavation indicate that contamination has not likely migrated off site.

Fuel Oil Tank Pit

- No petroleum compounds were detected above State guidance values within this excavation pit.

Waste Oil Tank Pit

- No petroleum contamination was detected above State guidance values within this excavation pit, with the exception of one chemical (xylenes) in the wall of the pit.

Limited Subsurface Investigation

- Since petroleum contamination extended beyond what was originally estimated, 13 test pits were dug throughout the property. It was observed that gasoline-contaminated soil extends to and potentially beyond the northern property boundary. Gasoline-contaminated soil extends to within approximately 35 feet of the eastern property boundary and to the fence line at the southern and western property boundaries.
- A source of petroleum contamination was identified by vapor measurements in the north-central portion of the property, likely from former pump islands and distribution lines.
- Elevated vapor measurements in the northwestern portion of the property suggest that there may be a secondary source of petroleum contamination in this area.
- A section of concrete uncovered in the north-central portion of the property is believed to be a remnant of a former pump island, which suggests that former distribution line piping may have released petroleum to the subsurface from this area as well.
- A section of former brick foundation and concrete footers uncovered in the eastern portion of the property is a potential remnant of a former automobile dealership and service center building.
- A rectangular wooden subsurface structure with visual evidence of congealed oil was uncovered in the eastern portion of the property. This structure is believed to be a former automobile service pit for changing motor oil in vehicles. Although congealed used motor oil was observed, no petroleum vapors were detected in soil samples collected from this structure, which may indicate that the petroleum has naturally degraded.
- The limited subsurface investigation further supports the earlier statement that gasoline impacted soil extends to and potentially beyond the northern property boundary. In addition, gasoline impacted soil extends to and potentially beyond the southern property boundary in the central portion of the property.
- The extent of the gasoline plume does not appear to have migrated to the southeastern portion of the property. However, since the soils were merely screened for vapors, oil, and metals, contaminants (which don't readily volatilize) may exist within this area.

6.4 MAJOR ISSUES OF PUBLIC CONCERN

It is unknown if petroleum contamination that was identified on the bordering property to the south (Syracuse University's Center of Excellence) originated from the subject property. It is also possible that the petroleum contamination has migrated off site to the north, east, and west. The Site Investigation Work Plan will include an investigation along the bordering streets to determine the nature and extent of off-site contamination, if any.

6.5 PROJECT SCHEDULE

700 Out Parcel, LLC shall use all best efforts to move forward with the project according to the following approximate timeline:

Submit Site Investigation Work Plan	September 2008
Receive comments, final Work Plan	October 2008
Procure contractors	October 2008
Field Investigation Work	October - November 2008
Submit draft Site Investigation Report	January 2009
Receive NYSDEC/NYSDOH comments, final Report	February 2009
Submit draft Work Plan	March 2009
NYSDEC/NYSDOH approve alternatives analysis	April 2009
Public 45-day comment period	April - May 2009
Receive comments, final Work Plan	May 2009
Procure contractors	May 2009
Field work	June - October 2009
Submit draft Engineering Report	December 2009
Receive NYSDEC/NYSDOH comments, final Report	January 2010

If possible, site development will occur concurrently with remedial activities.

Note that the timeframes for completion of the key components of the project are dependent on several factors, including the time needed for regulatory review and subcontractor procurement, and weather conditions.

6.6 CITIZEN PARTICIPATION ACTIVITIES

This Citizen Participation Plan is intended to create opportunities for early, inclusive citizen/public participation in the project before the selection of a preferred course of action. The Plan will include communication with the public at critical decision points during the project and will include the following activities to promote citizen participation:

1. Advertisement in The Post-Standard of the availability of the Site Investigation Work Plan for the public to review at the local public library. A Fact Sheet summarizing the work plan will be prepared and mailed to those on the Site Contact List, and a copy will be provided to the local public library.

2. Advertisement in The Post-Standard of the availability of the Site Investigation Report for the public to review at the local public library. A Fact Sheet summarizing the report will be prepared and mailed to those on the Site Contact List, and a copy will be provided to the local public library.

3. Provision of a 45-day comment period for submission of written comments regarding the draft Work Plan

4. Advertisement in The Post-Standard of the availability of the draft Engineering Report for the public to review at the local public library. A Fact Sheet summarizing the report will be prepared and mailed to those on the Site Contact List, and a copy will be provided to the local public library.

700 Out Parcel, LLC will be responsible for the preparation and distribution of all Fact Sheets and announcements for the duration of the project.

6.7 SITE CONTACT LIST

6.7.1 Chief Executive Officers and Planning Board Chairpersons

City of Syracuse
Mayor Matthew J. Driscoll
203 City Hall
Syracuse, NY 13202
(315) 448-8005
Fax (315) 448-8067
Email: Mayor@ci.syracuse.ny.us

City of Syracuse
Planning Department
201 East Washington Street
Room 211
Syracuse, NY 13202
(315) 448-8640
Fax (315) 448-8720

Joanie M. Mahoney
Onondaga County Executive
John Mulroy Civic Center
421 Montgomery Street
14th Floor
Syracuse, NY 13202
Tel: (315) 435-3516
Fax: (315) 435-8582

6.7.2 Adjacent Property Owners

Name of Owner (Description of Property Use)	Address	Direction from Subject Property
City of Syracuse (Vacant)	No known address	Northwest
BFS Retail & Commer, LLC (Auto Body and Tire Shop)	711-721 Erie Boulevard East	Northeast
ARC II, LLC (U-Haul Rental Facility)	740-746 Erie Boulevard East	East
Syracuse University (Under construction for Proposed Center of Excellence Project; Active Brownfield Cleanup Program Site)	727 Washington Street	South
Swanson Fayette Associates, LLC (Parking Lot)	650 East Water Street	Southwest
New York State (Parking Lot)	627 East Water Street	West

6.7.3 Local News Media

The Post-Standard
101 North Salina Street
Syracuse, NY 13202
(315) 470-0011

WSTM-TV 3 (NBC)
1030 James Street
Syracuse, NY 13204
(315) 477-9400

WTVH-TV 5 (CBS)
980 James Street
Syracuse, NY 13203
(315) 425-5555

WSYR-TV 9 (ABC)
5904 Bridge Street
East Syracuse, NY 13057
(315) 446-3333

News 10 Now-TV 10 (Time Warner)
815 Erie Boulevard East
Syracuse, NY 13210
(315) 492-9059

WSYT-TV 68 (FOX)
1000 James St.
Syracuse NY 13203
(315) 472-6800

WSYR- Clear Channel Radio
Bridgewater Place
500 Plum Street, Suite 100
Syracuse, New York 13204
(315) 474-NEWS

6.7.4 Public Water Supplier

City of Syracuse Water
233 East Washington Street, Room 106
Syracuse, NY 13202
(315) 448-8238
Name: Debi Somers, Manager

6.7.5 Environmental Consultants

Beardsley Design Associates
431 East Fayette Street
Syracuse, NY 13202
(315) 431-6980
Attention: Richard D. McKenna, Project Manager
Douglas F. Hurlbut, Senior Geologist

6.7.6 Area Schools

Dr. Edwin E. Weeks Public Elementary School
710 Hawley Avenue
Syracuse, NY 13203
(315) 435-4097
Attention: David Dutter, Chief Administrator

ABC Learning Center
573 East Genesee Street
Syracuse, NY 13202
(315) 435-4111

6.8 LOCATION OF REPORTS AND INFORMATION

6.8.1 Public Library

The Local History Department of the Onondaga County Public Library has agreed to keep public information pertaining to the project. The location and telephone number of the document repository is as follows:

Local History Department
Robert P. Kinchen Central Library
The Galleries of Syracuse
447 South Salina Street
Syracuse, New York 13202
Phone: (315) 435-1800

The hours of operation are:

Monday	9:00 a.m. – 5:00 p.m.
Tuesday	9:00 a.m. – 8:30 p.m.
Wednesday	9:00 a.m. – 8:30 p.m.
Thursday	9:00 a.m. – 5:00 p.m.
Friday	9:00 a.m. – 5:00 p.m.
Saturday	9:00 a.m. – 5:00 p.m.

6.8.2 New York State Department of Environmental Conservation

The contacts at the NYSDEC for this project are:

Christopher F. Mannes, P.E.
Project Manager
NYSDEC – Region 7
615 Erie Boulevard West
Syracuse, New York 13204
(315) 426-7515

Diane Carlton
Citizen Participation Specialist
NYSDEC – Region 7
615 Erie Boulevard West
Syracuse, New York 13204
(315) 426-7403

The contact at the NYSDOH for this project is:

Richard E. Jones
NYS Department of Health
Central Field Office
Division of Environmental Health Assessment
217 South Salina Street, 3rd Floor
Syracuse, New York 13202
(315) 477-8148

The hours of operation for both agencies are 8:30 a.m. to 4:45 p.m., Monday through Friday.

FIGURES

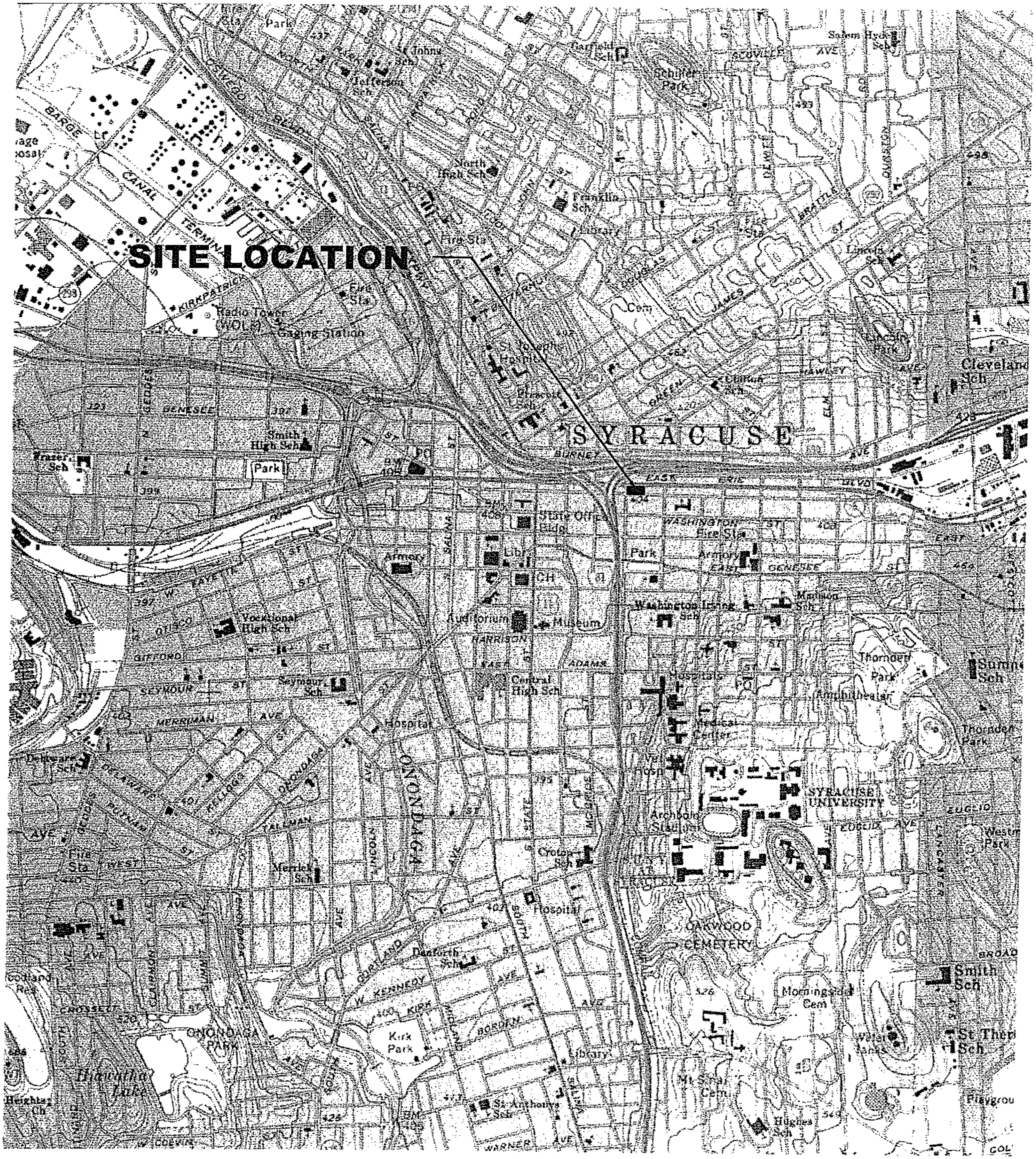


FIGURE 1 - LOCATION PLAN

700 Out Parcel, LLC
701–709 East Water Street
Syracuse, New York

RI Work Plan

Scale: 1" = 2,000'

