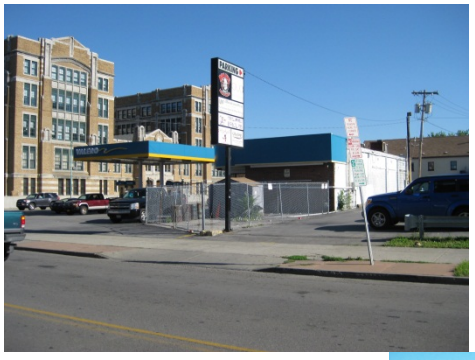
Remedial Investigation and Interim Remedial Measures Work Plan for Brownfield Cleanup Program

233 South Elmwood Avenue and 234 Delaware Avenue
Buffalo, New York



May 2013
LCS Project #12B2170.26

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REMEDIAL INVESTIGATION AND INTERIM REMEDIAL MEASURES WORK PLAN FOR BROWNFIELD CLEANUP PROGRAM

233 SOUTH ELMWOOD AVENUE AND 234 DELAWARE AVENUE BUFFALO, ERIE COUNTY, NEW YORK

Prepared for:

BTC BLOCK 20 INC.

Prepared by:

LCS INC.
Environmental and Real Estate Consultants

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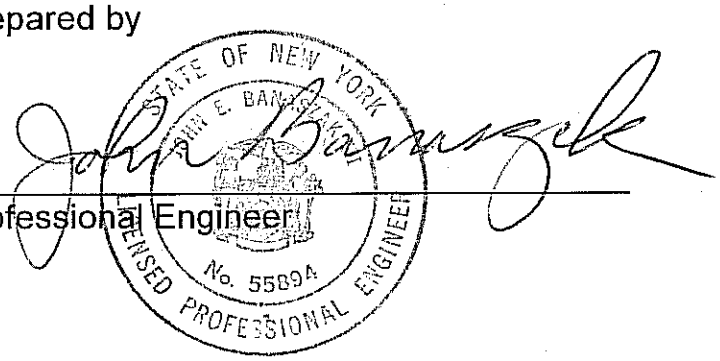

Professional Engineer

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1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this Remedial Investigation/Interim Remedial Measures (RI/IRM) Work Plan is to document planned investigative and remedial activities at the subject site located at 233 South Elmwood and 234 Delaware Avenue, in the City of Buffalo, Erie County, New York (see Figure 1-1), referred to herein as "Site." This work plan also includes a summary of environmental work previously completed at the Site. LCS understands that BTC Block 20 Inc., acting as an innocent owner, has agreed to participate in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) will enter into a Brownfield Cleanup Agreement (BCA) for remedial investigation/remedial action. This BCA process is initiated upon BTC Block 20 Inc.'s submittal of a BCP application submitted concurrently with this Remedial Investigation/Interim Remedial Measures Work Plan.

The objective of the remedial investigation outlined in this Work Plan is to further assess the environmental quality of the soils, groundwater, and soil vapor within the area subject to the BCA for which a release from liability is desired. Specifically, the objective of the remedial investigation is to define the nature and extent of contamination on-site, following/concurrent to the completion of proposed Interim Remedial Measures at the Site.

1.2 PROJECT BACKGROUND AND SITE HISTORY

The 233 South Elmwood Avenue and 234 Delaware Avenue Site encompasses approximately 1.96 acres in the City of Buffalo, New York (City of Buffalo I.D parcel no. 111.37-3-5.11). The subject property is described as developed land with two structures, located in a predominantly commercial and residential area of Buffalo, New York (see Figure 1-2). The Site and surrounding area was historically used for commercial and residential uses.

According to historical records, The Delaware Court building was identified as having been utilized as a mixed-use commercial building since its construction in 1925; this area had previously been utilized residentially. The area of the project site to the west of the Delaware Court Building was identified as having included gasoline stations in different locations on-site from at least 1925 to today. In addition, a tire service operation was present on-site in at least 1931 and 1936 (241 South Elmwood Avenue), and a service station was identified on the Project Site in 1982 and 1987 (239 South Elmwood Avenue); such suggests historic on-site automotive repair operations. Furthermore, a paint shop was located at 241 South Elmwood Avenue in 1925. Municipal records indicate the installation and removal of several underground storage tanks at the Project Site. Additional historical information relative to site history and previous studies performed at the Site are summarized in the following sections.

1.2.1 Previous Studies

To date, a series of investigations have been completed at the Site. The following section documents previous studies completed at the site to date and a summary of currently known environmental impacts at the Site. Figure 1-3 provides a summary of sampling and remedial work completed at the site to date.

October 17, 2001 – Phase I Environmental Site Assessment (ASTM Practice E 1527-00)

LCS prepared "*LCS Project #01B1032.21: Phase I Environmental Site Assessment Report for the Subject Property identified as Delaware Court Building, Best Mart Gasoline Station and AAA Safe & Lock, 230-260 Delaware Avenue, 239-241 South Elmwood Avenue and 101-143 West Chippewa Street, Buffalo, New York*," dated October 17, 2001, for Delaware Court Partnership.

This assessment was conducted on historic tax parcels 111.37-3-5.1 and 111.37-3-5.2. At the time of this assessment, the Site was developed with the Delaware Court Building and was also utilized as a gasoline station with two active USTs on-site, including one 4,000-gallon tank and one 8,000-gallon tank. These tanks were installed in 1970. One monitoring well was noted proximate the gasoline station. This study delineated the history of the Project Site; findings are summarized below.

- The Delaware Court building was identified as having been utilized as a mixed-use commercial building since its construction in 1925; this area had previously been utilized residentially. Minor staining was noted to the concrete floor within this building near a compressor. No other concerns were noted in this area of the Project Site.
- An area of petroleum-type staining was noted to the concrete floor within a locksmith building north of the existing gasoline station (this building has since been demolished).
- The Project Site west of the Delaware Court Building was identified as having included gasoline stations in different locations on-site from at least 1925 to at least 1986. In addition, a tire service operation was present on-site in at least 1931 and 1936 (241 South Elmwood Avenue), and a service station was identified on the Project Site in 1982 and 1987 (239 South Elmwood Avenue); such suggests historic on-site automotive repair operations. Furthermore, a paint shop was located at 241 South Elmwood Avenue in 1925.
- Municipal records indicated that two 4,000-gallon tanks, one 2,000-gallon tank, one 1,000-gallon tank, and one 550-gallon tank were installed at 141 West Chippewa Street in 1954, two 4,000-gallon tanks were installed at 239 South Elmwood Avenue in 1970, and one 4,000-gallon tank and one 6,000-gallon tank were installed at 239 South Elmwood Avenue in 1989.
- Municipal records indicated that two 4,000-gallon tanks and one 550-gallon tank were removed from 239 South Elmwood Avenue in 1970 and 1987, respectively. Documentation indicating the proper closure and removal of these USTs and the other USTs that had been installed on the Project Site had not been submitted to LCS for review at the time of this consultation.
- The area of the Project Site proximate the existing gasoline station was identified as a NYSDEC listed spills site. Spill No. 8900269 involved a tank closure in 1989 and was classified as "closed"; however, the EDR report suggested the potential for the presence of residual contamination on-site.

April 22, 2002 – Limited and Focused Subsurface Investigation

LCS prepared "LCS Project #01B1032.22: *Limited and Focused Subsurface Investigation for 239-241 South Elmwood Avenue & 101-143 West Chippewa Street, Buffalo, New York*," dated April 22, 2002, for Delaware Court Partnership.

To address concerns pertaining to current and historic on-site operations and USTs identified in the previous LCS investigations, this intrusive study investigated three Areas of Concern (AOCs) located on the Project Site proximate the existing gasoline station. These AOCs included an area of a historic gasoline station northeast of the current gasoline station (AOC #1), an area of a historic gasoline station north of the current gasoline station (AOC #2), and the area of the current gasoline station on the southwestern portion of the Project Site (AOC #3). Twenty-one boreholes (BH1-21) were drilled to depths of approximately 12 to 20 feet below ground surface (ft. bgs) and three temporary monitoring wells (TPMW1-3) were installed to depths of approximately 12 ft. bgs. within the AOCs. Groundwater was generally encountered in all boreholes at depths ranging from between approximately 3 and 9 ft. bgs. The major findings of this investigation are discussed below.

- PID measurements ranging between 0.1 and 1,982 parts per million (ppm) were encountered in all but one of the 127 soil samples collected for geologic description. In addition, suspected petroleum-type odors were noted within twelve of the twenty-one boreholes.
- Free-phase petroleum product was noted within four of the boreholes and two of the three monitoring wells; product measured approximately 0.25 inches or less in thickness.

- Select soil samples were analyzed for STARS-list volatile organic compounds (VOCs) and STARS-list semi-volatile organic compounds (SVOCs). Groundwater samples from all three monitoring wells were sampled for STARS-list VOCs only. According to the analytical results, VOC concentrations in soil samples from six boreholes exceeded the NYSDEC Recommended Soil Cleanup Objectives (SCOs); SVOC concentrations in two of these boreholes also exceeded SCOs. VOC concentrations in groundwater sampled from all three monitoring wells and from the pre-existing tank pit monitoring well exceeded New York State Class GA Groundwater standards. Based on these results and required by law, **NYSDEC Spill No. 0175554** was assigned to the Project Site.
- According to field observations and analytical results, the area of the current gasoline station (AOC #3) exhibited the most significant petroleum impact.

On May 24, 2002, the NYSDEC notified the owner of the Project Site that on-site investigation and remedial work was necessary pertaining to NYSDEC Spill No. 0175554.

June 26, 2002 – Supplemental Limited and Focused Subsurface Investigation

LCS prepared "LCS Project #01B1032.22: *Supplemental Limited and Focused Subsurface Investigation for 141 West Chippewa Street, Buffalo, New York*," dated June 26, 2002, for Delaware Court Partnership.

During this supplemental investigation, thirteen additional boreholes (BH22-34) and thirteen additional temporary monitoring wells (TPMW4-16) were installed on-site; most were sited proximate the current gasoline station (AOC #3) in order to better define the extent of petroleum-impacted groundwater in this area. Groundwater and soil samples were analyzed for STARS-list VOCs. The major findings of this investigation are discussed below.

- PID measurements ranging between 0.1 and >2,000 parts per million (ppm) were encountered in all but two of the 106 additional soil samples collected for geologic description. In addition, suspected petroleum-type odors were noted within all thirteen additional boreholes.
- Measureable free-phase petroleum product was identified within three of the sixteen existing monitoring wells located south and west of the existing gasoline station, ranging in thickness from 0.05 ft. to 1.18 ft. Free phase-petroleum product was also noted within two of the thirteen additional boreholes.
- Select soil and groundwater samples from all additional boreholes and monitoring wells were analyzed for STARS-list VOCs. According to analytical results, VOC concentrations in soil samples from five of the additional boreholes exceeded SCOs and VOC concentrations in all thirteen of the additional monitoring wells exceeded New York State Class GA Groundwater standards.
- The lower relative concentrations of lighter compounds (i.e., benzene) to heavier compounds (i.e. xylenes) north and east of the existing gasoline station suggested that impact in these areas may have resulted from historic releases.
- The higher relative concentrations of lighter compounds to heavier compounds south of the existing gasoline station, coupled with the presence of MTBE and free product in this area, suggested that impact south of the existing gasoline station resulted from more recent releases.

The NYSDEC reviewed LCS' intrusive investigations in July 2012, and indicated that further on-site and off-site soil and groundwater sampling would be required to confirm the extent of the impact.

October 14, 2002 – Third Limited and Focused Subsurface Investigation

LCS prepared "*LCS Project #01B1032.22: Third Limited and Focused Subsurface Investigation for 141 West Chippewa Street and South Elmwood Avenue, Buffalo, New York*," dated October 14, 2002, for Delaware Court Partnership.

The purpose of this intrusive study was to further characterize petroleum-impact in the areas east and southeast of the existing gasoline station, and to assess the potential for contaminant migration off-site, across South Elmwood Avenue. Due to the presence of numerous underground utilities on West Chippewa Street, it was determined unsafe to advance test borings in that area. Six additional boreholes (BH35-40) and six additional temporary monitoring wells (TPMW17-22) were drilled on-site, and two additional boreholes (BH41-42) and two additional temporary monitoring wells (TPMW23-24) were drilled off-site, along the western side of South Elmwood Avenue southwest of the current gasoline station. The major findings of this study are discussed below:

- PID measurements ranging between 0.1 and 4.2 parts per million (ppm) were encountered in all but five of the 47 additional soil samples collected for geologic description. No suspected petroleum-type odors were noted within any of the additional boreholes.
- Select soil and groundwater samples from all additional boreholes and monitoring wells were analyzed for STARS-list VOCs. According to the analytical results, no petroleum-impacted soils were identified within any of the additional boreholes drilled on-site and off-site, and petroleum-impacted groundwater was identified within one of the additional monitoring wells on-site.

Based on this third limited and focused subsurface investigation, it was LCS' opinion that the on-site extent of petroleum-impacted soil and groundwater had been defined and no off-site impact was identified.

November 4, 2002 – NYSDEC Spill Number 0175554

LCS prepared *LCS Project #01B1032.26: NYSDEC Spill Number 0175554, 239 South Elmwood Avenue and 141 Delaware Avenue, Buffalo, New York*, dated October 28, 2002, for the NYSDEC.

The purpose of this report was to inform the NYSDEC of the status of the Project Site and present a remedial action plan. The following was noted:

- In response to contaminated soil and groundwater discovered at the Project Site proximate the existing gasoline station during LCS' previous intrusive investigations, NYSDEC Spill No. 0175554 was assigned to this area of the Project Site (documentation is attached).
- In response to the significant free-phase petroleum product noted during LCS' previous intrusive investigations, LCS installed three high vacuum extraction points on-site, southwest of the existing gasoline station (installed prior to boreholes and monitoring wells installed during LCS' third subsurface investigation dated October 14, 2002) and recovered approximately 245 gallons of free-phase petroleum product and 3,360 gallons of water during an approximately sixteen hour extraction event. It was determined that a high vacuum extraction system (aka total fluids and vapor phase high vacuum extraction system) would be an appropriate remedial technique for this area of the Project Site; such would be capable of removing the recoverable separate phase product, contamination groundwater and vadose zone vapors.

The remedial action plan proposed the following:

- Pump groundwater and/or product from a series of nine extraction points located in the impacted area south and east of the existing gasoline station, installed to a depth of approximately 20 ft. bgs and consisting of approximately 13 feet of well screen. Separate the water from the free product and properly dispose of each (refer to Remedial Action Plan for specific details).
- A conservative radius of influence of the extraction points of approximately 15 to 20 feet (such was later modified to 40 feet) was planned; it was noted that such might be influenced by on-site restrictions such as buildings, USTs etc.
- The three previously installed initial extraction points would be utilized as product observation points; these extraction units in addition to other groundwater monitoring wells would be utilized to monitor the progress of the remediation system.

- Based on conversations with the NYSDEC, no remedial action was planned for the areas north, west, northwest, or northeast of the existing gasoline station.
- Water samples would be collected from the remedial system to verify that concentrations of analytes meet applicable standards for discharge to the municipal sewer system; upon confirmation of such, the remedial system would be set for continuous operation and site checks would be performed on a weekly basis.
- Additional remedial system checks would include weekly collection of system data and checking for leaks and damage to the system, monthly well gauging and system compliance monitoring and sampling, and quarterly groundwater sampling and reporting.

It should be noted that extraction of contaminated soils was not planned at that time, as it would have interfered with on-site business operations.

The following delineates the progress of the on-site remediation:

- **November 6, 2002**: NYSDEC approves LCS' Remedial Action Plan, with some additional requirements (letter included in appendix).
- **November 8, 2002**: LCS acknowledges NYSDEC's acceptance of Remedial Action Plan and additional requirements (letter included in appendix)
- **December 2002**: High-vacuum extraction wells installed south, southwest, and east of existing gasoline station to address the high levels of dissolved groundwater contamination observed east of the convenience store and the presence of free phase petroleum product proximate the three initial high vacuum extraction points (EP1, EP2, and EP3) south and southwest of the convenience store. Free-phase hydrocarbons are detected in five of these new extraction wells; thickness ranges from 0.06 to 2.09 feet, and increases from east to west across the southern portion of the convenience store parking lot.
- **February 2003**: NYSDEC sends letter to property owner to obtain commitment to clean up and remove discharge of petroleum on-site (letter included in appendix)
- **April 2003**: Extraction system is on-site. A Buffalo Sewer Discharge permit has been obtained.
- **May 2003**: Water table elevations are measured on-site prior to further remediation activities to determine groundwater flow direction. Groundwater flow direction is confirmed to be from the northeast to the southwest.
- **June 18, 2003**: Extraction system starts operating on-site.
- **July 2004**: Paving on-site results in loss of eleven temporary monitoring wells and one extraction well. Two of the wells are replaced for quarterly monitoring purposes.
- **September 2004**: First quarterly on-site groundwater sampling event

The high vacuum extraction system is shut down in October 2004 due to a significant decrease in free product observed in recovery wells. As of November 8, 2004, free product was only observed in two wells on-site, at thicknesses of 0.10 feet.

- **December 2004**: Second quarterly on-site groundwater sampling event
- **March 2005**: Third quarterly on-site groundwater sampling event
- **June 2005**: Fourth quarterly on-site groundwater sampling event
- **August 2005**: Based on analytical results from the on-site quarterly groundwater sampling, NYSDEC sends certified letters to the then-property owner requesting further remediation of the dissolved-phase groundwater plume or a right-of-access grant
- **September 2005**: Plans generated for further remediation pertaining to the dissolved-phase groundwater contamination on-site. C & W Environmental proposes use of a low-flow oxygen injection with nutrient-enriched liquid injection biodegradation system relative to this concern.
- **September 2005**: NYSDEC approves use of oxygen injection coupled with hydrocarbon degrading bacteria applications for further remediation of the dissolved-phase contamination at the site. Ten oxygen injection wells are installed on-site.

- **October 26 and 28, 2005**: Total of 1,000 gallons of brewed bacteria are injected on-site
- **January to March 2006**: Two 1,000-gallon batches of Waste Stream bio-blend (gasoline specific) bacteria are injected on-site
- **July 2006**: Another 1,000 gallons of Waste Stream bio-blend bacteria are injected on-site

The oxygen injection system was shut down on September 29, 2006, in accordance with the initial plan to operate the system for one year.

- **September 2006 to September 2007**: Quarterly groundwater reports indicate that VOC concentrations in on-site groundwater still exceed standards
- **October 2007**: NYSDEC requests further remediation
- **March 2009**: Attorney of property owner denies the existence of free phase petroleum on-site and states that there are no additional funds available for remediation.
- **April 2009**: Additional round of groundwater samples collected on-site. Results of April 2009 sampling indicate that BTEX in groundwater still exceeds standards
- **January 7, 2010**: NYSDEC informs property owner that a remedial plan has not yet been received for the Project Site, as originally promised by the property owner
- **July 8, 2011**: Environmental Products and Services (EPS) of Vermont submits a Corrective Action Plan for the Project Site to the NYSDEC to address the dissolved phase plume. EPS of Vermont recommends use of a chemical oxidizing agent.
- **June 2012**: LCS coordinates a geophysical survey on-site
- **July 2012**: Preparation of the Brownfield Application for the Project Site begins

August 8, 2003 – Limited Subsurface Investigation

LCS reviewed "*Limited Subsurface Investigation for Best Mart CITGO Gasoline Station, 239 South Elmwood Avenue, Buffalo, New York*," dated August 8, 2003, prepared by C & W Environmental for the NYSDEC.

The purpose of this intrusive study was to verify the southern extent of the on-site contamination along West Chippewa Street. Two boreholes were drilled in the center lane of West Chippewa Street. Select soil samples from both boreholes were then submitted for laboratory analysis and analyzed for STARS-list VOCs and MTBE. Impact was not found; therefore, it was C & W's opinion that contamination had not migrated into West Chippewa Street near the center turning lane, and that the extent of contamination as depicted in the previous LCS studies could be considered to be correct.

June 27, 2012 – Geophysical Investigation

LCS reviewed "*Geophysical Survey Report, Commercial Property, 232 Delaware Avenue, Buffalo, New York*," dated June 27, 2012, prepared by NOVA Geophysical Services for LCS.

On June 24, 2012, NOVA Geophysical Services conducted a geophysical survey over portions of the Project Site in order to better assist in determining if historic underground storage tanks (USTs) are located on-site. In addition, the geophysical survey served to assist in the identification of underground utilities and additional subsurface structures on-site. The Project Site was surveyed using a combination of ground penetrating radar (GPR), an electromagnetic (EM) metal detector and utility tracing instruments.

Based on the results of the geophysical survey, two major anomalies and a group of three smaller anomalies were identified on the southern portion of the Project Site. Based on reflection rates, these anomalies may represent USTs. In addition, the USTs associated with the existing gasoline station were identified near the southwestern corner of the Project Site and the current utility lines were also identified on-site. Lastly, scattered anomalies were identified throughout area surveyed; such are suspected to be associated with leftover pipes and former utility lines.

1.2.2 Summary of Known Contaminants at the Project Site

Soil samples from twenty-eight of the forty boreholes completed by LCS at the Site proximate the existing gasoline station were analyzed for VOCs. Soil samples from five of these twenty-eight boreholes were also sampled for SVOCs. Groundwater sampled from twenty-one of the twenty-two temporary monitoring wells installed by LCS on-site, in addition to groundwater sampled from the pre-existing on-site tank pit monitoring well, were sampled for VOCs.

Soil and groundwater samples from all two boreholes and all two monitoring wells completed by LCS off-site on South Elmwood Avenue were sampled for VOCs. Soil and groundwater samples from all two boreholes and all two monitoring wells completed by C & W Environmental off-site on West Chippewa Street were also sampled for VOCs.

No analytes exceeding New York State Soil Cleanup Objectives or NYSDEC Class GA groundwater samples were detected in off-site soil and groundwater samples. The following table provides an overview of the known contaminants of concern at the Project Site and the media which are known to have been affected:

Known Contaminants of Concern and Affected Media

Contaminant of Concern	Number of Known Affected* Boreholes - Soil	Number of Known Affected* Monitoring Wells – Groundwater (GW)	Maximum Concentration Detected (Parentheses denote New York State standard) Soil: µg/kg; GW: µg/L
methyl-t-Butylether	1	2	Soil: 1,140[2] (120) in BH25 GW: 98,500[2] (10) in TPMW7
Benzene	5	16	Soil: 25,400[1] (60) in BH21 GW: 48,300[2] (1) in TPMW7
Toluene	4	13	Soil: 368,000[1] (1500) in BH21 GW: 44,700[2] (5) in TPMW7
Ethylbenzene	5	14	Soil: 184,000[1] (5500) in BH21 GW: 4,620[2] (5) in TPMW7
M,p-xylene	9	17	Soil: 714,000[1] (1200) in BH21 GW: 20,600[1] (5) in TPMW1
o-xylene	9	15	Soil: 511,000[1] (1200) in BH21 GW: 10,000[2] (5) in TPMW7
Isopropylbenzene	0	11	GW: 79.8[2] (5) in TPMW16
n-Propylbenzene	5	13	Soil: 225,000[1] (3700) in BH21 GW: 1,980[1] (5) in TPMW1
1,3,5-Trimethylbenzene	6	14	Soil: 225,000[1] (3300) in BH21 GW: 3,570[1] (5) in TPMW1
1,2,4-Trimethylbenzene	7	15	Soil: 920,000[1] (10000) in BH21 GW: 14,700[1] (5) in TPMW1
sec-Butylbenzene	0	3	GW: 30.2[2] (10000) in TPMW16
n-Butylbenzene	5	10	Soil: 293,000[1] (13000) in BH21 GW: 4,430[1] (5) in TPMW1
Naphthalene (via 8260)	3	13	Soil: 382,000[1] (13000) in BH21 GW: 2,720[1] (10) in TPMW1
Naphthalene (via 8270)	2	not tested	Soil: 62,700[1] (60) in BH19

* Affected boreholes and monitoring wells are defined as those containing an analyte in a concentration which exceeds New York State Soil Cleanup Objectives (SCOs) or NYSDEC Class GA Groundwater Standards

[1]LCS April 2002 study

[2]LCS June 2002 study

[3]LCS October 2002 study

Known sources of the soil and groundwater contamination at the Site include current and/or historic gasoline station operations.

