Environmental Restoration Program
Orchard-Whitney Site (#E828123)
415 Orchard Street – 354 Whitney Street
City of Rochester
Monroe County, New York

Remedial Investigation and Interim Remedial Measures

Work Plan

Prepared for:

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1.0 INTRODUCTION

Lu Engineers has prepared this Remedial Investigation (RI)/Interim Remedial Measures (IRM) Work Plan on behalf of the City of Rochester (The City) for approval by the New York State Department of Environmental Conservation (NYSDEC) Region 8 Division of Environmental Remediation (DER). The Site location is illustrated on Figure 1-Site Location Plan. This plan has been prepared in substantial accordance with DER-10 "Technical Guidance for Site Investigation and Remediation," the NYSDEC "Municipal Assistance for Environmental Restoration Projects" Procedures Handbook and Technical Administrative and Guidance Memorandum (TAGM) 4048 "Interim Remedial Measures Procedures."

The City is undertaking this work under a State Assistance Contract (SAC) with the NYSDEC, which facilitates compliance review and provides partial funding for Site characterization and remediation under the NYSDEC's Environmental Restoration Program (ERP). The RI and IRM efforts described in this plan represent a continuation of investigation and remediation initiated in 2006 that was conducted under the SAC. The City will use the remainder of these funds to complete IRMs and additional RI work described in this Work Plan.

Several environmental assessments and two past phases of subsurface investigation have indicated the presence of contaminated soil and groundwater at the Site. The nature and extent of contamination has not yet been determined, but findings have allowed the identification of a total of 8 areas of concern (AOCs), listed as follows:

- AOC-1: Underground Storage Tanks
- AOC-2: Former Metal Plating Area
- AOC-3: Abandoned Hydraulic Lift
- AOC-4: Former Gasoline Storage and Dispenser
- AOC-5: Drain Systems
- AOC-6: Underground Tunnels and Buried Utilities
- AOC-7: Former 415 Orchard Street "Low-Rise"
- AOC-8: Former Coal Storage

The location of each AOC is indicated on the Site Plan (Figure 2). The purpose of planned RI activities is to more completely delineate and characterize these AOCs and provide sufficient information to adequately evaluate remedial alternatives, if necessary. Planned RI efforts will generally include ground penetrating radar (GPR) surveys, test pit excavations, advancement of soil borings, monitoring well installation, and soil and groundwater sampling to further characterize the Site.

Detailed RI work is planned for AOCs 1, 2 and 3. The detailed RI findings will be used to develop IRMs to remediate these areas of the Site to the extent possible using currently available funding. Contaminated materials and/or hazardous wastes encountered during the RI work associated with AOCs 4 through 8 will also be remediated to the extent possible as part of this project.

Preliminary Site assessment and remedial investigation findings to date are summarized below in the following sections.

1.1 Site Description and History

The Site is located at 415 Orchard Street and 354 Whitney Street in an industrially zoned area of the City of Rochester, New York (Figure 1). The Site consists of two (2) parcels with a combined area of approximately 3.9 acres. The site is located in the center of a commercial/ industrial area on the south side of Lyell Avenue near the intersection of Broad Street. Both parcels have been vacant since the mid 1990's.

The Site was used for various commercial and industrial uses since the early 1900's including tool and die shops, plastics manufacturing, printing operations, metal finishers, electric company and warehousing. From 1915 to 1922 the Site was occupied by Northeast Electric Company and from 1930 to 1967 by DELCO Appliance. Processes and materials that are thought to have contributed to site contamination include production and presence of electrical equipment, heat treating, plating, coal storage, petroleum fuel storage, wastewater treatment, asbestos. From 1971-1994 various tool & die, printers, plastic manufacturers, synthetic foam, metal finishers, bearing, warehousing operations were present on the Site.

Several multi-story factory buildings on the 354 Whitney parcel sustained extensive damage during an arson fire in 2003. Demolition of all structures on the 354 Whitney parcel was completed in 2007. One (1), six (6) story brick/stone structure of approximately 371, 600 square feet remains on the Orchard parcel. An adjacent, heavily dilapidated single story structure was demolished by the City in December 2009. Crushed masonry, brick, concrete and stone building materials created during the demolition process are staged on site for future use during redevelopment.

1.2 Previous Site Assessments and Investigations

From 1999 through 2006, a series of environmental assessments and investigations were conducted at the Site including:

- April 1999: Draft Center City Industrial Park Facility Assessment
- 1999: United States Environmental Protection Agency (USEPA) Hazardous Substance Removal Action
- December 2000: Phase I Environmental Site Assessment (ESA); 354 Whitney Street, 415 Orchard Street, and surrounding properties at 367, 370, and 406 Orchard Street
- August 2003: Pre-demolition Asbestos Inspection of 354 Whitney Street Building 1A.

- August 2003: Pre-demolition Asbestos Inspection of 354 Whitney Street Building 2/2A/Brick Mill
- 2005: Phase II Site Investigation completed by NYSDEC on the 354 Whitney Street parcel as part of a USEPA Targeted Brownfield Assessment

Brief descriptions of each of these investigations and assessments are provided in the following sections.

Draft Center City Industrial Park Facility Assessment, 1999

The Flint, Allen, White & Radley Draft Center City Industrial Park Facility Assessment consisted of visual inspection and analysis of general structural and Site conditions including interior and exterior roof conditions, floor loading potential and an estimated cost for rehabilitation and/or demolition.

USEPA Hazardous Substance Removal Action, 1999

Numerous drums containing suspected hazardous wastes were found in the abandoned 354 Whitney Street building during an inspection conducted by the City and NYSDEC. NYSDEC requested that the USEPA characterize and remove the abandoned wastes to mitigate the significant environmental and human health hazard posed by these substances. USEPA removed and disposed of over 700 drums of various sizes during this removal action. This building was later gutted by fire in 2003 and subsequently demolished by the City in 2006.

Phase I ESA, 2000

The Phase I ESA performed by Day Environmental in 2000 on the Site and several surrounding properties identified a number of environmental concerns including:

- Past use of the Site for industrial and manufacturing purposes;
- The presence of aboveground and underground storage tanks and associated piping;
- Suspect asbestos containing materials (ACM);
- Former coal storage piles and visible leachate;
- Floor drains;
- Containers with unknown contents;
- Suspect polychlorinated biphenyls (PCB)-containing equipment;
- Stained flooring;
- A potential on-Site wastewater treatment system; and
- Petroleum and several hazardous substances above NYSDEC groundwater quality standards in on-Site groundwater monitoring wells (installation date, construction details unknown).

Based on the ESA findings additional investigation was recommended to further characterize the Site. Figure 3 “Previous Assessment Summary” indicates the findings of the 2000 Phase I ESA. This plan, along with subsequent investigation findings, was used to assist in the identification of the AOCs depicted in Figure 2.

Asbestos Pre-demolition Surveys, 2003

Asbestos pre-demolition surveys were completed on the Whitney Street parcel by ENSR International, Inc. in 2005.

NYSDEC Investigation, 2005

The NYSDEC completed an environmental investigation on the Whitney Street parcel under the USEPA Targeted Brownfield Assessment Program that included the installation of six (6) monitoring wells (MWs). A Site-wide geophysical survey and utility assessment was also conducted.

The results of the NYSDEC investigation indicated surface soil samples were contaminated with polycyclic aromatic hydrocarbons (PAHs) and PCBs, as well as metals. However, the investigation was inconclusive as to the source, nature and extent of any subsurface soil or groundwater contamination at the Site. The Site was not listed on the Inactive Hazardous Waste Disposal Site (IHWDS) registry; however, further investigation was recommended to fully evaluate conditions at the Site.

Several of the MWs installed by the NYSDEC remain on the Site and have been used for subsequent sampling and testing including MW-3, 5 and 7. The other wells, MW-1, 2 and 4 were either destroyed or buried by demolition debris resulting from the demolition of structures located at 354 Whitney Street.

2.0 SUMMARY OF ENVIRONMENTAL CONDITIONS

The following sections summarize the findings of sampling and testing conducted by Lu Engineers for the City since 2006.

2.1 RI and IRMs Completed Prior to 2011

The RI, defined in the original Remedial Investigation Work Plan (RIWP), began at the Site in August 2006 and will be continued as defined in the current Work Plan. The following sections summarize RI and IRM work conducted under the NYSDEC ERP to date.

Pre-Demolition Phase

- Collection of twenty-two (22) samples for PCB analysis, from locations throughout the Site structures where previous investigations indicated former transformers or motorized equipment were located. An additional four (4) samples were collected from the water present in the basements of the structure to be analyzed for PCBs;

- Completion of a Hazardous Materials Inventory throughout the structures to identify, characterize, and properly dispose of abandoned wastes at regulated facilities;
- A Limited Lead Inspection and sampling for both the Orchard and Whitney Street parcels;
- Pre-Demolition Asbestos Survey of the Orchard Street Parcel;
- Orchard Street parcel Building Demolition, Inspection, and Air Monitoring.

After removal of regulated wastes from the Whitney Street building, Titan Wrecking and Environmental, LLC completed asbestos abatement and demolition of the structure in accordance with New York State Department of Labor (NYSDOL) variance #06-0493. No above grade building structures remain on the Whitney Street parcel. Below grade basements and tunnels are known to be present and require delineation and evaluation for the potential presence of contaminated materials. These underground structures may also be influencing groundwater and contaminant occurrence and movement on the Site. The locations of known tunnels and apparent basement locations as indicated by openings in the remaining concrete slab covering the eastern portions of the Whitney Street parcel observed to date are shown on each of the figures provided herein.

Post-Demolition Phase

Once the remaining 354 Whitney structures were demolished, Lu Engineers initiated site investigation activities including the following:

- Collection of four (4) surface soil samples from across the entire Site;
- Completion of five (5) off-Site soil borings to establish local background soil concentrations;
- Advancement of fifteen (15) on-Site soil borings;
- Installation of fifteen (15) groundwater monitoring wells to evaluate groundwater quality and flow information;
- Completion of two separate rounds of groundwater sampling (September 2008 and March 2009);
- Completion of eighteen (18) test excavations for sub-slab observation and soil sampling;
- Completion of limited intrusive inspection and delineation of USTs, tunnel system and other buried Site features;
- Water depth and hydraulic conductivity measurements for the wells;
- Development and sampling of existing and newly installed groundwater wells; and
- Completion of a Site survey of topographical features, landmarks, property lines, sample locations and monitoring wells;
- Consolidation and proper disposal of various hazardous and non-hazardous wastes including small amounts of drummed waste liquids, three oil-filled

transformers and 145 cubic yards (approximately 218 tons) of arsenic-contaminated (hazardous waste) ash.