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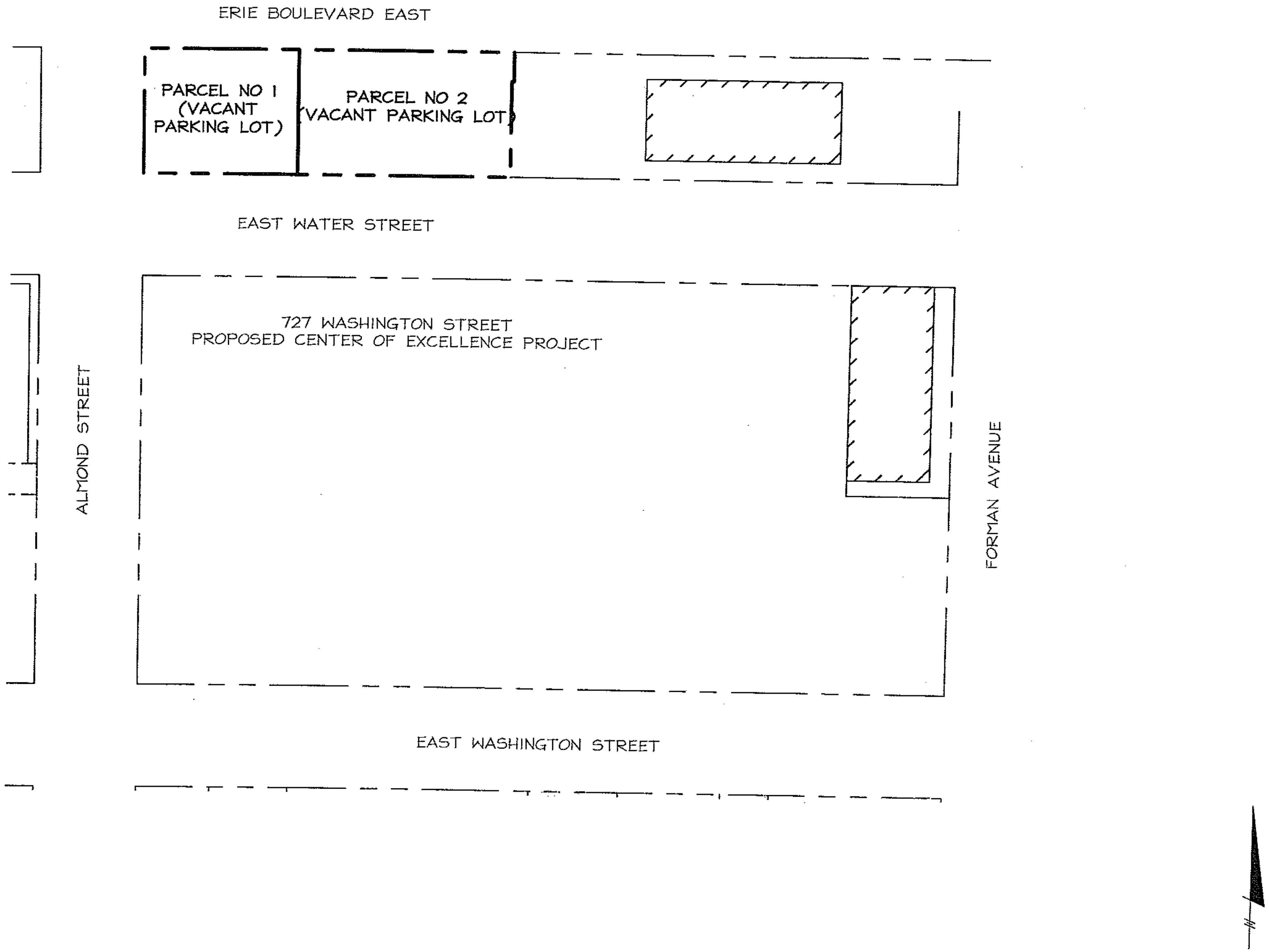


FIGURE 2 - PROPERTY BOUNDARY SKETCH

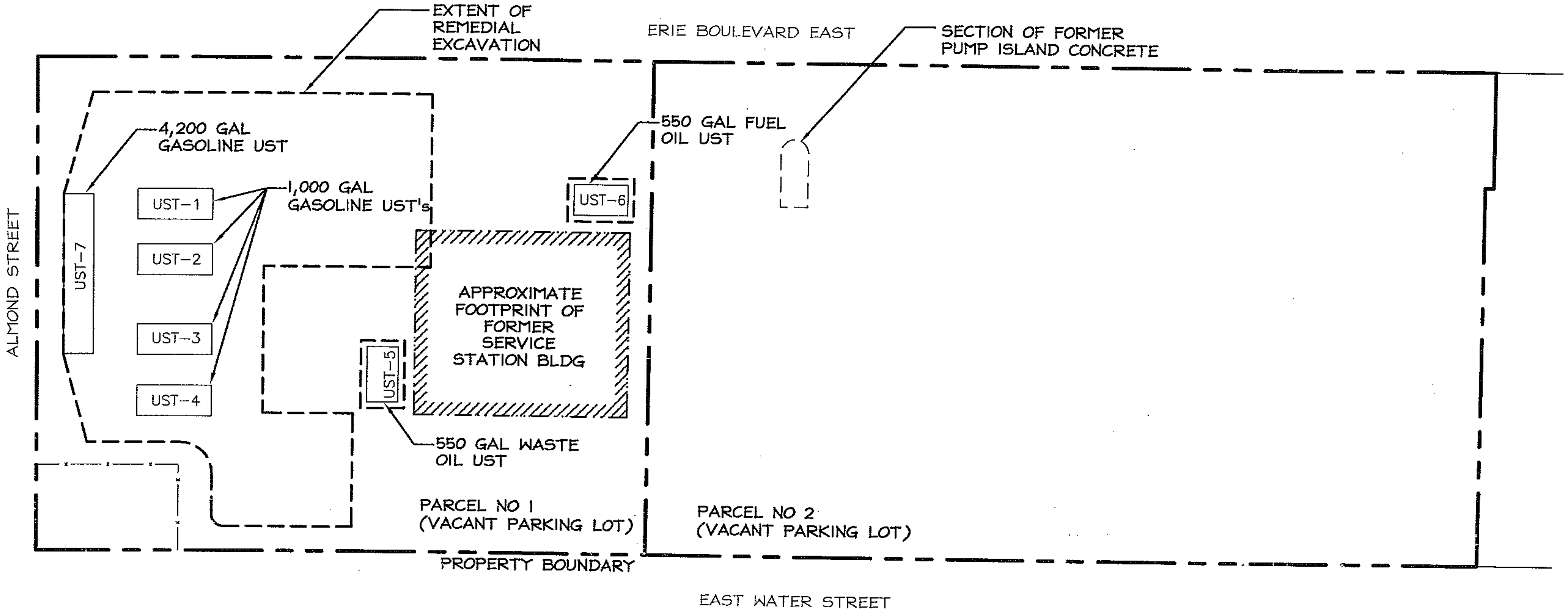
700 Out Parcel, LLC
701–709 East Water Street
Syracuse, New York

RI Work Plan

Scale: 1" = 80'

Notes:

1. Property Boundary Sketch prepared to show general arrangement of property for RI Work Plan. Do not use for any other purpose.



LEGEND

UST-1 UNDERGROUND STORAGE TANK (UST) W/ NUMERIC IDENTIFICATION

– – – – – EXTENT OF REMEDIAL EXCAVATION

▨ APPROXIMATE FOOTPRINT OF FORMER SERVICE STATION BLDG

——— PROPERTY BOUNDARY

—·—·— FENCE

FIGURE 3 - SITE PLAN -
UST LOCATIONS & REMEDIAL EXCAVATION LIMITS

700 Out Parcel, LLC
701-709 East Water Street
Syracuse, New York

RI Work Plan
Scale: 1" = 20'

Notes:

1. Figure prepared to show general arrangement of property for RI Work Plan. Do not use for any other purpose.

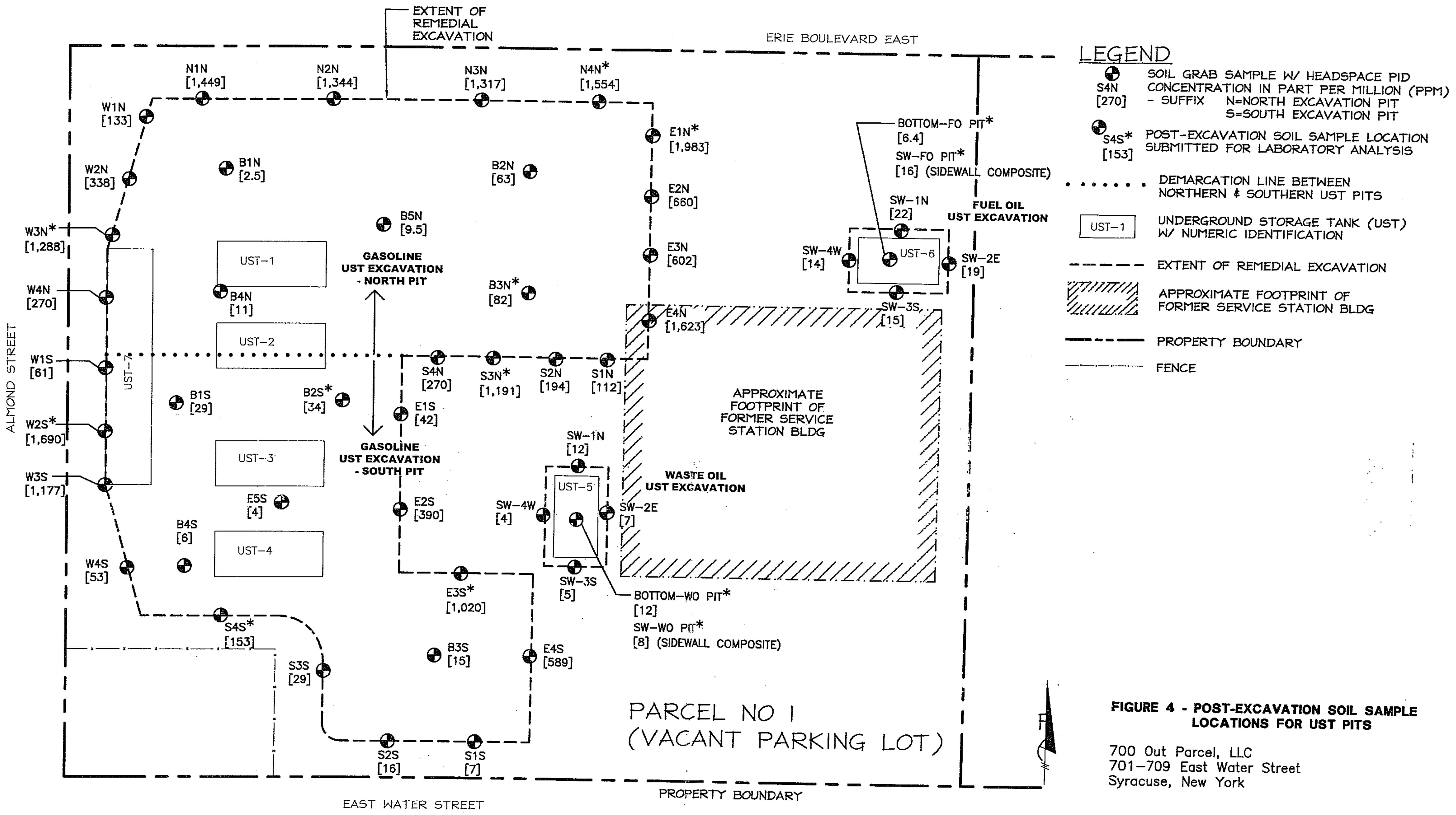


FIGURE 4 - POST-EXCAVATION SOIL SAMPLE LOCATIONS FOR UST PITS

700 Out Parcel, LLC
701-709 East Water Street
Syracuse, New York

RI Work Plan
Scale: 1" = 10'

Notes:

1. Figure prepared to show general arrangement of property for RI Work Plan. Do not use for any other purpose.

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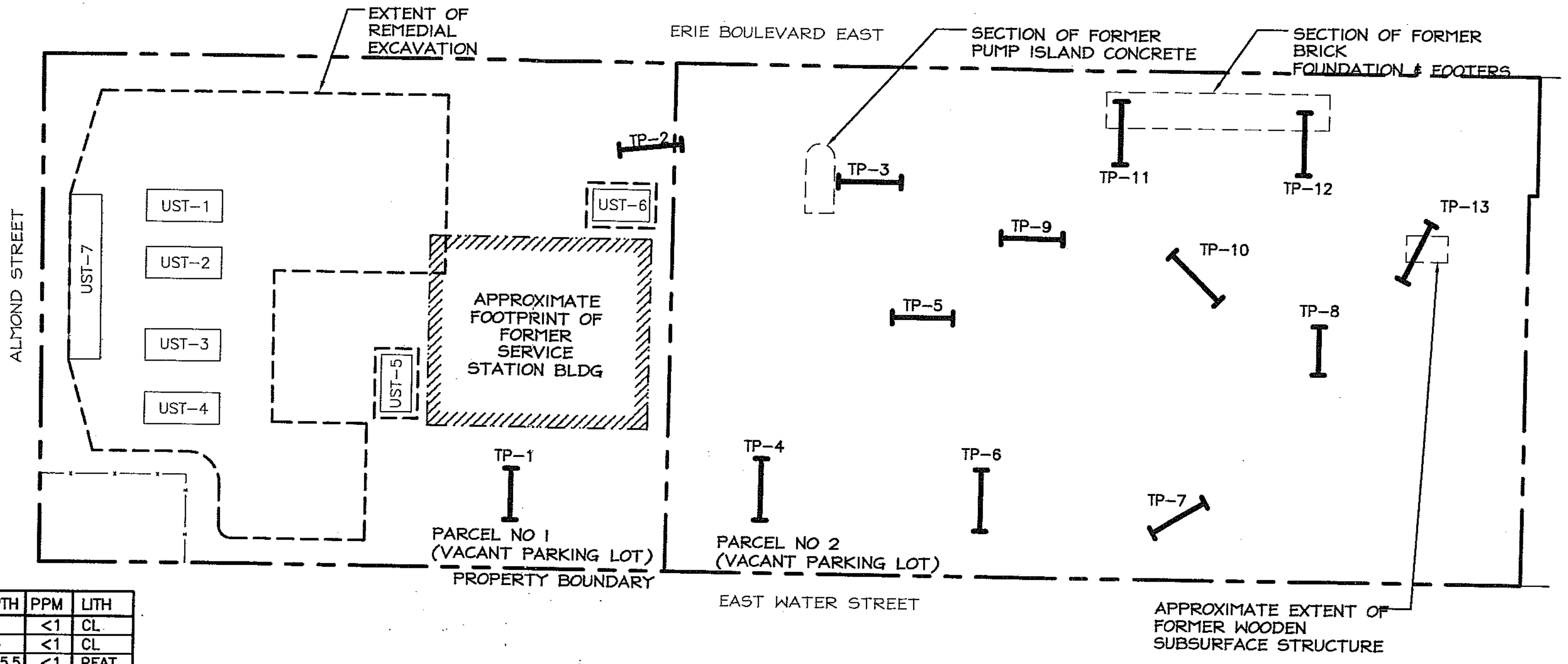
TEST PIT SCHEDULE