1.3 SITE GEOLOGY/HYDROGEOLOGY

According to the Bedrock Geologic Map of New York State (1970), bedrock underlying the Project Site consists of the Middle Devonian Onondaga and Bois Blanc Limestones. Thickness ranges up to 150 feet. Boreholes drilled at the Project Site ranged in depth between 12 and 20 feet below ground surface (ft. bgs); bedrock was not encountered.

According to the Surficial Geologic Map of New York State (1988), surficial deposits in the area of the subject property consist of outwash sand and gravel and lacustrine silt and clay. Outwash sand and gravel is characterized by coarse- to fine-grained, well-rounded and stratified deposits that were deposited in a proglacial fluvial environment. Thickness is variable, but generally ranges between two and twenty meters. Lacustrine silt and clay sediments were deposited in proglacial lakes, and generally consist of calcareous, laminated silt and clays that range in thickness up to 100 meters.

Sediments encountered during LCS' intrusive investigations at the Project Site in 2002 (Attachment 5) consisted of native mixtures of sand, silt and clay; gravel encountered on-site was suspected to be fill. Groundwater was encountered at depths ranging between approximately 7 and 9 ft. bgs within boreholes drilled north, northeast, and southeast of the existing gasoline station; these depths also corresponded to the depth of a contact between an upper silt and clay unit and a lower sand unit in these areas, suggesting that the upper silt and clay unit may act as a confining layer or partially-confining layer in these areas of the Project Site.

The depth of the contact between the upper silt and clay unit and the lower sand unit decreases to depths of 4 ft. bgs or less southwest of the existing gasoline station; however, groundwater was generally not encountered in the sand unit in this area until depths ranging between approximately 6 and 11 ft. bgs; this suggests that groundwater is under unconfined conditions southwest of the existing gasoline station.

Regional groundwater flow in the area of the Project Site is likely to be to the southwest. Such appears to be the case in the area of the existing gasoline station, as inferred by the general deepening of the water table in the unconfined sand unit southwest of the existing gasoline station towards the intersection of South Elmwood Avenue and West Chippewa Street.

1.4 PROJECT DESCRIPTION

This RI/IRM Work Plan outlines the scope of work (SOW) for the Site, including the field activities, rationale and quality control/quality assurance basis for this scope of work. Additional tasks include development of on-site worker and community health and safety plan (HASP), community air monitoring plan (CAMP) and a qualitative on-site and off-site public health exposure assessment. Those Plans will be submitted under separate cover.

1.5 PROJECT MANAGEMENT AND ORGANIZATION

LCS will manage the Brownfield cleanup on behalf of the property owner and will work on behalf of the property owner, including selection subcontractors for completion of the RI, and of the remediation contractor to perform the IRM activities on a design-build basis. The NYSDEC Division of Environmental Remediation will monitor the remedial actions to verify that the work is performed in accordance with the Brownfield Cleanup Agreement (BCA).

1.5.1 Personnel

The general responsibilities of key project personnel are listed below.

Project Manager	Mr. Douglas Reid of LCS, Inc. and Mr. David Crandall of LCS will have responsibility for overall project management and coordination of subcontractors.
Field Team Leader	Mr. Jeff Rowley will have responsibility for project management of field activities and LCS staff and coordination with NYSDEC.
Health and Safety Officer	Mr. Douglas Reid will be responsible for the preparation of the project health and safety plan, and tracking its implementation
Quality Assurance / Quality Control Officer	Mr. Douglas Reid and David Crandall will ensure the collection of reliable and defendable data and review data usability summary reports (DUSRs) prepared by an independent third party data validator.
Sample Team Leader	Mr. Doug Caton will be the field personnel responsible for overseeing the collection of environmental samples

1.5.2 Specific Tasks and Services

LCS has obtained subcontractor specialists for services relating to soil sampling and monitoring well installation, laboratory/analytical services, data validation services, and field surveying. The planned subcontractors for utilization for the Site are as follows.

Laboratory Analysis -	Accutest Laboratories
Data Validation -	Environmental Data Services, Inc.
Geoprobe®/Soil Vapor/Well Installation-	Trec Environmental (Geoprobe/Soil Vapor Points), Earth Dimensions, Inc. (Wells)
Surveying -	Clear Creek Land Surveying, LLC
Design-Build IRM Contractor-	Russo Development Inc.

1.5.3 Project Schedule

The proposed project schedule, including completion of the interim remedial measures, remedial investigation, and associated reporting, is included as Table 1.

2.0 INTERIM REMEDIAL MEASURES

As described in Section 1.2.2, analytical results to date identified elevated concentrations of petroleum-related VOCs and one petroleum related SVOC (Naphthalene), at concentrations above their applicable Guidance Values. An IRM is proposed to mitigate risks to public health and the environment attributable to contamination at the Site, and to expedite the redevelopment schedule. Based on the nature and extent of contamination, as indicated by prior investigations, the most applicable remedial measure is source removal via excavation with off-site disposal. The proposed IRM will be performed prior/concurrent to the RI field activities further described in this work plan.

2.1 OBJECTIVES

The objective of the IRM is to:

- Reduce the potential for exposure to VOC impacted soil/fill
- Reduce the potential for site-related VOCs to impact groundwater beneath the site
- Reduce the potential for site-related VOCs to impact soil vapor on-site.

The proposed approach for the implementation of the IRM includes:

- Securing all associated permits; including sidewalk closure, demolition, UST removal, and industrial discharge permits
- Demolition of the existing on-site gasoline station and associated structures
- Rerouting/cut off of existing on-site subsurface and overhead utilities
- Notification of NYSDEC Petroleum Bulk Storage (PBS) Department of tank system abandonment
- Removal of existing on-site USTs and associated piping and dispensers as shown on Figure 2-1
- Installation of sheet piling along the southwest corner of the Site to allow for excavation of impacted soils to approximately 18 feet below ground surface (ft. bgs) as shown on Figure 2-1
- Removal and off-site disposal of impacted soil/fill within the property boundaries as shown on Figure 2-1
- Dewatering activities during removal of impacted soil/fill
- Placement and compaction of non-impacted off-site soil [i.e., Part 375 Unrestricted Use compliant] soil/fill from an off-site source(s) as backfill.

This Work Plan addresses the following tasks in detail:

- Health and Safety Plan Development
- Pre-mobilization meetings, including a public meeting if requested by an interested party.
- Pre-excavation survey (following demolition of on-site structure(s).
- Sequencing of sheet piling installation, soil/fill excavation and soil backfill.
- Groundwater management.
- Dust, storm water, and erosion control measures required for minimizing potential releases of fill/soils outside the work zone during construction.
- Verification sampling.
- Equipment decontamination requirements.
- Off-site transportation and disposal of soil/fill.
- Acceptance criteria for soil backfill and gravel.
- Placement of backfill soils and gravel.
- Project documentation and schedule.

A detailed discussion of the tasks associated with implementation of the IRM is included in the following sections.

2.2 PRE-MOBILIZATION TASKS

2.2.1 Project Coordination Meeting

A project coordination meeting will be held with representatives of the Project Team, including the Design-Build Engineer's Project Manager; the remediation contractor; and the designated NYSDEC contact(s), as the involved regulatory agency. The New York State Department of Health (NYSDOH) will also be notified and invited to attend as an interested agency. The meeting will be held prior to the start of IRM activities to review responsibilities, personnel assignments, and construction details. Agenda items will include:

- Construction schedule
- Work sequencing
- Designation of responsibilities, contact personnel and pager/phone numbers
- Identification of borrow soil source and review of soils characterization and acceptance criteria.
- Project documentation requirements
- Staging of equipment, location of temporary office and decontamination pad
- Transportation routes/site egress
- Health and safety requirements
- Temporary controls (erosion, dust suppression)
- Work hours
- Site security
- Public relations, including procedures for addressing news media and citizen inquiries.

LCS will prepare meeting minutes for distribution to attendees following the project coordination meeting.

2.2.2 Permitting

Prior to implementation of the IRM, the remediation contractor will ensure that all necessary permits have been executed for completion of anticipated activities. Such will included the following:

- City of Buffalo Demolition Permit
- City of Buffalo Fire Department UST Removal Permit
- Buffalo Sewer Authority Industrial Discharge Permit
- City of Buffalo Sidewalk Closure Permit

2.2.3 Pre-Excavation Survey and Underground Utilities Location

Prior to initiating subsurface work, the remediation contractor will be responsible for locating and marking the site property boundaries and approximate limits of the excavation work. Property markers that cannot be relocated will be re-surveyed by a licensed NY State professional land surveyor. The surveyor will stake and mark all property corners, set markers at 50-foot increments along the property lines, and will establish a temporary benchmark on-site for the purpose of determining the extent of excavation performed. The surveyor will be present on the first scheduled day of excavation, if necessary, to confirm marker locations.

The remediation contractor will establish an approximate 25-foot x 25-foot square grid across the work area that will be used to determine pre- and post-excavation grades to verify excavation and backfill quantities.

The remediation contractor will locate, with the assistance of utility companies, all active utility lines within the work area. Underground lines will be staked and marked with fluorescent paint. Procedures for excavating near underground utilities are described in Section 2.3.10.

2.2.4 Health and Safety Plan Development

A Site-Specific Health and Safety Plan (HASP) will be prepared by LCS as well as by the remediation contractor in accordance with the requirements of 29 CFR 1910.120. The HASP will cover all on-site remediation activities. LCS will be responsible for the health and safety of its site workers. The remediation contractor is responsible for site control and the health and safety of its site workers. LCS's HASP will be provided under separate cover. The remediation contractor will be required to develop their own HASP.

In addition, LCS or LCS' designee will be responsible for the performance of community air monitoring, as discussed in Section 12.0 of this Work Plan.

2.3 IRM ACTIVITIES

2.3.1 Sequence of Operations

The remediation contractor's field operations at the Site will commence with mobilization, which will include establishing and staking the elevation grid; setting up and connecting temporary utilities at the field trailer (if mobilized); constructing the equipment decontamination pad (if utilized); and erecting safety fencing and other temporary controls identified in Section 2.1.

Prior to subsurface activities, the existing gasoline station structure, associated pump island and outbuilding will be demolished in accordance with all applicable rules and regulations, and overhead utilities will be relocated to allow for implementation of the IRM. As noted in Section 2.2.2, a City of Buffalo Demolition Permit will be acquired prior to the commencement of demolition activities.

Sheet piling installation will be completed along the south and west property boundaries, following cut off of site related underground utilities, to allow for removal of impacted soil to the property boundary.

The soil removal activities will begin with clearing any loose debris and trash located on the surface of the property, to be disposed separately from soil/fill material. Dump trailers will be backed up to the excavation area and loaded by backhoe or excavator bucket. Excavation will continue until verification samples indicate soil concentrations below Site Criteria Guidance Values (SCGs) [Part 375 Soil Cleanup Objectives – Unrestricted Use]. Visibly impacted excavated soil/fill will be direct-loaded into dump trucks for off-site disposal. During excavation activities, wetting of the excavation surface will be performed as necessary to control dust. Application of BioSolve® will be utilized as needed to suppress vapors and odors associated with the contaminated soil excavation. Pre- and post-excavation elevation measurements will be made at the nodes of the excavation grid. Depths of excavation will be determined to the nearest 1/10 foot for payment quantity measurement. Vehicles leaving the Site will be required to exit through a lined decontamination pad (if vehicles contain visible particulate matter) constructed in general conformance with Figure 2-2 (see Section 2.3.3). Alternatively, a clean haul road may be constructed to avoid decontamination requirements.

Backfilling will follow excavation work to minimize the area of open excavation. Alternatively, the excavation may be left open to facilitate future construction activities on-site. Requirements for off-site backfill soils characterization and placement/compaction are described in Section 2.3.13. Once backfill activities are substantially complete, heavy equipment demobilization and decontamination pad removal (if utilized) can occur.

Operation of heavy equipment on the work site will be limited throughout the duration of the project to 7:30 a.m. through 5:00 p.m., Monday through Friday, excluding holidays.

2.3.2 Temporary Facilities and Controls

The on-site construction field trailer (if utilized) will be available for use during the excavation and general backfill work. Temporary controls will be employed for protection against off-site migration of soil/fill and safety hazards during construction. These will include safety fencing, dust suppression, and erosion control as further described below.

2.3.3 Safety Fencing

Temporary or permanent safety construction fencing (i.e., 6-foot chain link with black netting) will be placed around the outer perimeter of the excavation and soil staging work areas to distinguish the work zone and discourage trespassing. The fencing will not be removed until the excavation, general backfill and/or soil disposal work is complete. In addition the fencing may be left in place for future construction activities anticipated to commence following completion of the IRM.

2.3.4 Dust Suppression

Dust suppression during site excavation work will be an integral and critical component of the soils/fill removal and soil backfill activities. During soil/fill excavation and loading activities, the remediation contractor will apply a water spray across the excavation face and surrounding areas as necessary to mitigate airborne dust formation and migration. Water will also be sprayed as needed to control dust migration from the handling, placement, and compaction of backfill soils. Potable water will be obtained from a City hydrant with a suitable backflow preventer. Other dust suppression techniques that may be used to supplement the water spray include:

- Applying water on haul roads
- Hauling materials in properly tarped containers or vehicles
- Restricting vehicle speeds on-site
- Covering excavated areas and materials after excavation activity ceases
- Reducing the excavation size and/or number of excavations
- Use of spray additives or polymers to bind soils and reduce dust
- Use of permanent fencing with sheeting to act as a windbreak for excavation activities

  Use of woven geotextiles to further eliminate dust through

Dust suppression techniques shall be employed even if the community air monitoring results indicate particulate levels are below action levels. All reasonable attempts will be made to keep visible and/or fugitive dust to a minimum. In addition, the Citizen Participation Plan, discussed in Section 12, shall include a communication plan to address fugitive dust complaints from potential receptors. Should prevailing winds or other uncontrollable conditions creative excessive dust or complaints from potential receptors, site activities will be discontinued until no fugitive dust issues remain.

2.3.4.1 Vapor/Odor Suppression

Due to the highly developed commercial/residential area surrounding the site, vapor and odor suppression techniques may be required during excavation of contaminated soil. As a contingency, the remedial contractor will be prepared to spray BioSolve® vapor suppression foam, or a similar product, to limit vapors and odors emanating from the open excavation. Such will be prepared to be sprayed utilizing a mixture tank equipped with an air compressor.

As IRM activities are planned for summer months, it is anticipated that warm temperatures, high humidity, and rapid changes in air pressure or wind direction may contribute to vapor/odor issues; LCS and the remediation contract will make note of climatological conditions during all on-site activities and modify site activities with the utilization of vapor suppression foam, minimization of the excavation area, and limitation of amount of impacted materials removed in an attempt to reduce the potential for vapor/odor issues. In addition, nuisance odors may lead to complaints from nearby receptors prior to reaching actionable levels at downwind areas; as such, LCS and the remediation contractor will pay close attention to downwind odor during the IRM activities. Should excessive odors be noted, site activities will be modified, or haulted, to allow for a reduction in downwind odors.

Furthermore, the Citizen Participation Plan, discussed in Section 12, shall include a communication plan to address vapor and odor complaints from potential receptors. Should prevailing winds or other uncontrollable conditions contribute to vapor or odor issues or complaints from potential receptors, site activities will be discontinued until no vapor or odor issues remain.

2.3.5 Erosion and Sedimentation Control

Provisions will be made for erosion and sedimentation control at the work perimeter. Continuous double-wall silt fencing may be installed prior to the initiation of excavation activities and will remain on the site perimeter until remediation activities have been completed. During periods of excavation and backfilling, excavations will be dewatered as required to prevent erosion and surface ponding, as described in Section 2.3.6

A Temporary IRM Construction Erosion Control Plan has been prepared and incorporated as Appendix B to this Work Plan. This Temporary IRM Construction Erosion Control Plan includes provisions for silt fencing, hay bailing, mulching, and other measures as warranted.

2.3.6 Groundwater Management

Borings and groundwater elevation measurements recorded during previous investigations indicate that groundwater is present within overburden soils in the vicinity of the proposed excavation at depths between approximately 8 and 12 ft. bgs. If dewatering becomes necessary, gasoline-powered trash pumps and hoses will be used to transfer groundwater and precipitation to a holding tank for pretreatment and discharge to the City of Buffalo's collection and conveyance system via a nearby sanitary sewer manhole. As noted in Section 2.2.2, a City of Buffalo Sewer Industrial Discharge Permit will be obtained by the remediation contraction prior to the implementation of IRM activities. In general, water removed from excavations will be stored/settled in a portable steel tank (Baker Open/Closed Top Tank or equivalent) and pumped through a 5-10 micron bag or cartridge filter prior to treatment using granular activated carbon (GAC). GAC vessels will be plumbed in series to allow for organic breakthrough monitoring between the lead and lag vessels. GAC vessel sizing will be dependent on the manufacturer. Two 1,000 lb vessels are anticipated based on average projected flow rates and maximum concentrations of constituents of concern, as detected during prior site investigations. Figure 2-1 shows the intended location for the temporary groundwater treatment system (if utilized).

Upon completion of excavation dewatering work, the tank(s) will be decontaminated via pressure washing and spent filter bags will be containerized for off-site disposal. Spent GAC will be characterized (TCLP VOC testing) and regenerated off-site, or disposed at a permitted TSDF in accordance with applicable federal and state regulations.

The need for additional pretreatment or characterization of collected waters will be determined by the City of Buffalo, in accordance with a Buffalo Sewer Authority Industrial Discharge Permit, to be obtained prior to the commencement of IRM activities. The remediation contractor will inspect the dewatering hose on each day of use. Any leaks will be immediately repaired or the hose will be replaced. Dewatering equipment will not normally be operated after working hours or on weekends, unless unusually heavy rainfall events cause substantial ponding in the excavation area.

2.3.7 Equipment Staging and Decontamination

A self-contained decontamination station of sufficient size to decontaminate the largest vehicle leaving the Site will be established on-site (if deemed necessary). As shown on Figure 2-2, the decontamination station will be lined with 60-mil HDPE and a protective geotextile fabric, and filled with washed gravel. The perimeter will be bermed approximately six inches above existing grade and sloped to a sump for collection and pumping of decontamination water. Decontamination will be performed with a high-pressure washer located within the decontamination basin. Decontamination water will be pumped, via a trash pump, to the groundwater management tank for treatment/discharge to the City of Buffalo Sanitary Sewer System.

In order to minimize the distribution of impacted soils, the equipment decontamination station will be located at the point of Site egress (see Figure 2-1). All vehicles leaving the Site that have been in direct contact with soil/fill in the work area, including trucks traveling across non-excavated areas of the Site, will be required to proceed through the decontamination station for removal of visible material from tires/undercarriage, etc. Alternatively, a clean haul road may be constructed to avoid decontamination requirements. Vehicles not in significant contact with soil/fill spoils or excavations will be inspected prior to leaving the Site and decontaminated if necessary.

Equipment that remains at the Site during the week and weekends will be left within the temporary fenced areas within the work zone. Alternately, for security purposes, equipment may be decontaminated and removed from the Site for temporary storage at a secured area.

Area streets will also be cleaned as necessary to mitigate dust or mud from vehicles entering/leaving the Site.

2.3.8 Sheet Piling

Sheet piles will be driven with hammers adequate to drive the piles to the depths necessary to allow for excavation to up 18 ft. bgs. Sheet piles will be driven along the southwest boundaries of the Site for excavation of contaminated material to the property boundaries, as required (Figure 2-1). To maintain alignment during installation, the piles will be driven in increments of penetration to prevent distortion of sheets or pulling apart of interlocks. When sheet piles have been installed to a depth acceptable to complete site excavation activities, the sheet piling will be cut off at or just beneath the ground surface. Sheet piling will remain in place following IRM activities.

2.3.9 Excavation

The excavation will begin along the installed sheet piling. Based on sample data for soil borings completed on the subject property and previous experience, the estimated lateral extent of excavation is presented on Figure 2-1. Excavation depth is anticipated to range between 12 and 18 feet below grade. Excavation sidewalls will be maintained as close to vertical as possible, except when necessary to comply with OSHA requirements. The lateral extent of excavation will be adjusted as determined by field observations and confirmatory sampling. Excavation off-site (i.e., into the streets) will not be completed and the south and west boundaries of the excavation will be the sheet piling, as described in section 2.3.8. A photoionization detector (PID) will also be employed to assist in determining the excavation limits prior to verification sampling. Where visibly impacted soil/fill is encountered along the sidewalls of the excavations, soil/fill removal will continue. Visible contamination is defined herein as visible non-aqueous liquid or semi-liquid globules disseminated within the soil/fill matrix.

If/when unanticipated structures or debris or known tanks are uncovered that are not consistent with typical fill material (e.g., buried foundations, etc.), the Design-Build Engineer will immediately notify the NYSDEC and will discuss an appropriate course of action.

Excavated contaminated or suspected contaminated materials will be loaded into dump trucks located near the excavation area. Care will be taken to minimize dust formation during loading. The excavation equipment will have sufficient boom length to allow for placement of soils into the truck bed. Side dumping (i.e., with a front-end loader) will only be permitted if fugitive dust can be consistently controlled within the Community Air Monitoring Plan action limits. If disposal transport truck scheduling necessitates stockpiling of excavated soils, the stockpiles will be covered with plastic tarp and ballast during non-working hours.

Excavated soils displaying no visual or olfactory identified contamination, or screened with a photoionization detector (PID) and illustrating low VOC concentrations will be segregated for confirmatory sampling and possible inclusion as backfill material. Samples will be analyzed for STARS List VOCs and STARS List SVOCs via SW-846 Test Methods 8260 and 8270, respectively. Use of such materials as excavation backfill will be dependent upon analytical results and consultation with the NYSDEC representative.

2.3.10 Underground Storage Tanks

Two USTs are present within the southwest portion of the property. Those USTs are associated with a gasoline station. Both USTs will be removed in accordance with 6NYCRR 613.9 Closure of Out-of Service. The locations of the USTs are shown on Figure 2-1. As noted in Section 2.2.2, the NYSDEC PBS Department will be notified of the closure of the on-site tank system, and a City of Buffalo Fire Department UST Removal Permit will be obtained prior to removal of such.