The results of the RI work described above are presented in the following figures:

Figure 4a – Soil Analytical Results (Metals and PCBs)
Figure 4b – Soil Analytical Results (VOCs and SVOCs)
Figure 5a – Groundwater Analytical Results (Fall 2008)
Figure 5b – Groundwater Analytical Results (Spring 2009)
Figure 6 – Groundwater Contours

Laboratory analytical results for all samples obtained during ERP RI work are provided in Appendix A.

Site soils consist of interbedded sand, gravel, silt and relatively small proportions of clay. Concrete, crushed stone and masonry was also observed in the subsurface to varying depths throughout the Site. It is contended that Site soils represent a typical example of udorthents observed throughout areas of the City with a long history of commercial/industrial use. These soils generally comprise the upper 5 to 7 feet of the 15 feet of overburden generally overlying the dolomitic bedrock that underlies the Site.

Groundwater typically occurs at between six (6) to ten (10) feet below the ground surface and flows in a northeastward direction across the site. Surface water is not present on the Site. Hydraulic conductivities have been determined to be approximately $1x10^{-5}$ cm per second. This data will be used to determine groundwater flow velocities as part of the current RI/IRM work effort. It is inferred that the bedrock/overburden interface and presence of buried tunnels, utilities conduits, foundation slabs and other subsurface features represent significant components of the Site groundwater flow regime. The findings of the RI and IRM work described in this work plan will provide a basis for a clear definition of Site groundwater flow patterns. Locations for planned RI/IRM work on the Site are indicated on the RI/IRM Site Plans (Figure 7a and 7b).

2.2 Supplemental Site Past-Use Information

Review of Historical Site plans provided by the City has helped to identify the possible layout of building foundations, USTs, tunnels and other underground features with potential environmental significance that may remain. Figure 8a and 8b indicate the location of past Site buildings as an overlay on the RI/IRM Site plan Figure 7a. These plans, and others developed during the RI process, will be used to focus RI and IRM activities to facilitate complete Site characterization. Site plans will be geo-coordinated and referenced for inclusion in the Site-specific GIS currently under development.

2.3 Conceptual Site Model

Contamination identified at the Site to date is related to years of commercial and industrial operations dating back to the early 1900’s. Known operations include: the production of electrical equipment, heat treating, plating, coal storage, boiler operations, petroleum fuel storage, industrial wastewater treatment, metal finishing, synthetic foam production, printing, plastic manufacturing, and warehousing.

A conceptual Site model for the project Site is outlined in the table below.

Media	Known or Suspected Source of Contamination	Type of Compounds (General)	Contaminants of Potential Concern (Specific)	Primary or Secondary Source Release Mechanism	Migration Pathways	Potential Receptors
Soil	1) Paint Booths 2) Petroleum storage tanks 3) Plating operations 4) Waste oils 5) Wastewater	Metals, solvents, fuels, PCBs	Arsenic; Cadmium; Chromium; Lead; Mercury; Acetone; Ethylbenzene; Methylene Chloride; Toluene; Xylene: PCBs	Leaks and spills	Infiltration / percolation	Human: direct contact if excavation occurs in contaminated areas
Groundwater	Contaminated Soil (secondary source)	Metals, solvents, fuels	Cadmium; Chromium; Lead; Mercury; Benzene; Ethylbenzene; Isopropylbenzene; Napthalene; 1,2,4 Trimethylbenzene, (TMB); 1,3,5 TMB; Xylene, PCBs	Infiltration or percolation from soils	Groundwater flow	Human or ecological receptors are not expected to be exposed
Air/Soil Vapor	Contaminated soil or groundwater under buildings	Solvents, fuels	Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	Volatilization of contaminated groundwater and/or soil	Migration into buildings	Human: Inhalation during investigation and cleanup
Building/ Underground Tunnels	1) Transformer oil 2) Fluorescent light capacitors 3) Building materials 4) Ash 5) Drains and Trenches 6) Manufacturing equipment	PCBs, Asbestos, waste oils	PCBs, Asbestos, waste oils	Leaks/Spills, disturbance of building materials	Dispersion by human activity	Human: direct contact with site workers/ visitors, inhalation

Previous environmental investigations have revealed that volatile organic compounds (VOCs), several metals, and semi-volatile organic compounds (SVOCs) have been detected in subsurface soils and groundwater above NYSDEC Soil Guidance Values (6 New York Code, Rules, and Regulations (NYCRR) Part 375-6) on the Whitney Street parcel. Information on the Orchard Street parcel is limited due to existing structures. There are no local private wells in the area of the Site and the surrounding community is on public water and sewer service.

3.0 SCOPE OF WORK

3.1 Purpose and Objective of the RI and IRM

Site investigation efforts to date have included the former location of the structures at 354 Whitney Street and the outer perimeter of the 415 Orchard Street buildings.

Surface soil sampling, subsurface soil sampling, well installations and groundwater sampling have been conducted on-Site and on City-owned property surrounding the Site. The single-story "Low- Rise" portion of the 415 Orchard Street property was demolished in late 2009. Asbestos materials and the extremely dilapidated condition of the Low Rise had prevented subsurface investigation efforts in this area. The 6-story 415 Orchard Street "High-Rise" building is still standing and has been evaluated to the extent possible, but unsafe conditions and asbestos remain. Cleanup of the High-Rise structure will be necessary to provide full access and possible subsurface investigation beneath the building's foot print at some point in the future.

The purpose of the current phase of the RI and IRM will be to complete Site characterization efforts and remediate accessible contamination. The RI will be completed within the 415 Orchard Street Low-Rise footprint and portions of the 354 Whitney Street property that were not completely evaluated during investigations to date. The objective of proposed IRM and RI efforts is to adequately define the nature and extent of Site contamination such that the NYSDEC can prepare a Record of Decision (ROD) for the Orchard Whitney Environmental Restoration Project (ERP) Site.

For ease of reference, Site features and RI findings to date have been categorized into a total of eight (8) AOCs within the Orchard-Whitney Site including:

- **AOC-1:** Underground Storage Tanks (located on the west side of the 415 Orchard Street High-Rise)
- **AOC-2**: Former Metal Plating Area (located immediately west of AOC-1)
- **AOC-3**: Abandoned Hydraulic Lift (located in the north-central portion of the Whitney Street (open) parcel)
- **AOC-4**: Former Gasoline Storage and Dispenser (located in the center of the Whitney Street Parcel)
- **AOC-5**: Drain Systems (located beneath former buildings in the Whitney Street parcel)
- **AOC-6**: Underground Tunnels and Buried Utilities
- **AOC-7**: Former "Low-Rise" (footprint of former single-story building at 415 Orchard)
- **AOC-8**: Former Coal Storage (located along southern Site perimeter)

The location of each AOC is indicated on the Site Plan (Figure 2) and the RI/IRM Site Plans (Figures 7a and 7b). The following sections provide brief descriptions of the findings in each area defined above.

<u>AOC- 1, Underground Storage Tanks</u>

At least four (4) underground storage tanks (USTs) are located in this area. These tanks appear to range in size from 1,000 gallons to 8,000 gallons based on limited measurements possible due to the presence of sand in two (2) of the tanks and other access restrictions. Investigation findings indicate that three (3) of the tanks appear to have been used for fuel oil storage in the past. One (1) of the tanks, likely the smallest, appears to have contained gasoline based on odors at the time this area was initially investigated in 2008.

The condition of these tanks and surrounding soil and groundwater cannot be fully assessed due to the presence of concrete surface cover and the presence of large quantities of crushed brick to the south.

AOC-2, Former Metal Plating Area

Surface features in the remaining concrete slab covering a large portion of AOC-2 and review of past environmental assessment documentation indicate that this location was used for plating metal car parts and related work.

Soil and groundwater, TB-19 and MW-17, respectively indicate the presence of high concentrations of chromium exceeding guidance and regulatory criteria by several orders of magnitude. The valence state of the chromium has not been determined, and the possible occurrence of cyanide, often a constituent in plating wastes, has not been ascertained. In addition, the quantity of affected soil and groundwater has not been determined for AOC-2, in part, due to the lack of contaminant delineation to the south. As is the case for AOC-1, the southern portion of AOC-2 is covered by large amounts of brick demolition debris. Limited delineation to the west, north and east is provided by nearby wells, borings and test pits completed during the initial phase of the RI.

AOC-3, Abandoned Hydraulic Lift

An in-ground hydraulic lift cylinder is located in the north-central portion of the Whitney Street parcel. It is inferred that a hydraulic reservoir is located underground in the vicinity of this lift, but the reservoir's location has not been determined.

Soils in the area of the lift were observed to be contaminated with petroleum as evidenced by odors and elevated MiniRAE 2000 photoionization detector (PID) (10.2 eV lamp or equivalent) (PID) readings at TP-03. Soil and groundwater analytical in this area (MW-18 and MW-19) did not indicate the presence of elevated petroleum constituents or other contaminants of concern. The hydraulic lift, reservoir, associated piping and potentially contaminated soils will require removal and proper disposal as part of the final evaluation of the environmental significance of this site feature.

AOC- 4, Former Gasoline Storage and Dispenser

Previous environmental assessment work identified a gasoline dispenser pump in the north-central portion of the 354 Whitney Street parcel, approximately 75 feet southwest of AOC-3. Test pit excavation in this location (TP-08) indicated the presence of strong petroleum odors and elevated (>1,000 ppm) PID readings. Soil and groundwater analytical results did not indicate the presence of elevated concentrations of contaminants of concern. The presence of elevated levels of volatile organic compounds (VOCs) in soils detected by PID readings indicates a potential issue for future development.