TEST PIT	DEPTH	PPM	LITH
TP-1	2	6	GC
	5	7	ML
	9.5	237	ML
	11	1,439	GP
	12	85	ML
	13	44	ML
	14.5	41	ML
TP-2	3	3.5	GC
	5	2.8	PEAT
	9.5	2.5	ML/CL
	10.5	193	GP
	12.7	1,732	GP
	14	70	ML
	16	1.8	GC
TP-3	2.5	1.4	GC
	4.5	26	PEAT
	7	5	ML/CL
	9	3.2	ML/CL
	12.5	11.2	GP
	14.5	1.0	GC
TP-4	3	1.5	GC
	5	1.8	ML
	7	1.5	ML
	10.5	32	GP
	12.5	1,970	GP
	14	79	ML
	16	39	GC
TP-5	3.5	1.9	GC
	6	39	ML
	11	42	GP
	13	49	GP
	14.5	15	ML
	15	1.5	GC
TP-6	2.5	4	GC
	7	4.2	ML/CL
	10	3	ML/CL
	12	350	GP
	14	4.5	ML
	16	4.4	GC
TP-7	2	<1	SM
	4	<1	CL
	6	<1	ML
	8	<1	ML
	10	<1	ML
	12	4.5	GP
	13	1.5	ML
	15	<1	GC
TP-8	2	<1	GC
	4	<1	PEAT
	6	<1	ML
	8	<1	CL
	10	<1	ML
	12	<1	GP
	14	<1	ML
	15.5	<1	GC
TP-9	2	4	CL
	4	2	CL
	4.5–5.5	24	PEAT
	6	5	CL
	8	73	ML
	10	1,530	SP
	12	367	GP
	14	3	GC
	15.5	3	GC

TEST PIT	DEPTH	PPM	LITH
TP-10	2	<1	CL
	4	<1	CL
	4.5–5.5	<1	PEAT
	6	<1	CL
	8	<1	ML
	10	<1	ML
	12	17	GP
	13.5	19	GP
	14	1.5	GC
	15.5	<1	GC
TP-11	2	<1	GC
	4	<1	ML
	6	<1	ML
	8	3.5	ML
	10	2,000+	GP
	12	1,594	GP
	14	5	ML
	15.5	4.5	GC
TP-12	2	<1	GC
	4	2.7	PEAT
	6	4.3	PEAT
	8	<1	CL
	10	4.9	ML
	12	93	GP
	13	18	GP
	15	<1	GC
TP-13	2	<1	CL
	4	<1	ML
	6	<1	ML
	7	<1	ML
	8	<1	CL
	10	1.5	SP
	12	<1	SP
	14	<1	GC



LEGEND

UST-3	LOCATION OF FORMER UNDERGROUND STORAGE TANK REMOVED AS PART OF THIS INVESTIGATION W/ NUMERIC IDENTIFICATION.
TP-6	TEST PIT TRENCH LOCATION & ORIENTATION W/ NUMERIC IDENTIFICATION
TEST PIT | DEPTH | PPM | LITH	TEST PIT SCHEDULE DATA BOX

- LITH: SOIL LITHOLOGIC DESIGNATION USING THE UNIFIED SOIL CLASSIFICATION SYSTEM (SEE ATTACHMENT C)
- PPM: TOTAL VOC HEADSPACE SOIL CONCENTRATION IN PARTS PER MILLION (PPM)
- DEPTH: SOIL SAMPLE COLLECTION DEPTH IN FEET BELOW GROUND SURFACE
- TEST PIT: TEST PIT NUMERIC IDENTIFICATION

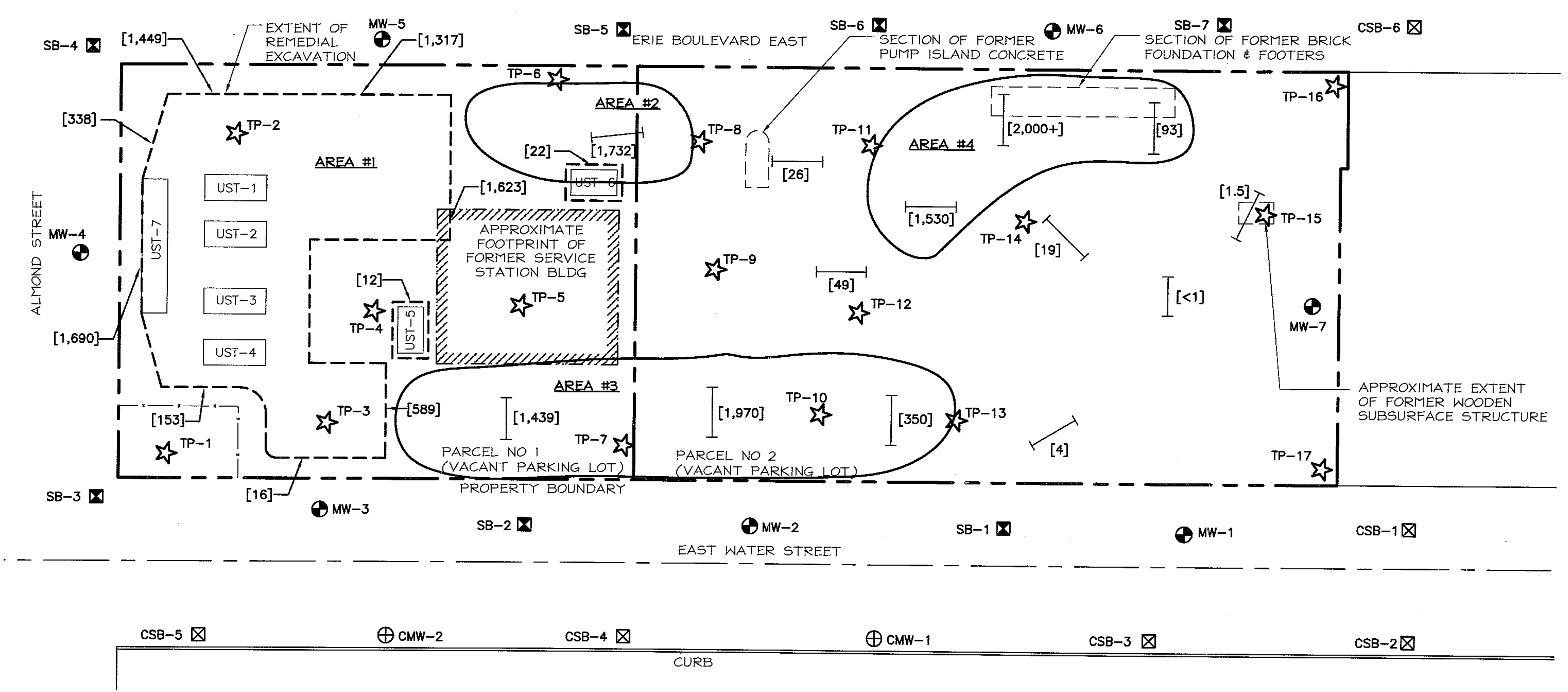
FIGURE 5 - PRIOR TEST PIT LOCATIONS & RESULTS OF SOIL SAMPLE HEADSPACE ANALYSES

700 Out Parcel, LLC
701–709 East Water Street
Syracuse, New York

RI Work Plan
Scale: 1" = 20'

Notes:

1. Figure prepared to show general arrangement of property for RI Work Plan. Do not use for any other purpose.



LEGEND

UST-3	LOCATION OF FORMER UNDERGROUND STORAGE TANK.
├──┤	PRIOR TEST PIT LOCATION & ORIENTATION
MW-1 ●	APPROXIMATE OFF-SITE MONITORING WELL LOCATION
CMW-1 ⊕	APPROXIMATE OFF-SITE CONTINGENT MONITORING WELL LOCATION
TP-1 ☆	APPROXIMATE ON-SITE TEST PIT LOCATION
SB-1 ☒	APPROXIMATE OFF-SITE SOIL BORING LOCATION
CSB-1 ☒	APPROXIMATE OFF-SITE CONTINGENT SOIL BORING LOCATION
[16]	MAXIMUM HEADSPACE READING

FIGURE 6 - APPROXIMATE TEST PIT, BORING, & MONITORING WELL LOCATIONS

700 Out Parcel, LLC
701-709 East Water Street
Syracuse, New York

RI Work Plan
Scale: 1" = 20'

Notes:

1. Figure prepared to show general arrangement of property for RI Work Plan. Do not use for any other purpose.

08921.000

ATTACHMENT A

UST EXCAVATION PIT SOIL SCREENING RESULTS

TABLE 1 SUMMARY OF POST-EXCAVATION SOIL SAMPLES
DECEMBER 2006 UST CLOSURE REPORT
FORMER GASOLINE SERVICE STATION, 700 OUTPARCELS, ALMOND AND WATER STREETS, SYRACUSE, NEW YORK

Sample Number	Depth (feet bgs)	Headspace Total VOC Concentration (ppm)	Soil Description[a]
FORMER GASOLINE UST FIELD- NORTH EXCAVATION PIT			
N1N	10	1,449	GP
N2N	10	1,344	GP
N3N	10	1,317	GP
N4N*	10	1,554	GP
E1N*	8	1,983	ML
E2N	8	660	ML
E3N	8	602	ML
E4N	8	1,623	ML
S1N	10	112	GP
S2N	10	194	GP
S3N*	10	1,191	GP
S4N	10	148	GP
W1N	10	133	GP
W2N	10	338	GP
W3N*	10	1,288	GP
W4N	7	270	ML
B1N	14-15	2.5	ML
B2N	14-15	63	ML
B3N*	14-15	82	ML
B4N	14-15	11	ML
B5N	14-15	9.5	ML

(a) All soil samples were described using the Unified Soil Classification System.

NOTE: * = Soil sample was retained for laboratory analysis.

TABLE 1 SUMMARY OF POST-EXCAVATION SOIL SAMPLES (CONTINUED)

Sample Number	Depth (feet bgs)	Headspace Total VOC Concentration (ppm)	Soil Description(a)
FORMER GASOLINE UST FIELD- SOUTH EXCAVATION PIT			
E1S	10	42	ML
E2S	10	390	ML
E3S	10	1,020	ML
E4S*	10	589	ML
S1S	10	7	GP
S2S	10	16	GP
S3S	10	29	GP
S4S*	10	153	GP
W1S	8.5	61	GP
W2S*	9	1,690	GP
W3S	8.5	1,177	GP
W4S	9.5	53	ML
B1S	14-15	29	ML
B2S*	14-15	34	ML
B3S	14-15	15	ML
B4S	14-15	6	ML
B5S	14-15	4	ML

(b) All soil samples were described using the Unified Soil Classification System.

NOTE: * = Soil sample was retained for laboratory analysis.

TABLE 1 SUMMARY OF POST-EXCAVATION SOIL SAMPLES (CONTINUED)

Sample Number	Depth (feet bgs)	Headspace Total VOC Concentration (ppm)	Soil Description[a]
FORMER FUEL OIL UST PIT			
SW-1N	5-6	22	Peat/ML
SW-2E	5-6	19	Peat/ML
SW-3S	5-6	15	Peat/ML
SW-4W	5-6	14	Peat/ML
FO-SW*	5-6	16	Peat/ML
Bottom- FO Pit*	5-6	6.4	ML
FORMER WASTE OIL UST PIT			
SW-1N	6	12	Peat/ML
SW-2E	6	7	Peat/ML
SW-3S	6	5	Peat/ML
SW-4W	6	4	Peat/ML
WO-SW*	6	8	Peat/ML
Bottom- WO Pit*	9	12	ML

(c) All soil samples were described using the Unified Soil Classification System.

NOTE: * = Soil sample was retained for laboratory analysis.

ATTACHMENT B

UST EXCAVATION PIT LAB ANALYSIS RESULTS

TABLE 2 SUMMARY OF ANALYTICAL RESULTS FOR POST-EXCAVATION SOIL SAMPLES COLLECTED FROM NORTH EXCAVATION PIT OF THE GASOLINE UST FIELD, WOODBINE GROUP, 700 OUTPARCELS, SYRACUSE, NEW YORK

Compound	North Sidewall	East Sidewall	South Sidewall	West Sidewall	Excavation Bottom	TAGM Cleanup Objectives[(a)]
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (ppb)						
Benzene	ND<2,000	ND<2,000	ND<200	ND<5	ND<5	60
Toluene	ND<2,000	**12,000**	ND<200	ND<5	ND<5	1,500
Ethylbenzene	7,300	14,000	360	ND<5	ND<5	NA
Total Xylenes	**34,000**	**81,000**	**1,400**	24	ND<10	1,200
Total BTEX	41,300	107,000	1,760	24	ND	NA
Isopropylbenzene	ND<2,000	ND<2,000	ND<200	ND<5	ND<5	5,000
4-Isopropyltoluene	ND<2,000	ND<2,000	ND<200	9.6	ND<5	NA
Methyl Tert-Butyl Ether	ND<2,000	ND<2,000	ND<200	ND<5	ND<5	120
Naphthalene	4,600	6,200	620	ND<5	ND<5	13,000
n-Propylbenzene	5,600	5,300	ND<200	5.6	ND<5	14,000
1,2,4-trimethylbenzene	**35,000**	**34,000**	1,100	9.6	ND<5	13,000
1,3,5-trimethylbenzene	**12,000**	**11,000**	320	49	ND<5	3,300
Total VOCs	98,500	163,500	3,800	97.8	ND	NA
SEMI-VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8270 (ppb)						
Acenaphthylene	ND<1,000	ND<200	ND<200	ND<200	ND<200	41,000
Anthracene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Benzo(a)anthracene	ND<1,000	ND<200	ND<200	ND<200	ND<200	224
Benzo(b)fluoranthene	ND<1,000	ND<200	ND<200	ND<200	ND<200	1,100
Benzo(g,h,i)perylene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Benzo(k)fluoranthene	ND<1,000	ND<200	ND<200	ND<200	ND<200	1,100
Benzo(a)pyrene	ND<1,000	ND<200	ND<200	ND<200	ND<200	61
Chrysene	ND<1,000	ND<200	ND<200	ND<200	ND<200	400
Dibenzofuran	ND<1,000	ND<200	ND<200	ND<200	ND<200	6,200
Dibenz(a,h)anthracene	ND<1,000	ND<200	ND<200	ND<200	ND<200	14
Fluorene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Fluoranthene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Indeno(1,2,3-cd)pyrene	ND<1,000	ND<200	ND<200	ND<200	ND<200	3,200
2-Methylnaphthlene	ND<1,000	ND<200	ND<200	ND<200	ND<200	NA
4-Methylphenol	ND<1,000	ND<200	ND<200	ND<200	ND<200	900
Naphthalene	ND<1,000	ND<200	ND<200	ND<200	ND<200	13,000
Phenanthrene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Pyrene	ND<1,000	ND<200	ND<200	ND<200	ND<200	50,000
Total SVOCs	ND	ND	ND	ND	ND	NA

(a) In accordance with cleanup objectives in NYSDEC Division TAGM, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC 1994).