Prior to removal of the USTs, all products will be removed from the tank and piping system to the extent possible. Any waste from the tanks will be containerized into drums prior to proper off-site disposal. The tanks will be rendered free for petroleum vapors. All connecting lines and ancillary piping will be disconnected and removed, if possible. Following removal of the USTs the interior will be cleaned to remove residual contents. Following cleaning of the USTs they will be disposed of at a local metal recycling facility.

2.3.11 Buried Utilities

The remediation contractor will contact the responsible utility companies to acquire depth and configuration information, and to inform them of the intended excavation work. If underground utilities are encountered during soil/fill removal, excavation will proceed no deeper than the top of bedding beneath the pipe. Care will be taken not to disturb buried utility lines. Hand removal may be required in the immediate vicinity of the utility. Any damage to utilities caused by the excavation or backfill work will be immediately repaired.

2.3.12 Verification Sampling

Verification sampling will be performed on the sidewalls and bottom of the excavation after lateral and vertical excavation limits have been achieved and visibly impacted soil/fill has been removed or the property boundary has been encountered. Verification samples from the south and west side walls will be collected during installation of sheet piling. In general, sidewall samples will be collected on each of the four sides of the excavation and from the bottom of the excavation. The backhoe bucket will be used to assist in sample collection and avoid the need for confined space entry. As the excavation progresses, verification soil samples will be collected and submitted for laboratory analysis of petroleum and solvent-related VOCs. A minimum of one sample per 30 linear feet of sidewall and one sample for each 900 square feet of excavation bottom will be collected. Verification samples will be analyzed for petroleum-and solvent related VOCs (NYSDEC STARS List VOCs and SVOCs) in accordance with USEPA SW-846 methodology. The laboratory will be required to furnish an equivalent ASP Category B deliverables package to facilitate data evaluation by a third-party validation expert. Lateral and vertical excavation will continue as described above until visually impacted soil/fill no longer exists, SSALs are met, or NYSDEC agrees that no further excavation is required. Excavation off-site (i.e., into the streets) will not be completed.

Quality Assurance (QA) samples will be collected to support the verification sample data evaluation. The QA samples will include a minimum of one matrix spike, one matrix spike duplicate, and one blind duplicate per 20 verification samples. Dedicated equipment will be used to avoid the need for equipment/rinsate blanks.

2.3.13 Soil Disposal

To confirm that the impacted soil/fill is acceptable for disposal at a permitted solid waste disposal facility, samples will be collected from the impacted area and analyzed for waste profile characterization parameters as required by the disposal facility. Based on the historic testing performed to date and the nature of the contamination, development and approval of a waste profile will require characterization of the impacted soil/fill for leachable (RCRA list) VOCs, SVOCs and metals, and ignitability per 40 CFR Part 261. Two samples will be required for the first 1,000 CY, with one sample per 1,000 CY thereafter. Waste profile samples will be collected utilizing direct-push methods, following a grid pattern to adequately characterize the soils from within anticipated excavation area. Should additional samples be required due to the volume of soil removed from the site, such samples will be collected during excavation activities. Samples will be analyzed in accordance with USEPA SW-846 methodology.

Following waste characterization and acceptance by the laboratory, all contaminated (i.e., soil/fill exceeding Part 375 Unrestricted Use Soil Cleanup Objectives) soil/fill removed from the Site will be loaded into dump trailers or trucks for transport to an off-site sanitary disposal facility (assuming non-hazardous characterization). Fly-ash or other suitable admix material may be added to the soil/fill as necessary to absorb free liquid in saturated soils and meet moisture content limits established by the disposal facility. Copies of the waste profile will be provided with each load, if required by the disposal facility. All trucks/trailers leaving the Site will be fully tarped to mitigate spills or wind erosion of soils.

2.3.14 Backfill

The excavation will be backfilled to the extent necessary, to facilitate the proposed construction (if necessary), with imported fill material. Off-site sources intended for use as backfill must be inspected and approved by the Design-Build Engineer and NYSDEC prior to acceptance at the Site. Acceptance of all off-site borrow sources will only occur after the borrow site owner/operator submits a written certification that the site is neither known to have or exhibit evidence of disposal or release of hazardous or toxic substances, radioactive wastes, solid wastes or petroleum products.

Off-site material originating from “non-virgin” sources, or virgin sources that have been stockpiled at an uncontrolled site, will be sampled according to the following schedule:

- 1 composite per 250 cubic yards of soil for the first 1,000 cubic yards
- 1 composite per 1,000 cubic yards of soil thereafter

Each composite will be comprised of a minimum of three grab samples (samples for VOC analysis will be collected as individual grabs in lieu of composites). Samples will be analyzed for the following constituents in accordance with USEPA SW-846 methodology:

- Target Compound List (TCL) VOCs - Method 8260B
- TCL SVOCs - Method 8270C
- TCL Organochlorine Pesticides and PCBs - Method 8081A/8082
- TAL Metals – Method 6010B
- Cyanide - Method 9013

Only materials that contain concentrations of these organic compounds and metals at or below Part 375 Unrestricted Recommended Soil Cleanup Objectives, or levels acceptable to NYSDEC, will be used. In addition, off-site backfill soils will not contain any material (i.e., rocks) greater than 3 inches in any dimension; will be classified as SC, SM, CL, GC, GM or ML by the Unified Soil Classification System; and will be substantially free of roots and other degradable materials.

Characterization testing for both on-site and off-site sources will be performed by an independent, NYSDOH ELAP-approved laboratory having CLP certification. An equivalent ASP Category B deliverables package will be furnished with the data to allow data evaluation and preparation of a Data Usability Summary Report by an independent, 3rd party data validation expert. QA samples will be collected to support the data evaluation. The QA samples will include a minimum of one matrix spike, one matrix spike duplicate, and one blind duplicate per 20 verification samples.

Backfilling may closely follow the excavation work to minimize the amount of open excavation. Alternatively, the excavation may remain open to accommodate planned construction activities. Any backfill soil will be maintained at a sufficient distance from the working face of the excavation to prevent contact or mixing with fill soils designated for removal. Wetting of the backfill soil during placement, spreading and compaction will be performed as required to control fugitive dust within the Community Air Monitoring Plan action limits.

Backfill soil will be placed in maximum 1-foot thick lifts, and compacted by approved compaction equipment. Compaction testing of each borrow source will be completed. Standard proctor tests will be employed to establish a maximum compaction. Backfill originating from on-site sources will be compacted to achieve 90% of maximum dry density as determined by the Modified Proctor Test. Backfill originating from off-site sources will be compacted to achieve 95% of maximum dry density as determined by the Modified Proctor Test.

The handling, spreading, and compacting will be directed toward obtaining a stable and homogeneous fill that is free of stratifications, lenses, or pockets. Backfill will not occur when soils are frozen or moisture content is too high/low to achieve compaction requirements. Admixing of wet soils with dry backfill material and addition of water will be permitted to achieve suitable moisture content.

2.3.15 Progress Meetings

Progress meetings will be conducted at the project site (or alternate location) by LCS's Project Inspector on a weekly basis throughout the construction period. Progress meetings will be attended by the contractor and key subcontractors, if appropriate. NYSDEC and NYSDOH will have access to all progress meetings

2.4 COMMUNITY AIR MONITORING

Real-time community air monitoring will be performed during IRM activities at the Site. A Community Air Monitoring Plan shall be included within LCS's HASP. Real-time particulate and VOC monitoring will be performed along the upwind and downward perimeter of the work area during subgrade excavation, grading and soil/fill handling activities in accordance with this plan. This plan is consistent with the requirements for community air monitoring at remediation sites as established by the NYSDOH and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDOH's Generic Community Air Monitoring Plan (dated June 20, 2000) and NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4031: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.

The Community Air Monitoring Plan shall be submitted with the LCS HASP as a stand alone document prior to the initiation of IRM Activities.

2.5 DOCUMENTATION AND REPORTING

The Design-Build Engineer will be on-site on a full-time basis during the soil/fill removal measures to document activities associated with the construction. Such documentation will include, at a minimum, daily reports of construction activities, community air monitoring results (see Appendix C), and photographs and sketches, as necessary. In addition, NYSDEC and NYSDOH will be invited to attend weekly progress meetings, and will be provided written progress reports every month.

2.5.1 Construction Monitoring

Standard daily reporting procedures will include preparation of a daily report and, when appropriate, problem identification and corrective measures reports. Appendix B contains sample project documentation forms. Information that may be included on the daily report form includes:

- Processes and locations of construction under way.
- Equipment and personnel working in the area, including subcontractors.
- Number and type of truckloads of soil/fill removed from the site.
- A description of off-site materials received, including any quality verification (certification) documentation.

The completed reports will be available on-site and will be submitted to the NYSDEC as part of the Final Report.

A problem identification report and a corrective measure report will be completed whenever major field problems are encountered and corrective measures may be necessary. These reports will be attached to the monthly progress reports. The NYSDEC will be promptly notified of problems requiring modifications to this Work Plan prior to proceeding or completion of the construction item. Changes or additions will be noted in the Progress and Final Reports.

Photo documentation of the IRM activities will be prepared by the Design-Build Engineer throughout the duration of the project as necessary to convey typical work activities and whenever changed conditions or special circumstances arise. Photos will be provided in digital format.

2.5.2 Progress Reports

LCS will prepare and submit to NYSDEC monthly progress reports that include:

- Activities performed during reporting period.
- Results of sampling and tests or other pertinent data.
- Work scheduled for the upcoming reporting period.
- Other actions/information pertinent to the project.
- Percentage of completion, delays encountered or anticipated that may affect the schedule, and a description of efforts made to mitigate those delays or anticipated delays.

2.6 PROJECT SCHEDULE

The IRM Activities detailed above shall be completed within approximately 3 months, following approval of the Work Plan. In order to provide limited disturbance to the surrounding area, the IRM field schedule is proposed to begin immediately following the completion of the academic year at the school located west adjacent to the site. Table 1 presents and overall project schedule for the performance of the RI/IRM and subsequent reporting.

3.0 REMEDIAL INVESTIGATION SCOPE AND RATIONALE

The purpose of the field activities is to better determine the environmental quality of the overburden soils and groundwater and to determine the environmental quality of on-site soil vapor following completion of/concurrent to the IRM. On-site field activities will include a direct-push (e.g., Geoprobe®) soil sampling and/or rotary auger soil sampling, monitoring well installation, groundwater sampling of existing and newly installed monitoring wells, soil vapor/vapor intrusion sampling, collection of hydraulic data and a site survey.

The field activities are focused on collecting current environmental data and supplementing data from previous investigations to obtain a better understanding of current on-site conditions. Environmental sampling and other field activities will be performed in general accordance with the techniques outlined below. A listing of appropriate guidance documents are appended to this document.

The estimated number of samples collected for analytical testing from each environmental media, including appropriate quality assurance samples, is summarized in Table 2. Borehole, monitoring well, and soil vapor/air sample designation, location rationale, estimated depths and testing parameters are summarized in Tables 3 through 5. A general site plan is included as Figure 3-1. Locations of proposed and existing boreholes, monitoring wells, and soil vapor/air sampling locations are shown on Figure 3-2.

The following field activities are planned.

3.1 PRE-INVESTIGATION TASKS

Prior to the on-site intrusive investigation, several tasks are warranted. These tasks include obtaining any necessary permits, notifying Dig Safely New York to locate buried utilities, constructing a temporary decontamination pad on-site, preparation of the HASP (to be submitted under separate cover) inspecting the site for potential health and safety hazards and marking proposed borehole/monitoring well locations.

3.1.1 Decontamination Pad

Prior to the initiation of field activities, a temporary equipment decontamination pad will be constructed by the drilling subcontractor in the equipment decontamination area. The decontamination pad will be constructed so that liquid and solid wastes can be contained and subsequently collected. The decontamination pad will be constructed using wood and high-density polyethylene (HDPE) plastic or similar material as a barrier with raised berms on each side to contain decontamination water and constructed of a sufficient size to accommodate any equipment to be decontaminated. The pad will be equipped with a sump area to allow for ready collection of decontamination waters. Decontamination wastes will be stored in covered drums located adjacent to the decontamination pad. [Testing of the decontamination water for eventual disposal will be completed at a later date.] The decontamination pad will be reconstructed as necessary to maintain its integrity. The decontamination area will be chosen based on field conditions. Equipment will be decontaminated as specified in Section 3.8 of this work plan.

3.2 DIRECT PUSH SAMPLING

Up to five direct push test borings will be advanced to approximately 16-20 ft. bgs. An additional three direct push test borings will be advanced within the basement of the 234 Delaware Avenue structure to assess subsurface conditions beneath the remaining on-site structure. Test borings will be conducted in accordance with SOPs as defined in section 4.1 of this work plan. Refer to Table 3-2 for specific borehole designation, rationale, and testing parameters. Refer to Figure 3-2 for specific test boring locations. Boreholes will be designated as follows:

BCP BH # – Boreholes proposed for this investigation.

For reference purposes and included on Figure 3-2, please note the following soil boring designations for test borings previously completed on-site:

BH # – Borehole previously completed by LCS.
C&W Soil Boring # – Borehole previously completed by C&W Environmental

3.2.1 Subsurface Soil Samples

Subsurface soil samples have been previously collected for STARS-VOCs, STARS-SVOCs, and RCRA metals using USEPA SW-846 Methods. Based on the analytical results of that testing, VOCs commonly associated with petroleum are located on-site.

Eight additional subsurface soil samples will be collected on-site for analytical testing parameters including TCL-VOCs (plus additional NYSDEC STARS List VOCs), TCL-SVOCs (plus additional NYSDEC STARS List SVOCs), Target Analyte List (TAL) metals (including cyanide), and TCL PCBs/pesticides using SW-846 methods and Category B deliverables.

3.3 SOIL VAPOR SURVEY

Concurrent with the direct push sampling, 5 soil vapor sampling points will be installed at locations on-site in order to assess the potential for vapor intrusion into structures following redevelopment (Figure 3-1). Soil Vapor points will be installed to at depths approximate current on-site structures to provide sufficient data to evaluate the potential for vapor intrustion. Soil vapor points shall be installed and sampled in accordance with *NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October, 2006).

3.3.1 Soil Vapor Samples

In order to assess petroleum-related VOC impacts to soil vapor and the potential for soil vapor intrusion into on-site structures following redevelopment, soil vapor samples will be analyzed for TCL and STARS List VOCs by USEPA SW-846 method TO-15 and reported as Category B deliverables.

3.4 MONITORING WELL INSTALLATION/GROUNDWATER SAMPLING

Previous investigations have included the installation of groundwater monitoring wells. While shallow, unconfined aquifer groundwater flow and on-site groundwater quality have been sufficiently documented in regards to known on-site contaminants of concern, additional wells are warranted assess groundwater quality following completion of the IRM. This investigation will include installation of five additional overburden groundwater monitoring wells. Monitoring wells installed during this investigation will be designated as follows:

BCP MW - Monitoring well proposed for this investigation

For reference purposes and included on Figure 3-1, please note the following monitoring well designations for wells previously completed on-site:

TPMW – Monitoring well previously completed by LCS.

3.4.1 Monitoring Well Installation

Groundwater monitoring well installations will be conducted in accordance with SOPs as defined in section 4.3 of this work plan. Five monitoring wells will be installed on-site to straddle the groundwater table when constructed with a 10-ft. screened interval to a depth not greater 20 ft. bgs. Monitoring wells will be installed with the screened interval spanning the groundwater/vadose zone interface. An additional three monitoring wells will be installed in the area of the IRM excavation to evaluate groundwater quality following completion of such. Based on previous on-site investigations, groundwater within the overburden will be encountered between approximately 9 and 12 ft. bgs. Refer to Table 4 for specific monitoring well designation, rationale, testing parameters. Refer to Figure 3-1 for specific well locations.

3.4.2 Groundwater Sampling

Groundwater sampling will be conducted in accordance with SOPs as defined in sections 4.4 of this work plan. The newly installed monitoring wells will be sampled. Newly installed monitoring wells will be sampled for analytical testing parameters including TCL-VOCs (plus additional NYSDEC STARS List VOCs), TCL-SVOCs (plus additional NYSDEC STARS List SVOCs), Target Analyte List (TAL) metals (including cyanide), and TCL PCBs/pesticides using SW-846 methods and Category B deliverables. These samples will be collected to document the condition of on-site groundwater for general site characterization and to confirm groundwater quality following completion of the IRM.

3.5 HYDRAULIC ASSESSMENT

Hydraulic data, including determination of hydraulic conductivity, groundwater velocity and estimated groundwater flow direction, will be collected. Hydraulic conductivity data will be collected from each newly installed well. Such will be collected employing a slug test or pump test method as described in Section 4.8 of this work plan.

3.6 SURVEY

A surveyor will be subcontracted to establish vertical and horizontal control of the new and existing monitoring wells and test borings as well as the limits of the property. The survey will also identify other site features, structures, etc. where horizontal and/or vertical measurements are required. Vertical measurements will include the ground surface, top of casing and top of riser at each monitoring well and the ground surface only at the test borings/soil sampling locations. A mark made into the north side of the top of the riser will serve as the water level monitoring point. Vertical measurements will be made relative to the National Geodetic Vertical Datum. Monitoring point measurements and top of protective casing measurements will be accurate to within 0.01 foot. Horizontal measurements will be accurate to within 0.1 foot.

Data from the land survey will be utilized for the development of a base map. The base map will include site boundary lines, existing monitoring wells and other key site features. The site property lines will be obtained from the site tax map.

3.7 SCHEDULE

It is anticipated that the field work phase of this project will require approximately five field days. Please refer to Table 1 for an anticipated project schedule.

4.0 SITE INVESTIGATION PROCEDURES AND RATIONALE

The fieldwork is focused on collecting high-quality current environmental data and supplementing data from previous investigations to obtain a better understanding of current site specific conditions. Environmental sampling and other field activities will be performed in general accordance with the appropriate techniques as outlined below. Appropriate guidance documents are appended to this document. All work will be conducted according the SOPs as described in this work plan and according to the HASP to be submitted under separate cover.

Table 2 contains a list of the media to be sampled and the expected number of samples, including those required for quality assurance/quality control, for each matrix.

4.1 TEST BORINGS

Test borings will be advanced into the overburden using direct-push (i.e., Geoprobe) methods. Samples will be obtained by driving an approximate two-inch outside diameter (O.D.) by 48-inch long steel sampling rod equipped with a dedicated liner. The sampler will be driven its entire length (unless refusal is encountered) with a hydraulic and percussion drive system mounted to a pick-up truck. No drilling fluids will be used during Geoprobe work. This technique generates limited spoil; however, any spoil or excess samples will be containerized for future characterization and/or disposal.

Soil samples will be classified by LCS in the field by visual examination in general accordance with the Unified Soil Classification System (USCS) (visual-manual method) soil description procedure. A log of each boring will be prepared with sample identification, sample depth interval, recovery and date. A sample subsurface log is included in Appendix C.

As detailed above, the direct-push rig, tools, sample rods, etc. will be decontaminated between holes at an on-site temporary decontamination pad constructed in an area acceptable to the NYSDEC.

4.1.1 Borehole Abandonment

Following the completion of each borehole, monitoring wells will be installed by over drilling the previous boreholes. If monitoring wells are not installed over a previous borehole, the driller will abandon the borehole location using a bentonite grout injected into the boreholes. Following curing of the grout the surface will be restored with native soil or repaired with asphalt cold patch, if applicable.

4.2 SOIL VAPOR POINTS

Concurrent with the direct push sampling, 5 soil vapor sampling points will be installed at locations on-site in order to assess the potential for vapor intrusion into structures following redevelopment (Figure 3-1). Soil Vapor points will be installed to approximately 8 ft. bgs or just above the observed groundwater table, whichever is shallower. Utilizing a direct-push drill rig, a borehole will be advanced to the target depth. Upon reaching the target depth, a six-inch stainless steel screen, attached to Teflon-lined tubing will be lowered to the bottom of the borehole. A clean silica sand or glass bead pack will be inserted to approximately 1 ft. above the top of the stainless steel screen, with the remainder of the borehole filled with hydrated bentonite pellets. Soil vapor points will be allowed to site for at least 24-hours prior to sampling. Soil vapor points shall be installed and sampled in accordance with *NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October, 2006).

4.2.1 Soil Vapor Sampling

The following procedures will be followed for collection of soil vapor samples:

- At least 24 hours after the installation of the soil vapor point, one to three implant volumes (i.e., the volume of the sample probe and tube) should be purged prior to collecting the samples. Purged air will be analyzed using a ppbRAE to determine VOC content. In addition, helium tracer gas leak testing will be performed to ensure that ambient air is not infiltrating into the sample point.
- Samples will be collected using individually certified 6-L Summa® canisters with individual flow regulators at a rate not to exceed 0.2 liters per minute in order to minimize outdoor air infiltration during sampling.
- Following termination of the sample, the following information will be recorded on the field sample form:

    - Sample identification,
    - Date and time of sample collection,
    - Sampling depth,
    - Identity of samplers,
    - Sampling methods and devices
    - Purge volumes,
    - Volume of soil vapor extracted,
    - The vacuum pressure of the canister before and after samples were collected
    - Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone

Soil vapor samples will be analyzed for TCL and STARS List VOCs by USEPA SW-846 method TO-15 and reported as Category B deliverables.

4.3 MONITORING WELL INSTALLATION

Overburden monitoring wells will be constructed of 2 inch I.D. flush jointed Schedule 40, PVC riser and screen. The actual installation depth of the screen will be selected based upon the intended purpose of the well (the zone to be monitored), observation of subsurface materials and headspace screening test results. The screen will consist of a maximum 10-foot long section of 0.010-inch factory slotted PVC. The actual length of the well screen may vary depending upon subsurface conditions encountered. Attempts will be made to limit the well screen to the zone being monitored. Schematics of the well construction details are provided in Appendix C.

Following determination of the monitoring zone and placement of the assembled screen and riser, the annular space of the borehole will be backfilled. Generally, this will include the placement of a sand filter pack consisting of Morie #0 sand around the well screen such that the sand extends a minimum of 1 foot above the top of the screen. A minimum 3-foot layer of bentonite pellets will be placed above the sand filter, tap water will be poured over pellets and they will be allowed time to hydrate. A mixture of cement/bentonite extending to about 3 feet below the ground surface will be placed above the bentonite seal. The monitoring well will be completed by placing a locking steel protective casing over the riser. Above-grade protective casings will be utilized.

Materials used in well installation will be stockpiled in an on-site storage area (provided a secure and appropriate location can be identified) for use as necessary. Items will be brought to the site clean and in like-new condition and kept clean and in satisfactory condition for potential use. Well materials (screen and riser pipe), will not be cleaned on-site prior to use unless the protective wrap is compromised. The cleaning procedure (if necessary) is described in Section 3.9.4. Following cleaning, well materials will be wrapped in clean plastic sheeting for transportation to the well location. Site personnel handling well equipment after cleaning are required to wear clean rubber gloves. A typical well installation diagram is included in Appendix C.

4.4 GROUNDWATER SAMPLING

Groundwater sampling from newly installed and existing monitoring wells includes initial recording of data, purging of the well, and collection of the sample. The text below addresses these items. Installation of monitoring wells is discussed in Section 4.3.