No documentation has been reviewed relative to removal of the documented storage tank, dispenser pump or associated piping. It is inferred that these features may have been removed during demolition of the structures formerly located on the western portions of the 354 Whitney parcel. Additional research and possible geophysical investigation is necessary to verify the nature and extent of subsurface contamination associated with AOC-4. The approximate location of the extent of AOC 4 as indicated by previous investigations is shown on Figures 2 and 7a.

AOC- 5, Drain Systems

Floor drains beneath the former buildings located within the Whitney Street parcel were observed during the test pit excavations. Two (2) of the drains included clay sumps that were intact prior to excavation at TP-01 and TP-05. These clay sumps were found to contain sludge and sediment contaminated with hazardous waste concentrations of non-chlorinated organic solvents. Release of this contamination to the environment was not indicated. The sludge was containerized and disposed of as hazardous waste. The layout of the underground drainage features is not entirely indicated on Figures 2 and 7a due to the fact that insufficient information exists at the present time for complete mapping purposes.

It is inferred that additional contamination may be present in other locations associated with drain systems in the Whitney Street parcel.

AOC-6,Underground Tunnels and Buried Utilities

Based on previous investigations, plan review and RI efforts to date, at least two (2) tunnels are located beneath the 354 Whitney portion of the Site. These tunnels were apparently used to move equipment and materials around the Site as part of past manufacturing operations. The apparent location and orientation of these tunnels is indicated on Figures 2 and 7a. Tunnel and underground utility locations are also indicated on Figures 8a and 8b. The exact layout of the tunnels has not been determined. Measurements taken during 2009 RI work indicated a total tunnel depth of 20 feet and the presence of at least 4 feet of standing water. No indications of detectable contaminants of concern were observed in water sampled from the tunnels in 2007.

The tunnels were reportedly empty during inspections conducted prior to 2007. Several locations were accessed from the surface for visual inspection during the 2009 RI. Apparent HVAC equipment was observed in the tunnel access point located at the northwest corner of AOC-1. No visual access to the tunnels was possible elsewhere on the Site, but underground voids were indicated during limited demolition using a hoe-ram. The presence of these voids was used to identify presumed tunnel locations as indicated on Figures 2 and 7a.

Previous investigations also indicated the presence of various buried utilities throughout the Site. The location of these partially mapped utilities has not been verified, but as is the case with the tunnel system, may represent conduits or preferred pathways for migration of contamination beneath the Site. Determining the location and capacity of Site utilities will also provide data necessary for completion of the pre-development engineering assessment planned for the subject property.

AOC-7, Former Low-Rise

The presence of the single story portion of the 415 Orchard structure prevented subsurface investigation beneath the former Low-Rise footprint due to widespread asbestos debris observed in this structure. Little information is available as to the nature of past operations in the Low-Rise. Limited inspection in 2007 and 2009 did not identify the presence of environmentally significant equipment or materials. A full inspection was not possible until the building was demolished.

The Low-Rise was demolished and all asbestos was removed in accordance with applicable regulations by the City in December 2009. With access to the footprint of the former Low-Rise now possible, RI efforts will be expanded to include this portion of the Site.

AOC-8, Former Coal Storage

The southern perimeter of the Site is defined by a railroad alignment reportedly used to supply equipment and materials to former Site manufacturing operations. This past activity has been confirmed by review of past investigations and historical aerial photographs.

Coal was used as a fuel for the boiler system that was the Site power plant. Coal was offloaded from rail cars and stored in “coal pockets” reportedly located along the southern Site perimeter. Portions of the eastern extent of this area were partially evaluated (TB-07) in 2008 RI work. However, the extent and environmental condition of the former coal storage area (AOC-8) has not fully been assessed. It is noted that construction/demolition (C/D) debris consisting primarily of brick and masonry is stored throughout the central and western portion of AOC-8.

Locations where RI and IRM activities are planned are indicated on Figures 7a and 7b and referenced herein. Figures 8a and 8b (and other documentation of past building and features currently under review) will be used to assist in determining the exact placement of subsurface sample and test locations. It is noted that, to the extent possible, RI efforts will be coordinated with the pre-development engineering assessment work planned for the Site.

Planned remedial investigation work associated with AOC-2, AOC-4, AOC-7 and AOC-8 will include subsurface investigation by means of well installations, soil borings, and test pits. The full extent of the tunnel system, buried utilities and drainage systems (AOC-6 and AOC-5, respectively) beneath the 354 Whitney property and Low-Rise (AOC-7) will be ascertained primarily using geophysical rather than intrusive methods to the extent possible. Planned remedial efforts will include proper closure of accessible USTs (AOC-1) and a hydraulic lift (AOC-3); removal/disposal of contaminated materials found within drainage features (AOC-5); and remediation of hazardous waste-level chromium contamination (AOC-2 and AOC-1 respectively) associated with past Site operations. In addition, hazardous materials encountered during the investigation portion of the work effort will be handled and disposed of in accordance with applicable regulations.

Site data collected during past phases of the Orchard/Whitney ERP project has been stored in a geodatabase to facilitate access and plan creation using geographical information system (GIS) software. This database will be updated during the continuing RI and IRM effort described herein. In addition, available past data not currently included in the Site geodatabase will be input to the extent necessary to provide a comprehensive collection of project information.

3.2 Phasing

To ensure efficient use of the resources required for this project, it is essential that the sequence of site activities be well defined. Although the remedial investigation findings to date provide enough data to warrant remedial work, the UST and former plating areas have not been completely defined. For this reason, additional investigation is required to verify the extent of contaminated soil and groundwater and the size, number and configuration of the abandoned USTs before remedial work can begin. Additional investigation is also necessary to complete the RI with respect to identifying potential impact associated with underground utilities and tunnels, the former Low-Rise footprint and the southernmost area of the Site where coal pockets were reportedly present in the past. It is contended that the hydraulic lift, described above as AOC-3, has been adequately assessed for remedial planning purposes.

The RI and IRM work at the Site will be conducted in the following sequence:

1. Site preparation
2. Evaluation of tunnels and underground utilities using geophysical methods and detailed inspection to verify location of buried utilities and tunnels
3. Partial excavation of USTs to determine subsurface conditions and to verify/sample contents
4. High resolution test boring/groundwater sampling program within former plating area
5. Brief work plan addendum for review and approval
6. UST closures
7. Hydraulic lift closure
8. Test pit excavations
9. Plating area source removal
10. Well installation, development, and sampling

The proposed schedule for completion of this work is provided in Section 8.0 of this work plan. All activities will be conducted in accordance with the NYSDEC-approved Quality Assurance Project Plan (QAPP) and Community Air Monitoring Plan (CAMP) used for the previous phases of site investigation and IRMs. These documents are provided as Appendix D and C, respectively. Lu Engineers will provide oversight, air monitoring, soil screening, GPS data and photographic and other documentation during all RI and IRM activities. The following sections define the work required to complete each of the tasks comprising the RI/IRM effort.

3.2.1 Site Preparation

The work area is completely fenced. No additional fencing is anticipated. If fence repair is necessary the City will provide the services necessary to secure the Site.

A large amount of C/D debris has been staged on the southern and western perimeter of the Site. This material consists of crushed brick, concrete and other masonry debris derived from demolition of Site buildings by the City over the past ten (10) years. The central portions of the 354 Whitney parcel include depressions and pits that have been previously investigated and constitute a potential slip, trip and fall hazard to Site workers.

Prior to initiation of RI and IRM efforts, pits and depressions not requiring additional investigation will be described/logged, photographed, located using GPS and then filled with Site C/D debris to mitigate this hazard. Upon completion of IRM and RI activities, remaining depressions and pits will also be logged, photographed and located using GPS prior to being backfilled using this material. As noted in the following sections, Site C/D debris will be used as backfill during completion of all RI work. The volume of C/D debris remaining after this process will be estimated using existing survey data and observed volumes while filling the void spaces.

3.2.2 Evaluation of Tunnels and Underground Utilities

The underground features described as AOC-5 and AOC-6 ("Drainage Systems" and "Underground Tunnels and Buried Utilities", respectively) require additional evaluation in order to determine their potential environmental significance and to identify potential environmental or other impediments to future development of the Site. These features may also affect the distribution of subsurface contaminants by allowing preferred migration pathways and/or representing barriers to groundwater flow patterns.

The RI/IRM Site Plans (Figures 2, 7a and 7b) indicates the location of the known extent of AOC-6. The layout of underground drainage features defined herein as AOC-5 is not indicated due to the fact that insufficient information exists at the present time for mapping purposes. The former locations of tile drainage features removed during the initial phase of the RI in 2008 are indicated as TP-01 and 05 as shown on Figures 2, 7a and 7b.

The possible presence of hazardous materials, and asbestos within the tunnels and/or utilities as well as the potential for contaminant migration pathways will be assessed during this evaluation.

A detailed record review will be conducted prior to initiation of on-Site evaluation of buried utilities. Research will include correspondence with utility companies known to own and/or maintain underground utilities in the area of the Site. Available record plans will be reviewed to determine the location of Site drainage systems and other utilities that once served past Site operations and structures.

Ground penetrating radar (GPR) will be used to attempt to determine the precise location of the tunnel system located within the 354 Whitney parcel and elsewhere as necessary to define the extent of the system on-Site. This subsurface exploration method is based on the introduction of a high frequency radio (radar) signal into the subsurface and recording the signal reflected back to the surface. The GPR unit produces a real-time profile of the reflected signal that is interpreted in the field. The profile provides an approximated depth of observed features based on the delay between the signal and refection. Changes in soil type, moisture content and the presence of subsurface features such as piping or tanks are visible on the profile. If significant features are identified, the images can be saved on a USB drive for future reference or printing.

The presence of widespread reinforced concrete flooring in the investigation areas precludes the use of electromagnetic geophysics and creates difficulties in the use of GPR associated with the presence of voids immediately beneath the slabs. However, it is contended that careful selection of locations where subsurface features are suspected will facilitate the use of GPR to identify the extent of the tunnel system and verify the location of utilities previously mapped on the Site. The GPR approach will also be used to attempt to determine the precise location and orientation of the USTs to be removed within AOC-1 prior to initiation of the work described in Section 3.2.3. GPR will also be used to attempt to identify the possible location of abandoned UST(s) and/or piping associated with past operations within AOC-4.