NOTE: TAGM = Technical Administrative Guidance Memorandum.
EPA = U.S. Environmental Protection Agency.
ND = Analyzed but not detected at concentration above reporting limit.
NA = Not applicable.
NYSDEC = New York State Department of Environmental Conservation.
Concentrations in **BOLD** indicate an exceedance of TAGM soil cleanup objectives.

TABLE 3 SUMMARY OF ANALYTICAL RESULTS FOR POST-EXCAVATION SOIL SAMPLES COLLECTED FROM SOUTH EXCAVATION PIT OF THE GASOLINE UST FIELD, WOODBINE GROUP, 700 OUTPARCELS, SYRACUSE, NEW YORK

Compound	North Sidewall	East Sidewall	South Sidewall	West Sidewall	Excavation Bottom	TAGM Cleanup Objectives[a]
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (ppb)						
Benzene	NA	ND<200	ND<200	ND<1,000	ND<5	60
Toluene	NA	ND<200	ND<200	ND<1,000	ND<5	1,500
Ethylbenzene	NA	ND<200	ND<200	ND<1,000	ND<5	NA
Total Xylenes	NA	ND<700	ND<700	ND<4,000	ND<10	1,200
Total BTEX	NA	ND	ND	ND	ND	NA
Isopropylbenzene	NA	ND<200	ND<200	ND<1,000	15	5,000
4-Isopropyltoluene	NA	ND<200	ND<200	ND<1,000	6	NA
Methyl Tert-Butyl Ether	NA	ND<200	ND<200	ND<1,000	ND<5	120
Naphthalene	NA	ND<200	ND<200	ND<4,000	12	13,000
n-Propylbenzene	NA	ND<200	ND<200	2,100	33	14,000
1,2,4-trimethylbenzene	NA	ND<200	ND<200	9,100	13	13,000
1,3,5-trimethylbenzene	NA	ND<200	ND<200	1,800	62	3,300
Total VOCs	NA	ND	ND	13,000	128	NA
SEMI-VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8270 (ppb)						
Acenaphthylene	NA	ND<200	ND<1,000	ND<1,000	ND<200	41,000
Anthracene	NA	ND<200	ND<1,000	ND<1,000	ND<200	50,000
Benzo(a)anthracene	NA	ND<200	ND<1,000	ND<1,000	ND<200	224
Benzo(b)fluoranthene	NA	ND<200	ND<1,000	ND<1,000	ND<200	1,100
Benzo(g,h,i)perylene	NA	ND<200	ND<1,000	ND<1,000	ND<200	50,000
Benzo(k)fluoranthene	NA	ND<200	ND<1,000	ND<1,000	ND<200	1,100
Benzo(a)pyrene	NA	ND<200	ND<1,000	ND<1,000	ND<200	61
Chrysene	NA	ND<200	ND<1,000	ND<1,000	ND<200	400
Dibenzofuran	NA	ND<200	ND<1,000	ND<1,000	ND<200	6,200
Dibenz(a,h)anthracene	NA	ND<200	ND<1,000	ND<1,000	ND<200	14
Fluorene	NA	ND<200	ND<1,000	ND<1,000	ND<200	50,000
Fluoranthene	NA	ND<200	ND<1,000	1,600	ND<200	50,000
Indeno(1,2,3-cd)pyrene	NA	ND<200	ND<1,000	ND<1,000	ND<200	3,200
2-Methylnaphthlene	NA	ND<200	ND<1,000	ND<1,000	ND<200	NA
4-Methylphenol	NA	ND<200	ND<1,000	ND<1,000	ND<200	900
Naphthalene	NA	ND<200	ND<1,000	ND<1,000	ND<200	13,000
Phenanthrene	NA	ND<200	ND<1,000	1,300	ND<200	50,000
Pyrene	NA	ND<200	ND<1,000	1,300	ND<200	50,000
Total SVOCs	NA	ND	ND	4,200	ND	NA

(a) In accordance with cleanup objectives in NYSDEC Division TAGM, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC 1994).

NOTE: TAGM = Technical Administrative Guidance Memorandum.
EPA = U.S. Environmental Protection Agency.
ND = Analyzed but not detected at concentration above reporting limit.
NA = Not applicable.
NYSDEC = New York State Department of Environmental Conservation.
Concentrations in **BOLD** indicate an exceedance of TAGM soil cleanup objectives.

TABLE 4 SUMMARY OF ANALYTICAL RESULTS FOR POST-EXCAVATION SOIL SAMPLES COLLECTED FROM THE WASTE OIL AND FUEL OIL EXCAVATION PITS, WOODBINE GROUP, 700 OUTPARCELS, SYRACUSE, NEW YORK

	Waste Oil UST Pit		**Fuel Oil UST Pit**		
Compound	WO-SW Sidewall Composite	Bottom-WO Pit	FO-SW Sidewall Composite	Bottom-FO Pit	TAGM Cleanup Objectives(a)
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (ppb)					
Benzene	ND<200	ND<5	ND<10	ND<5	60
Toluene	220	ND<5	ND<10	ND<5	1,500
Ethylbenzene	ND<200	ND<5	ND<10	ND<5	NA
Total Xylenes	**1,300**	ND<10	ND<30	ND<10	1,200
Total BTEX	1,520	ND	ND	ND	NA
Isopropylbenzene	ND<200	ND<5	ND<10	ND<5	5,000
4-Isopropyltoluene	ND<200	ND<5	ND<10	ND<5	NA
Methyl Tert-Butyl Ether	ND<200	ND<5	ND<10	ND<5	120
Naphthalene	920	ND<5	ND<10	ND<5	13,000
n-Propylbenzene	ND<200	ND<5	ND<10	ND<5	14,000
1,2,4-trimethylbenzene	1,200	8.2	ND<10	ND<5	13,000
1,3,5-trimethylbenzene	460	ND<5	ND<10	ND<5	3,300
Total VOCs	4,100	8.2	ND	ND	NA
SEMI-VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8270 (ppb)					
Acenaphthylene	ND<1,000	ND<200	ND<200	ND<200	41,000
Anthracene	ND<1,000	ND<200	ND<200	ND<200	50,000
Benzo(a)anthracene	ND<1,000	ND<200	ND<200	ND<200	224
Benzo(b)fluoranthene	ND<1,000	ND<200	ND<200	ND<200	1,100
Benzo(g,h,i)perylene	ND<1,000	ND<200	ND<200	ND<200	50,000
Benzo(k)fluoranthene	ND<1,000	ND<200	ND<200	ND<200	1,100
Benzo(a)pyrene	ND<1,000	ND<200	ND<200	ND<200	61
Chrysene	ND<1,000	ND<200	ND<200	ND<200	400
Dibenzofuran	ND<1,000	ND<200	ND<200	ND<200	6,200
Dibenz(a,h)anthracene	ND<1,000	ND<200	ND<200	ND<200	14
Fluorene	ND<1,000	ND<200	ND<200	ND<200	50,000
Fluoranthene	1,100	ND<200	ND<200	ND<200	50,000
Indeno(1,2,3-cd)pyrene	ND<1,000	ND<200	ND<200	ND<200	3,200
2-Methylnaphthlene	ND<1,000	ND<200	ND<200	ND<200	NA
4-Methylphenol	ND<1,000	ND<200	ND<200	ND<200	900
Naphthalene	ND<1,000	ND<200	ND<200	ND<200	13,000
Phenanthrene	ND<1,000	ND<200	ND<200	ND<200	50,000
Pyrene	1,100	ND<200	ND<200	ND<200	50,000
Total SVOCs	2,200	ND	ND	ND	NA

(a) In accordance with cleanup objectives in NYSDEC Division TAGM, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC 1994).

NOTE: TAGM = Technical Administrative Guidance Memorandum.
EPA = U.S. Environmental Protection Agency.
ND = Analyzed but not detected at concentration above reporting limit.
NA = Not applicable.
NYSDEC = New York State Department of Environmental Conservation.
Concentrations in **BOLD** indicate an exceedance of TAGM soil cleanup objectives.

ATTACHMENT C

SOP #2012 – SOIL SAMPLING

U. S. EPA ENVIRONMENTAL RESPONSE TEAM

STANDARD OPERATING PROCEDURES

SOP: 2012
PAGE: 1 of 13
REV: 0.0
DATE: 02/18/00

SOIL SAMPLING

CONTENTS

SUPERCEDES: SOP #2012; Revision 0.0; 11/16/94; U.S. EPA Contract 68-C4-0022.

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling.*

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT

Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
    - Tubes
    - Points
    - Drive head
    - Drop hammer
    - Puller jack and grip
- Backhoe

6.0 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.

10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

    When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler in a perpendicular position on the sample material.

3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration

activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OHSA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

ASTM D 1586-98, ASTM Committee on Standards, Philadelphia, PA.

APPENDIX A
Figures
SOP #2012
February 2000

FIGURE 1. Sampling Augers

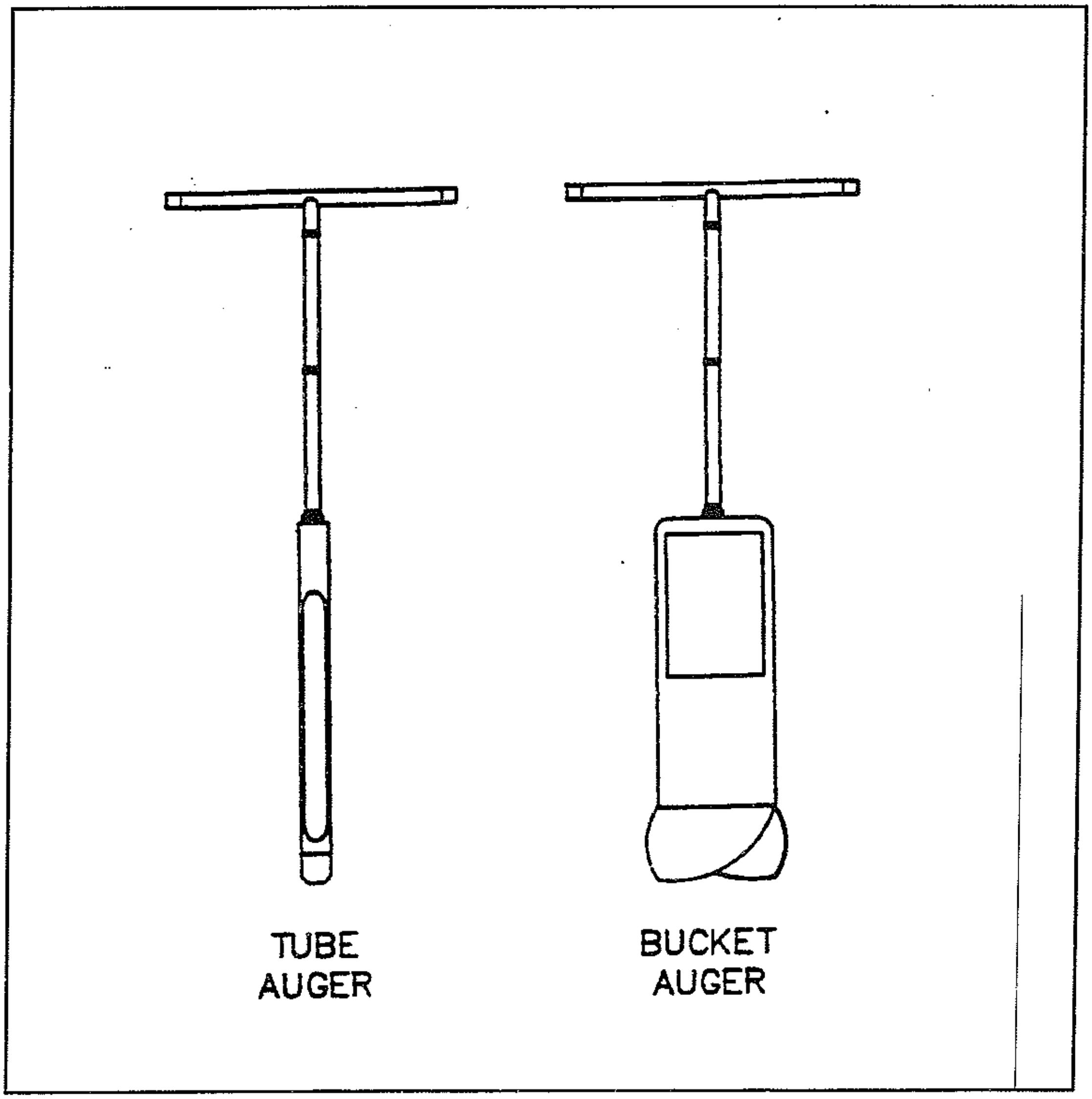
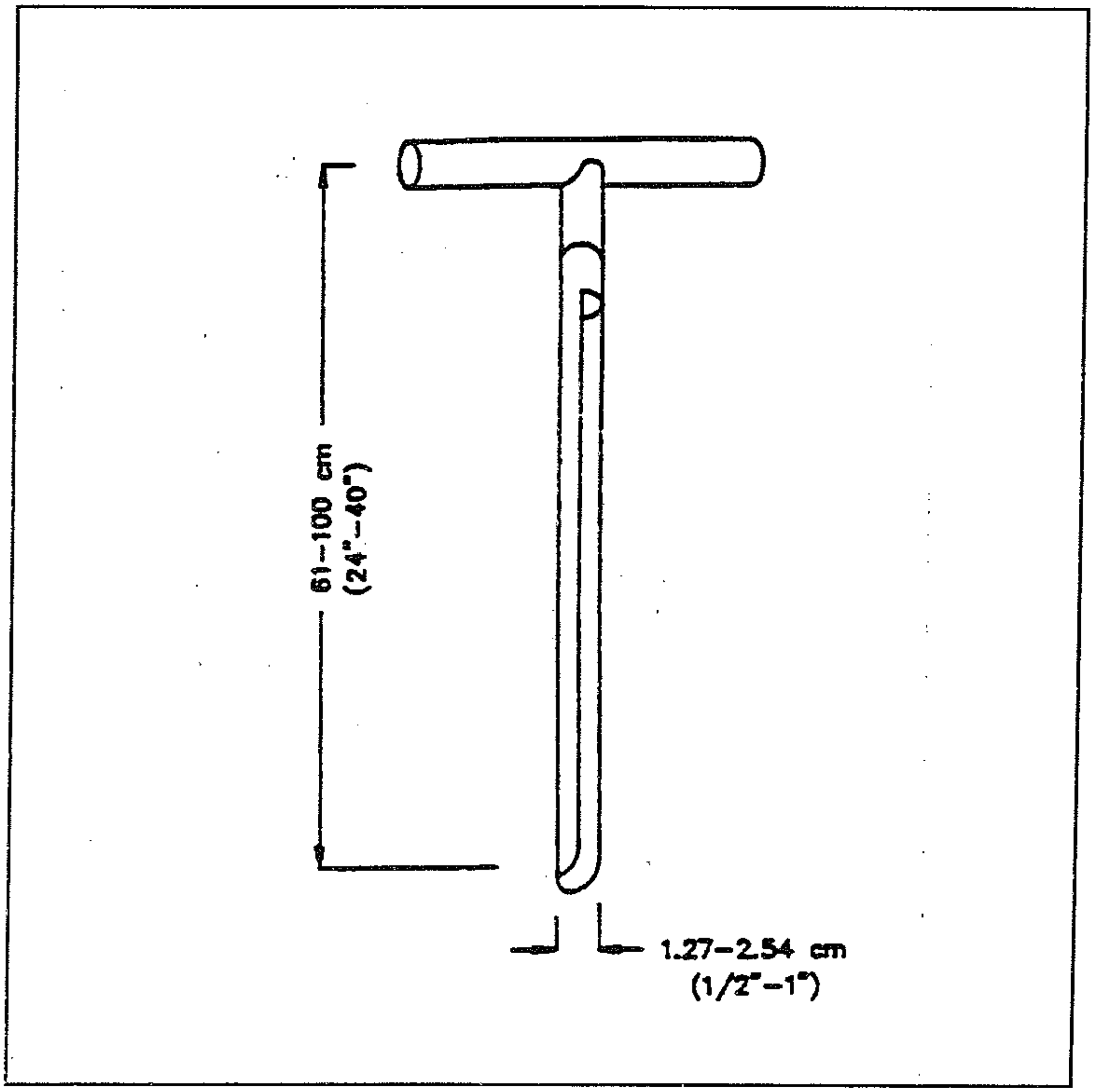