4.4.1 Initial Data Recording

Groundwater sampling begins by locating the well to be sampled and recording the appropriate field data, as summarized below.

- Observations of the well (conditions of cap, collar, casing, etc.) and the ambient conditions (weather, surrounding area, date and time, sampling crew members, and observers, if any.) See also Section 6.1 for information to be recorded in the field notebook.
- Unlocking the well cover, surveying ambient air, upwind air, and air directly at the top of the well
- Taking a water level measurement, noting the reference point from which the measurement is made (typically a mark on the north lip of the inner casing).
- Sounding the bottom of the well and agitating/loosening accumulated silt/sediment (this assumes sounding indicates minimal sediment accumulation and no need for well redevelopment).

4.4.2 Well Development/Well Purging

Each newly installed overburden monitoring well will be developed prior to sampling. The wells will be developed to remove residual sediments and to ensure good hydraulic connection with the water-bearing zone. Monitoring wells will be developed after a minimum of two days subsequent to installation (to allow grout utilized in well installation to set). Monitoring wells will be developed as follows.

After the initial observations are recorded, the total volume of water within the well is calculated. The well is then purged of at least three volumes of standing water. Purging will be accomplished by bailing and/or pumping, using a centrifugal pump connected to dedicated Teflon® tubing connected to a foot valve set within the well, to remove water from the well. Prior to removal of the first volume of water, and after each subsequent volume of water removed, field parameters (pH, turbidity, temperature and specific conductance) will be measured and recorded to document the presence of representative water in the well (i.e., equilibration to steady readings), or as an indicator that conditions have not reached a steady state. Prior to sample collection, the variability of field testing results between successive well volumes should not vary by more than 10% for turbidity and specific conductance, $\pm$0.2 units for pH, and $\pm 0.5^{o}$C for temperature. The turbidity objective is less than 50 nephelometric turbidity units (NTUs); if parameters are stable but turbidity is still greater than 50 NTU, purging will continue until 50 NTU is achieved, or five well volumes are evacuated (whichever comes first). A minimum of three well volumes and a maximum of five volumes will be removed from each well prior to sampling.

In the event that groundwater recharge is slow, the purging process will continue until the well is purged "dry". After the water level has returned to its pre-purge level (or within a maximum of two hours), samples will be collected. If the water level is slow to recharge and does not reach to its pre-purge level within two hours, then samples can be collected after sufficient water has recharged, and the degree of recharge indicated in field notes with time and depth to water noted.

4.4.3 Groundwater Sampling

Prior to groundwater sampling, monitoring wells will have been developed in accordance with SOPs described in section 3.4.2. Bailers will be used for sample collection and will be equipped with a bottom check-valve. Bailers will be dedicated and made of disposable PVC. Bailers will be clean upon arrival at the site, therefore, site decontamination of bailers will not be necessary. Bailers will be lowered gently with minimal water agitation into the well with dedicated polyethylene or polypropylene line.

Sample Collection

Once field parameters are within specific limits as described within Section 3.4.2, groundwater will be collected for analysis. Groundwater for VOC analysis will be collected first.

Two or three (depending on laboratory-specific requirements) 40-ml glass vials (with Teflon septa) will be used to collect samples for VOCs. The vials will be filled by gently pouring water from the top of the bailer into the vial until a convex meniscus is formed. The vials will be filled concurrently, alternating between vials. The vials will then be capped, inverted and inspected for air pockets/bubbles that may be present on the inside surfaces of the vial. If any bubbles or aggregate of bubbles are observed, then a new sample will be obtained either using a new vial or the same vial.

Subsequent sampled water will be collected for the remaining and field parameter testing. The remaining sample bottles will be filled sequentially in the following order:

- Semi-volatile organic compounds (SVOCs);
- PCBs/Pesticides;
- TAL metals/mercury;

Sample bottles are discussed in more detail in Section 5.2.

4.5 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) SAMPLING

In order to provide control over the collection of environmental measurements and subsequent validation, review and interpretation of generated analytical data, QA/QC samples are required.

4.5.1 Non-Aqueous Matrix

Equipment (Rinsate) Blanks

The purpose of this sample is to assure proper decontamination of the soil sampling equipment. The performance of rinsate blanks requires two sets of identical bottles; one set filled with demonstrated analyte-free water provided by the laboratory and one empty set of bottles. The bottles will be either 40 ml septum vials or 1L wide mouth bottles. At the field location, in an area suspected to be contaminated, the water will be passed from the full set of bottles through the decontaminated sampling devices (undisturbed tube or split spoon samplers) into the empty set of bottles. This will constitute identical bottle-to-bottle transfer. The blanks must be preserved in the same manner as samples and will only be analyzed for volatile organics. One rinsate blank will be collected for every 20 soil samples submitted to the laboratory or one each week, whichever is more frequent. For logistical purposes, the laboratory will provide at least one additional 40 ml vial to perform the field blank.

Trip Blanks

Trip blanks will not be required for non-aqueous matrix samples.

Duplicate Samples

The purpose of this sample is to assess the quality of the laboratory analyses. Field duplicate non-aqueous matrix samples will be collected at a frequency of one per 20 soil samples submitted to the laboratory for analysis. These samples will be collected on different days (first and last days). Obtaining duplicate samples in soil requires homogenization of the sample aliquot prior to the filling of sample containers. Regardless, volatile organic samples must always be taken from discrete locations or intervals without compositing or mixing.

Homogenization and sample collection will be accomplished as discussed in section 3.7. Each duplicate soil sample will be analyzed for each of the analytical parameters for the respective sample location. All duplicate samples must be submitted to the laboratory as blind samples. A note within the field log shall be made referencing the sample location of all duplicate samples (e.g., DUP1 = BH 1 6-8 ft.).

4.5.2 Aqueous Matrix

Equipment (Rinsate) Blanks

The performance of field blanks requires two sets of identical bottles; one set filled with demonstrated analyte free water provided by the laboratory and one empty set of bottles. The bottles should be either 40 ml septum vials or 1L wide mouth bottle. At the field location, in an area suspected to be contaminated, the water is passed from the full set of bottles through the decontaminated sampling devices (disposable bailer) into the empty set of bottles. This will constitute identical bottle-to-bottle transfer. Field blanks must be preserved in the same manner as samples and will be analyzed for all the same parameters as samples collected that day. One field blank will be collected per workday. For logistical purposes, the laboratory will provide at least one additional 40 ml vial to perform the field blank. Aqueous water samples will be analyzed for volatile organics only.

Trip Blanks

The purpose of the trip blank is to determine whether the sample vials and/or samples have been impacted by contaminants throughout their use. Trip blanks consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte free water. These bottles will accompany the bottles that are prepared at the lab into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never to be opened by LCS personnel. Each trip blank will be analyzed for volatile organic parameters only. Trip blanks must be included at a rate of one per sample shipment except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinsate blanks).

Duplicate Samples

The purpose of these samples is to assess the quality of the laboratory analyses. Duplicate aqueous matrix samples will be collected at a frequency of one per 20 environmental samples submitted for laboratory analysis.

Each duplicate sample should be created by alternating filling sample containers in nearly equal portions. This will help to assure that the two samples are homogenous.

4.6 AIR SURVEILLANCE AND MONITORING

Air surveillance, via screening of volatile compounds for health and safety concerns will be performed with a portable Photovac photoionization detector (PID) or equivalent. Monitoring will be performed during invasive activities such as drilling, monitoring well installation, well development, and sampling. Additional details are presented in the site specific HASP to be provided under separate cover.

4.7 SOIL SAMPLING

Test Boring/Geoprobe soil will be sampled by opening the PVC liners (direct push), bisecting the core (if intact) vertically down the middle with a cleaned sharp knife or similar blade, and scooping sufficient sample from the long axis of the split core with a decontaminated stainless steel spoon or spatula. If the core is not intact, then upon opening the barrel the contents can be scooped directly with the spoon or spatula. Samples for VOCs will be collected and transferred to sample containers immediately after opening and bisecting the split spoon sample. If the core is not homogeneous, representative portions of each type of material within the spoon will be collected. There may also be situations where it will be appropriate to grab-sample specific zones due to textural variations, the presence of apparent staining, or "hot spot" preliminary screening results. Soil samples collected for analysis, with the exception of those for VOCs, will be homogenized. The homogenization will be completed by removing the soil from the sampling equipment and transferred to a clean surface (steel pan, bowl, etc.) and mixed to provide a more homogeneous sample to the lab. The soil will be scraped from the sides, corners, and bottom of the clean surface, rolled to the middle, and thoroughly mixed until the material appears homogenous. An aliquot of this mound will then be transferred to the required sample containers, slightly tamped-down, filled to near the top of the container, and sealed with the appropriate cap. Any soil or sediment on the threads of the container will be wiped off with a clean paper towel or equivalent prior to placing the cap on the sample container.

VOC soil samples will not be mixed, but will be placed directly from the sampling equipment into the sample container (a 4 oz. wide mouth glass jar) in a manner limiting headspace by compacting the soil into the container. Samples for VOC analysis will be placed into the appropriate container prior to sample homogenization for the remaining analyses.

4.7.1 Headspace Screening

Soil screening will be performed by headspace screening with the PID. A representative portion of each sample interval will first be collected for VOC analysis and containerized to minimize loss of potential VOC constituents present in the soil sample. The remainder of each sample interval will be placed into PVC container bags and allowed to equilibrate to ambient temperature. The container will be slightly opened and the PID probe will be placed within the headspace of the container to allow for a reading of the VOCs within the headspace. The PID readings will be recorded on the subsurface logs and the field book.

4.8 HYDRAULIC ASSESSMENT

Hydraulic assessment includes the completion of hydraulic conductivity tests and measurement of water levels in monitoring wells.

Hydraulic conductivity testing will be done on the newly installed monitoring wells using a variable head method. Variable head tests will be completed using a stainless steel or PVC slug to displace water within the well or by removing water from the well with a bailer or pump. The recovery of the initial water level is measured with respect to time. Data obtained using this test procedures will be evaluated using procedures presented in “The Bouwer and Rice Slug Test - An Update”, Bouwer, H., Groundwater Journal, Vol. 27, No. 3, May-June 1989, or similar method.

Water level measurements will include measuring the depth of water within the wells from a monitoring point mark of known elevation established at the top of the well riser. The depth to surface water will be measured relative to the monitoring point. The water elevations will then be calculated based on the known elevation and measured depth to water. Wells will be allowed to equilibrate a minimum of 24 hours after purging or testing prior to measuring the water level.

4.9 EQUIPMENT DECONTAMINATION

To avoid cross contamination, non-dedicated sampling equipment (defined as any piece of equipment that may contact a sample) will be decontaminated according to the following procedures outlined below.

4.9.1 Non-Dedicated Reusable Equipment

Non-dedicated reusable equipment such as knives, split spoons, stainless steel mixing bowls and spoons, pumps used for groundwater evacuation (and sampling, if applicable), etc. will require field decontamination. Acids and solvents will not be used in the field decontamination of such equipment. Decontamination typically involves scrubbing/washing with a laboratory grade detergent (e.g. Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses (as provided by the analytical laboratory). Tap water may be used from any treated municipal water system. Equipment will be allowed to air dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination. Any tubing will be dedicated (new tubing will be used for each well).

4.9.2 Disposable Sampling Equipment

Disposable sampling equipment includes disposable bailers, bailer cords, direct push sampling tubes, tubing associated with groundwater sampling/purging pumps; etc. Such equipment will not be field-decontaminated; equipment other than bailers may be rinsed with laboratory-provided analyte-free water prior to use. Non-disposable spoons or spatulas will be decontaminated using steam or high pressure hot water rinse, followed by analyte free water rinse. The equipment will be allowed to air dry prior to use.

4.9.3 Heavy Equipment

Certain heavy equipment such as Geoprobe sampling tubes, drilling augers, etc., may be used to obtain samples. Such equipment will be subject to high pressure hot water or steam cleaning between uses. A member of the sampling team will visually inspect the equipment to check that visible contamination has been removed by this procedure prior to sampling. The drilling rods will be cleaned between test borings; decontamination between samples at a single test boring will not be done. Samples submitted for analysis will not include material that has been in contact with the sampling tubes/drilling augers. Decontamination of heavy equipment will be completed on the decontamination pad.

4.9.4 Monitoring Well Construction Materials

Well construction materials including well screens, well riser and end caps/tailpieces will not be cleaned prior to installation unless the plastic packaging is damaged. If decontaminating of the well piping is deemed necessary, it will be washed by steam cleaning or high pressure hot water rinse. If necessary, the cleaned materials will then be wrapped in plastic to limit the potential for contamination.

4.10 STORAGE AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

The sampling methods and equipment selected limit both the need for decontamination and the volume of waste material to be generated. Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste.

Excess soil cuttings not returned to the borehole and from the decontamination pad will be drummed and stored on-site for future characterization and/or disposal. The NYSDEC will be contacted for approval of the disposal method. Excess well purge water and decontamination water will be drummed for testing prior to determining disposition. It is currently assumed that any waters can eventually be discharged through the municipal sanitary sewer system.

4.11 SURVEY

The survey of the site will include a layout survey at the project onset for the exploration locations, and will also include development of a base map. The base map will include property lines, existing monitoring wells and other key site features. The site property lines will be obtained from the site tax map.

A site survey will be completed to measure the vertical and horizontal locations of the new monitoring wells and test borings, and the limits of the property. Vertical measurements will include the ground surface, top of casing and top of riser. The top of riser will serve as the water level monitoring point. Vertical measurements will be made relative to the National Geodetic Vertical Datum. Monitoring point measurements and top of protective casing measurements will be accurate to within 0.01 foot. Horizontal measurements will be accurate to within 0.1 foot.

5.0 SAMPLE HANDLING

5.1 SAMPLE IDENTIFICATION/LABELING

Samples will be assigned a unique identification using the sample location or other sample-specific identifier. The general sample identification format follows.

SL-XX-YY

Where:

SL = Location identifier (see below)

BCP BH = Geoprobe direct push boring installed as part of this investigation
BH = Geoprobe direct push boring previously installed by LCS
BCP MW = Groundwater monitoring well installed as part of this investigation
TPMW = Groundwater monitoring well previously installed by LCS
SV = Soil vapor point installed as part of this investigation
EB = Equipment (Field Rinsate) Blank
TB = Trip Blank
DUP = Duplicate Sample

XX = Numerical location identifier (1 or 2 characters). This will ordinarily be a number corresponding to the probe, well, etc. location.

YY = Numerical sample identifier (2 or 3 characters). This will ordinarily be an arbitrary, sequential number and will correspond to sample location information and numbering. However, for soil borings it will identify from which split spoon the sample was obtained (e.g., S1, S2, etc; the number will be the same as indicated on the boring log).

QC field duplicate samples will be submitted blind to the laboratory; a fictitious sample ID will be created using the same system as the original. The sample identifications (of the original sample and its field duplicate) will be marked in the field book and on the copy of the chain-of-custody kept by the sampler and copied to the project manager. To the extent possible, sample containers will be labeled in the field prior to the collection of samples (the exact depth of soil samples to be collected are unknown, thus these containers cannot be fully labeled prior to collection). Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink.

- Site name, location, and job number;
- Sample identification code;
- Date and time;
- Sampler's name;
- Preservative;
- Type of sample (e.g., water, soil, sludge, sediment); and
- Requested analyses.

5.2 SAMPLE, BOTTLES, PRESERVATION, AND HOLDING TIME

Table 6 specifies the analytical method, matrix, holding time, containers, and preservatives for the various analyses to be completed. Sample bottle requirements, preservation, and holding times are discussed further below.

5.2.1 Sample Bottles

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements and any regulatory protocol requirements. All sample containers will be certified clean as provided by the analytical laboratory under sample bottle tracking sheets.

5.2.2 Sample Preservation

Samples will be preserved as detailed below and summarized on Table 6.

Soil Samples

Analytical (all analyses) - cooled to 4 ^{o}C with ice; no chemical preservatives added.

Aqueous Samples

Volatile Organics (VOCs) - cooled to <4 ^{o}C; HCl added.

Semi-volatile organics - cooled to <4 ^{o}C; no chemical preservatives added.

PCBs/Pesticides - cooled to <4 ^{o}C; no chemical preservatives added.

Metals - HNO_3 to pH $\leq$2; cool to <4 ^{o}C.

Chemical preservatives will be added to the sample bottles (prior to sample collection) by the analytical laboratory. Sample preservation is checked upon sample receipt by the laboratory; this information is reported to the LCS quality assurance officer within two business days of sample receipt. If it appears that the level of chemical preservation added is not adequate, laboratory preservative preparation and addition will be modified or additional preservative will be added in the field by the sampling team.

Liquid Product Samples

Liquid product samples, if collected, will not require preservatives. At this time, no liquid product samples are anticipated to be collected.

5.2.3 Holding Times

Holding times are judged from the verified time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Holding time requirements will be those specified in the NYSDEC Analytical Services Protocol (ASP) (June 2000); it should be noted that for some analyses, these holding times are more stringent than the holding time for the corresponding USEPA method. Holding times for analytical parameters are included on Table 4.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to return; the goal is that trip blanks should be held for no longer than one week prior to use.

5.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. A sample Chain of Custody Form to be used in shipping the samples to the laboratory is included in Appendix C, Field Forms. Sample/bottle tracking sheets or the chain-of-custody will be used to track the containers from the laboratory to the containers' destination. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. All sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in sealable plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4 ^{o}C. The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic sealable bag in the cooler. The completed shipping container will be closed for transport with shipping tape, and two paper seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing "Environmental Samples" and the cooler will be picked up by, shipped by an overnight delivery service to or hand delivered to the laboratory. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain-of-custody form and provide one copy to the Project Manager to verify receipt.

6.0 DATA QUALITY REQUIREMENTS

6.1 ANALYTICAL METHODS

Analyses for volatile and semi-volatile organic compounds, PCBs/Pesticides, and metals (including cyanide) will utilize ASP 2005 methods as follows:

Volatile Organics	SW-846 Method 8260B/TO-15
Semi-volatile Organics	SW-846 Method 8270C
PCBs/Pesticides	SW-846 Method 8081/8082
Metals (including cyanide)	SW-846 Method 6010/9013

Analytical methods used during this project are presented in the NYSDEC Analytical Services Protocol (ASP), July 2005. Specific methods and references for each parameter are shown above. It is the laboratory's responsibility to be familiar with this document and procedures and deliverables within it.

LCS has subcontracted an analytical laboratory approved by NYSDEC. A single laboratory (Accutest Laboratories) will be utilized. Accutest is certified by the NYSDOH Environmental Laboratory Approval Program and is in good standing for all the ASP/CLP parameter groups.

6.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this document will be used in assessing the uncertainty associated with decisions related to this site.

6.2.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is established by NYSDEC as part of the ASP-CLP. It is understood that such limits are dependent upon matrix interference. Quantitation limits are defined for each parameter and matrix within the NYSDEC ASP.

5.2.2 Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Laboratory duplicate analyses will be performed once for every twenty samples for metals as specified in the NYSDEC ASP.

Relative Percent Difference (RPD) criteria, prescribed by the NYSDEC, and those determined from laboratory performance data, are used to evaluate precision between duplicates. A matrix spike duplicate will be performed once for every twenty samples for volatile organics.

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation but other estimates such as the coefficient of variation, relative standard deviation, range (maximum value minus minimum value), and relative range are common, and may be used pending review of the data.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

Precision will be determined from field duplicates, as well as laboratory matrix duplicate samples for analyses, and matrix spikes and matrix spike duplicates for organic analyses. It will be expressed as the relative percent difference (% RPD):

$$\% \text{ RPD} = 100 \times (X_1 - X_2) / (X_1 + X_2)$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is $\leq$ 50% RPD for all matrices.

6.2.3 Accuracy

The laboratory objective for accuracy is to equal or exceeding the accuracy demonstrated for the applied analytical method on similar samples. Percent recovery criteria, published by the NYSDEC as part of the ASP, and those determined from laboratory performance data, are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike will be performed once for every sample delivery group (SDG) as specified in the ASP. This will apply to inorganics and volatile and semi-volatile organics analyses. Other method-specific laboratory QC samples (such as laboratory control samples for metals, and continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\%R = (SSR-SR)/SA \times 100,$$

where:

SSR = Spiked sample Result
SR = Sample Result, and
SA = Spike Added

Accuracy measures the bias in a measurement system. It is difficult to measure accuracy for the entire data collection activity. Accuracy will be assessed through use of known QC samples.

Accuracy values can be presented in a variety of ways. Accuracy is most commonly presented as percent bias or percent recovery. Percent bias is a standardized average error, that is, the average error divided by the actual or spiked concentration and converted to a percentage. Percent bias is unitless and allows accuracy of analytical procedures to be compared.

Percent recovery provides the same information as percent bias. Routine organic analytical protocol requires a surrogate spike in each sample. Surrogate recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

where:

S = surrogate spike concentration
R = reported surrogate concentration

Recovery criteria for laboratory spikes and other laboratory QC samples through which accuracy may be evaluated are established in the applicable analytical method.

6.2.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices, are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

6.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the U.S. Environmental Protection Agency (USEPA), or the New York State Departments of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

6.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data. The highest degree of completeness would be to find all deliverables flawless, valid and acceptable. The lowest level of completeness is excessive failure to meet established acceptance criteria and consequent rejection of data. The completeness goal is 95% useable data. It is acknowledged that this goal may not be fully achievable; for example, individual analytes (e.g., 2-hexanone) may be rejected within an otherwise acceptable analysis. The impact of rejected or unusable data will be made on a case-by-case basis. If the site investigation can be completed without the missing datum or data, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

6.3 FIELD QUALITY ASSURANCE

Blank water generated for use during this project must be "demonstrated analyte-free". The criteria for analyte-free water is based on the USEPA assigned values for the Contract Required Detection Limits (CRDLs) and CRQLs. If the levels of detection needed on a specific site are lower than the CLP CRDLs/CRQLs, then those levels are used to define the criteria for analyte-free water.

The analytical testing required for the water to be demonstrated as analyte free must be performed prior to the start of sample collection; thus, blank water will be supplied by the laboratory.

6.3.1 Equipment (Rinsate) Blanks

To the extent possible, based on known site conditions, samples expected to be the least impacted will be collected first, so as to limit the potential for cross-over contamination. However, to confirm the adequacy of the decontamination process, equipment blanks will be collected. These blanks consist of demonstrated, analyte-free water that show if sampling equipment has the potential for contaminant carryover to give a false impression of contamination in an environmental sample. When blank water is used to rinse a piece of sampling equipment (before it is used to sample), the rinsate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Field Equipment (Rinsate) blanks for bailers: Disposable bailers will be obtained from a single vendor for this project. One rinsate blank will be collected for each groundwater sampling event.

One rinsate blank will be collected for every 20 Geoprobe samples collected and submitted to the laboratory or one each per week, whichever is more frequent. The rinsate blanks will be collected from the soil sampling equipment.

6.3.2 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. For soil samples, these samples are separate aliquots of the same sample; prior to dividing the sample into "sample" and "duplicate" aliquots, the samples are homogenized (except for the VOC aliquots, which are not homogenized). Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container (technically, these are co-located samples). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day. The blind field duplicate Relative Percent Difference (RPD) objective will be $\pm$50% percent RPD for all matrices. Field duplicates will be collected at a frequency of 1 per 20 environmental samples for both matrices (aqueous and non-aqueous) and all test parameters.