Locations planned for the use of GPR and detailed physical inspection will be selected in the field with the concurrence of the City based on the mapped location of the tunnel system as identified by Lu Engineers in 2008, and underground utilities mapped by previous investigators (Empire Geo, Inc. in 2005) at the direction of the NYSDEC. This data will be verified and tied into the site map using a hand held global positioning system (GPS) unit. Based on the findings of the GPR survey, additional locations for physical inspection may be selected.

Detailed inspection of the tunnels will not include entry. Tunnels will be accessed by the use of a hoe-ram or equivalent equipment as done during RI work in 2008. Locations for inspection will be selected with the concurrence of the City and will be based on the GPR and research findings. Visual inspection will be conducted from the surface using high-power flashlights to illuminate the interiors of tunnels and utility conduits/chases to the extent possible. Interior vapor levels will be continuously monitored during inspection using a PID.

Boroscopic investigation is not anticipated to be necessary, but will be considered if adequate access is not otherwise possible. If running water is identified, or if continuity between inspected locations requires verification, smoke and/or inert dye testing may be used to derive all available information from the inspection process. Inspection locations requiring the use of heavy equipment for access will be inspected concurrently with later RI/IRM work to avoid a separate equipment mobilization.

Additional data regarding the layout of tunnels and underground features may also be obtained during the test pit excavation process described in Section 3.2.8. It is noted that a detailed evaluation of subsurface features including utilities and the tunnel system is a substantial component of the planned pre-development engineering assessment. Careful coordination between the RI and the pre-development work will avoid duplication of effort and will maximize the quality and volume of useful data obtained during this project.

3.2.3 UST evaluation

Based on the investigation findings to date, it is estimated that a total of four (4) USTs will be removed, cleaned, and disposed of in accordance with NYSDEC protocols in DER-

10 Section 5.5, Petroleum Bulk Storage (PBS) regulations in 6 New York Codes, Rules, and Regulations (NYCRR) Part 6.13.9 and all other applicable regulations. Based on measurements taken on-Site, it is assumed for estimating purposes that two (2) 8,000-gallon, one (1) 5,000-gallon, and one (1) 1,000-gallon USTs will be removed. These tanks are defined collectively as AOC-1, as identified on Figures 2, 7a and 7b. It is noted that the actual configuration, capacities and number of USTs present in this location may be substantially different than as described above. Recent review of available record plans indicates the presence of a 10,000-gallon UST as indicated on Figure 8a.

Verification of the number and size of tanks associated with AOC-01 is the intent of the work defined in this section. In the event that additional USTs are identified, protocols used for the evaluation of such tanks will be consistent with previously approved methods described herein.

To assure that the closure process proceeds as planned, the area containing the USTs will be investigated to verify the actual size, construction, configuration and contents of all tanks present. This portion of the Site is limited to the former courtyard defined by the former boiler house and plating area to the west, brick mill to the north, Low-Rise to the east and High-Rise to the south. The approximate boundary of the area of the Site including USTs is shown as AOC-1 on Figures 2, 7a and 7b.

With the exception of several isolated locations where concrete was broken up for preliminary investigation work in 2008, the entire area is covered by reinforced concrete slabs approximately 4 to 6 inches in thickness. The slabs preclude the use of geophysical methods for identifying the size, number and configuration of USTs present. Partial excavation is therefore necessary to identify the actual subsurface conditions in this area in order to facilitate the closure process. As described in Section 3.2.2, attempts will be made to verify subsurface conditions using GPR to the extent possible.

A qualified and licensed tank removal firm will be used to provide labor and equipment necessary to expose the tanks, piping, and other buried features in this area. In order to completely access the area including the USTs at the Site, a portion of the crushed brick and related debris will be moved to an approved location in the immediate area of the USTs and later used as backfill. It is assumed that a front-end loader or equivalent equipment will be needed to facilitate this process.

Prior to excavation, the concrete slab located above the USTs will be broken up with a hoe-ram and removed to allow free access to the subsurface. The concrete will be crushed to the extent possible and staged with crushed building debris at an approved location on-Site. The size, orientation and contents of each tank will be determined once the USTs have been accessed. This data will be used to update the NYSDEC PBS Registration for the facility to allow the appropriate State notifications to be completed. No fee is anticipated due to the project being handled within the Environmental

Restoration Project (ERP). Lu Engineers will provide oversight, and health and safety monitoring, including air monitoring, during this process.

Based on visual inspections to date, the material contained in the USTs is comprised of fine-grained sand. Sand to be removed from the USTs will be sampled and analyzed as necessary for disposal to allow pre-profiling and live loading of contaminated materials in order to expedite the IRM as described in section 3.2.6. Depending on the actual parameters required by the selected disposal facility (to be determined), it is assumed that this analysis will include the following:

- NYSDEC Spill Technology and Remediation Series (STARS) Volatiles and Semi-Volatiles (Environmental Protection Agency (EPA) 8260 and 8270 BN)
- RCRA Metals – EPA Method 6010B/7470A
- Flashpoint
- Polychlorinated biphenyls (PCBs) - EPA Method 8082

3.2.4 Detailed Investigation of Former Metal Plating Area

The elevated chromium concentration observed in groundwater sampled (by low-flow methods) from MW-17 (32,300 ug/l) and elevated concentration in soil at TB -19 (584 mg/kg) indicates the need for further delineation of the chromium levels in soil and groundwater in this area. It is inferred that unidentified, more highly contaminated soils in this area of the Site may be acting as a source area for the observed groundwater contamination. IRM efforts in 2008 and 2009 also indicated the likely presence of residual arsenic contaminated sediments in this area of the Site. This portion of the Site is referred to as AOC-2 and is identified on Figures 2, 7a and 7b.

Prior to investigation of AOC-2, a portion of the crushed demolition debris located to the south of existing MW-17 will require removal and relocation within the Site. Although some of this material will be used as backfill for the adjacent tank removal area, an alternative location for excess debris, likely to be the top of the existing berm to the immediate south of AOC-2, will be determined with the concurrence of the NYSDEC and the City.

As indicated on Figure 7a and 7b, a total of approximately 20 soil borings will be installed to better characterize the nature and extent of contaminated soil. Each of the borings may be converted into a one-inch diameter temporary micro-well to allow groundwater sampling for more complete source area delineation. The actual number and location of soil borings and micro-wells will be defined by the NYSDEC and the City as work progresses.

Soil borings will be installed using hollow stem auger methods, as defined in Section 3.2.10 and in the QAPP using a CME-75 or equivalent drill rig. A four (4) foot sample barrel lined with a new acetate sleeve will be used for all subsurface soil sampling in this area. If shallow (less than approximately 15 feet below grade) refusal is encountered as a result of buried concrete, building foundations or similar materials, coring or roller bit drilling will be considered to attain target depths at each location. Borings will be advanced to bedrock or auger refusal, which is anticipated to be approximately 15 feet below grade in this location. Sampling will be conducted as defined in the QAPP and as further specified herein. It will be necessary to decontaminate drilling equipment and tooling between each boring/micro-well location. Decontamination residues will be discharged to the ground surface at an approved location on-Site as done previously.

Each soil sample will be logged by an appropriately qualified professional and screened for the presence of volatile organics using a PID. Soils will also be screened at one foot increments for the presence of arsenic and chromium by means of a Thermo Scientific NITON XL3t 600 Series analyzer (X-ray fluorescence (XRF) testing). The manufacturer indicates that this meter has detection limits for arsenic and chromium of 11 and 85 ppm (mg/kg), respectively. All data collected during this process will be entered into the subsurface logs prepared for each boring location.

Sample locations and depths will be determined by the field team leader in concurrence with the City as work progresses. A total of 20 soil samples obtained from discrete depths corresponding to selected XRF test intervals will be analyzed for RCRA metals (Category B deliverables) by an accredited laboratory. Laboratory analysis results will be used to extrapolate results from XRF data to be used as a screening tool during the source removal process.

Once each boring is advanced to refusal, a micro-well will be installed to provide temporary access to groundwater for sampling and source area delineation. Wells will be installed with new 0.01-inch screen size and #4 quartz sand will be used to fill the annulus as the augers are withdrawn.

Each micro-well will be allowed to stabilize for at least twelve (12) hours prior to sampling and developed, if necessary. Low-flow methods will be used to obtain groundwater samples from each location where water is present. Each groundwater sample will be analyzed for RCRA metals only with the exception of up to two (2) additional samples to be analyzed for hexavalent chromium and cyanide.

In addition to soil borings, test pits will also be excavated within AOC-2 in order to determine whether hydrogeologic or other connections exist between AOC-2 and other areas of the Site. Features associated with AOC-2 include AOC-6, the inundated base of the former smoke stack and former location of the adjacent boiler room.

All micro-wells, test pits and other Site features will be mapped using GPS. Sample depths will also be logged and entered into the Site geodatabase to facilitate data access and visualization (i.e., reporting and mapping). If considered relevant based on the defined nature and extent of contamination within AOC-2, 3-dimensional graphical representations of contaminant occurrence will be prepared to assist with the closure process described in Section 3.2.9. At a minimum, a detailed map will be prepared indicating the areas of AOC-2 found to contain soils requiring stabilization and disposal. All mapping will provide an indication of the depth of elevated metals concentrations exceeding applicable criteria. Mapping will be used as a basis for determining more precise estimates as to volumes and quantities of environmental media to be remediated.

In order to facilitate eventual disposal after stabilization of affected soils, waste characterization analysis will be completed for up to two (2) "worst-case" samples as identified at the discretion of the field team leader. Waste characterization samples will also help to determine disposal options. These samples will be analyzed for the following parameters:

- Ignitability
- Toxic Characteristic Leaching Procedure (TCLP) Metals
- Volatile Organic Compounds (VOCs)- STARS list (EPA Method 8021B)
- Semi-volatile Organic Compounds (SVOCs)- base/neutrals (EPA Method 8270D)
- Amenable Cyanide
- Paint Filter Test

The soil planned for removal from the former plating area is anticipated to exhibit hazardous waste levels of leachable chromium and/or arsenic based on existing analytical results from the 2008 and 2009 sampling events. To allow off-Site disposal as non-hazardous waste, on-Site stabilization is proposed. This task is described in detail in Section 3.2.9. Before implementation, a treatability bench study will be conducted on representative samples of the affected soils to define the dosage rate required to provide adequate stabilization. The results of this bench study will be shared with the City and NYSDEC for discussion prior to implementation.