FIGURE 2. Sampling Trier



ATTACHMENT D

SOP #2006 – SAMPLING EQUIPMENT DECONTAMINATION

SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.
More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

C The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).

C The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.

C If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.

C Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

C Non-phosphate detergent
C Selected solvents (acetone, hexane, nitric acid, etc.)
C Tap water
C Distilled or deionized water

5.2 Decontamination Tools/Supplies

C Long and short handled brushes
C Bottle brushes
C Drop cloth/plastic sheeting
C Paper towels
C Plastic or galvanized tubs or buckets
C Pressurized sprayers (H_2O)
C Solvent sprayers
C Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

C Trash bags
C Trash containers
C 55-gallon drums
C Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In general, the following solvents are typically utilized for decontamination purposes:

C 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
C Acetone (pesticide grade)(1)
C Hexane (pesticide grade)(1)
C Methanol(1)

(1) - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

C The number, location, and layout of decontamination stations.

C Decontamination equipment needed.

C Appropriate decontamination methods.

C Methods for disposal of contaminated clothing, equipment, and solutions.

C Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.
Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station . Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10 : Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.

2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.

5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.

6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.

7. Empty low-pressure sprayer water onto the ground.

8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITYASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1
Soluble Contaminants and Recommended Solvent Rinse

SOLVENT(1)	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents (2)	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent(2)	Hexane	PCBs

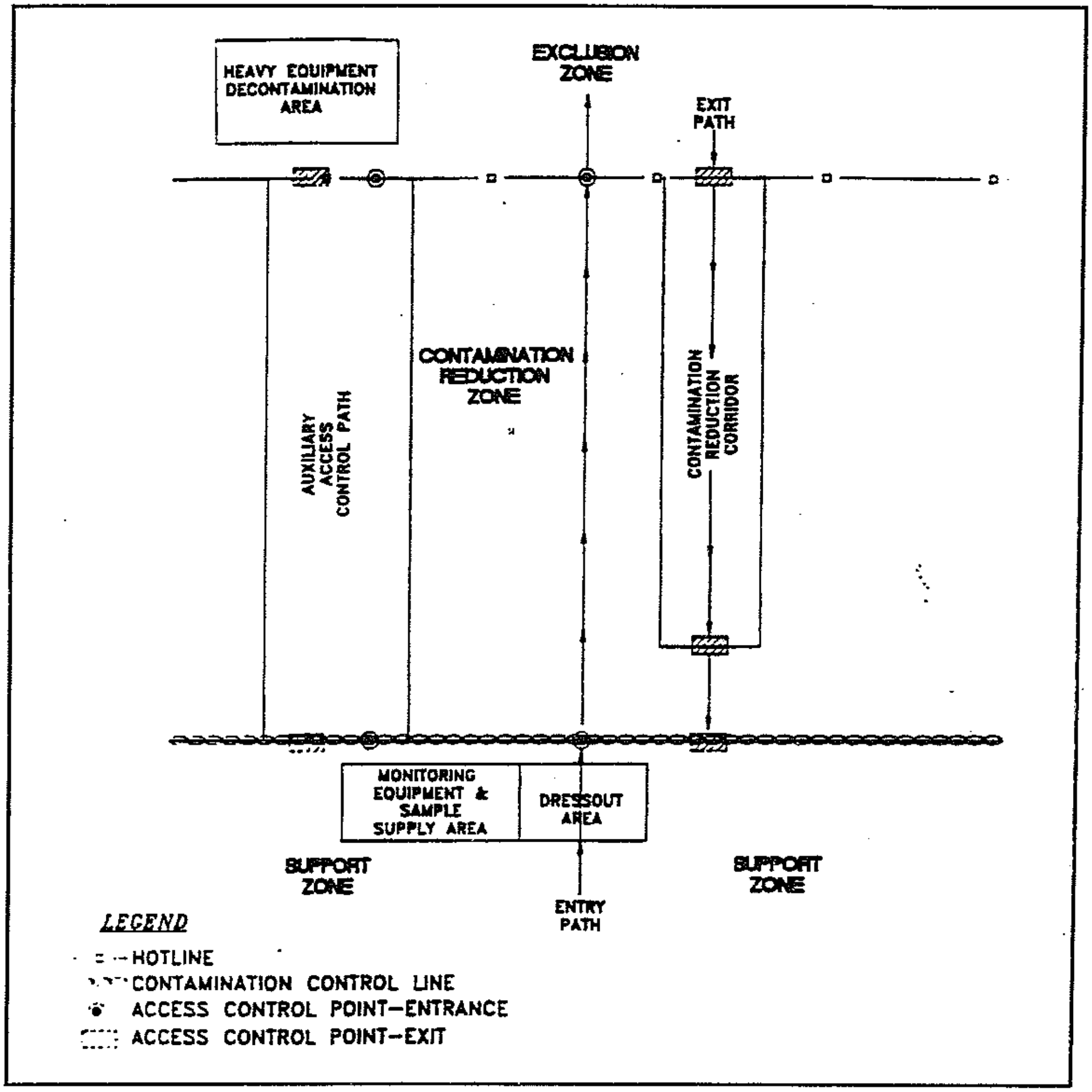
(1) - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

(2) - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

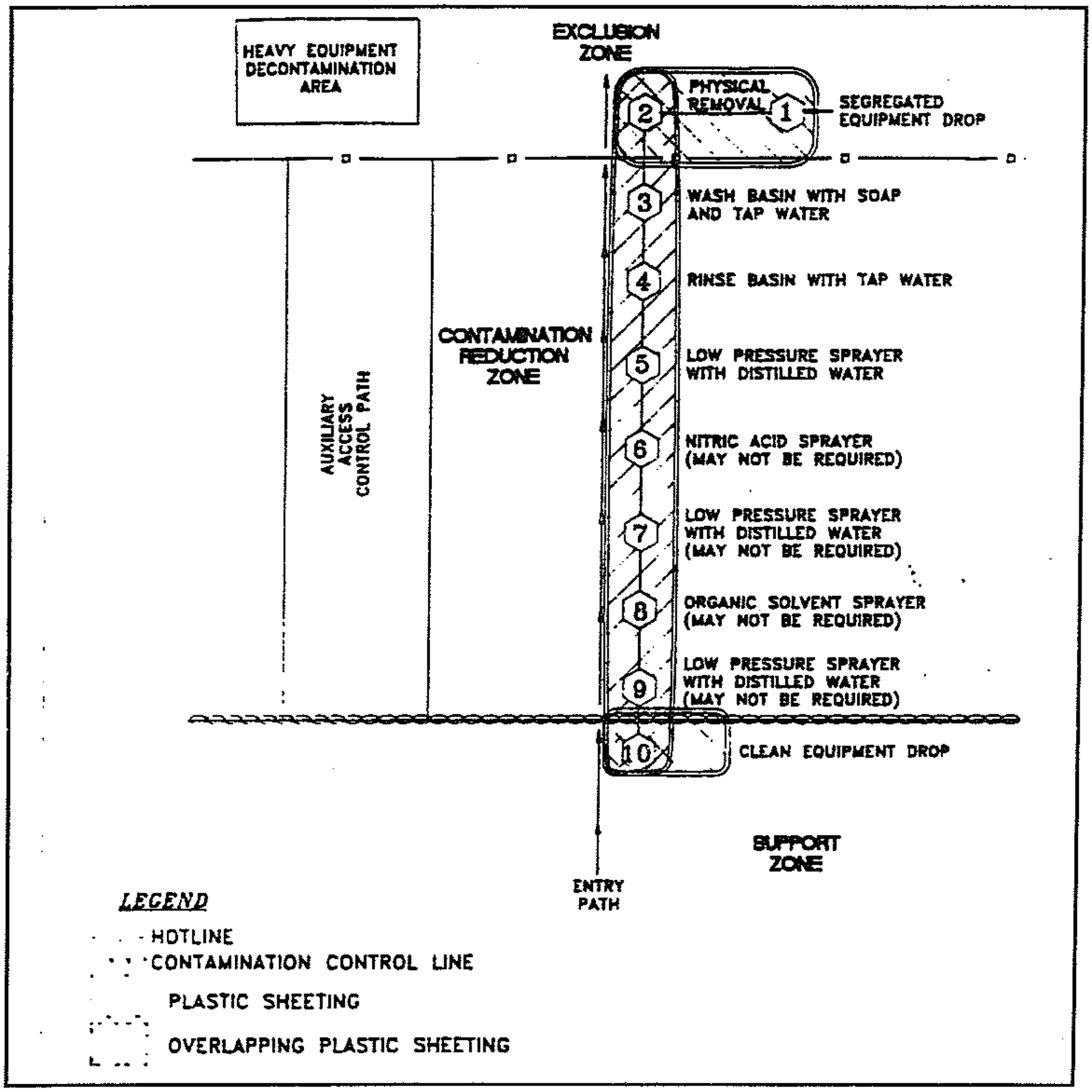
Figure 1. Contamination Reduction Zone Layout



APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout



ATTACHMENT E

DATA QUALITY OBJECTIVES FORMS

DATA QUALITY OBJECTIVES FORM

Site Name/Location:
700 Outparcel
701-709 East Water Street
Syracuse, New York

Sampling Objectives:
Characterize subsurface on-site soils.
Determine potential extent of soil contamination.

Sampled Media:

__Groundwater
__Surface water
__Wetland water
X Soils
__Sediment
__Waste material

Data Use:

X Site characterization
X Risk assessment
__Health and Safety
X Evaluate remediation alternatives
X Monitoring

Data Types:	**Parameters:**			
X TCL or Modified TCL	X VOCs	X Semi-VOCs	X Metals	
	X Mercury	X Cyanide	X PCB/Pest	
__Field Parameters	__pH	__Sp.Cond	__Turb	__Temp

Level of Analysis:

__ **Level I: Field Screening**

__ **Level II: Field Analysis**

__ **Level III: ASP Analytical Methods**
Samples will be analyzed in accordance with NYSDEC-ASP 1995

X **Level IV: ASP Reportables/Deliverables**
NYSDEC-ASP 1995 Category B Reportables/Deliverables documentation to be provided.

Sampling Procedures:
Sampling Procedures are described within the Sampling and Analysis Plan (SAP).

Data Quality Factors:
Analytical Detection Limits will be consistent with ASP- Contract Required Quantitation Limits (CRQLs).

QA/QC Samples:
X Duplicate
X Field Blank
X Matrix Spike
__Trip Blank
X Matrix Spike Duplicate

DATA QUALITY OBJECTIVES FORM

Site Name/Location:

700 Outparcel
701-709 East Water Street
Syracuse, New York

Sampling Objectives:

Characterize subsurface off-site soils.
Determine potential extent of soil contamination.

Sampled Media:

___Groundwater
___Surface water
___Wetland water
X Soils
___Sediment
___Waste material

Data Use:

X Site characterization
X Risk assessment
___Health and Safety
X Evaluate remediation alternatives
X Monitoring

Data Types:	**Parameters:**			
X TCL or Modified TCL	__PCB/Pest	X VOCs	X Semi-VOCs	_Metals
	_Mercury	_Cyanide	X Lead	
__Field Parameters	__pH	__Sp.Cond	__Turb	__Temp

Level of Analysis:

__ **Level I: Field Screening**

__ **Level II: Field Analysis**

__ **Level III: ASP Analytical Methods**
Samples will be analyzed in accordance with NYSDEC-ASP 1995

X **Level IV: ASP Reportables/Deliverables**
NYSDEC-ASP 1995 Category B Reportables/Deliverables documentation to be provided.

Sampling Procedures:
Sampling Procedures are described within the Sampling and Analysis Plan (SAP).

Data Quality Factors:
Analytical Detection Limits will be consistent with ASP- Contract Required Quantitation Limits (CRQLs).