6.3.3 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis. Trip blanks will be collected only when aqueous volatile organics are being sampled and shipped; except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinsate blanks).

6.4 FIELD TESTING QC

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity), turbidity, temperature and dissolved oxygen (DO) are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings.

Field data for temperature, pH, conductivity, turbidity, temperature and DO will be collected using a Horiba U-10 Water Quality Checker, or equivalent instrument(s). Field equipment calibration records will be recorded in the daily field log book.

6.4.1 pH

The pH meter is calibrated twice daily (prior to initial use and midday), using two standards bracketing the range of interest (generally 4.0 and 7.0 unless field conditions suggest otherwise). The standards will be provided either by the vendor or the analytical laboratory. If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds $\pm$ 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by $\pm$ 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used. Field pH calibration records will be recorded in the daily field logbook.

6.4.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter twice daily (prior to initial use and midday). Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride solutions provided by the vendor in accordance with manufacturer's recommendations. Field conductivity records calibration records will be recorded in the daily field log book.

6.4.3 Turbidity

The turbidity meter should be calibrated using a standard as close as possible to 50 NTUs (the critical value for determining effectiveness of well development and evacuation). The turbidity meter will be calibrated/checked twice daily with vendor-supplied standards. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar). Field turbidity records calibration records will be recorded in the daily field log book.

6.4.4 Temperature

Temperature probes associated with an instrument are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument's temperature reading be checked against a NBS-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

6.4.5 Dissolved Oxygen

The dissolved oxygen (DO) meter is calibrated twice per day in accordance with manufacturer's requirements. In general, the DO meter should be calibrated to ambient air based on probe temperature and true local atmospheric pressure conditions, or to feet above mean sea level based on National Geodetic Vertical Datum. Field DO meter calibration events will be recorded in the daily field logbook.

6.5 LABORATORY QUALITY ASSURANCE

6.5.1 Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. They are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every 20 samples analyzed or as otherwise specified in the analytical protocol.

6.5.2 Laboratory Duplicates

Laboratory duplicates are sub-samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized (with the exception of VOCs), to assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates will be performed on spiked samples as a Matrix Spike and a Matrix Spike Duplicate (MS/MSD) for volatile and semi-volatile organics, and as a matrix spike and matrix duplicate for inorganics.

6.5.3 Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are analyzed to evaluate instrument and method performance and performance on samples of similar matrix. MS/MSD will be analyzed at a frequency of one (pair) for every 20 samples. MS/MSD will be performed on additional samples as designated by LCS field staff. For inorganics, a matrix spike and matrix duplicate are analyzed for each set of 20 samples. In addition, matrix spike blanks (MSBs) will also be run by the lab as part of the NYSDEC ASP.

7.0 DATA DOCUMENTATION

7.1 FIELD NOTEBOOK

Dedicated field notebooks will be initiated at the start of on-site work. In addition to any forms that will be filled out summarizing field work (and become part of the project file), the field notebook will include the following daily information for all site activities:

- Date;
- Meteorological conditions (temperature, wind, precipitation);
- Site conditions (e.g., dry, damp, dusty, etc.);
- Identification of crew members (LCS staff and subcontractor present) and other personnel (e.g., agency or site owner) present;
- Description of field activities;
- Location(s) where work is performed;
- Problems encountered and corrective actions taken;
- Records of field measurements or descriptions recorded; and,
- Notice of modifications to the scope of work.

During drilling operations, the supervising field personnel will add the following information:

- Rig type;
- Documentation of materials used;
- Downtime;
- Time work is performed at an elevated or lowered level of respiratory protection; and,
- Diagram of well construction.

During sampling of wells, field samplers will add the following:

- sampling point locations and test results such as pH, specific conductance, etc.;
- information about sample collection;
- chain of custody information; and,
- field equipment calibration.

7.2 FIELD REPORTING FORMS

Field reporting forms (or their equivalent) to be utilized in this investigation are presented in Appendix C. These include:

- Geoprobe Boring Log
- Monitoring Well Installation Log;
- Monitoring Well Field Measurements/Well Development Log;
- Monitoring Well Construction Detail;
- Chain of Custody Form;
- PID Calibration Log; and,
- Water Quality Meter Calibration Log (pH, turbidity, specific conductivity).

These forms, when completed, will become part of the project file and final report, as appropriate.

8.0 EQUIPMENT CALIBRATION AND MAINTENANCE

8.1 STANDARD WATER AND AIR QUALITY FIELD EQUIPMENT

Field equipment used during the collection of environmental samples, includes a photoionization detector (PID), turbidity meter, pH meter, conductivity meter (specific conductance per EPA Method 120.1), thermometer, and photoionization detector. See also Section 6.4 of this work plan for additional discussion.

Calibration and standardization for the field water quality tests will be in conformance with the manufacturer's recommendations.

The pH meter will be fully calibrated (two points) at least two times daily and it will be checked with pH 7.0 buffer every five samples, two hours, or every time it has been turned off for more than two hours and then turned on, whichever occurs first.

The calibration of the specific conductance meter will be checked twice daily (at the beginning and in the middle of the workday).

Temperature will be measured with an NBS/NIST traceable thermometer, or with a platinum electrode, factory calibrated and coupled to the conductivity meter, or similar meter.

The Photovac PID (or equivalent organic vapor analyzer) used for soil screening and health and safety air monitoring will be calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut off for more than two hours, and at the field technician's discretion.

8.2 LABORATORY EQUIPMENT

Laboratory equipment will be calibrated by the laboratory according to the requirements of the 2005 Revised NYSDEC ASP, Superfund Contract Laboratory Program for each parameter or group of similar parameters, and maintained following professional judgment and the manufacturer's specifications.

9.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services will perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

10.1 LABORATORY DATA REPORTING AND REDUCTION

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the 2005 revision of the NYSDEC ASP CLP. In addition, the laboratory will be accredited pursuant to the NYSDEOH Environmental Laboratory Accreditation Program (ELAP) for the category of parameters analyzed. Laboratory data reports will conform to NYSDEC Category B deliverable requirements.

Copies of the laboratory's generic Quality Assurance Plan (QAP) are on file at LCS and with the NYSDEC. The laboratory's QAP will indicate the standard methods and practices for obtaining and assessing data, and how data are reduced from the analytical instruments to a finished report, indicating levels of review along the way.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data in spreadsheet form on computer disk (CD). The CD will be generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data.

10.2 DATA VALIDATION

Data will be validated by an independent third party. Data validation will be performed by following the guidelines established in Appendix 2B of *Final DER-10 Guidance for Site Investigation and Remediation*.

Validation reports will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text.

10.3 DATA USABILITY

Data usability summary reports (DUSRs) will be prepared by an independent validator. The DUSRs, which will be provided as part of the Remedial Investigation Report, encompass both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality. If similar analyses are performed by more than one method, a discussion of the extent of agreement among the various methods will be included, as well as discussion of any discrepancies among the data sets. The QAO will also indicate if there is a technical basis for selecting one data type over another for multiple measurements that are not in agreement.

10.4 FIELD DATA

Field chemistry data collected during air monitoring, soil screening (e.g., PID readings), and water monitoring (i.e., pH, turbidity, specific conductance, temperature and DO) will be presented in tabular form with any necessary supporting text. Unless activities resulted in significant unexpected results, field data comments can be added as footnotes to the tables.

11.0 PERFORMANCE AND SYSTEM AUDITS

The laboratory assigned to this project has been verified to be certified by the NYSDOH Environmental Laboratory Approval Program for the analytical protocols to be used. Therefore, no audit of the laboratory(s) during the Investigation will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of LCS and the NYSDEC.

12.0 CITIZENS PARTICIPATION PLAN

A Citizen Participation (CP) Plan will be prepared for the Site in accordance with the requirements outlined in NYSDEC's *DER-23 Citizen Participation Handbook for Remedial Programs,* issued January 2010. The CP Plan provides for issuance of fact sheets and/or public meetings at various stages in the remedial process. One fact sheet will be mailed to announce the availability of the BCP application and RI/IRM Work Plan for review, followed by a 45-day comment period. A public meeting will be held, if requested, during the public comment period. The fact sheet containing information about the RI/IRM will be direct-mailed by BTC Block 20 Inc. to those individuals on the CP Plan contact list, including property owners and residents adjacent to the project site, environmental groups, local political representatives, and interested regulatory agencies. A copy of this Work Plan will be made available for public review at the NYSDEC Region 9 office and the Buffalo and Erie County Public Library, and an announcement will be issued in the *Environmental Notice Bulletin* and in *The Buffalo News.*

The major components of the CPP are as follows:

- names and addresses of the interested public as set forth on the Brownfield site contact list provided with the BCP application;
- identification of major issues of public concern related to the site;
- a description of citizens participation activities already performed;
- identification of document repositories for the project; and,
- a description and schedule of public participation activities that are either required by law or needed to address public concerns related to the site.

In addition to the above, the CP Plan will include contact information for local receptors to notify of any off-site fugitive dust, vapor, or odor complaints.

13.0 REPORTING

Project status reporting to the NYSDEC, if requested, will include aspects of quality control that were pertinent during the investigation activities. Problems revealed during review of the investigation activities will be documented and addressed. These reports will include a description of completed and on-going activities and an indication how each task is progressing relative to the project schedule.

The project manager, through task managers, will be responsible for verifying that records and files related to this project are stored appropriately and are retrievable.

The laboratory will submit any memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.

13.1 IRM CONSTRUCTION CLOSEOUT REPORT

An IRM construction closeout report will be prepared and submitted to the NYSDEC after the Site is remediated. The report will be stamped by a NYS licensed Professional Engineer and will be submitted within 90 days of completion of the work. At a minimum, the report will include:

- A Site or area planimetric map showing the parcel(s) remediated.
- A survey showing: the lateral limits of excavation, the grade before excavation, the grade when excavation is complete, and grade following backfill where soil/fill is excavated. The survey will be accurate to within 0.1 feet on a grid spacing no greater than 25 feet by 25 feet.
- Tabular summaries of unit quantities including, at a minimum: volume of soil/fill excavated; disposition of excavated soil/fill and collected ground/surface water; volume/type/source of backfill; and volume of ground/surface water pumped and treated.
- Planimetric map showing location of all verification and other sampling locations with sample identification labels/codes.
- Tabular comparison of verification and other sample analytical results to SCGs. An explanation shall be provided for all results exceeding acceptance criteria.
- Copies of daily inspection reports and, if applicable, problem identification and corrective measure reports.
- Text describing the excavation activities performed; a description of any deviations from the Work Plan and associated corrective measures taken; and other pertinent information necessary to document that the site activities were carried out in accordance with this Work Plan.
- A certification by a licensed NYS Professional Engineer that all work was performed in accordance with the Brownfield Cleanup Agreement and approved Remedial Investigation and Interim Remedial Measures Work Plan.

In the event that no further remediation is necessary to achieve the goals of the Brownfield Cleanup Program application, this report will also serve as a Final Engineering Report for remediation of the Site.

13.2 FINAL REMEDIAL INVESTIGATION/ALTERNATIVES ANALYSIS REPORT

Upon completion of the activities undertaken as described in this work plan, a final Remedial Investigation Report will be generated for the site. The final report will include a summary of the IRM actions and investigation work completed, as well as all data generated relative to the Site and other information obtained as part of the implementation of the work plan (e.g., boring logs, well construction diagrams, well development data, detailed site plan documenting sampling locations, groundwater flow maps, analytical data, data usability reports, volumes and limits of contamination, etc.). A qualitative on- and off-site exposure assessment and receptor analysis will be included in the final investigation report, if necessary.

Preparation of a Remedial Alternative Analysis Report shall be included in the event further remediation is required. Such an evaluation will consider institutional and environmental controls to protect human health and the environment.

The final report will be certified by the person with primary responsibility for day to day performance of the activities undertaken as part of the investigation. The final report will be submitted to the NYSDEC for their review and comment.

PROJECT SCHEDULE
233 SOUTH ELMWOOD AND 234 DELWARE AVENUE
BUFFALO, NEW YORK

ID	Task Name
1	BCP Pre-Application Meeting
2	Advertise Application with RI/IRM Work Plans
3	Public Comment, Fact Sheet Distribution
4	BC Agreement Issued
5	BC Agreement Reviewed/Executed
6	IRM Planning/Coordination
7	IRM Mobilization
8	IRM Construction
9	IRM Demobilization
10	Prepare DRAFT Engineering Report
11	Prepare DRAFT RA Report
12	RI Sampling and Analysis
13	Preliminary Data Submittal to NYSDEC
14	Data Validation/Interpretation
15	DRAFT RI and IRM Construction Report Preparation (including Remedial Alternatives Analysis if needed)
16	NYSDEC Report Review/Revisions

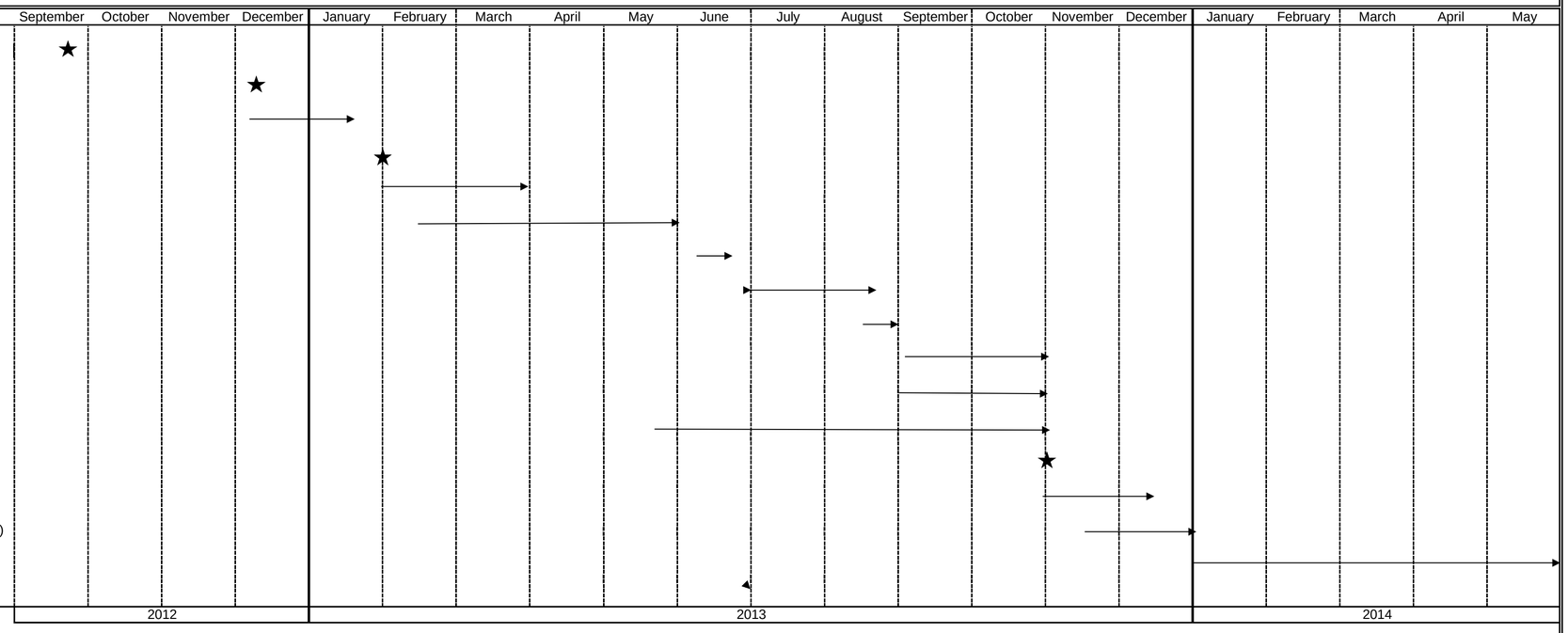


Table 2 Analytical Summary
233 South Elmwood Avenue and 234 Delaware Avenue
Buffalo, New York

Matrix	Parameter	Sample Quantity	Equipment (Rinsate) Blank Quantity	Matrix Spike/ Matrix Spike Duplicate Quantity	Duplicate Quantity	Trip Blank Quantity
Soil						
	TCL (plus STARS List) VOCs	8	1	1	1	NA
	TCL (plus STARS LIST) SVOCs	8	1	1	1	NA
	TAL Metals (w/cyanide)	8	1	1	1	NA
	PCBs/Pesticides	8	1	1	1	NA
Soil Vapor/Air						
	TCL (plus STARS List) VOCs	5	NA	NA	1	NA
Groundwater						
	TCL (plus STARS List) VOCs	8	1	1	1	1
	TCL (plus STARS LIST) SVOCs	8	1	1	1	NA
	TAL Metals (w/ cyanide)	8	1	1	1	NA
	TCL PCBs/Pesticides	8	1	1	1	NA

VOCs- volatile organic compounds
SVOCs- semi-volatile organic compounds
PCBs - Polychlorinated Biphenyls
TAL - Target Analyte List
TCL - Target Compound List
STARS- Spill Technology and Remediation Series

Table 3 Soil Analytical Summary
233 South Elmwood Avenue and 234 Delaware Avenue
Buffalo, New York

Borehole[1]	Rationale	No. Samples	Parameters
BCP BH1	Site Characterization	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH2	Site Characterization	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH3	Site Characterization	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH4	Site Characterization	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH5	Site Characterization	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH6	Site Characterization/Post IRM evaluation	-	NA
BCP BH7	Site Characterization/Post IRM evaluation	-	NA
BCP BH8	Site Characterization/Post IRM evaluation	-	NA
BCP BH9	Site Characterization (234 Delaware Structure)	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH10	Site Characterization (234 Delaware Structure)	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP BH11	Site Characterization (234 Delaware Structure)	1	TCL (plus STARs List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides

[1] Proposed boring locations are shown on Figure 3-1 Proposed Sampling Locations
BCP BH1 - proposed soil boring for this Brownfield Cleanup Program investigation.
VOCs- volatile organic compounds
SVOCs- semi-volatile organic compounds
PCBs - Polychlorinated Biphenyls
TAL - Target Analyte List
TCL - Target Compound List
STARS- Spill Technology And Remediation Series

Table 4 Groundwater Analytical Summary
915 Cleveland Avenue
Niagara Falls, New York

Newly installed Monitoring Wells

MW[1]	Rationale	No. Samples	Parameters
BCP MW1	Site Characterization	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW2	Site Characterization	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW3	Site Characterization	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW4	Site Characterization	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW5	Site Characterization	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW6	Site Characterization/Post IRM Groundwater Evaluation	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW7	Site Characterization/Post IRM Groundwater Evaluation	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides
BCP MW8	Site Characterization/Post IRM Groundwater Evaluation	1	TCL (plus STARS List) VOCs/SVOCs, TAL Metals plus cyanide, PCBs/TCL Pesticides

[1] Proposed monitoring well locations are shown on Figure 3-1 Proposed Sampling Locations

BCP MW1 - proposed monitoring well for this Brownfield Cleanup Program investigation.

VOCs- volatile organic compounds

SVOCs- semi-volatile organic compounds

PCBs - Polychlorinated Biphenyls

TAL - Target Analyte List

TCL - Target Compound List

STARS- Spill Technology And Remediation Series

Table 5 Soil Vapor/Air Analytical Summary
233 South Elmwood Avenue and 234 Delaware Avenue
Buffalo, New York

Location[1]	Rationale	No. Samples	Parameters
234 Delaware Avenue	Site Characterization	5	TCL (plus STARS List) VOCS

[1] Proposed soil vapor locations are shown on Figure 3-1 Proposed Sampling Locations

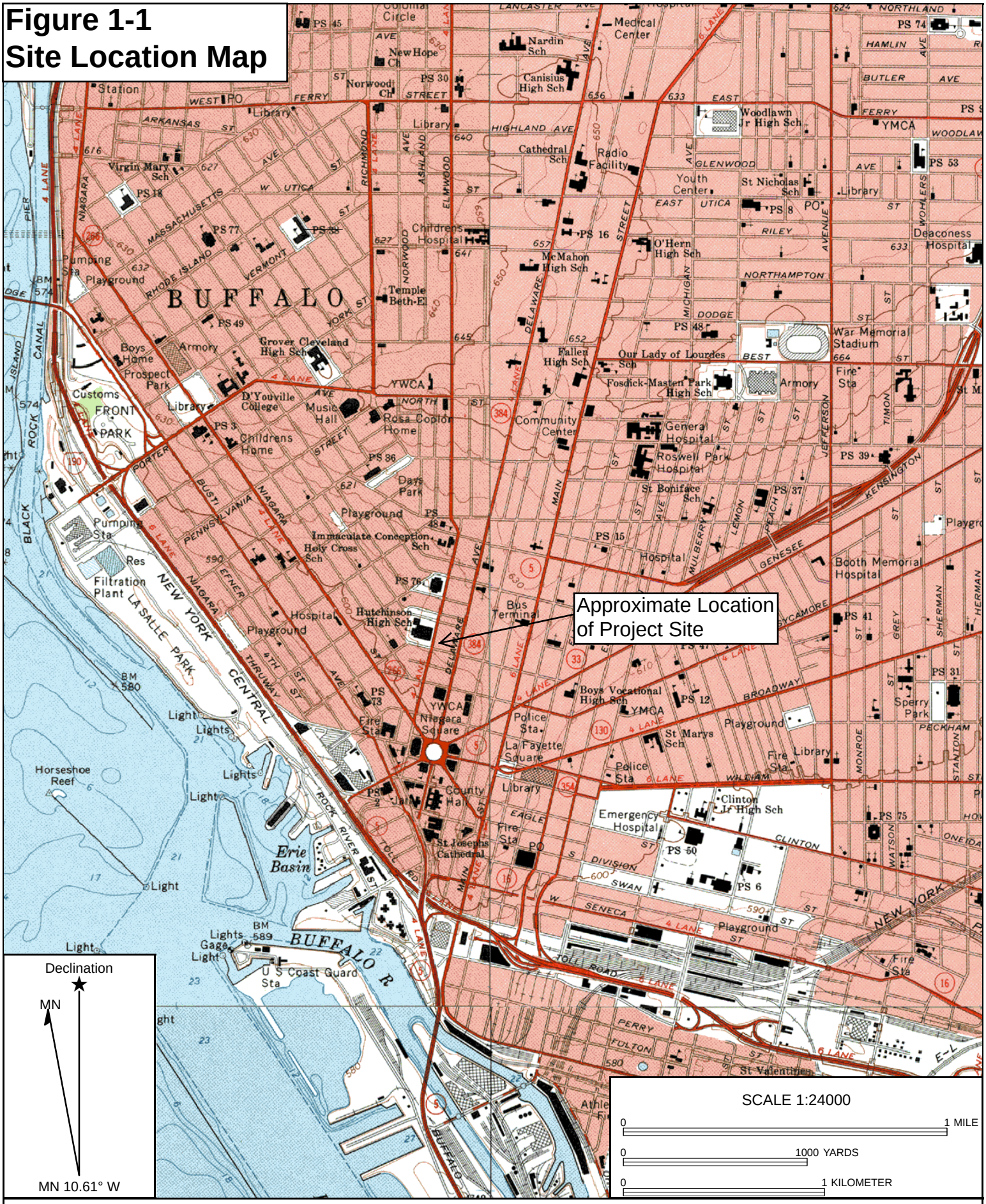
VOCs- volatile organic compounds

Table 6 Sample Volumes, Containers, Holding Times and Preservatives
233 South Elmwood Avenue and 234 Delaware Avenue
Buffalo, New York