Assuming that hazardous waste levels of leachable chromium and/or arsenic are identified during this part of the investigation, the stabilization goal with respect to chromium and arsenic will be to analytical levels below the Land Disposal Restriction criteria of 0.75 ppm.

As described in Section 3.2.9, for estimating purposes it is assumed that a total of 1,000 tons of soil will require excavation, stabilization and disposal as non-hazardous waste. Lu Engineers will work with the City and NYSDEC to obtain final approval for the source area removal/remediation program as specified in Section 3.2.5. Alternatives to stabilization will be evaluated as data becomes available during the detailed investigation planned for AOC-2.

3.2.5 Work Plan Addendum

Based on the results of the investigation work planned for AOC-1 and AOC-2, Lu Engineers will prepare an IRM work plan addendum to more precisely define the scope of the IRM process. This plan will specify the actual number, size, type and contents of the USTs and define the projected soil and groundwater quantities to be removed from the plating area.

This addendum will be used to obtain final approval of the planned IRM efforts from NYSDEC Region 8. Approvals from NYSDOH and NYSDEC are anticipated to be necessary for this part of the process to ensure regulatory concurrence with the selected remedial approach. The addendum will also serve as a clear guide and reference for field personnel to use during implementation of the IRMs. The following Sections describe the anticipated Scope of Work based on information obtained to date.

3.2.6 Underground Storage Tank Closures

It is assumed that, due to the fact that one or more of the USTs associated with AOC-1 appear to be filled with sand, the City Fire Department will allow them to be opened for sand removal during the excavation process. Opening of these tanks will be done by means of a “nibbler” or equivalent hydraulic cutting tool to avoid the generation of heat or sparks. Lu Engineers will work with the City of Rochester Fire Marshall to obtain a variance for partial demolition of the tanks on-Site to facilitate access to tank contents for removal and disposal.

Sand contained within the USTs will be live-loaded into trucks for immediate transportation and disposal off-Site. Disposal coordination will be based on the pre-profiling work described in Section 3.2.3.

If de-watering of the excavation is required, this water will be pumped directly into a 20,000-gallon frac tank for staging prior to transportation off-Site and disposal. For estimating purposes, it is assumed that 20,000 gallons of water will require disposal during the tank closure process. The water will be profiled for disposal before work begins using the existing groundwater data obtained from this area of the Site. It is assumed that this water will require disposal as a hazardous waste due to the elevated levels of chromium observed at MW-17.

Lu Engineers will provide continuous perimeter and work zone air monitoring during removal activities using a MiniRAE 2000 PID to ensure that workers and the public are not exposed to elevated concentrations of VOCs.

Upon excavation of the USTs, Lu Engineers will screen the sidewalls and floor of the tank pit with a PID and collect confirmation soil samples to verify remaining soil conditions, in accordance with NYSDEC DER-10. An XRF may also be used for screening if indicated by the findings of the assessment work described in Section 3.2.4 with respect to AOC-2.

For estimating purposes it is assumed that a total of ten (10) confirmatory soil samples will be obtained. Soil samples will be obtained from each test pit and well location and analyzed (with Category B Deliverables) for the following parameters:

- VOCs – EPA 8260 (plus NYSDEC STARS compounds)
- SVOCs – EPA Method 8270 (STARS Only)
- RCRA Metals – EPA Method 6010B/7470A

The open excavation left by the removal of the USTs will be back-filled using crushed brick material located on-Site, adjacent to the excavations. It is noted that excavation in the area may be limited by the presence of the High-Rise. Use of this material will mitigate potential compaction problems during backfilling caused by groundwater infiltration. The widespread presence of concrete, masonry and brick materials in Site soils sampled to date suggests that the use of these materials should not have a significant effect on groundwater pH or other background Site groundwater chemistry. Testing for pH will be conducted as necessary before and after IRM work is complete.

Other than sand removed from within the USTs, disposal of contaminated soil is not anticipated as part of this IRM.

It is assumed that the IRM work necessary at AOC-1 may result in the destruction of MW-16. If this occurs, this well will be replaced during the work described in Section 3.2.10. If significant contamination is identified during the tank closure process, one or more recovery wells may be installed during backfilling in this area. The possible installation of wells into the excavation backfill may preclude the need for a drilled replacement well for MW-16. This determination will be made with the concurrence of the City and NYSDEC.

3.2.7 Hydraulic Lift Closure

The hydraulic lift located in the former automotive shop at the northwestern corner of the former 354 Whitney Street building will be closed in accordance with applicable protocols and regulations. The location of this lift is indicated on Figures 2 and 7a.

The lift will be partially excavated with a backhoe by the contractor concurrently with the UST closures process. The lift will be pulled from its sleeve and decontaminated. Soils in the area of the lift were observed to be minimally contaminated with petroleum as evidenced by odors and elevated PID readings at TP-03. Soil and groundwater analytical in this area (MW-18 and MW-19) did not indicate the presence of elevated petroleum constituents or other contaminants of concern. Therefore, petroleum impacts are anticipated to be minimal. PCBs have not been observed in analytical results obtained from this location (TP-02 and 03).

The cylinder, sleeve, associated piping and oil reservoir will be excavated and rendered free of oil and contaminated residues such that the steel will be acceptable for scrap metal recycling. Oils and contaminated soils will be containerized and disposed of as appropriate. Available construction/demolition debris will be used to backfill the hydraulic lift excavation. Soil or groundwater disposal are not anticipated to be necessary for closure of the hydraulic lift.

One confirmatory soil sample will be obtained from the bottom of the excavation once the lift has been removed. This sample will be analyzed (with Category B Deliverables) for the following parameters:

- VOCs – EPA 8260 (plus NYSDEC STARS compounds)
- SVOCs – EPA Method 8270 (STARS Only)
- RCRA Metals – EPA Method 6010B/7470A
- PCBs- EPA Method 8082

3.2.8 Test Pit Excavations

Lu Engineers will continue proposed RI work for the area formerly occupied by the single-story “Low-Rise” portion of 415 Orchard Street (AOC-7). The southern portion of the Site will also be evaluated with respect to former uses including coal storage defined as AOC-8. Planned activities for this task will include excavation of twenty (20) test pits. Test pits will also be used as part of investigation efforts associated with AOCs 1, 2, 4, 5 and 6 as described previously. The location of all test pits will be determined with the concurrence of the NYSDEC and the City. Proposed locations for test pits identified to date are indicated on Figure 7a, 8a and 8b.

The test pits will be excavated and sampled according to the methods and procedures detailed in the QAPP included in Appendix D.

Test pits will be excavated to bedrock, if possible in each location, using a 300-series excavator. All materials removed from the pit will be returned and the pit will be completely filled before the backhoe leaves the Site. A PID will be used to continuously monitor gases exiting the test pits during excavation and sampling operations. Areas associated with former coal storage will also be screened with a methane detector as excavation progresses.

Lu Engineers will provide continuous perimeter and work zone air monitoring during excavation activities using a PID and other instrumentation as necessary to ensure that workers and the public are not exposed to elevated concentrations of VOCs dusts, methane and/or other contaminants of concern. As indicated by prior sampling and testing, XRF testing will be considered and used if necessary as an additional screening method for the test pit investigation process. Testing to evaluate the possible occurrence of methane will also be conducted as part of this process. XRF testing will also be used in areas where metal contamination was previously identified or is suspected.

A Site specific CAMP is included in Appendix C. Dust suppression will be provided as necessary using water available from the nearest fire hydrant located adjacent to the Site. All appropriate coordination will be provided with the City Bureau of Water and Lighting for access and a backflow preventer.

Field screening with the PID, XRF, and observations made during excavation activities will be used to isolate any VOC contamination boundaries. Soil samples will be obtained according to the QAPP using a stainless steel spoon or trowel.

Test pits will be backfilled upon completion of sampling with excavated material and concrete from each test pit. Photographs will be taken at each test pit and logs will be developed to appropriately document the findings.

Soil samples will be obtained from each test pit and analyzed (with Category B Deliverables) for the following parameters:

- VOCs – EPA 8260 (plus NYSDEC STARS compounds)
- SVOCs – EPA Method 8270 (NYSDEC STARS Only)
- RCRA Metals – EPA Method 6010B/7470A
- PCBs - EPA Method 8082

3.2.9 Plating Area Source Removal

The goal of this IRM is to remove chromium and arsenic impacted soils to meet Restricted Commercial SCOs (400 and 16 ppm respectively). Based on the IRM work plan addendum described in Section 3.2.5, contaminated soil and groundwater will be removed from AOC-2 for treatment and/or disposal at approved facilities. An appropriately qualified contractor will be used to conduct all excavation, stabilization and dewatering activities under the direction of the City.

During removal of affected soils, excavated materials and the excavation floor and sidewalls will be examined for any physical evidence of contamination and screened with a PID and XRF along transects no more than 5 feet apart. Sampling will be biased to suspected areas of greatest contamination. To the extent possible under the current budget, soils will be removed for stabilization and disposal if XRF readings exceed 400 ppm (or equivalent) for chromium and/or 16 ppm for arsenic. It is noted that the 6NYCRR Part 375 Restricted Commercial Soil Cleanup Objective is 400 ppm for chromium and 16 ppm for arsenic. Data obtained during the detailed evaluation described in Section 3.2.4 will be used to precisely focus excavation and/or in-situ remedial activities on the areas and depths where the highest contaminant concentrations were identified.

The following discussion is based on the assumption that the appropriate remedial approach for AOC-2 will be excavation and stabilization combined with offsite disposal of soils and water produced during the excavation process. The assumed use of this approach was necessary to allow reasonable IRM cost estimates to be prepared. The actual IRM(s) used to address contamination associated with this area of the Site will be based on the findings of the detailed investigation of AOC-2.