QA/QC Samples:

X Duplicate
X Field Blank
X Matrix Spike
__Trip Blank
X Matrix Spike Duplicate

DATA QUALITY OBJECTIVES FORM

Site Name/Location: **700 Outparcel**
701-709 East Water Street
Syracuse, New York

Sampling Objectives: **Determine type of soil contamination.**

Sampled Media:

___Groundwater
___Surface water
___Wetland water
_X_Soils
___Sediment
___Waste material

Data Use:

_X_ Site characterization
__Risk assessment
___Health and Safety
___Evaluate remediation alternatives
__Monitoring

Data Types: **Parameters:**

__TCL or Modified TCL __PCB/Pest __VOCs _Semi-VOCs __Metals
_Mercury _Cyanide _ Lead
_X_Total Petroleum Hydrocarbon
__Field Parameters __pH __Sp.Cond __Turb __Temp

Level of Analysis: **__ Level I: Field Screening**

__ Level II: Field Analysis

_X_ Level III: ASP Analytical Methods
Samples will be analyzed in accordance with NYSDEC-ASP 1995

__ Level IV: ASP Reportables/Deliverables
NYSDEC-ASP 1995 Category B Reportables/Deliverables documentation to be provided.

Sampling Procedures:
Sampling Procedures are described within the Sampling and Analysis Plan (SAP).

Data Quality Factors:
Analytical Detection Limits will be consistent with ASP- Contract Required Quantitation Limits (CRQLs).

QA/QC Samples:

_Duplicate
_Field Blank
_Matrix Spike
__Trip Blank
_Matrix Spike Duplicate

DATA QUALITY OBJECTIVES FORM

Site Name/Location:	**700 Outparcel** **701-709 East Water Street** **Syracuse, New York**
Sampling Objectives:	**Determine presence/absence of PCB contamination near former waste oil UST and wooden structure.**

Sampled Media:

___Groundwater	___Wetland water	___Sediment
___Surface water	_X_Soils	___Waste material

Data Use:

_X_ Site characterization	___Health and Safety	__Monitoring
__Risk assessment	___Evaluate remediation alternatives	

Data Types:	**Parameters:**			
__TCL or Modified TCL	_X_PCB	__VOCs	_Semi-VOCs	__Metals
	_Mercury	_Cyanide	_ Lead	
_Total Petroleum Hydrocarbon				
_Field Parameters	__pH	__Sp.Cond	__Turb	__Temp

Level of Analysis:

__ Level I: Field Screening

__ Level II: Field Analysis

_X_ Level III: ASP Analytical Methods

Samples will be analyzed in accordance with NYSDEC-ASP 1995

__ Level IV: ASP Reportables/Deliverables

NYSDEC-ASP 1995 Category B Reportables/Deliverables documentation to be provided.

Sampling Procedures:

Sampling Procedures are described within the Sampling and Analysis Plan (SAP).

Data Quality Factors:

Analytical Detection Limits will be consistent with ASP- Contract Required Quantitation Limits (CRQLs).

QA/QC Samples:

_Duplicate	_Matrix Spike	_Matrix Spike Duplicate
_Field Blank	__Trip Blank	

ATTACHMENT F

COMPOUND/ANALYTE LISTS

http://www.epa.gov/superfund/programs/clp/som-vtarget.htm
Last updated on Thursday, January 31st, 2008.

Superfund Analytical Services / Contract Laboratory Program

You are here: EPA Home Superfund Home Programs Superfund Analytical Services/Contract Laboratory Program (CLP) Services Analytical Services Target Compounds and Analytes
SOM01.2 Volatiles

SOM01.2 Volatile Target Compound List and Corresponding CRQLs

COMPOUND	SOM01.2 CONTRACT REQUIRED QUANTITATION LIMITS				
	Trace Water by SIM (ug/L)	Trace Water (ug/L)	Low Water (ug/L)	Low Soil (ug/kg)	Med. Soil (ug/kg)
Dichlorodifluoromethane	--	0.50	5.0	5.0	250
Chloromethane	--	0.50	5.0	5.0	250
Vinyl chloride	--	0.50	5.0	5.0	250
Bromomethane	--	0.50	5.0	5.0	250
Chloroethane	--	0.50	5.0	5.0	250
Trichlorofluoromethane	--	0.50	5.0	5.0	250
1,1-Dichloroethene	--	0.50	5.0	5.0	250
1,1,2-Trichloro-1,2,2-trifluoroethane	--	0.50	5.0	5.0	250
Acetone	--	5.0	10	10	500
Carbon disulfide	--	0.50	5.0	5.0	250
Methyl acetate	--	0.50	5.0	5.0	250
Methylene chloride	--	0.50	5.0	5.0	250
trans-1,2-Dichloroethene	--	0.50	5.0	5.0	250
Methyl tert-butyl ether	--	0.50	5.0	5.0	250
1,1-Dichloroethane	--	0.50	5.0	5.0	250
cis-1,2-Dichloroethene	--	0.50	5.0	5.0	250
2-Butanone	--	5.0	10	10	500
Bromochloromethane	--	0.50	5.0	5.0	250
Chloroform	--	0.50	5.0	5.0	250
1,1,1-Trichloroethane	--	0.50	5.0	5.0	250
Cyclohexane	--	0.50	5.0	5.0	250
Carbon tetrachloride	--	0.50	5.0	5.0	250
Benzene	--	0.50	5.0	5.0	250
1,2-Dichloroethane	--	0.50	5.0	5.0	250
1,4-Dioxane	--	--	100	100	5000
Trichloroethene	--	0.50	5.0	5.0	250
Methylcyclohexane	--	0.50	5.0	5.0	250
1,2-Dichloropropane	--	0.50	5.0	5.0	250
Bromodichloromethane	--	0.50	5.0	5.0	250
cis-1,3-Dichloropropene	--	0.50	5.0	5.0	250
4-Methyl-2-pentanone	--	5.0	10	10	500
Toluene	--	0.50	5.0	5.0	250
trans-1,3-Dichloropropene	--	0.50	5.0	5.0	250
1,1,2-Trichloroethane	--	0.50	5.0	5.0	250

Tetrachloroethene	--	0.50	5.0	5.0	250
2-Hexanone	--	5.0	10	10	500
Dibromochloromethane	--	0.50	5.0	5.0	250
1,2-Dibromoethane	0.050	0.50	5.0	5.0	250
Chlorobenzene	--	0.50	5.0	5.0	250
Ethylbenzene	--	0.50	5.0	5.0	250
o-Xylene	--	0.50	5.0	5.0	250
m,p-Xylene	--	0.50	5.0	5.0	250
Styrene	--	0.50	5.0	5.0	250
Bromoform	--	0.50	5.0	5.0	250
Isopropylbenzene	--	0.50	5.0	5.0	250
1,1,2,2-Tetrachloroethane	--	0.50	5.0	5.0	250
1,3-Dichlorobenzene	--	0.50	5.0	5.0	250
1,4-Dichlorobenzene	--	0.50	5.0	5.0	250
1,2-Dichlorobenzene	--	0.50	5.0	5.0	250
1,2-Dibromo-3-chloropropane	0.050	0.50	5.0	5.0	250
1,2,4-Trichlorobenzene	--	0.50	5.0	5.0	250
1,2,3-Trichlorobenzene	--	0.50	5.0	5.0	250

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http://www.epa.gov/superfund/programs/clp/som-svtarget.htm
Last updated on Thursday, January 31st, 2008.

Superfund Analytical Services / Contract Laboratory Program

SOM01.2 Semivolatile Target Compound List and Corresponding CRQLs

COMPOUND	SOM01.2 CONTRACT REQUIRED QUANTITATION LIMITS				
	Low Water by SIM (ug/L)	Low Water (ug/L)	Low Soil by SIM (ug/kg)	Low Soil (ug/kg)	Med. Soil (ug/kg)
Benzaldehyde	--	5.0	--	170	5,000
Phenol	--	5.0	--	170	5,000
Bis(2-chloroethyl) ether	--	5.0	--	170	5,000
2-Chlorophenol	--	5.0	--	170	5,000
2-Methylphenol	--	5.0	--	170	5,000
2,2'-Oxybis(1-choloropropane)	--	5.0	--	170	5,000
Acetophenone	--	5.0	--	170	5,000
4-Methylphenol	--	5.0	--	170	5,000
N-Nitroso-di-n propylamine	--	5.0	--	170	5,000
Hexachloroethane	--	5.0	--	170	5,000
Nitrobenzene	--	5.0	--	170	5,000
Isophorone	--	5.0	--	170	5,000
2-Nitrophenol	--	5.0	--	170	5,000
2,4-Dimethylphenol	--	5.0	--	170	5,000
Bis(2-chloroethoxy) methane	--	5.0	--	170	5,000
2,4-Dichlorophenol	--	5.0	--	170	5,000
Naphthalene	0.10	5.0	3.3	170	5,000
4-Chloroaniline	--	5.0	--	170	5,000
Hexachlorobutadiene	--	5.0	--	170	5,000
Caprolactam	--	5.0	--	170	5,000
4-Chloro-3-methylphenol	--	5.0	--	170	5,000
2-Methylnaphthalene	0.10	5.0	3.3	170	5,000
Hexachlorocyclopentadiene	--	5.0	--	170	5,000
2,4,6-Trichlorophenol	--	5.0	--	170	5,000
2,4,5-Trichlorophenol	--	5.0	--	170	5,000
1,1'-Biphenyl	--	5.0	--	170	5,000
2-Chloronaphthalene	--	5.0	--	170	5,000
2-Nitroaniline	--	10	--	330	10,000
Dimethylphthalate	--	5.0	--	170	5,000
2,6-Dinitrotoluene	--	5.0	--	170	5,000
Acenaphthylene	0.10	5.0	3.3	170	5,000
3-Nitroaniline	--	10	--	330	10,000
Acenaphthene	0.10	5.0	3.3	170	5,000
2,4-Dinitrophenol	--	10	--	330	10,000

4-Nitrophenol	--	10	--	330	10,000
Dibenzofuran	--	5.0	--	170	5,000
2,4-Dinitrotoluene	--	5.0	--	170	5,000
Diethylphthalate	--	5.0	--	170	5,000
Fluorene	0.10	5.0	3.3	170	5,000
4-Chlorophenyl-phenyl ether	--	5.0	--	170	5,000
4-Nitroaniline	--	10	--	330	10,000
4,6-Dinitro-2-methylphenol	--	10	--	330	10,000
N-Nitrosodiphenylamine	--	5.0	--	170	5,000
1,2,4,5-Tetrachlorobenzene	--	5.0	--	170	5,000
4-Bromophenyl-phenylether	--	5.0	--	170	5,000
Hexachlorobenzene	--	5.0	--	170	5,000
Atrazine	--	5.0	--	170	5,000
Pentachlorophenol	0.20	10	6.7	330	10,000
Phenanthrene	0.10	5.0	3.3	170	5,000
Anthracene	0.10	5.0	3.3	170	5,000
Carbazole	--	5.0	--	170	5,000
Di-n-butylphthalate	--	5.0	--	170	5,000
Fluoranthene	0.10	5.0	3.3	170	5,000
Pyrene	0.10	5.0	3.3	170	5,000
Butylbenzylphthalate	--	5.0	--	170	5,000
3,3'-dicholorobenzidine	--	5.0	--	170	5,000
Benzo(a)anthracene	0.10	5.0	3.3	170	5,000
Chrysene	0.10	5.0	3.3	170	5,000
Bis(2-ethylhexyl) phthalate	--	5.0	--	170	5,000
Di-n-octylphthalate	--	5.0	--	170	5,000
Benzo(b) fluoranthene	0.10	5.0	3.3	170	5,000
Benzo(k) fluoranthene	0.10	5.0	3.3	170	5,000
Benzo(a) pyrene	0.10	5.0	3.3	170	5,000
Indeno(1,2,3,-cd) pyrene	0.10	5.0	3.3	170	5,000
Dibenzo(a,h) anthracene	0.10	5.0	3.3	170	5,000
Benzo(g,h,i) perylene	0.10	5.0	3.3	170	5,000
2,3,4,6-Tetrachlorophenol	--	5.0	--	170	5,000

http://www.epa.gov/superfund/programs/clp/mtarget.htm
Last updated on Friday, September 28th, 2007.

Superfund Analytical Services / Contract Laboratory Program

You are here: EPA Home Superfund Home Programs Superfund Analytical Services/Contract Laboratory Program (CLP) Services Analytical Services Target Compounds and Analytes
ILM05.3/ILM05.4 Metals and Cyanide

ILM05.3/ILM05.4 Metals and Cyanide Target Analyte List and Corresponding CRQLs

ANALYTES	CONTRACT REQUIRED QUANTITATION LIMITS		
	ICP-AES Water (ug/L)	ICP-AES Soil (mg/kg)	ICP-MS Water (ug/L)
Aluminum	200	20	--
Antimony	60	6	2
Arsenic	10	1	1
Barium	200	20	10
Beryllium	5	0.5	1
Cadmium	5	0.5	1
Calcium	5000	500	--
Chromium	10	1	2
Cobalt	50	5	1
Copper	25	2.5	2
Iron	100	10	--
Lead	10	1	1
Magnesium	5000	500	--
Manganese	15	1.5	1
Mercury	0.2	0.1	--
Nickel	40	4	1
Potassium	5000	500	--
Selenium	35	3.5	5
Silver	10	1	1
Sodium	5000	500	--
Thallium	25	2.5	1
Vanadium	50	5	1*
Zinc	60	6	2
Cyanide	10	2.5	--

ATTACHMENT G

MATERIAL SAFETY DATA/FACT SHEETS

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs):	**CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours):	Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website	www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)		Exposure Limits		
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity:OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

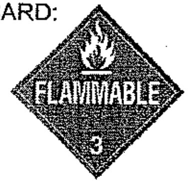
13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:



15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: **07/01/06**

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MSDS SUMMARY SHEET

Manufacturer:
Name: PHILLIPS PETROLEUM COMPANY
Address 1:
Address 2:
Address 3:
CSZ: BARTLESVILLE **State:** OK **Zipcode:** 74004
Emergency phone: (800) 424-9300
Business phone: 800-762-0942

Product:

Ferndale MSDS#: 1354 **Version # :** 6
Manufacturer MSDS#: 0041
Current? : 2002
Name:

NO. 2 DIESEL FUEL

Synonyms:

- CARB **Diesel** TF3
- CARB **Diesel**
- CARB **Diesel** 10%
- **Diesel** Fuel Oil
- EPA Low Sulfur **Diesel** Fuel
- EPA Low Sulfur **Diesel** Fuel – Dyed
- EPA Off Road High Sulfur **Diesel** – Dyed
- Fuel Oil No. 2 – CAS # 68476-30-2
- No. 2 **Diesel** Fuel Oil
- No. 2 Fuel Oil – Non Hiway – Dyed
- No. 2 High Sulfur **Diesel** – Dyed
- No. 2 Low Sulfur **Diesel** - Dyed
- No. 2 Low Sulfur **Diesel** - Undyed
- Crude column 3rd IR
- Crude column 3rd side cut
- Atmospheric tower 3rd side cut
- Ultra Low Sulfur **Diesel** No. 2
- Finished **Diesel**
- DHT Reactor Feed
- Straight Run **Diesel**
- **Diesel**
- Middle Distillate

Product/Catalog Numbers:
MSDS Date: 01/01/2002 **(received:** 01/14/2002)

NFPA codes:
Health: 0 **Flammability:** 2 **Reactivity:** 0

MATERIAL SAFETY DATA SHEET
No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name:	No. 2 Diesel Fuel
Product Code:	Multiple
SAP Code:	
Synonyms:	1354 CARB Diesel TF3 CARB Diesel CARB Diesel 10% Diesel Fuel Oil EPA Low Sulfur Diesel Fuel EPA Low Sulfur Diesel Fuel – Dyed EPA Off Road High Sulfur Diesel – Dyed Fuel Oil No. 2 – CAS # 68476-30-2 No. 2 Diesel Fuel Oil No. 2 Fuel Oil – Non Hiway – Dyed No. 2 High Sulfur Diesel – Dyed No. 2 Low Sulfur Diesel - Dyed No. 2 Low Sulfur Diesel – Undyed No. 2 Ultra Low Sulfur Diesel – Dyed No. 2 Ultra Low Sulfur Diesel - Undyed
Intended Use:	Fuel
Chemical Family:	
Responsible Party:	Phillip's Petroleum Company Bartlesville, Oklahoma 74004
For Additional MSDSs:	800-762-0942
Technical Information:	

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire or Accident
Call CHEMTREC
North America: (800) 424-9300
Others: (703) 527-3887 (collect)

California Poison Control System: 800-356-3120

Health Hazards/Precautionary Measures: Causes severe skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with adequate ventilation. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance:	Straw-colored to dyed red
Physical Form:	Liquid
Odor:	Characteristic petroleum

HFPA Hazard Class:		**HMIS Hazard Class**
Health:	0 (Least)	Not Evaluated
Flammability:	2 (Moderate)	
Reactivity:	0 (Least)	

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% VOLUME	Limits	EXPOSURE GUIDELINE Agency	 Type
Diesel Fuel No. 2 CAS# 68476-34-6	100	100* mg/m3	ACGIH	TWA-SKIN
Naphthalene CAS# 91-20-3	<1	10ppm	ACGIH	TWA
		15ppm	ACGIH	STEL
		10ppm	OSHA	TWA
		250ppm	NIOSH	IDLH

All components are listed on the TSCA inventory

Tosco Low Sulfur No. 2 Diesel meets the specifications of 40 CFR 60.41 for low sulfur diesel fuel.

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

*Proposed ACGIH (1999)

3. HAZARDS IDENTIFICATION

Potential Health Effects:

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Severe skin irritant. Contact may cause redness, itching, burning, and severe skin damage. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin, leading to dermatitis (inflammation). Not actually toxic by skin absorption, but prolonged or repeated skin contact may be harmful (see Section 11).

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD – This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea, diarrhea and transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: Possible skin cancer hazard (see Sections 11 and 14).

Target Organs: There is limited evidence from animal studies that overexposure may cause injury to the kidney (see Section 11).

Developmental: Inadequate data available for this material.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders and kidney disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Immediately remove contaminated shoes, clothing, and constrictive jewelry and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek immediate medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek immediate medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard; Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point: >125°F/>52°
OSHA Flammability Class: Combustible liquid
LEL %: 0.3 / UEL %; 10.0
Autoignition Temperature: 500°F/260°C

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharged. The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing or high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSIZ49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentration below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge maybe used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrants a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation and skin damage (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eyes/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1atm).

Appearance: Straw-colored to dyed red
Physical State: Liquid
Odor: Characteristic petroleum
pH: unavailable
Vapor Pressure (mm Hg): 0.40
Vapor Densisty (air=1):>3
Boiling Point/Range: 320-700°F /160-371°C
Freezing/Melting Point: No Data
Solubility in Water: Negligible
Specific Gravity: 0.81-0.88 @ 60°F
Percent Volatile: Negligible
Evaporation Rate (nBuAc=1): <1
Viscosity: 32.6-40.0 SUS @ 100°F
Bulk Density: 7.08 lbs/gal
Flash Point: >125°F / >52°C
Flammable/Expolsive Limits (%): LEL: 0.3 / UEL: 10.0

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions To Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

Hazardous Decomposition Products: The use of hydrocarbon fuels in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. ACGIH has included a TLV of 0.05 mg/m3 TWA for diesel exhaust particulate on its 1999 Notice of Intended Changes. See Section 11 for additional information on hazards of engine exhaust.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Diesel Fuel No. 2 (CAS# 68476-34-6)

Carcinogenicity: Chronic dermal application of certain middle distillate streams contained in diesel fuel No. 2 resulted in an increased incidence of skin tumors in mice. This material has not been identified as carcinogen by NTP, IARC, or OSHA. Diesel exhaust is a probable cancer hazard based on tests with laboratory animals.

Target Organ(s): Limited evidence of renal impairment has been noted from a few case reports involving excessive exposure to diesel fuel No. 2.

Naphthalene (CAS# 91-20-3)

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has not been identified as a carcinogen by IARC or OSHA.

12. ECOLOGICAL INFORMATION

Not evaluated at this time

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001) and benzene (D018). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material, once it becomes a waste, is subject to the land disposal restrictions in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent then the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container ?insate? could be considered a RCRA hazardous waste and must be disposed of with care and in compliance with federal, state and local regulations. Large empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Shipping Description:	Diesel Fuel, NA1983
Non-Bulk Package Marking:	Diesel Fuel, 3, NA 1993, III

15. REGULATORY INFORMATION

EPA SARA 311/312 (Title III Hazard Categories):

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

SARA 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Component	CAS Number	Weight %
-- None known --		

California Proposition 65:
Warning: This material contains the following chemicals which are known to the state of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Effect
Benzene	Cancer, Developmental and Reproductive Toxicant
Toluene	Developmental Toxicant

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any. Diesel exhaust is a probable cancer hazard based on tests in laboratory animals. It has been identified as carcinogen by IARC.

EPA (CERCLA Reportable Quantity: None

16. OTHER INFORMATION

Issue Date: 01/01/02
Previous Issue Date: 05/15/01
Product Code: Multiple
Revised Sections: None
Previous Product Code: Multiple
MSDS Number: 0041

Disclaimer of Expressed and Implied Warranties:

The information presented in this Material Data Safety Sheet is based on data believed to be accurate as of the date this Material Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THE PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

UltraLow Sulfur Diesel Product Specification

Ferndale Product Code:34380xx (5) Product Code: ULSD2

(COMETS)

Specification	Unit	Limit	Test Procedure	Typical
Appearance				
Water & Sediment	Vol %	0.05 Max	D 2709	
Color	Number	3.0 Max	D 1500	
Haze Rating	Rating	2 Max	D 4176	
Composition				
Carbon Residue (Ramsbottom)	Wt %	0.35 Max	D 524, D 189	
Volatility				
90% Recovered	Deg; F	540 Min	D 86	
	Deg; F	640 Min	D 86	
Flash Point	Deg; F	125 Min (1)	D 93	130 F
Gravity	API	30 Min	D 287, D4052	
Fluidity				
Pour Point	Deg; F	See Season Table (6)	D 97	
Cloud Point	Deg; F	See Season Table (6)	D 2500	10 F
Viscosity @ 104F	cSt	1.9 Min	D 445	
	cSt	4.1 Max	D 445	
Lubricity, SLBOCLE	grams	3100 Min	D 6078	3300gm
Lubricity, HFRR	mm	.45	D 6079	
Combustion				
Cetane Index or Cetane Number (3,4)	Number	40.0 Min	D 976, D613	47.0
Corrosion				
Copper Strip, 3hr @ 50 deg C	Number	3 Max (2)	D 130	
Aromatics (4)	Vol %	35 Max	D 1319	25 %
Contaminants				
Total Sulfur	PPM	30 Max	D 2622, D4294	15-20ppm
Water & Sediment	Vol %	0.05 Max	D 1796	
Ash	Wt %	0.01 Max	D 482	
Additives				
Cetane Improver	Lb/MBbl	675 Max		
Dye		Undyed		

1. Minimum release specification is 125 deg. F. The refinery should target 135 deg. F.
2. Test result reported as a number and letter (e.g. 1a). Any letter is allowable as long as the number meets the spec shown.
3. Either specification must be met.
4. Either cetane index minimum or aromatics maximum must be met.
5. Winter cloud and pour specifications may be relaxed to the summer specifications by agreement with the customer.
6. Season Table

Month	Product Code	Pour Point	Cloud Point
Jan, Feb, Nov, Dec	WI	0 max (5)	14 max (5)
Mar - Oct	SU	15 max	24 max

MATERIAL SAFETY DATA BULLETIN

Version: August 16, 2007

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Used Oil**

SUPPLIER:

Atlantic Industrial Services, Inc.
6600 NW 12TH AVENUE, SUITE 205
FORT LAUDERDALE, FL 33309

Product and MSDS Information: (800) 256-9900or (318) 688-1191

CHEMTREC: (800) 424-9300 or (202) 483-7616

2. MATERIAL INFORMATION

Identity:	USED OIL – On Specification Fuel
Synonyms:	USED LUBRICATING OIL; USED ENGINE OIL; USED CRANKCASE OIL; USED MACHINERY OIL; USED MOTOR OIL MIXTURE
Family Chemical Name:	PETROLEUM HYDROCARBON
NFPA Rating (scale 0-4):	0-HEALTH 1-FIRE 0-REACTIVITY
MSDS Form No:	Used Oil 8-16-07

3. HAZARDS IDENTIFICATION

This material is a complex mixture of paraffinic, naphthenic & aromatic petroleum hydrocarbons that may contain one or more of the following: carbon deposits, sludge, aromatic & non-aromatic solvents, water (as a water-in-oil emulsion), glycols, wear metals & metallic salts, silicon-based antifoaming compounds, and miscellaneous lube-oil additive materials. This product fits the ACGIH definition for mineral-oil mist.

TYPICAL INGREDIENTS:	TYPICAL VOLUME %:	CAS NUMBER:
Used Oil	80 – 100	N/A
Water	0 – 20	N/A
Diesel Fuel	0 – 5	68476-34-6 / 64742-34-3
Gasoline	0 – 1	6474-46-4
Solvents	0 – 1	N/A
Ethylene Glycol	Trace – 3	107-21-1
Deposits & Sludge	Trace – 1	N/A
Misc. Additive Compounds	Trace – 0.5	N/A

EXPOSURE LIMITS IN AIR

	USED OIL: Liq /Mist	DIESEL FUEL: Liq / Mist	GASOLINE
OSHA PEL – TWA (mg/M^3)	NE / 5	NE / 5	NE
OSHA PEL - STEL (mg/M^3)	NE / N/A	NE / N/A	NE
ACGIH TLV – TWA (mg/M^3)	NE / 5	NE / 5	300 (ppm)
ACGIH TLV – STEL (mg/M^3)	NE /10	NE / 10	NE
CAL OSHA – TWA (mg/M^3)	NE / 5	NE / 5	NE

Note: NE = None Established; N/A = Not Applicable or Not Available

4. FIRST AID MEASURES

EYE CONTACT: Immediately flush eyes with large amounts of water for a minimum of 15 minutes. If redness or irritation is present, continue flushing until the irritation subsides. If the material is hot, seek medical attention immediately for thermal burns.

SKIN CONTACT: Wash contact area with soap and water. If clothing is contaminated, minimize contact time on skin by removing contaminated clothing (if applicable) and washing contact area thoroughly with soap and water. If material is hot, flush or submerge affected area in cold water, and seek medical attention immediately for thermal burns.
INHALATION: This material is of low vapor pressure and is not expected to present an inhalation exposure hazard at ambient conditions. If oil mist or aerosol is present, refer to section 8 (Exposure Controls/Personal Protection) of this document for appropriate preventative measures.

INGESTION: This material does not present an ingestion hazard if a very small quantity is accidentally swallowed. May act as a laxative. No treatment is necessary under ordinary circumstances. If cramping and/or diarrhea are present following ingestion, seek medical attention.

5. FIRE PROTECTION & FIRE-FIGHTING MEASURES

FLASH POINT: > 350 F TEST METHOD: ASTM D-92 (Cleveland Closed Cup)

AUTOIGNITION TEMP: 500 – 800 F, based on % volatile components. TEST METHOD: E 659.

FLAMMABLE LIMITS IN AIR (% by vol): LOWER:< 1.0 UPPER: 7.0

EXTINGUISHING MEDIA: Use Dry Chemical, Foam, or Carbon Dioxide.

SPECIAL FIRE FIGHTING PROCEDURES: Water may be ineffective but can be used to cool containers exposed to heat or flame. Caution should be exercised when using water or foam, as flash-steaming and/or frothing may occur, especially if sprayed directly into burning containers.

SPECIAL PROTECTIVE EQUIPMENT: Use Self-Contained Breathing Apparatus (SCBA) in enclosed areas.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dense, irritating smoke may be generated at the site of the fire. Closed containers of used oil (e.g., 55-gallon drums) at the fire site may rupture and explode when exposed to heat. Use caution when closed, heated containers are present.