Parameter	No. of Containers/Sample Volume	Sample Container	Sample Holding Time	Sample Preservative
Soil				
TCL (plus STARS List) VOCs	1- 4 oz.	glass w/ teflon-lined cap	7 days[1]	none
TCL (plus STARS List) SVOCs	1- 8 oz.	glass w/ teflon-lined cap	7 days	none
TAL Metals	1- 8 oz.	glass w/ teflon-lined cap	180 days[2]	none
Cyanide	1- 8 oz.	glass w/ teflon-lined cap	14 days	none
PCBs/Pesticides	1 - 8 oz.	glass w/ teflon-lined cap	7 days	none
Groundwater				
TCL (plus STARS List) VOCs	3- 40 mL	glass with teflon septum	7 days	Hydrochloric acid
TCL (plus STARS List) SVOCs	1- 1 liter	amber glass w/ teflon cap	7 days	none
TAL Metals	1- 500 mL	polyethylene	180 days	Nitric acid
Cyanide	1- 250 mL	polyethylene	14 days	Sodium Hydroxide
PCBs/Pesticides	1- 1 liter	amber glass w/ teflon cap	7 days	none
Soil Vapor				
TCL (plus STARS List) VOCs	1 - 6L	Certified Summa® Canister	30 days	none

[1] holding times are calculated from the time of arrival at the laboratory.
[2] except mercury (28 days).
TCL VOCs- Target Compound List volatile organic compounds
TCL SVOCs- Target Compound List semi-volatile organic compounds
TAL Metals - Target Analyte List metals
TCL PCBs - Target Compound List Polychlorinated Biphenyls
TCL Pesticides - Target Compound List Pesticides
STARS- Spill Technology And Remediation Series

Figure 1-1
Site Location Map

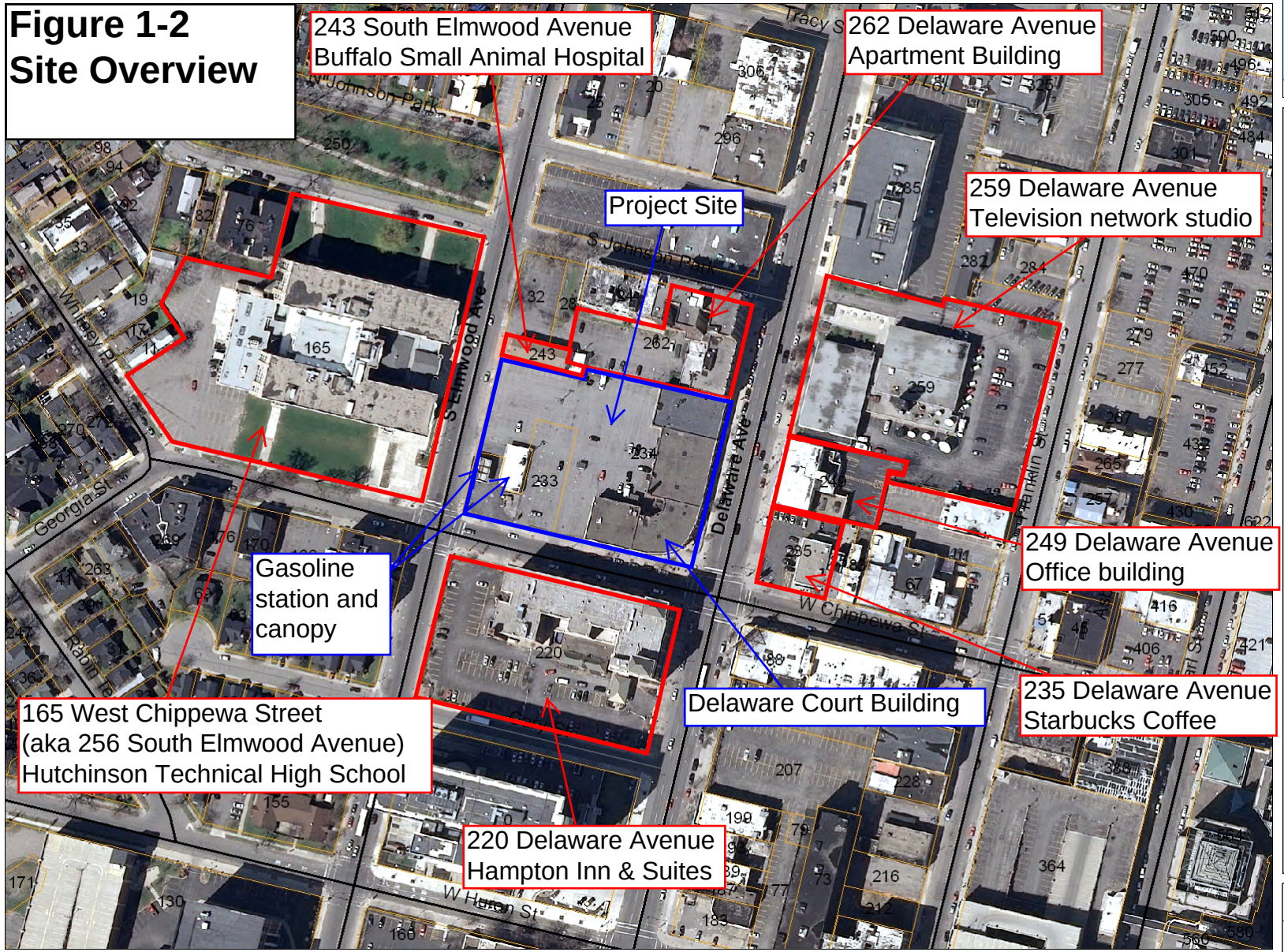


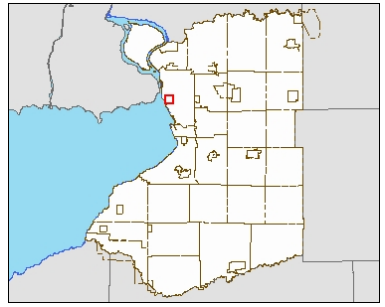
Quadrangle: Buffalo NE (NY)
Map Date: 1965
Scale: 1 inch = 2,000 ft.

Site: 233 South Elmwood Avenue and
234 Delaware Avenue
RI/IRM Work Plan

Erie County On-Line Mapping System

Figure 1-2
Site Overview





Legend

Streets and Highways
- Interstate
- Primary State Road
- Secondary State Road
- County Road
- Local Road

Parcels

1ft Color Orthos - 2011
- Red: Band_1
- Green: Band_2
- Blue: Band_3

2ft Color Orthso - 2011
- Red: Band_1
- Green: Band_2
- Blue: Band_3

1: 2,695

Notes

Enter Map Description

0.1 0 0.04 0.1 Miles

ERIE COUNTY, NEW YORK
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GEOGRAPHIC INFORMATION SERVICES

N

NORTH ADJACENT
VETERINARY CLINIC

FENCE

Permanent Fence In-Place
For IRM and Future
Site Redevelopment

Truck Staging
And Equipment
Storage Area

OVERHEAD UTILITIES
TO BE RELOCATED

ESTIMATED LIMITS OF EXCAVATION

GROUNDWATER
TREATMENT SYSTEM
(IF REQUIRED)

SHED

EXISTING GASOLINE STATION
(TO BE DEMOLISHED)

PUMP
ISLAND

USTS

SHEET
PILING
LOCATIONS

SIDEWALK

SIDEWALK

SOUTH ELMWOOD AVENUE

SIDEWALK

DELAWARE COURT BUILDING

WEST CHIPPEWA STREET

USTs = UNDERGROUND STORAGE TANKS

Drawn by: DCC

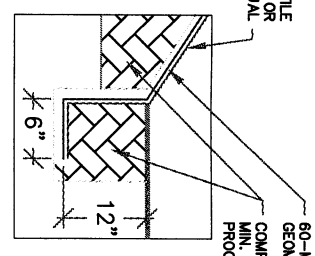
Checked by: DBR

Scale: Approx. 1 inch = 30 ft.

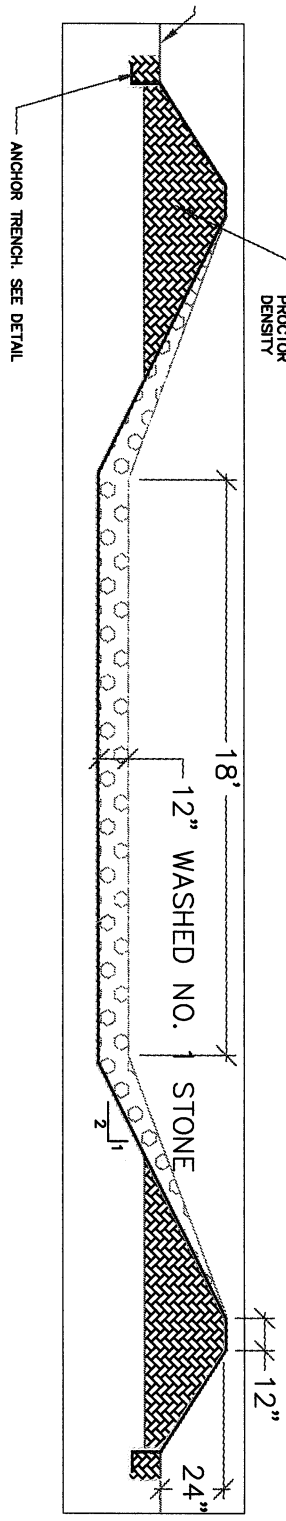
RI/IRM WORK PLAN

FIGURE 2-1
INTERIM REMEDIAL MEASURES SITE PLAN
233 SOUTH ELMWOOD AVENUE AND 234 DELAWARE AVENUE
BUFFALO, NEW YORK

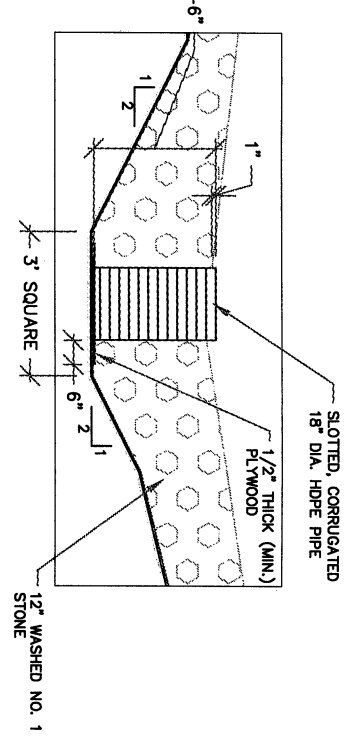
LCS, INC.

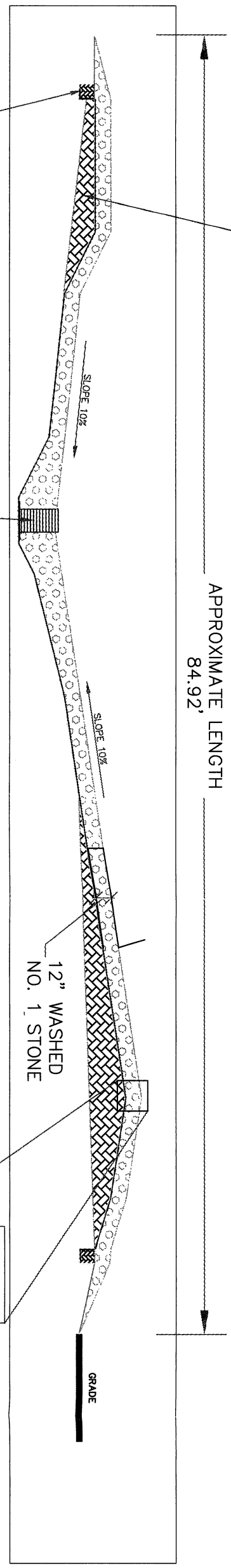


TYPICAL ANCHOR TRENCH DETAIL



SUMP DETAIL





SECTION

SECTION

FIGURE 2-2 DECONTAMINATION PAD DETAIL

RI/IRM WORK PLAN
233 SOUTH ELMWOOD AND 234 DELAWARE AVENUE SITE
BUFFALO, NEW YORK

LCS INC.
Environmental and Real Estate Consultants

LCS JOB #12B2170.26

N

NORTH ADJACENT
VETERINARY CLINIC

FENCE

KNOWN EXTENT OF PLUME REQUIRING
REMEDIATION, BASED ON ANALYTICAL RESULTS
FROM SAMPLING CONDUCTED IN 2002

SIDEWALK

SOUTH ELMWOOD AVENUE

SIDEWALK

BCP BH5/MW5
BCP SV5
BH13
BH31*#
TPMW13*
BH32*
TPMW14*#
BCP BH7/MW7
BH14*#
SUSPECT AREAS OF
HISTORIC USTS
AOC #2
BH33*
TPMW15*#
BH11*#
TPMW2*#
EP
BH29*
TPMW11*#
BH15*#
BH16*
PUMP
ISLAND
AOC #3
BH17
BH34*P
TPMW16*P
USTS
EP2
EP
BH41*
TPMW23*
TANK PIT
MONITORING WELL *#
BH18*#P
BH20*#P
EP
EP1
EP3
EP
BH19*#
TPMW3*#P
BH25*#P
TPMW7*#P
BH42*
TPMW24*
BH23*#
TPMW5*#
BCP BH8/MW8
EP
BH24*
TPMW6*#
BH21*#P
BH22
TPMW4*#

ESTIMATED AREA OF
HISTORIC GASOLINE
STATIONS

BH5
BH6*#
BH3
BH2
SUSPECT AREAS OF
HISTORIC UST(S)
AOC #1
BH4
BH1
BH7
BH8
BH9
BH39*
TPMW21*#
BCP BH4/MW4
SHED
BH38*
TPMW20*
BCP SV4
BH30*#
TPMW12*#
BH28*#
TPMW10*#
EP
EXISTING
GASOLINE
STATION
EP
BH10*#P
TPMW1*#P
EP
BH27*#
TPMW9*#
BCP BH6/MW6
BCP BH3/MW3
BH26*
TPMW8*#
EP
BCP SV3
BH40*
TPMW22*
BH35*
TPMW17*
BH37*
TPMW19*
BH36*
TPMW18*

BCP BH11
BCP BH2/MW2
BCP SV2
BCP BH10
DELAWARE COURT BUILDING
BCP SV1
BCP BH1/MW1
BCP BH9

SIDEWALK

C&W Soil
Boring 1 (2003)

C&W Soil
Boring 2 (2003)

WEST CHIPPEWA STREET

■ PROPOSED BOREHOLE
◒ PROPOSED SOIL VAPOR POINT
✛ PROPOSED BOREHOLE/MONITORING WELL
● EXISITNG BOREHOLE / MONITORING WELL
USTs = UNDERGROUND STORAGE TANKS
⊕ EP =APPROXIMATE LOCATION OF EXTRACTION POINTS
○ EP = PILOT EXTRACTION POINTS
* = INDICATES SAMPLE SUBMITTED TO LAB FOR ANALYSIS
# = INDICATES AN EXCEEDANCE OF NYSDEC GUIDANCE VALUE
P = FREE PHASE PETROLEUM PRODUCT NOTED

Drawn by: APS

Checked by: DBR

Scale: Approx. 1 inch = 30 ft.

RI/IRM WORK PLAN

FIGURE 3-1
PROPOSED SAMPLE LOCATIONS
233 SOUTH ELMWOOD AVENUE AND 234 DELAWARE AVENUE
BUFFALO, NEW YORK

LCS, INC.

Appendix A

Previous Studies
(Provided with BCP Application)

Appendix B

Temporary IRM Consturction Erosion Control Plan

Temporary IRM Construction Erosion Control Plan

Table of Contents

Appendices

Appendix B-1	Temporary IRM Construction Erosion Control Details

INTRODUCTION

1.1 Background and History

An Interim Remedial Measure (IRM) is being completed at the 233 South Elmwood Avenue and 234 Delaware Avenue Site, Buffalo, New York Site (Figure 1). The IRM is being performed on behalf of BTC Block 20 LLC through the New York State Department of Environmental Conversation (NYSDEC) Brownfield Cleanup Program (BCP). BTC Block 20 LLC (client) executed a Brownfield Cleanup Agreement (BCA) for remedial investigation/remedial action at the Site as a non-responsible party (volunteer) per ECL§27-1405. Lender Consulting Services, Inc. (LCS) is completing the IRM to address petroleum- and solvent impacted soil/fill present at the site.

The 233 South Elmwood Avenue and 234 Delaware Avenue Site encompasses approximately 1.96 acres in the City of Buffalo, New York (City of Buffalo I.D parcel no. 111.37-3-5.11). The subject property is described as developed land with two structures, located in a predominantly commercial and residential area of Buffalo, New York. The Site and surrounding area was historically used for commercial and residential uses.

According to historical records, The Delaware Court building was identified as having been utilized as a mixed-use commercial building since its construction in 1925; this area had previously been utilized residentially. The area of the project site to the west of the Delaware Court Building was identified as having included gasoline stations in different locations on-site from at least 1925 to at least 1986. In addition, a tire service operation was present on-site in at least 1931 and 1936 (241 South Elmwood Avenue), and a service station was identified on the Project Site in 1982 and 1987 (239 South Elmwood Avenue); such suggests historic on-site automotive repair operations. Furthermore, a paint shop was located at 241 South Elmwood Avenue in 1925. Municipal records indicate the installation and removal of several underground storage tanks at the Project Site. Additional historical information relative to site history and previous studies performed at the Site are summarized in the following sections.

1.2 Purpose and Scope

Erosion control will be a critical component of preventing the potential migration of contaminants onto remediation property or off-site during remediation of the site. This Temporary IRM Construction Erosion Control Plan was prepared to provide guidance to contractors during excavation and backfill activities. This document is generic in nature and provides minimum erosion control practices to be used during construction activities.

2.0 General Permit Requirements

Remediation activities will be conducted in accordance with the Brownfield Cleanup Agreement (BCA). Since construction activities at the Site will not disturb more than one acre of land, the Federal Water Pollution Control Act (as amended, 33 U.S.C. 1251 et. Seq.) and the New York State Environmental Conservation Law (Article 17, Titles 7 and 8, and Article 70) do not apply.

3.0 Potential Erosion Control Concerns

Potential areas and items of concern during site construction activities include the Following:

- In the event that the site or portions of the site are developed for non-industrial use, vegetative or other (e.g., asphalt, building, concrete) surface coverage over the entire area will be required as a pre-condition of occupancy. The transportation and placement activities associated with this work will require erosion and sediment controls to prevent the surface soil from being washed from the area being developed.
- Remediation areas or off-site properties adjacent to the construction activity need protection so they do not become impacted by site operation.
- Storm water inlets will require protective measures to limit sediment transfer to storm sewers.
- Runoff from potential soil stockpiles will require erosion controls.
- Surface slopes need to be minimized as much as practical to control sediment transfer.
- Soil/fill excavated during construction will require proper handling and disposal.

4.0 Erosion Control Measures

4.1 Background

Standard soil conservation practices need to be incorporated into the construction plans to mitigate soil erosion damage, off-site sediment migration, and water pollution from erosion. These practices combine vegetative and structural measures, many of which will be permanent in nature and become part of the completed project (i.e. drainage channels and grading). Other measures will be temporary and serve only during the construction stage. Selected erosion and sediment control measures will meet the following criteria:

- Minimize erosion through project design (maximum slopes, phased construction, etc.).
- Incorporated temporary and permanent erosion control measures.
- Remove sediment from sediment-laden storm water before it leaves the Site.

4.2 Temporary Control Measures

Temporary erosion and sedimentation control measures and facilities will be used during construction. These measures will be installed and maintained by the property owner(s) until they are either no longer needed or until such time as permanent measure are installed and become effective. At a minimum, the following temporary measures will be used:

- Silt fencing
- Straw/hay bales
- Temporary vegetation/mulching
- Temporary sedimentation basins
- Cautious placement, compaction and grading of stockpiles

4.2.1 Silt Fencing

Construction and regrading activities will result in surface water flow to drainage ditches and swales, storm sewers, and adjacent properties. Silt fencing will be the primary sediment control measure used in these areas. Prior to extensive soil excavation or grading activities, silt fencing will be installed along the perimeter of all construction areas. The orientation of the fencing will be adjusted as necessary as the work proceeds to accommodate changing sire conditions.

Intermediate fencing will be used upgradient of the perimeter fencing to help lower surface water runoff velocities and reduce the volume of sediment to perimeter fencing. Stockpiles will also be surrounded with silt fencing.

As sediment collects, the silt fences will be cleaned as necessary to maintain their integrity. Removed sediment will be used elsewhere on-site as general fill. All perimeter silt fences will remain in place until construction activities in an area are completed and vegetative cover has been established. Silt fencing will be installed in accordance with the details presented in Appendix A-1.

4.2.2 Straw and/or Hay Bales

Straw and/or hay bales will be used to intercept sediment laden storm water runoff in drainage channels during construction. The use of either hay or straw will be based on the availability of materials at the time of construction.

Bales will be placed in swales and ditches where the anticipated flow velocity is not expected to be greater than 5 feet/second (fps). Intermediate bales will be placed upgradient to the final barrier to reduce flow velocities and sediment loadings where higher velocities are anticipated.

As with silt fencing, sediment will be removed as necessary from behind the bales and disposed of on-site. Bales that have become laden with sediment or that have lost their structural integrity or effectiveness due to the weather will be replaced. Bales should be installed in accordance with the details presented in Appendix B-1.

4.2.3 Cautious Placement of Stockpile

Excavation activities will produce stockpiles of soil and subgrade soil/fill materials. Careful placement and construction of stockpiles will be required to control erosion. Stockpiles will be placed no closer than 50 feet from storm water inlets and parcel boundaries. Additionally, stockpiles will be graded and compacted as necessary for positive surface water runoff and dust control. Impacted stockpiles will be underlain and covered with secured polyethylene tarpaulin until proper disposal has been secured.

4.3 Permanent Control Measures

Permanent erosion and sedimentation control measures and structures will be installed as soon as practical during construction for long-term erosion protection. Examples of permanent erosion control measures include:

- Using maximum slopes in erosion prone areas to limit erosion.
- Minimizing the potential contact with, and migration of, subsurface soil/fill through the placement of a “clean” soil cover system in all areas not covered with structures, roads, parking areas, sidewalks, etc.
- Planting and maintaining vegetation.
- Limiting runoff flow velocities to the extent practical.
- Lining collection channels with riprap, erosion control fabric, vegetation, or similar materials.