The ground surface in the former plating area is predominantly comprised of concrete. Prior to excavation, the concrete pavement located above the contaminated soil and groundwater will be broken up with a hoe-ram and removed to allow free access to the subsurface. The concrete will be crushed to the extent possible and staged with crushed building debris at an approved location on-Site. Sub-slab piping and drainage structures can potentially act as migration pathways for contaminants to follow. If any such piping or drainage structures are encountered, they will be investigated and removed to the extent practicable during the soil removal. As described previously, GIS based mapping generated during the RI work in this area will be used to the extent possible to define the affected areas and features requiring remedial measures.

During excavation clean soil, as identified by screening, will be stockpiled and reused as backfill material. Soils exhibiting evidence of contamination (XRF readings >400 ppm for chromium and >16 ppm for arsenic) will be staged in a designated area of the Site for stabilization. For estimating purposes, it is assumed that 1000 tons of soil will require removal, stabilization and off-Site disposal. It is noted that the target XRF readings will be adjusted as necessary based on the results of screening and laboratory analytical results during the detailed investigation planned at AOC-2.

If the extent of soil contamination encountered substantially exceeds the estimated 1,000 ton quantity, only the most highly contaminated soils will be removed as part of the IRM to the extent possible under the existing project scope and budget. The target XRF reading used to evaluate soil contaminant levels will be adjusted as necessary with concurrence of the City and NYSDEC. If necessary, soil contamination associated with the former plating area will be characterized in the remaining assessment activities and addressed as necessary in the proposed remedial action plan (PRAP) development phase of this project.

It is assumed that de-watering of the excavation will be required, this water will be pumped directly into a 20,000 gallon frac tank for staging prior to transportation off-Site and disposal. For estimating purposes, a total of 40,000 gallons of hazardous waste-level, chromium-contaminated water will be generated and require disposal during this task. The water will be profiled for disposal before work begins using the existing groundwater data obtained from this area of the Site. It is assumed that this water will require disposal as a hazardous waste due to the elevated levels of chromium observed at MW-17. However, after settling, the water contained in the frac tank(s) will be tested for RCRA metals to verify proper disposal options. Disposal as either hazardous or non-hazardous waste will be determined by the findings of this analysis. Likewise, any sludges generated by this process that are retained in storage tanks will require proper disposal as indicated by appropriate testing to be determined based on potential analytical findings, volumes, and other relevant factors.

Dust suppression will be provided as necessary using water available from the nearest fire hydrant located adjacent to the Site. All appropriate coordination will be provided with the City Bureau of Water and Lighting for access and a backflow preventer.

The limits of the excavation will be located using a handheld GPS unit and added to the Site Plan.

An approximate 5,000 square foot portion of the property will be selected near the northwest quadrant of the Site for the on-Site stabilization of chromium and arsenic impacted soils. This area will be covered by an impermeable liner configured in such a way as to prevent runoff and run-on from occurring while stabilization is underway.

The stabilization reagent will be selected based on the analytical findings obtained during investigation phase work at AOC-2 as described in Section 3.2.4. The selected material will be transported to the Site by the contractor and stored in a 4,000-gallon polyethylene tank. The reagent is sprayed onto the affected soil during staging. Soils will be placed in the containment area in six (6)-inch lifts and treated with the reagent via a liquid sprayer. The stabilization reagent will be allowed to react for 48 hours before confirmatory sampling is conducted to verify effectiveness. One (1) composite soil sample will be obtained for TCLP Metals analysis for each 250 tons of soil placed (4 samples total).

Once the stabilization process is complete and has been verified by laboratory analytical findings, the soil will be loaded into trucks for transportation and disposal off-Site as non-hazardous waste. A front-end loader will be used for this process. The impermeable liner, storage tank and any residual reagent will be transported from the Site by the contractor for disposal or re-use elsewhere as appropriate.

The excavation will be back-filled while excavation is in progress to limit the amount of groundwater infiltration requiring disposal. The excavation will be back filled using crushed brick material located on-Site, adjacent to the excavations. Crushed concrete generated during the excavation process will also be used for backfill. As is the case for the UST closure, use of this material will mitigate potential compaction problems during backfilling caused by groundwater infiltration.

3.2.10 Well Installation, Development and Sampling

A CME-75 or equivalent drill rig will be mobilized to the Site for the installation of three (3) new permanent groundwater monitoring wells. Two (2) wells will be installed within AOC-7 and at least one (1) will be installed within AOC-2 once IRM activities have been completed in this area. Proposed well locations are indicated on Figure 7a, 8a and 8b.

The permanent wells will be installed in borings advanced using 4.25 ID hollow-stem augers. Continuous split spoon samples will be collected and screened using a PID. The borings will be advanced approximately 5 feet into groundwater. For estimating purposes, the depth to groundwater is assumed no greater than 15 feet and that a total of 5 feet of rock coring or tri-cone bit drilling will be required for installation.

Prior to initiating drilling activities the drilling rig, augers, rods, split spoons and related equipment will be steam cleaned. These activities will be performed in a designated decontamination area. Throughout and after the cleaning process, direct contact between the equipment and the ground surface will be avoided. Plastic sheeting and/or clean support structures (i.e., pallets, sawhorses) will be used. The drill rig and all equipment will be steam cleaned upon completion of the investigation and prior to leaving the Site. As was the case during previous well installation and drilling activities, decontamination and drilling-derived fluids and solids will be discharged to the ground surface on-Site. In addition, equipment decontamination procedures outlined in the QAPP will be followed.

All permanent groundwater monitoring wells will be constructed according to the following specifications: 10 feet of 2-inch Schedule 40 polyvinyl chloride (PVC) machine-slotted screen (0.010-inch slot) installed 5 feet into groundwater followed by 2-inch ID schedule 40 PVC riser casing. A sand filter pack composed of chemically inert, coarse-grained sand will be placed from the bottom of the boring to 1 to 2 feet above the top of the screen. A 2 foot thick bentonite seal will be placed above the sand, followed by Portland cement/ 5% bentonite grout to surface.

The wells will be completed with bolted flush-to-grade manway well covers set in concrete drainage pads. Vented PVC well caps will be placed on each well upon completion. No glue will be used for completion of wells. The soil borings and monitoring wells will be installed, surveyed, and sampled according to the QAPP.

One (1) soil sample will be obtained from each well bore based on PID readings and/or other observations. These samples will be analyzed (with Category B Deliverables) for the following parameters:

- VOCs – EPA 8260 (plus NYSDEC STARS compounds)
- SVOCs – EPA Method 8270 (STARS Only)
- RCRA Metals – EPA Method 6010B/7470A

After construction of each well is complete, the well will be developed using submersible pumps until turbidity of the discharge is 50 nephelometric turbidity units (NTU) or less. All field instrument measurement made during development will be recorded. The wells will initially be purged in order to draw sediments out of the sand pack and into the well for removal. If significant effort does not attain the proposed goal of 50 NTU, the

NYSDEC will be consulted. Records of well development activities will be kept by Lu Engineers. Water generated from the development activities will be discharged to the ground surface.

Groundwater sampling will take place after two (2) weeks of well installation, as detailed in the QAPP. Analytical work will be completed using Category B deliverables and data will be validated as outlined in QAPP for the Site. One (1) groundwater sample will be obtained using low-flow purging and sampling procedures from each Site monitoring well. All groundwater samples will be analyzed for the following parameters:

- VOCs – EPA 8260 (plus NYSDEC STARS compounds)
- SVOCs – EPA Method 8270 (STARS Only)
- RCRA Metals – EPA Method 6010B/7470A

3.2.11 RI/IRM Sampling and Analysis Summary

The following table summarizes the sampling and laboratory analysis planned for the RI and IRM activities specified in Section 3.2.

Analyte	Location	Media	Number	QA/QC	Total
RCRA Metals	TPs, Borings, UST and Hyd Lift Confirm., and Groundwater	Soil and Groundwater	87	15	102
TCLP Metals	UST and Plating Area Waste Characterization	Soil	3	0	3
TCL VOCs	TPs, Borings (3 only), UST and Hyd Lift Confirm. and Groundwater	Soil and Groundwater	47	9	56
TCLP VOCs	UST and Plating Area Waste Characterization	Soil	3	0	3
SVOCs (B/Ns)	TPs, Borings (3 only), UST and Hyd Lift Confirm. and Groundwater	Soil and Groundwater	47	9	56
TCLP SVOCs	UST and Plating Area Waste Characterization	Soil	3	0	3
Flash Point	UST and Plating Area Waste Characterization	Soil	3	0	3
PCBs	UST and Plating Area Waste Characterization, TPs and New MWs	Soil	16	3	19
Hex. Chromium	Plating Area Waste Characterization	Groundwater	2	0	2
Cyanide and pH	Plating Area Waste Characterization	Soil and Groundwater	2	0	2

3.3 IRM Cleanup Objectives

The IRM work planned for the Site is intended to remediate documented contamination at AOC1 and 2 to meet Restricted Commercial Soil Cleanup Objectives (SCOs) as specified in NYCRR Part 375-6. As indicated by the RI component of this project, locations where hazardous wastes are found to be present or soil contaminant levels are found to exceed the Restricted Commercial SCOs will also be remediated to the extent possible as part of this effort. Planned IRMs are also intended to attain applicable groundwater standards for contaminants of concern including RCRA metals and organic contaminants.

Although Site-wide attainment of applicable regulatory criteria may not be possible for all AOCs identified, IRMs will be implemented in such a way as to maximize the remedial benefit using available resources.

3.4 Off-Site Disposal of Contaminated Materials

Off-Site disposal of contaminated soil or groundwater are not anticipated as part of planned RI activities including boring/well installation, test pitting and associated sampling and testing. Drilling and well development waste water, soil cuttings, clean test pit excavation materials and clean soils removed to facilitate IRM work will be returned to the ground surface upon completion of RI activities.

Contaminated soil and groundwater associated with AOCs 1 and 2 and elsewhere on the Site will be evaluated based on the planned RI work described in Sections 3.2. For estimating purposes, stabilization and offsite disposal of chromium and arsenic contaminated soils is planned. Based on the proposed detailed evaluation of AOC-2 specified in Section 3.2.4, an approach for remediation will be developed for approval by all project stakeholders prior to implementation.

3.5 Sample Documentation

All samples will be identified and documented in a Site-specific field log book as detailed in the Quality Assurance Project Plan (QAPP). In addition, all instruments and equipment used during sampling and analysis will be operated, calibrated and maintained according to manufacture’s guidelines and recommendations as detailed in the QAPP (Appendix D).