NFPA HAZARD ID:
Health: 0
Flammability: 1
Reactivity: 0

HAZARDOUS COMBUSTION PRODUCTS: Carbon Dioxide, Carbon Monoxide, and oxides of sulfur and phosphorus may be generated as products of combustion.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Immediately contact the local Fire Department, Police Department and other appropriate authorities with (1) the time of the spill, (2) an estimate of the quantity spilled, and (3) the nature of the spill (locally contained or widespread). STAY CALM at all times. In addition, contact the US Coast Guard National Response Center at 1-800-424-8802 if a spill of any amount is made into or upon U.S. navigable waterways, contiguous waterways, drainage ways, and/or adjoining shorelines.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Contain spill immediately. If possible, do not allow spill to enter sewers or watercourses. Remove all sources of ignition. Immediately apply an absorbent material such as sand, clay, diatomaceous earth, etc. to the spilled area. Large, voluminous spills may be picked up using vacuum pumps, shovels, buckets, or other means and placed in drums or other suitable containers.

ENVIRONMENTAL PRECAUTIONS: Disposal of collected material must comply with federal, state, and local regulations. The material, if spilled or discarded, may be a regulated waste – refer to state and local regulations.
If regulated solvents are used to clean up spilled material, the resulting waste mixture may be regulated. Department of Transportation (DOT) regulations may apply for transporting this material.
Materials should be recycled if possible.

PERSONAL PRECAUTIONS: Refer to section 3 (Hazards Identification), section 4 (First Aid Measures), section 8

(Exposure Controls / Personal protection) and section 11 (Health Hazard Information) for necessary information.

7. HANDLING AND STORAGE

HANDLING: Keep away from heat, sparks and flames. Avoid generating oil mists or aerosols.

STORAGE: Store in closed containers away from sources of heat and oxidizing chemicals. Do not store in, or transfer material to, unmarked containers. Always maintain Class 'B' fire extinguishers & keep readily available wherever this material is stored. See NFPA 30 and OSHA 1910.106 – Flammable and Combustible Liquids.

This material is not classified as hazardous under DOT regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: If vapor or aerosol mist is generated when the material is heated or handled, adequate ventilation in accordance with Good Engineering Practice must be provided to maintain concentrations below the specified exposure or flammable limits.

RESPIRATORY PROTECTION: If oil mist or aerosol is present, use a NIOSH-approved organic-vapor respirator with an organic mist filter. Do not use compressed oxygen in hydrocarbon atmospheres.

EYE PROTECTION: Not required under conditions of normal use. If material is handled such that it could be splashed into eyes, wear a plastic face shield or splash-proof safety goggles.

SKIN PROTECTION: For prolonged and/or repeated exposures, wear impervious clothing (e.g., boots, gloves, aprons, smocks, etc.) over parts of the body subject to exposure. For hand protection, wear latex, nitrile rubber, neoprene or equivalent gloves to prevent contact with the skin. Use barrier-specific protective creams to cover exposed skin that impervious clothing does not cover.
If handling hot material, use insulated protective clothing (e.g., gloves, boots, etc.). All clothing should be properly laundered in hot water & detergent to remove traces of material. If clothing is disposable, overly contaminated or cannot be decontaminated properly (i.e., leather articles, including shoes), these should be properly disposed of in closed appropriate containers.

EXPOSURE LIMITS: Caution should be exercised to not exceed the exposure limits listed in section (3) of this document.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Dark, viscous, oily liquid.
COLOR: Dark brown to black.
ODOR: Pronounced hydrocarbon odor
ODOR THRESHOLD-ppm: NE
pH: N/A
BOILING POINT C(F): > 82 C (180 F)
MELTING POINT C(F): N/A
FLASH POINT C(F): > (350 F)
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 1 (Air=1)
EVAPORATION RATE: 0.001 (Ether=1)
DENSITY: 7.1 Lbs/Gal
SPECIFIC GRAVITY, 60F: 0.85 to 0.88
API GRAVITY, 60 F: 22 to 29 API
SOLUBILITY IN WATER: Insoluble
POUR POINT C(F): -12 C (10 F)
FREEZING POINT C(F): N/A
VOLATILE ORGANIC COMPOUNDS: < 2% (by vol)
Note: N/A=NOT APPLICABLE; NE=NOT ESTABLISHED
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable
CONDITIONS TO AVOID: Avoid heat, flame and contact with strong oxidizing agents.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong Oxidizers (e.g., peroxides, chromate and permanganate compounds)

HAZARDOUS DECOMPOSITION PRODUCTS Thermal decomposition products are highly dependent on the combustion conditions. A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide and other unidentified organic compounds may be formed upon combustion.

HAZARDOUS POLYMERIZATION: Will not occur under normal temperature and pressure conditions

11. HEALTH HAZARD INFORMATION

ACUTE SYMPTOMS OF EXPOSURE

INHALATION: High concentrations of aerosol or mist may be generated at high temperatures and may be irritating to the respiratory tract, including nose and throat, and may cause difficulty breathing. This may be particularly true with people who have a high level of sensitivity and allergic reactions.

SKIN: Prolonged and/or repeated exposure may cause mild skin irritation, including redness, burning, temporary drying/cracking, and acute dermatitis. Contact with hot material may cause thermal burns.

EYES: Contact may cause slight to moderate irritation, including burning, redness, and tearing. Contact with hot material may cause thermal burns.

INGESTION: May cause mild irritation of the digestive tract, including cramping, diarrhea, nausea and vomiting. Aspiration into the lungs – by initial ingestion or vomiting – may cause mild to severe pulmonary injury.

CHRONIC SYMPTOMS OF EXPOSURE

INHALATION: Exposure to high levels of oil mist concentration may lead to chronic pulmonary conditions such as chronic bronchitis, pneumonia, and emphysema.

SKIN: Cracking, drying and chronic dermatitis

12. STATEMENT OF CARCINOGENICITY

Used motor oil and some cutting oils are possible skin cancer hazards based on animal testing.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Disposal of collected material must comply with federal, state, and local regulations. The material, if spilled or discarded, may be a regulated waste – refer to federal, state and local regulations for regulated waste transport and disposal.

14. TRANSPORT INFORMATION

USA DOT: This material is not classified as hazardous under DOT regulations.

15. REGULATORY INFORMATION

Governmental Inventory Status (TSCA): Components of this material are listed in the TSCA Inventory.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III: This material contains toxic compounds of zinc and lead subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986, and 40 CFR Part 372.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Immediate (Acute) Health Effects: NO
Delayed (Chronic) Health Effects: YES
Fire Hazard: YES
Sudden Release of Pressure Hazard: NO
Reactivity Hazard: NO
California Prop. 65: This material may contain chemicals known to the State of California to cause cancer. (See also section 11 (Health Hazard Information) and section 12 (Statement of Carcinogenicity).

16. OTHER INFORMATION

USE: Used Oil for Recycling/Re-refining.

Legally required information is given in accordance with applicable regulations. Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses, which infringe valid patents, or as extending any license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. AISI neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- ☐ PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- ☐ PAHs can occur in air attached to dust particles.
- ☐ Some PAH particles can readily evaporate into the air from soil or surface waters.
- ☐ PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- ☐ PAHs enter water through discharges from industrial and wastewater treatment plants.
- ☐ Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- ☐ Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- ☐ In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- ☐ PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- ☐ Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- ☐ Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- ☐ Coming in contact with air, water, or soil near hazardous waste sites.
- ☐ Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- ☐ Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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MERCURY
CAS # 7439-97-6

Agency for Toxic Substances and Disease Registry ToxFAQs April 1999

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mũr′kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- ☐ Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- ☐ It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- ☐ Methylmercury may be formed in water and soil by small organisms called bacteria.
- ☐ Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- ☐ Eating fish or shellfish contaminated with methylmercury.
- ☐ Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- ☐ Release of mercury from dental work and medical treatments.
- ☐ Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- ☐ Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also can pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- ☐ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ☐ When lead is released to the air, it may travel long distances before settling to the ground.
- ☐ Once lead falls onto soil, it usually sticks to soil particles.
- ☐ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- ☐ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- ☐ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- ☐ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- ☐ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

☐ Avoid exposure to sources of lead.

☐ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

☐ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

☐ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children

☐ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636. FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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CYANIDE

CAS# 74-90-8, 143-33-9, 151-50-8, 592-01-8, 544-92-3, 506-61-6, 460-19-5, 506-77-4

Division of Toxicology and Environmental Medicine ToxFAQs™ July 2006

This fact sheet answers the most frequently asked health questions (FAQs) about cyanide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to high levels of cyanide harms the brain and heart, and may cause coma and death. Exposure to lower levels may result in breathing difficulties, heart pains, vomiting, blood changes, headaches, and enlargement of the thyroid gland. Cyanide has been found in at least 471 of the 1,662 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cyanide?

Cyanide is usually found joined with other chemicals to form compounds. Examples of simple cyanide compounds are hydrogen cyanide, sodium cyanide and potassium cyanide. Certain bacteria, fungi, and algae can produce cyanide, and cyanide is found in a number of foods and plants. In certain plant foods, including almonds, millet sprouts, lima beans, soy, spinach, bamboo shoots, and cassava roots (which are a major source of food in tropical countries), cyanides occur naturally as part of sugars or other naturally-occurring compounds. However, the edible parts of plants that are eaten in the United States, including tapioca which is made from cassava roots, contain relatively low amounts of cyanide.

Hydrogen cyanide is a colorless gas with a faint, bitter, almond-like odor. Sodium cyanide and potassium cyanide are both white solids with a bitter, almond-like odor in damp air. Cyanide and hydrogen cyanide are used in electroplating, metallurgy, organic chemicals production, photographic developing, manufacture of plastics, fumigation of ships, and some mining processes.

What happens to cyanide when it enters the environment?

☐ Cyanide enters air, water, and soil from both natural processes and industrial activities.

☐ In air, cyanide is mainly found as gaseous hydrogen cyanide; a small amount is present as fine dust particles.

☐ The half-life (the time needed for half of the material to be removed) of hydrogen cyanide in the atmosphere is about 1–3 years.

☐ Most cyanide in surface water will form hydrogen cyanide and evaporate.

☐ Cyanide in water does not build up in the bodies of fish.

☐ Cyanides are fairly mobile in soil. Once in soil, cyanide can be removed through several processes. Some cyanide compounds in soil can form hydrogen cyanide and evaporate, whereas some cyanide compounds will be transformed into other chemical forms by microorganisms in soil. At the high concentrations, cyanide becomes toxic to soil microorganisms. Because these microorganisms can no longer change cyanide to other chemical forms, cyanide is able to passes through soil into underground water.

How might I be exposed to cyanide?

☐ Breathing air, drinking water, touching soil, or eating foods that contain cyanide.

☐ Smoking cigarettes and breathing smoke-filled air during fires are major sources of cyanide exposure.

☐ Breathing air near a hazardous waste site containing cyanide.

☐ Eating foods naturally containing cyanide compounds, such as tapioca (made from cassava roots), lima beans, and almonds. However, the portions of these plants that are eaten in the United States contain relatively low amounts of cyanide.

How can cyanide affect my health?

You are not likely to be exposed to large enough amounts of cyanide in the environment to cause adverse health effects. The severity of the harmful effects following cyanide exposure depends in part on the form of cyanide, such as hydrogen cyanide gas or cyanide salts. Exposure to high levels of cyanide for a short time harms the brain and heart and can even cause coma and death. Workers who inhaled low levels of hydrogen cyanide over a period of years had breathing difficulties, chest pain, vomiting, blood changes, headaches, and enlargement of the thyroid gland.

Some of the first indications of cyanide poisoning are rapid, deep breathing and shortness of breath, followed by convulsions (seizures) and loss of consciousness. These symptoms can occur rapidly, depending on the amount eaten. The health effects of large amounts of cyanide are similar, whether you eat, drink, or breathe it; cyanide uptake into the body through the skin is slower than these other means of exposure. Skin contact with hydrogen cyanide or cyanide salts can irritate and produce sores.

How likely is cyanide to cause cancer?

There are no reports that cyanide can cause cancer in people or animals. EPA has determined that cyanide is not classifiable as to its human carcinogenicity.

How can cyanide affect children?

Effects reported in exposed children are like those seen in exposed adults. Children who ate large quantities of apricot pits, which naturally contain cyanide as part of complex sugars, had rapid breathing, low blood pressure, headaches, and coma, and some died. Cyanide has not been reported to directly cause birth defects in people. However, among people in the tropics who eat cassava root, children have been born with thyroid disease because of the mothers' exposure to cyanide and thiocyanate during pregnancy. Birth defects occurred in rats that ate cassava root diets, and harmful effects on the reproductive system occurred in rats and mice that drank water containing sodium cyanide.

How can families reduce the risk of exposure to cyanide?

Families can reduce their exposure to cyanide by not breathing in tobacco smoke, which is the most common source of cyanide exposure for the general population. In the event of a building fire, families should evacuate the building immediately, because smoke from burning plastics contains cyanide (and carbon monoxide). Breathing this smoke can lead to unconsciousness or death. Cyanide in smoke can arise from the combustion of certain plastics (e.g., polyacrylamines, polyacrylics, polyurethane, etc.).

Compounds that release cyanide are naturally present in plants. The amounts are usually low in the edible portion but are higher in cassava. Pits and seeds of common fruits, such as apricots, apples, and peaches, may have substantial amounts of cyanide-releasing chemicals, so people should avoid eating these pits and seeds to prevent accidental cyanide poisoning.

Is there a medical test to show whether I've been exposed to cyanide?

There are medical tests to measure blood and urine levels of cyanide; however, small amounts of cyanide are always detectable in blood and urine. Tissue levels of cyanide can be measured if cyanide poisoning is suspected, but cyanide is rapidly cleared from the body, so the tests must be done soon after the exposure. An almond-like odor in the breath may alert a physician that a person was exposed to cyanide.

Has the federal government made recommendations to protect human health?

EPA regulates the levels of cyanide that are allowable in drinking water. The highest level of cyanide allowed in drinking water is 0.2 parts cyanide per 1 million parts of water (0.2 ppm).

The Occupational Safety and Health Administration (OSHA) has set a limit for hydrogen cyanide and most cyanide salts of 10 parts cyanide per 1 million parts of air (10 ppm) in the workplace.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Cyanide (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737. FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

ARSENIC

CAS # 7440-38-2

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

☐ Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
☐ Arsenic cannot be destroyed in the environment. It can only change its form.
☐ Rain and snow remove arsenic dust particles from the air.
☐ Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
☐ Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

☐ Ingesting small amounts present in your food and water or breathing air containing arsenic.
☐ Breathing sawdust or burning smoke from wood treated with arsenic.
☐ Living in areas with unusually high natural levels of arsenic in rock.
☐ Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

☐ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.

☐ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

☐ If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.