5.0 Construction Management Practices

5.1 General

The following general construction practices should be evaluated for erosion and sedimentation control purposes during site construction activities:

- Clearing and grading only as much area as is necessary to accommodate the construction needs to minimize disturbance of areas subject to erosion (i.e. phasing the work).
- Covering exposed or disturbed areas of the site as quickly as practical.
- Installing all erosion and sediment control measures before disturbing the site subgrade.
- Using routine entry/exit routes to minimize both the on-site and off-site tracking of soil by vehicles.

5.2 Monitoring, Inspection, and Maintenance Plan

All erosion and sedimentation controls described in this Plan should be inspected by a qualified representative of the property owner(s) within 24 hours of a heavy rainfall event and repaired or modified as necessary to effectively control erosion of turbidity problems. Inspections should include areas under construction, stockpile areas, erosion control devices (i.e., silt fencing, hay bales, etc.), and entry/exit routes. Routine inspections of the entire site should also be made during the construction. If inspections indicate problems, corrective measures should be implemented within 24 hours.

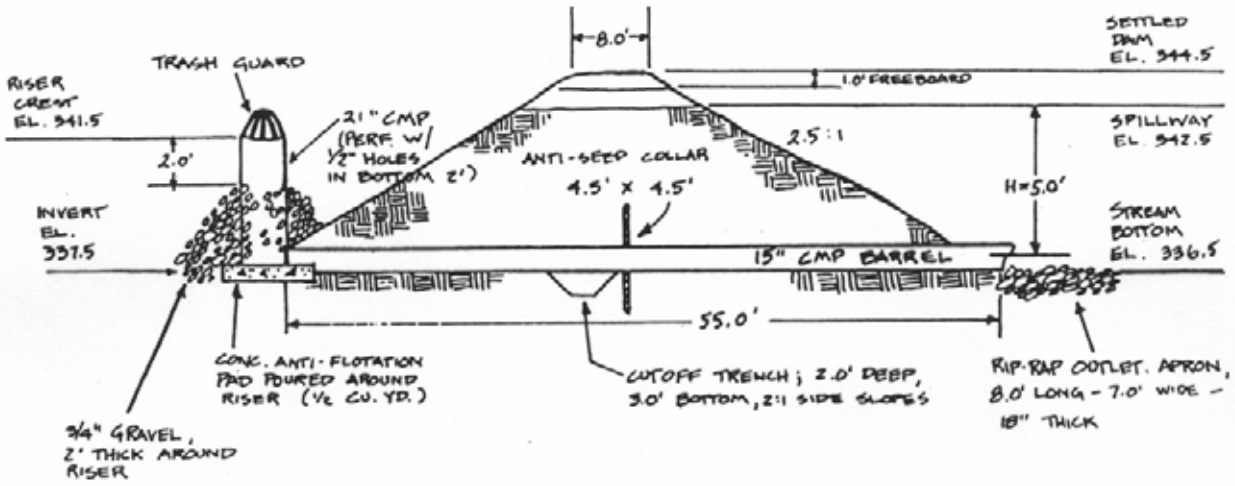
Appendix B-1

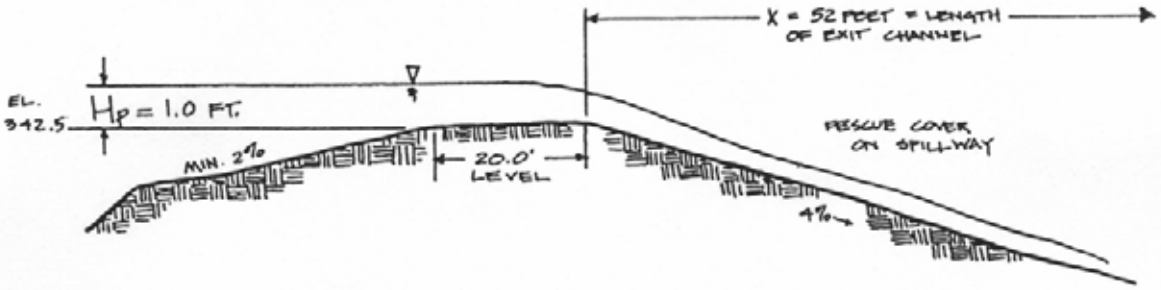
Temporary IRM Erosion Control Details

- *Silt Fence*
- *Sraw Bale Dike*
- *Perimeter Dike/Swale*
- *Temporary Swale*
- *Sediment Trap for Drop Inlet*

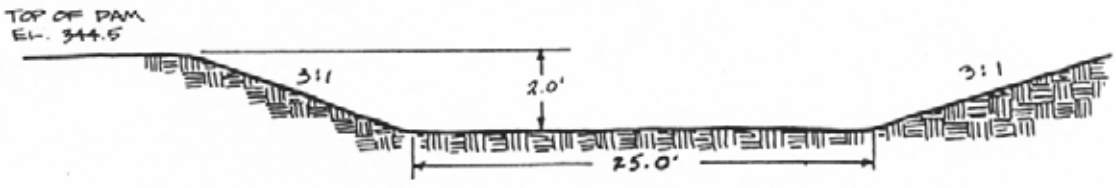
DETAIL DRAWINGS AND SPECIFICATIONS

1. SEDIMENT BASIN





SPILLWAY PROFILE



SPILLWAY : CROSS SECTION AT CONTROL SECTION

(1.) CONSTRUCTION SPECIFICATIONS:

1. CLEAR AND GRUB FOUNDATION FOR EMBANKMENT AND EXCAVATE THE AREA FOR THE RIPRAP OUTLET PAD. AREA TO BE 8.0' LONG, 7.0' WIDE AND 1.5' DEEP. (NOTE: THIS EXCAVATION WILL SERVE AS A SEDIMENT TRAP WHILE STRUCTURE IS BEING BUILT.)

2. EXCAVATE CUTOFF TRENCH ALONG EMBANKMENT CENTERLINE AND UP ABUTMENTS TO ELEVATION 344.0 AS SHOWN. KEEP TRENCH DRY WHEN BACKFILLING AND COMPACTING.

3. USE SEDIMENT POOL AREA AS SOURCE OF FILL MATERIAL FOR THE DAM. MATERIAL SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY MATERIAL, ROCKS OR OTHER OBJECTIONABLE MATERIAL. SCARIFY FOUNDATION AND PLACE FILL IN LAYERS NOT TO EXCEED 8" OVER THE ENTIRE LENGTH OF DAM. COMPACT BY HEAVY WHEEL EQUIPMENT. THE ENTIRE SURFACE OF EACH LAYER MUST BE TRAVERSED BY AT LEAST ONE WHEEL OF THE COMPACTION EQUIPMENT. THE FILL MATERIAL MUST BE MOIST BUT NOT SO WET THAT WATER CAN BE SQUEEZED FROM IT.

4. PERFORATE 24" CMP RISER WITH ½" HOLES SPACED 3" APART IN EACH OUTSIDE VALLEY TO WITHIN 2.0' OF THE TOP. SECURE TRASH RACK TO RISER TOP. MAXIMUM OPENING BETWEEN BARS OF RACK NOT TO EXCEED 3".

5. SECURELY ATTACH THE RISER TO THE BARREL AND ALL OTHER PIPE JOINTS WITH ROD AND LUG CONNECTOR BANDS WITH RUBBER GASKETS TO ASSURE WATER TIGHTNESS. PLACE THE BARREL AND RISER ON A SMOOTH, FIRM FOUNDATION. PLACE FILL AROUND THE PIPE IN 4" LAYERS AND HAND COMPACT. TAKE CARE NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER PIPE HAUNCHES.

6. SECURE ONE STANDARD CORRUGATED METAL ANTI-SEEP COLLAR AROUND BARREL. MAKE SURE CONNECTION IS WATERTIGHT. HAND COMPACT AROUND ANTI-SEEP COLLAR.

7. PLACE A MINIMUM OF 2 FT. OF HAND COMPACTED BACKFILL OVER PIPE BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

8. ANCHOR RISER IN PLACE WITH ½ YD^3 CONCRETE PAD POURED AROUND RISER.

9. PLACE 3/4" GRAVEL (D.O.T. #5 WASHED STONE) OVER THE PERFORATED HOLES APPROXIMATELY 2" THICK.

10. INSTALL EMERGENCY SPILLWAY IN UNDISTURBED SOIL TO THE LINES AND GRADES SHOWN IN DRAWINGS.

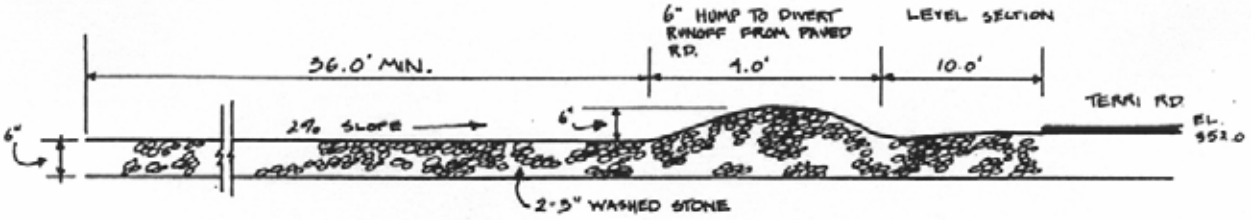
11. PLACE CLASS A EROSION CONTROL STONE OVER FILTER FABRIC ON LEVEL GRADE FOR RIPRAP APRON AT PIPE OUTLET. TOP OF RIPRAP TO BE SAME ELEVATION AS OUTLET CHANNEL BOTTOM. NO OVERFALL.

12. CLEAR SEDIMENT POOL AREA TO ELEVATION 341.5 AFTER THE EMBANKMENT IS COMPLETE.

13. VEGETATE ALL DISTURBED AREAS (EXCEPT THE SEDIMENT POOL) IN ACCORDANCE WITH THE VEGETATIVE PLAN.

14. SEDIMENT TO BE REMOVED FROM BASIN WHEN THE LEVEL IS WITHIN 2.0' OF THE TOP OF THE RISER. (SAME LEVEL AS TOP OF GRAVEL.)

2. TEMPORARY GRAVEL CONSTRUCTION ENTRANCE



GRAVEL ENTRANCE/EXIT : WIDTH — 15.0', FLARED TO 25.0' AT ROAD
LENGTH — 50.0'
GRADE — 2.0%

(2.) CONSTRUCTION SPECIFICATIONS

1. CLEAR THE ENTRANCE/EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL.

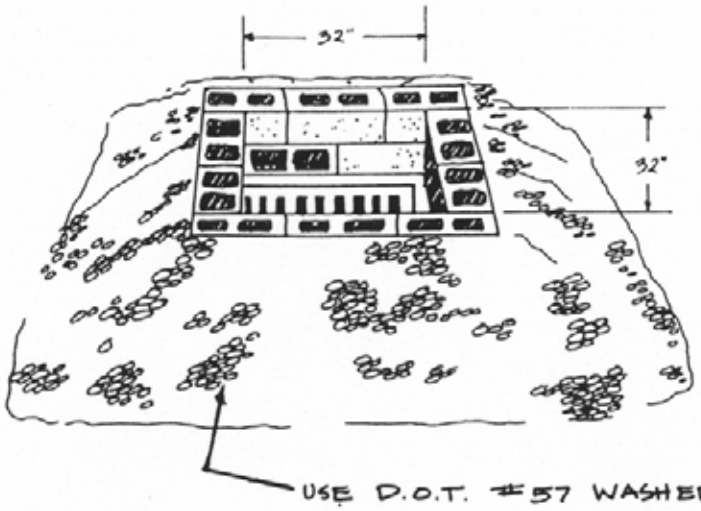
2. GRADE THE ROAD FOUNDATION SO THAT THE ENTRANCE/EXIT WILL HAVE A CROSS SLOPE TO THE SOUTH AND ALL RUNOFF WILL DRAIN TO THE BLOCK AND GRAVEL DROP INLET PROTECTION STRUCTURE.

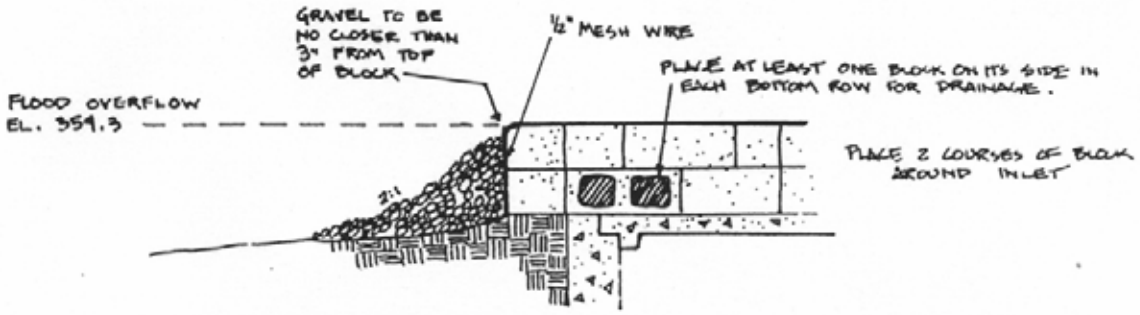
3. PLACE STONE TO THE DIMENSIONS, GRADE AND ELEVATION SHOWN.

4. USE WASHED STONE 2" TO 3" IN SIZE.

NOTE: MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE SITE. SHOULD MUD BE TRACKED OR WASHED ONTO TERRI ROAD, IT MUST BE REMOVED IMMEDIATELY.

3. TEMPORARY BLOCK AND GRAVEL DROP INLET PROTECTION





(3.) CONSTRUCTION SPECIFICATIONS

1. LAY CONCRETE BLOCKS ON FIRM, SMOOTH FOUNDATION EXCAVATED 3" BELOW STORM DRAIN TOP. PLACE BLOCKS AGAINST DRAIN INLET FOR LATERAL SUPPORT.

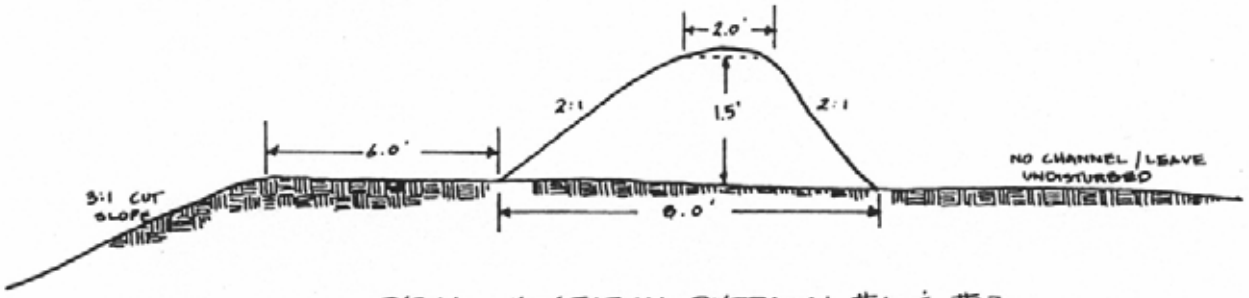
2. PLACE AT LEAST ONE CONCRETE BLOCK ON IT'S SIDE IN EACH BOTTOM ROW OF BLOCKS.

3. PLACE WIRE MESH WITH ½" OPENINGS OVER ALL BLOCK OPENINGS USED FOR DRAINAGE.

4. USE D.O.T. #57 WASHED STONE TO REDUCE FLOW RATE BUT ALLOW DRAINAGE. PLACE STONE ON 2:1 SLOPE TO WITHIN 3" OF TOP OF BLOCK.

5. ANY SOIL LEFT EXPOSED BETWEEN THE BLOCK AND CONCRETE DRAIN INLET SHOULD BE FILLED WITH 3" DIAMETER STONE TO PREVENT WASHING WHEN WATER FLOWS OVER BLOCKS INTO DRAIN.

4. TEMPORARY DIVERSIONS



TYPICAL X-SECTION DIVERSION #1 & #2

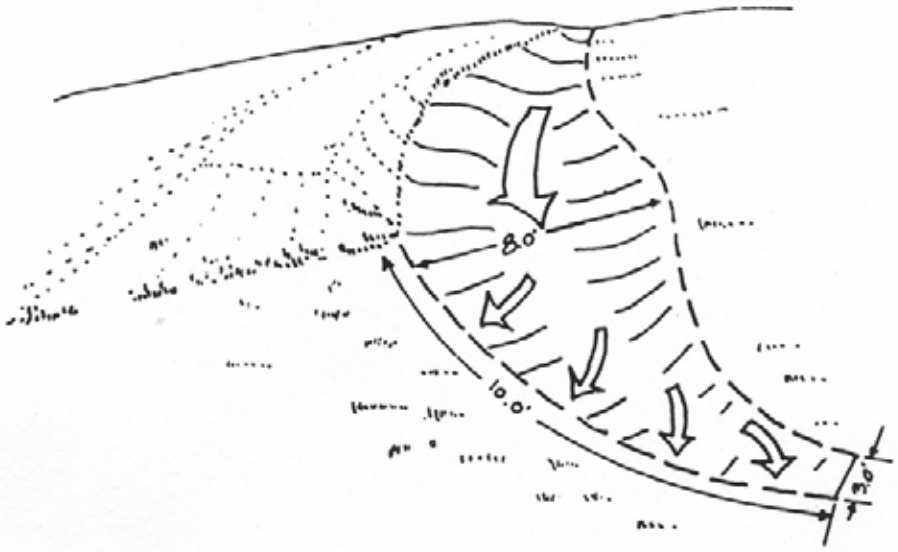
DIVERSION #1 — GRADE = 2%
LENGTH = 450'

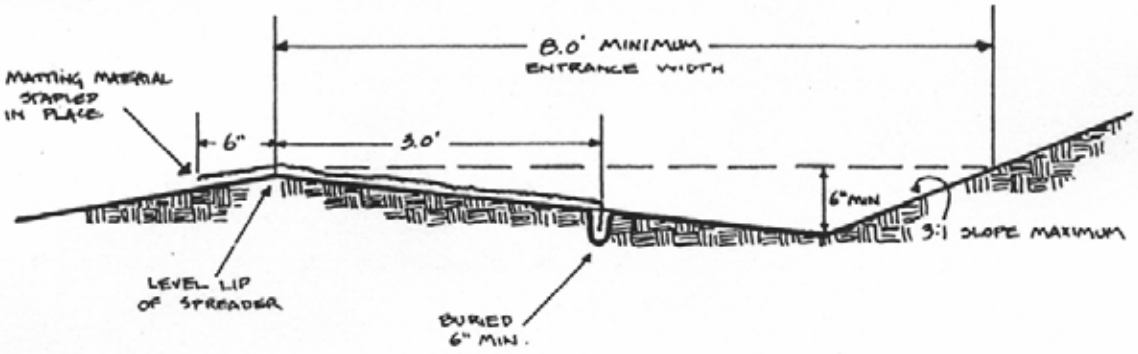
DIVERSION #2 — GRADE = 0.5%
LENGTH = 400'

(4.) CONSTRUCTION SPECIFICATIONS

1. REMOVE ALL TREES, BRUSH & STUMPS FROM DIVERSION FOUNDATION.
2. CONSTRUCT RIDGE TO FULL DIMENSIONS SHOWN — ALLOW 10% FOR SETTLING.
3. COMPACT RIDGE BY WHEELS OF CONSTRUCTION EQUIPMENT.
4. ENSURE THAT THE TOP OF THE DIVERSION IS ON DESIGN GRADE OR HIGHER AT ALL POINTS.
5. SEED AND MULCH IMMEDIATELY AFTER CONSTRUCTION. SEE VEGETATIVE PLAN.

5. LEVEL SPREADER





CROSS SECTION

(5.) CONSTRUCTION SPECIFICATIONS

1. FIBERGLASS MATTING, 4.0 FT. WIDE, SHOULD EXTEND 6" OVER THE LEVEL LIP AND BE BURIED 6" DEEP AT THE LOWER EDGE.

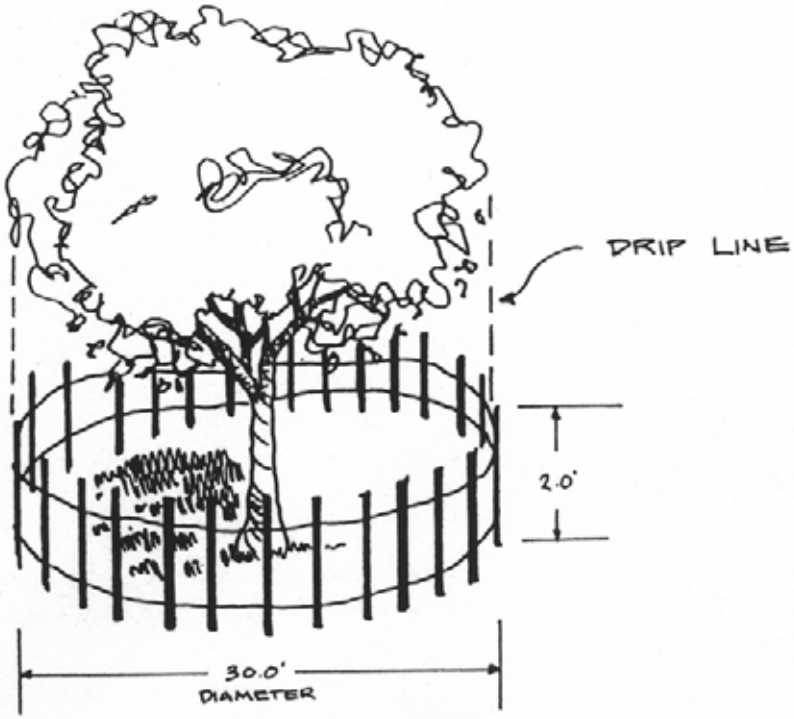
2. ENSURE THAT THE SPREADER LIP IS LEVEL THROUGHOUT ITS LENGTH.

3. CONSTRUCT THE LEVEL SPREADER ON UNDISTURBED SOIL (NOT ON FILL.)

4. CONSTRUCT A TRANSITION SECTION FROM THE DIVERSION TO BLEND SMOOTHLY TO THE WIDTH AND DEPTH OF THE SPREADER.

5. IMMEDIATELY AFTER CONSTRUCTION, APPROPRIATELY SEED AND MULCH THE ENTIRE DISTURBED AREA OF THE SPREADER. SEE VEGETATIVE PLAN.

6. TREE PRESERVATION & PROTECTION



NOTE: SEDIMENT FENCE MATERIAL MAY BE USED TO BUILD FENCE.

- DRIVE STAKES FIRMLY INTO GROUND – AT LEAST 12"

7. LAND GRADING

1. FINISHED LAND SURFACES WILL BE GRADED AS SHOWN ON SITE DEVELOPMENT PLAN.
2. CUT SLOPES WILL BE 3:1 OR FLATTER FOR MAINTENANCE BY MOWING AND ROUGHENED FOR VEGETATIVE ESTABLISHMENT.
3. THE HIGH FILL SLOPE ON THE NORTH WILL NOT BE STEEPER THAN 2:1 AND ROUGHENED BY GROOVING ACROSS THE SLOPE.
4. TOPSOIL WILL BE REMOVED FROM AREAS TO BE GRADED AND FILLED AND IT WILL BE STOCKPILED IN LOCATIONS SHOWN.
5. AREAS TO BE FILLED WILL BE CLEARED AND GRUBBED.
6. FILL WILL BE PLACED IN LAYERS NOT TO EXCEED 9" AND COMPACTED AS REQUIRED IN THE SPECIFICATIONS FOR THE DEVELOPMENT PLAN (NOT A PART OF SEDIMENT CONTROL PLAN.)