3.6 Restoration

Once all backfilling has been completed, the ground surface will then be rough-grade leveled using a back hoe or equivalent.

Crushed demolition debris located on-Site will be used as backfill in areas where insufficient material is present and will be placed to create temporary road surfaces within the work area to facilitate movement of heavy equipment.

4.0 HEALTH AND SAFETY PLANS

Monitoring of the work area and screening of soil and groundwater will be conducted throughout the duration of field activities to assure the safety of on-Site workers. A copy of the Site-Specific Health and Safety Plan (HASP) is provided as Appendix A.

Air monitoring of the work areas and environmental media therein will be conducted using the following (or equivalent) instrumentation:

- PID equipped with a 10.2 eV lamp (or equivalent)
- aerosol particulate meter
- methane detector
- XRF
- explosimeter

A CAMP for the Site work is attached as Appendix C.

5.0 QA/QC

To ensure that suitable and verifiable data results are obtained from the information collected at the Site, quality assurance procedures are detailed in a QAPP. The QAPP was developed as part of the RIWP, included in Appendix D, further details the activities and how they are designed to achieve the data quality objectives.

All samples will be obtained, handled and characterized in accordance with NYSDEC ASP methods. Once obtained, samples will be immediately labeled and stored on ice in a cooler. Samples will be relinquished to Paradigm Environmental Services, Inc., an accredited New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH ELAP) and appropriately certified analytical laboratory. All chain of custody requirements will be strictly adhered to for designated analyses.

The NYSDEC DER *Guidance for the Development of Quality Assurance Plans and Data Usability Summary Reports* will be followed. Lu Engineers' Quality Assurance Officer for this project will be Susan Hilton. Greg Andrus will be the Project Manager and Eric Detweiler will be the Field Team Leader for this project. Category B deliverables will be required for all analytical reporting in order to provide the necessary documentation to be reviewed to evaluate the usability of the data and to provide calibration data needed to verify results, as necessary.

One (1) duplicate sample will be obtained for each sample type for each week that sampling occurs. Also, one (1) MS/MSD will be collected for samples of each media for each week that sampling occurs. Samples duplicated will be selected at the discretion of the Field Team Leader.

6.0 PROJECT ORGANIZATION

The personnel for this project are anticipated as follows:

Steve Campbell	Project Director
Greg Andrus, CHMM	Project Manager
Susan Hilton, PE	Quality Assurance and Site Safety Officer
Eric Detweiler	Field Team Leader/Geologist
Laura Neubauer	Alternate Field Team Leader
Bryan Bancroft	Environmental Scientist
Jon Becker	Field Technician
Cliff Rigerman	Field Technician- Survey

Subcontractors

Paradigm Environmental	Analytical Laboratory
Op-Tech Environmental	Excavation Contractor
SJB Drilling	Well and Boring Installations
Trec Environmental	UST Closures and TBD
Advanced Waste Solutions	Waste Disposal
TBD	Data Validation (as necessary)

7.0 REPORT

Once the contract laboratory has provided all analytical data and hydrogeologic information has been evaluated, Lu Engineers will develop a report on the findings of the investigation activities. A draft Remedial Investigation (RI) and Interim Remedial Mausures (IRM) report will be prepared for review. The report will be prepared in recommended ERP format and identify and list recommended cleanup levels in accordance with Standards, Criteria, and Guidelines (SCGs). In addition, the report shall identify all applicable Federal and State criteria, advisories and guidances associated with any identified hazardous substances. Hazardous substances to which SCGs have been exceeded or contravened will be identified in the draft report. Upon review and approval of the draft report by City of Rochester, Lu Engineers will forward the necessary copies to the NYSDEC for their review and comment. The following sections identify specific elements of the report.

Exposure Assessment

Using the information gathered under this investigation, Lu Engineers will conduct an Exposure Assessment. This Exposure Assessment will be conducted in accordance with Federal, State and American Standards of Testing and Materials (ASTM) guidance.

The exposure assessment is a significant tool in the development decision for Brownfield projects. After enough information is gathered during the Site assessment, a risk assessment will be prepared to evaluate the potential exposure concerns for the public and future Site workers. The risk assessment may identify engineering controls (i.e. ventilation, pavement capping, etc.) that can be built into development projects to minimize further expenses. Potential exposure risks can include use of groundwater and surface water resources, contact with contaminated soils and inhalation of Site dusts or gases/vapors.

Development of Alternatives

The first step in evaluating the above noted items is to develop remedial action objectives (RAOs). This is accomplished by evaluating the cleanup goals for each environmental medium (soils, groundwater, waste) based on medium-specific receptors and exposure routes. As necessary, a baseline risk assessment will be performed for the Site based on proposed future use(s). The risk assessment, applicable relevant and appropriate requirements (ARARs), and other guidances to be considered (TBCs) will be used to establish cleanup goals.

ARARs for soil will be based on 6 NYCRR Part 375-6.8 Remedial SCOs, with consideration of proposed future use of the Site. All groundwater in New York is considered a drinking water resource, and thus is subject to State drinking water regulations. Class GA Maximum Contaminant Levels (MCLs) will be considered ARARs for the groundwater at the Site unless otherwise determined by the NYSDEC.

Once the cleanup goals have been set, the areas requiring remediation will be determined by comparing the Site Characterization data to the cleanup goals.

Development of Remedial Alternatives

Development of remedial alternatives involves identifying technologies appropriate for treating the types of wastes identified in the RI and assembling those technologies into alternatives. At this step in the project, the No Further Action (NFA) alternative, treatment technologies and containment technologies will be identified. The types of contaminants that may be found at the Site (metals, fuel-related organics) are commonly associated with treatment alternatives that are relatively mature and provide very effective solutions. We believe that this would likely reduce the number of treatment alternatives screened at this stage. However, new or innovative technologies that may offer cost or effectiveness advantages will be considered and evaluated as alternatives, as appropriate.

Once appropriate technologies have been identified, they will be assembled into alternatives. The alternatives will provide a clear definition of the technologies they incorporate and will span the range of approaches from NFA to full Site remediation if necessary.

Detailed Analysis of Alternatives

A detailed analysis of alternatives will be completed on the technologies remaining after the development of alternatives. Lu Engineers will assemble and use information necessary to evaluate each alternative including Federal and State SCOs and other criteria, and guidance related to proposed actions that are to be used in the analysis and selection of a remedy.

In this component of the project, each alternative will be fully described (including development of capital, operation and maintenance (O&M), and present worth costs), and then evaluated both individually and comparably. The individual evaluations will analyze each alternative against the following seven criteria. These criteria, including the following, will be evaluated and compared using procedures identified in NYSDEC Guidance and policy directives:

- Protection of Human Health and the Environment
- Compliance with SCGs
- (implementability, reduction of toxicity, short-term effectiveness and long-term effectiveness)
- Cost
- Community Acceptance

Review and Comparison of Alternatives

Following individual analyses, the alternatives will be comparatively reviewed in accordance with NYSDEC TAGM 4030/DER-10 and evaluated using the factors noted above.

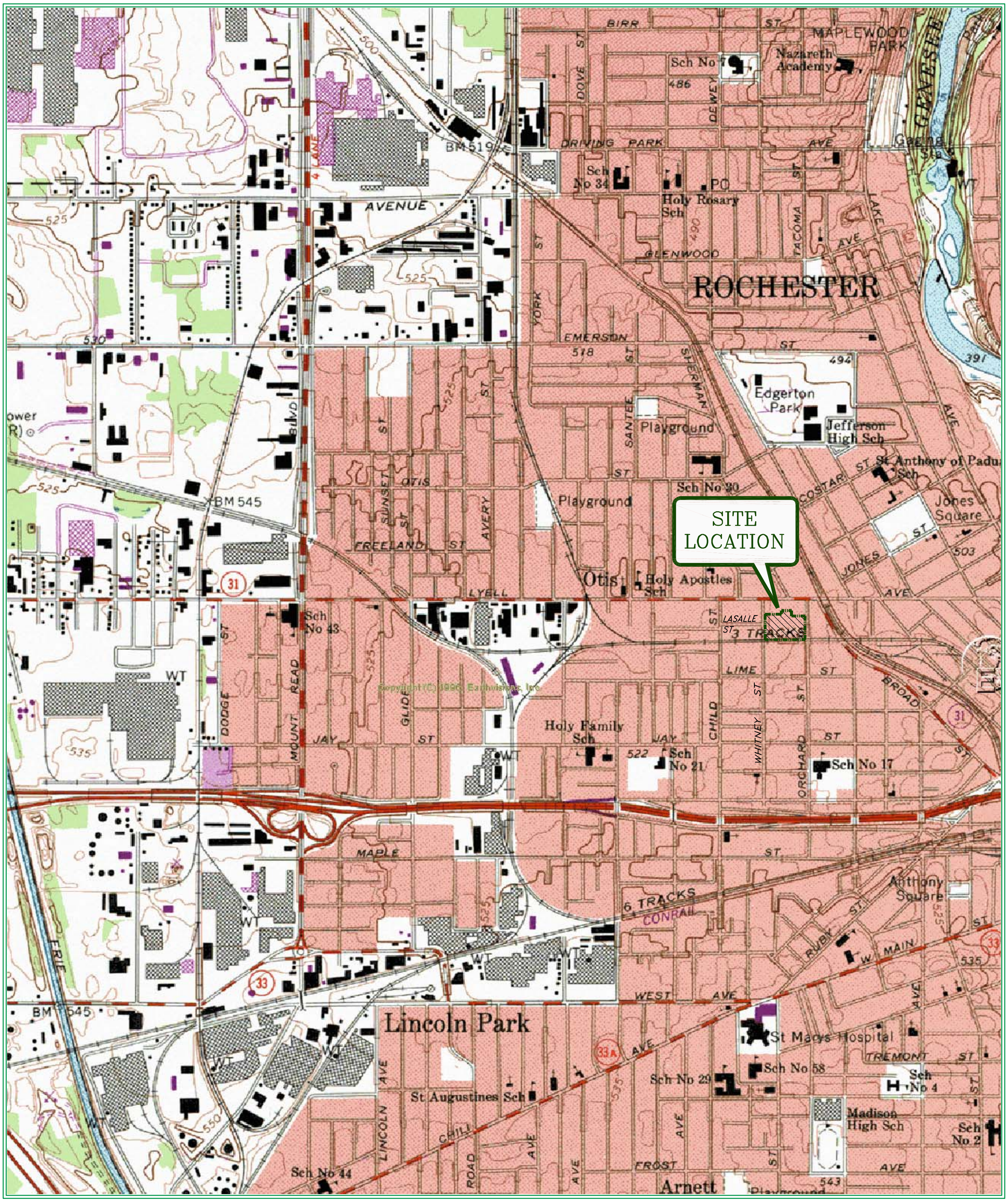
Remedy Selection

Based on the evaluation of Remedial Alternatives, Lu Engineers will recommend a remedy that is practical for the Site, protective of human health and the environment, cost effective, and meets SCGs to the extent practicable. The selection of remedy will be made considering a preference for alternatives that satisfy RAOs. A conceptual design of the selected remedial alternative will be presented in the Remedial Alternatives Report.