7. FROZEN MATERIAL OR SOFT, HIGHLY COMPRESSIBLE MATERIAL WILL NOT BE USED AS FILL.

8. FILL WILL NOT BE PLACED ON A FROZEN SURFACE.

9. ROAD AND PARKING SURFACES WILL BE SLOPED AS SHOWN ON SITE DEVELOPMENT PLAN TO CONTROL RUNOFF.

10. LAND ADJOINING PAVED AREAS WILL BE SLOPED NO STEEPER THAN 6:1 AND GRADED TO DRAIN AS SHOWN.

11. SURFACE RUNOFF FROM BUILDINGS WILL BE COLLECTED IN GUTTERS AND PIPED TO CHANNELS 1, 2, 3 AND 4.

12. DIVERSIONS WILL BE INSTALLED ABOVE CUT SLOPES PRIOR TO LAND CLEARING AND GRADING.

13. A DIVERSION WILL BE MAINTAINED AT ALL TIMES ABOVE THE FILL SLOPE TO PREVENT OVERFLOW ON THIS STEEP AREA.

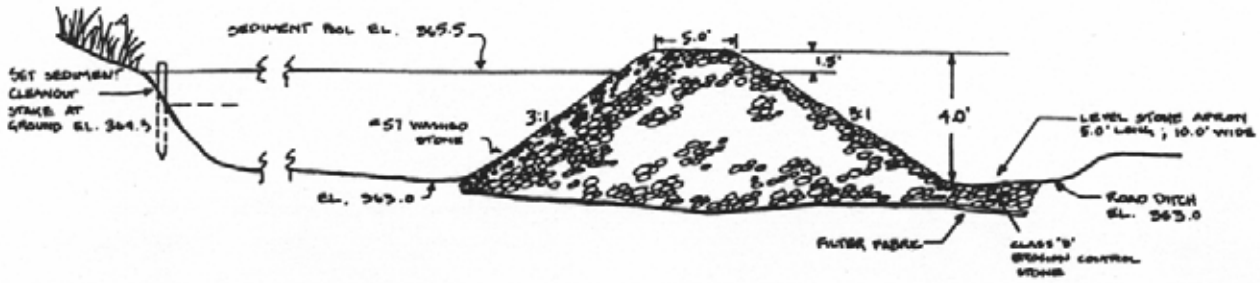
14. CUTTING AND FILLING WILL BE DONE AS A CONTINUOUS OPERATION UNTIL FINAL GRADE IS REACHED. SHOULD GRADING BE TEMPORARILY DISCONTINUED, A TEMPORARY DIVERSION WILL BE CONSTRUCTED ACROSS THE MIDDLE OF THE DISTURBED AREA TO BREAK UP THE LONG SLOPE TO THE NORTH.

15. AS SOON AS FINAL GRADES ARE REACHED THE GRADED AREAS WILL BE STABILIZED IN ACCORDANCE WITH THE VEGETATIVE PLAN.

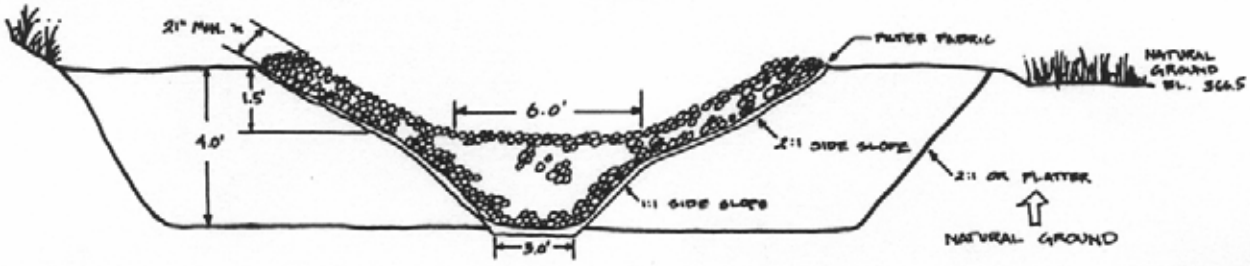
16. AN UNDISTURBED AREA WILL BE LEFT AS A BUFFER AROUND THE ENTIRE GRADED SITE EXCEPT AT ROAD ENTRANCE AND CHANNEL #3 OUTLET.

17. WHEN THE DEVELOPED SITE HAS BEEN PROPERLY STABILIZED, ALL THE TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES WILL BE REMOVED, THE DISTURBED AREA GRADED TO BLEND WITH THE SURROUNDING AREA, AND VEGETATED.

8. TEMPORARY SEDIMENT TRAP



CROSS SECTION



STONE SECTION

(8.) CONSTRUCTION SPECIFICATIONS

1. CLEAR, GRUB AND STRIP THE AREA UNDER THE EMBANKMENT OF ALL VEGETATION AND ROOT MAT.
2. CLEAR POND AREA BELOW ELEVATION 365.5
3. USE FILL MATERIAL FREE OF ROOTS, WOODY VEGETATION AND ORGANIC MATTER. PLACE FILL IN LIFTS NOT TO EXCEED 9" AND MACHINE COMPACT.
4. CONSTRUCT DAM AND STONE SPILLWAY TO DIMENSIONS, SLOPES AND ELEVATIONS SHOWN.
5. ENSURE THAT THE SPILLWAY CREST IS LEVEL AND AT LEAST 1.5' BELOW THE TOP OF THE DAM AT ALL POINTS.
6. STONE USED FOR SPILLWAY SECTION — CLASS "B" EROSION CONTROL STONE.

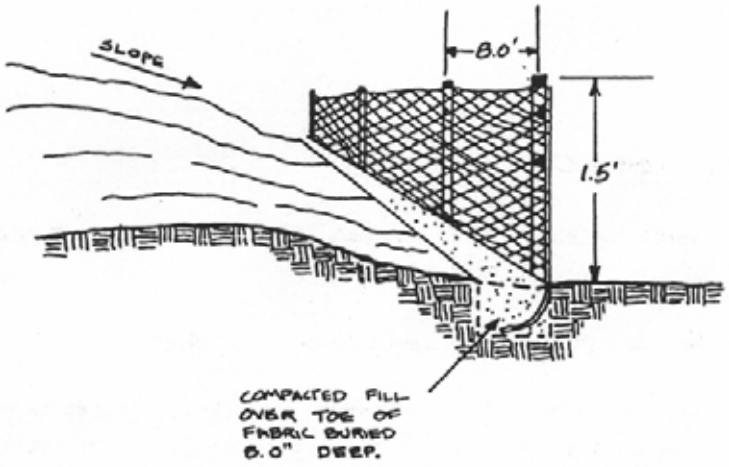
7. STONE USED ON INSIDE SPILLWAY FACE TO CONTROL DRAINAGE — D.O.T. # 57 WASHED STONE.

8. EXTEND STONE OUTLET SECTION TO VEGETATED ROAD DITCH ON ZERO GRADE WITH TOP ELEVATION OF STONE LEVEL WITH BOTTOM OF DRAIN.

9. ENSURE THAT THE TOP OF THE DAM AT ALL POINTS IS 0.5' ABOVE NATURAL SURROUNDING GROUND.

10. STABILIZE THE EMBANKMENT AND ALL DISTURBED AREA ABOVE THE SEDIMENT POOL AS SHOWN IN THE VEGETATION PLAN.

9. SEDIMENT FENCE



(9.) CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.

2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.

3. BURY TOE OF FENCE APPROXIMATELY 8" DEEP TO PREVENT UNDERCUTTING.

4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.

5. FILTER FABRIC TO BE OF NYLON, POLYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH — 50 LB/LIN. IN. (MINIMUM) — AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT^2/MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS.

6. POST TO BE 4" DIAMETER PINE WITH A MIMUMUM LENGTH OF 4' FEET.

NOTE: IF HIGH CUT SLOPES ADJOINING CHANNELS 1, 2, AND 3 ARE NOT ADEQUATELY STABILIZED BEFORE CHANNEL IS CONSTRUCTED, A SEDIMENT FENCE SHOULD BE LOCATED ON THE CHANNEL BERM TO PREVENT SEDIMENT FROM ENTERING THE CHANNEL SYSTEM. THE FENCE SHOULD BE INSTALLED AS SHOWN ABOVE ALONG THE ENTIRE UNSTABLE AREA ADJOINING THE CHANNEL.

Appendix C

Field Forms

Site Location ____________________ **Project #** __________

Client ______________________ **Date** _________

Truck ID (License #)	Time In	Time out

LCS INC.
Environmental and Real Estate Consultants

INSPECTOR'S DAILY REPORT

CONTRACTOR			
CLIENT		DATE:	

LOCATION				DAY		JOB NO.	
WEATHER		TEMP	° F	START		END	

WORK PERFORMED:

CONTRACTOR ACTIVITIES:

[PUT CONTRACTOR ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES PERFORMED, BY WHOM, LOCATION OF LANDFILL ETC.]

LCS ACTIVITIES:

[PUT ENGINEER ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES AND TESTING PERFORMED, SAMPLES COLLECTED, BY WHOM, LOCATION OF LANDFILL ETC.]

TEST PERFORMED		*QA PERSONNEL SIGNATURE*			
PICTURES TAKEN	none	REPORT NO.			
VISITORS	none	SHEET	1	OF	

LCS INC.
Environmental and Real Estate Consultants

INSPECTOR'S DAILY REPORT

CONTRACTOR			
CLIENT		DATE:	
LOCATION		DAY	JOB NO.
WEATHER	TEMP ° F	START	END

MEETINGS HELD & RESULTS:

CONTRACTOR'S WORK FORCE AND EQUIPMENT

DESCRIPTION	*H*	#	*DESCRIPTION*	*H*	#	*DESCRIPTION*	*H*	#	*DESCRIPTION*	*H*	#
Field Engineer						Equipment			Front Loader Ton		
Superintendent			Ironworker			Generators			Bulldozer		
						Welding Equip.			DJ Dump truck		
Laborer-Foreman			Carpenter						Water Truck		
Laborer									Backhoe		
Operating Engineer			Concrete Finisher						Excavator		
						Roller			Pad foot roller		
Carpenter						Paving Equipment					
						Air Compressor					

REMARKS:

REFERENCES TO OTHER FORMS:

SAMPLES COLLECTED:					
SAMPLE NUMBER					
APPROX. LOCATION OF STOCKPILE					
NO. OF STOCKPILE					
DATE OF COLLECTION					
CLIMATOLOGIC CONDITIONS					
FIELD OBSERVATION		SHEET		OF	

LCS INC.
Environmental and Real Estate Consultants

DAILY LOG	DATE			
	REPORT NO.			
	PAGE		OF	

PROBLEM IDENTIFICATION REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Problem Description:

Problem Location (reference test location, sketch on back of form as appropriate):

Problem Causes:

Suggested Corrective Measures or Variances:

Linked to Corrective Measures Report No. *or Variance Log No.*

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

LCS INC.
Environmental and Real Estate Consultants

DAILY LOG	DATE			
	REPORT NO.			
	PAGE		OF	

CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

LCS INC.
Environmental and Real Estate Consultants

HOT WORK PERMIT

PART 1 - INFORMATION

Issue Date:

Date Work to be Performed: Start: Finish (permit terminated):

Performed By:

Work Area:

Object to be Worked On:

PART 2 - APPROVAL

(for 1, 2 or 3: mark Yes, No or NA)*

Will working be on or in:	Finish (permit terminated):
1. Metal partition, wall, ceiling covered by combustible material?	yes no
2. Pipes, in contact with combustible material?	yes no
3. Explosive area?	yes no

* = If any of these conditions exist (marked "yes"), a permit will not be issued without being reviewed and approved by Thomas H. Forbes (Corporate Health and Safety Director) Required Signature below.

PART 3 - REQUIRED CONDITIONS**

(Check all conditions that must be met)

	PROTECTIVE ACTION		PROTECTIVE EQUIPMENT
	Specific Risk Assessment Required		Goggles/visor/welding screen
	Fire or spark barrier		Apron/fireproof clothing
	Cover hot surfaces		Welding gloves/gauntlets/other:
	Move movable fire hazards, specifically		Wellintons/Knee pads
	Erect screen or barrier		Ear protection: Ear muffs/Ear plugs
	Restrict Access		B.A.: SCBA/Long Breather
	Wet the ground		Respirator: Type:
	Ensure adequate ventilation		Cartridge:
	Provide adequate supports		Local Exhaust Ventilation
	Cover exposed drain/floor or wall cracks		Extinguisher/Fire blanket
	Fire watch (must remain on duty during duration of permit)		Personal flammable gas monitor
	Issue additional permit(s):		

Other precautions:

** Permit will not be issued until these conditions are met.

SIGNATURES

Orginating Employee:	Date:
Project Manager:	Date:
Part 2 Approval:	Date:

Prepared By: _____

Vapor Sampling Log

Date:_____ LCS Project #:_____ Weather:_____ Barometric Pressure:_____

Dry Bulb:_____ Wet Bulb:_____ Depression (Dry Bulb – Wet Bulb):_____

Barometric Pressure:_____

Vapor Sampling Point						
PID Reading (ppm)						
Regulator Number						
Canister Number						
Regulator Reading Before Test (Hg)						
Regulator Reading After Test (Hg)						
Test Start Time						
Test Stop Time						
Hose Length (inch)						
Purge Time (sec)						
Tracer Gas Test (pass/fail)						

LCS Inc. SUBSURFACE LOG

PROJECT/ LOCATION: _____ PROJECT No. _____

CLIENT: _____ BORING/WELL No. _____

DATE STARTED: _____ DATE COMPLETED: _____ RECORDED BY: SM

GROUNDWATER DEPTH WHILE DRILLING: _____ AFTER COMPLETION: NA

WEATHER: _____ DRILL RIG: Geoprobe DRILLER: _____ .

DRILL SIZE/TYPE: Macro-core SAMPLE HAMMER: WEIGHT NA FALL NA

Sample No.	PID/HNu Reading (ppm)	Depth (Feet)	Type *	Blows/6"	N	Recovery (Inches)	Material Classification and Description (Unified Soil Classification System-Visual Manual Method)
1		0-2	U	-	-		
2		2-4	U	-	-		
3		4-6	U	-	-		
4		6-8	U	-	-		
5		8-10	U	-	-		
6		10-12	U	-	-		
7		12-14	U	-	-		
8		14-16	U	-	-		

NOTES NA = Not Applicable

ft. bgs = feet below ground surface

Fill to ~8 ft. bgs

No suspect odors detected

*SS - SPLIT-SPOON SAMPLE U - UNDISTURBED TUBE P - PISTON TUBE C - CORE

LCS, Inc.
GROUNDWATER SAMPLING LOG

Site Name: 12B1425.22	Site Location: 1200 Clinton Street and 474 Babcock Street	
Well No:	**Sample ID:**	**Date:**

PURGING DATA

Well Diameter:	Tubing Diameter:	Well Screen Interval Depth:	Static Depth To Water:	Purge Pump Type Or Bailer: -

Well Volume Purge: 1 Well Volume = (Total Well Depth – Static Depth To Water) X Well Capacity
(only if applicable) = (ft. –ft.) X . gal/ft = 0.3056 gallons

Initial Pump or Tubing Depth in Well (feet):	Initial Pump or Tubing Depth in Well (feet):	Purging Initiated At:	Purging Ended At:	Total Volume Purged:

Time	Volume Purged (gal)	Cumulative Volume Purged (gal)	ORP	Depth to Water (feet)	pH (satandard units)	Temp. (ºC)	Conductivity (µmhos/cm or µS/cm)	Dissolved Oxygen (mg/L or % saturation)	Turbidity (NTUs)	Color	Odor

Well Capacity (Gallons per Foot): **0.75”**=0.02 **1”**=0.04 **1.25”**=0.06 **2”**=0.16 **3”**=0.37 **4”**=0.65 **5”**=1.02 **6”**=1.47 **12”**=5.88

Tubing Inside Dia. Capacity (Gal/Ft): **1/8”**=0.0006 **3/16”**=0.0014 **¼”**=0.0026 **5/16”**=0.004 **3/8”**=0.006 **1/2”**=0.010 **5/8”**=0.016

SAMPLING DATA

Sampled by (Print)/ Affiliation:	Sampler’s Signature:	Sampling Initiated At:	Sampling Ended At:

Pump Or Tubing Depth In Well (feet):	Sample Pump Flow Rate (mL/min):	Tubing Material Code:
Field Decontamination	**Field-Filtered: Filter Size:** **Filtration Equipment Type:**	**Duplicate: No**

Sample Container Specification		Sample preservation	Intended Analysis and/or Method	Sampling Equipment Code
# Containers	Volume	Preservation Used		

Remarks:

Material Codes: **AG=** Amber Glass **CG=** Clear Glass **PE=** Polyethylene **S=** Silicone **T=** Teflon **O=** Other (Specify)

Sampling/Purging Equipment Codes: **B=** Bailer **BP=** Bladder Pump **ESP=** Electric Submersible Pump **PP=** Peristaltic Pump **TP=** Transfer Pump **O=** Other (Specify)

NOTES:

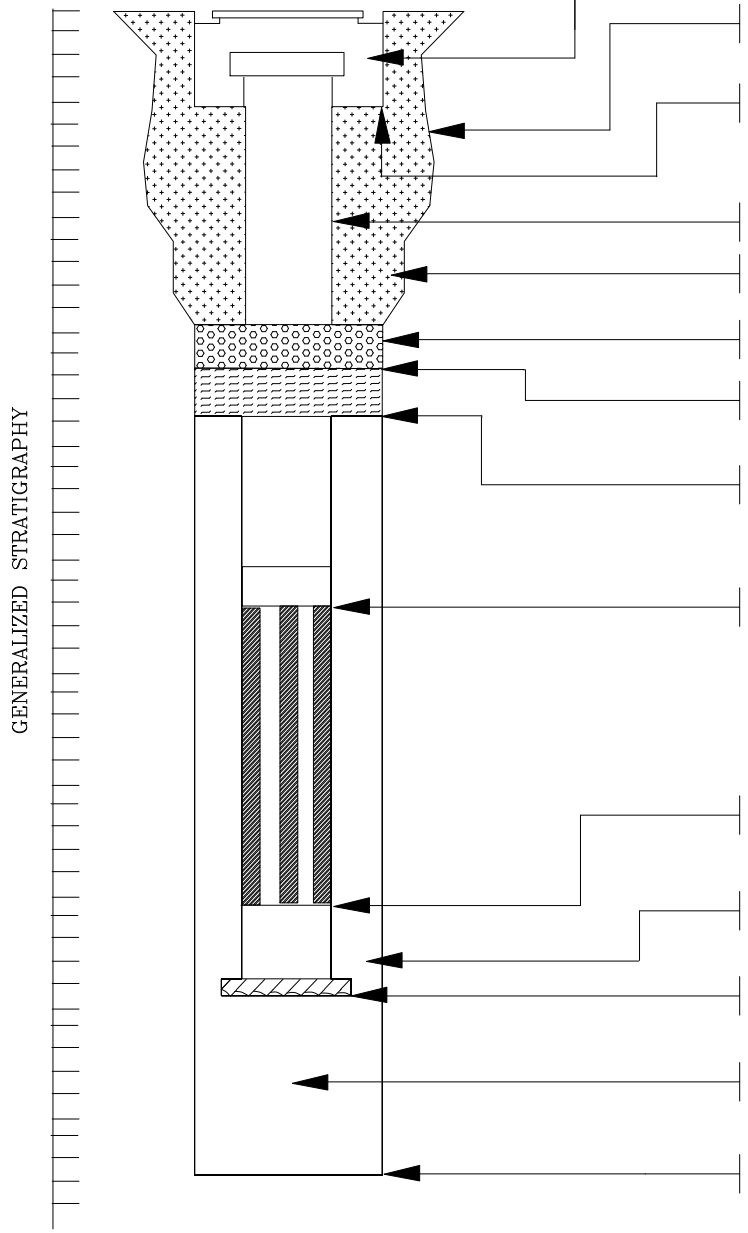
1. **Stabilization Criteria for range of variation of last three consecutive Readings**
   pH: ± 0.2 units; **Temperature:** ± 0.5^{0}C; **Specific Conductance:** ± 10%; **Turbidity:** ≤ 50 NTU
   A minimum of three well volumes and a maximum of five well volumes are to be removed from each well prior to sampling. In the event that groundwater recharge is slow, the purging process will continue until the well is purged “dry”. After the water level has returned to its pre-purge level (or within a maximum of two hours), samples will be collected. If the water level is slow to recharge and does not reach its pre-purge level within two hours, then samples can be collected after sufficient water has recharged, and the degree of recharge indicated in field notes with time and depth to water noted.

LCS, Inc. WELL CONSTRUCTION DETAIL

PROJECT/LOCATION: _____ PROJECT No. _____

CLIENT: _____ WELL No. TPMW

DATE COMPLETED: _____ SUPERVISED BY: _____



REFERENCE POINT
Elevation/Depth: NA

SURFACE SEAL
Type/Depth: NA

DEPTH OF SURFACE CASING: NA

RISER PIPE Size/Type: 1.0 inch/Schedule 40 PVC

DIAMETER OF BOREHOLE: 2.2 inches

TYPE OF FILL: NA

TOP OF SEAL Elevation/Depth: ft. bgs
TYPE OF SEAL: Hydrated bentonite

TOP OF FILTER PACK Elevation/Depth: ft. bgs
FILTER PACK MATERIAL: #00N silica sand

TOP OF SCREEN Elevation/Depth: ft. bgs
SCREEN SIZE/TYPE: 0.010 inch/Schedule 40 PVC

BOTTOM OF SCREEN Elevation/Depth: ft. bgs

BOTTOM OF FILTER PACK
Elevation/Depth: ft. bgs

BOTTOM OF PLUGGED BLANK SECTION
Elevation/Depth: ft. bgs

TYPE OF FILLER
BELOW PLUGGED BLANK: Native soils

BOTTOM OF BOREHOLE
Elevation/Depth: ft. bgs

NOTES

Appendix D

Reference Documents

REFERENCES

Technical Guidance for Site Investigation and Remediation (DER-10), NYSDEC, Division of Environmental Remediation, May 2010.

Guidance for Evaluating Soil Vapor Intrusion in the State of New York, NYSDOH, October 2006.

Draft Brownfield Cleanup Program Guide, NYSDEC, Division of Environmental Remediation, May 2004.

Sampling Guidelines and Protocols, NYSDEC, Division of Water, March 1991.

Compendium of Superfund Field Operations Methods, US EPA, December 1987 (EPA/540/P-87/001).

RCRA Ground-Water Monitoring: Draft Technical Guidance, US EPA, November 1992 (EPA/530-R-93-001).

Soil Sampling Quality Assurance User's Guide (Second Edition), US EPA, March 1989, (EPA/600/8-89/046).

USEPA Region II CERCLA Quality Assurance Manual, Revision 1, USEPA Region II, October 1989.

Technical and Administrative Guidance Memoranda (TAGM); #4032 Disposal of Drill Cuttings, NYSDEC Department of Hazardous Waste Remediation, November 1989.