8.0 SCHEDULE

It is assumed that NYSDEC will expedite review and approval of this work plan due to the fact that the current SAC terminates on December 31, 2011. With expedited work plan approval by mid March, field work will commence on or about April 1. Field activities and laboratory analysis will require an estimated three (3) months to complete. Results from this additional RI/IRM Work Plan will be included with the final RI/IMR Report and submitted to the NYSDEC and the NYSDOH for review on or about September 1st of 2011.

Figures



SCALE: 1" = 2000'

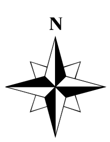


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FIGURE 1. SITE LOCATION MAP

CITY OF ROCHESTER
REMEDIAL INVESTIGATION
415 ORCHARD / 354 WHITNEY

DATE:	MARCH 2010
SCALE:	1:24,000
DRAWN BY:	DLS
MAP SOURCE:	ROCHESTER WEST QUADRANGLE NEW YORK – MONROE COUNTY 7.5 MINUTE SERIES (TOPOGRAPHIC) 1971; PHOTOREVISED 1978

J:\Projects\4200 Rochester\4216 Orchard-Whitney\Cadd\4216-01 (supplemental IRM)\1_USGS-Location.dwg, 2/14/2011 8:48:52 AM, diane*AC2009

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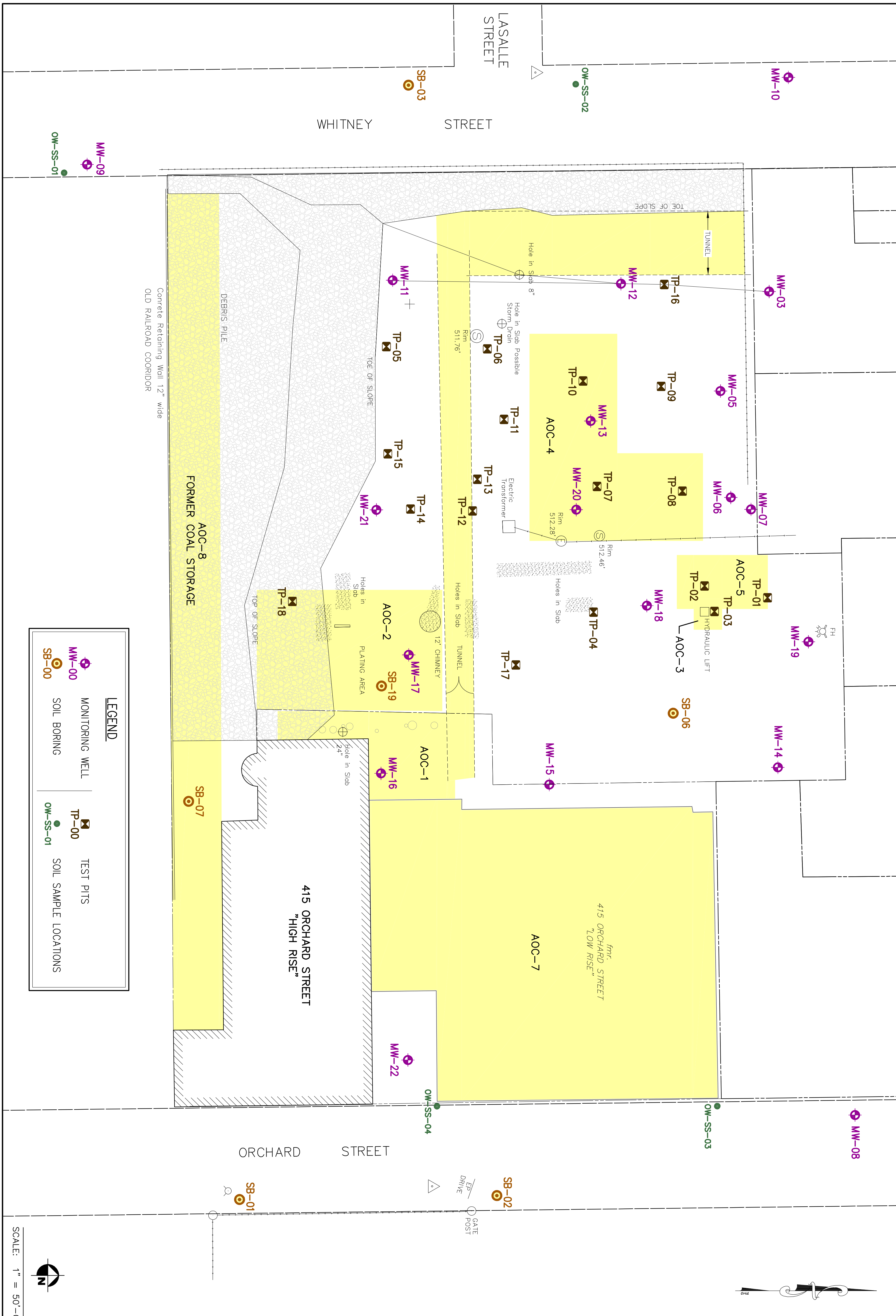

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FIGURE 2. SITE PLAN

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE:	MARCH 2010
DESIGNED/DRAWN:	GLA/DLS
MAP SOURCE:	SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

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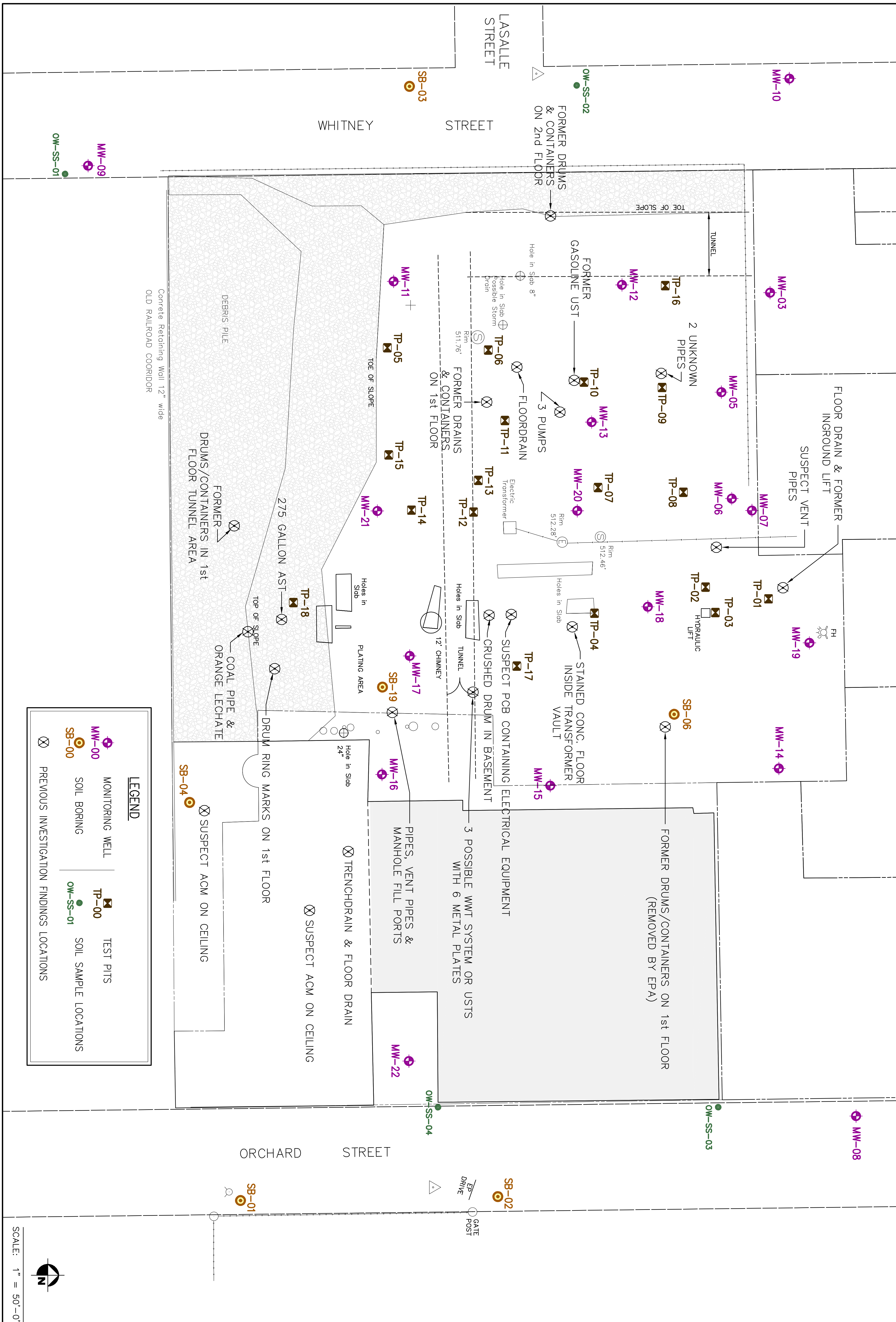

FIGURE 3.
PREVIOUS ASSESSMENT SUMMARY

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

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DATE: MARCH 2010
DESIGNED/DRAWN: GLA/DLS
MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

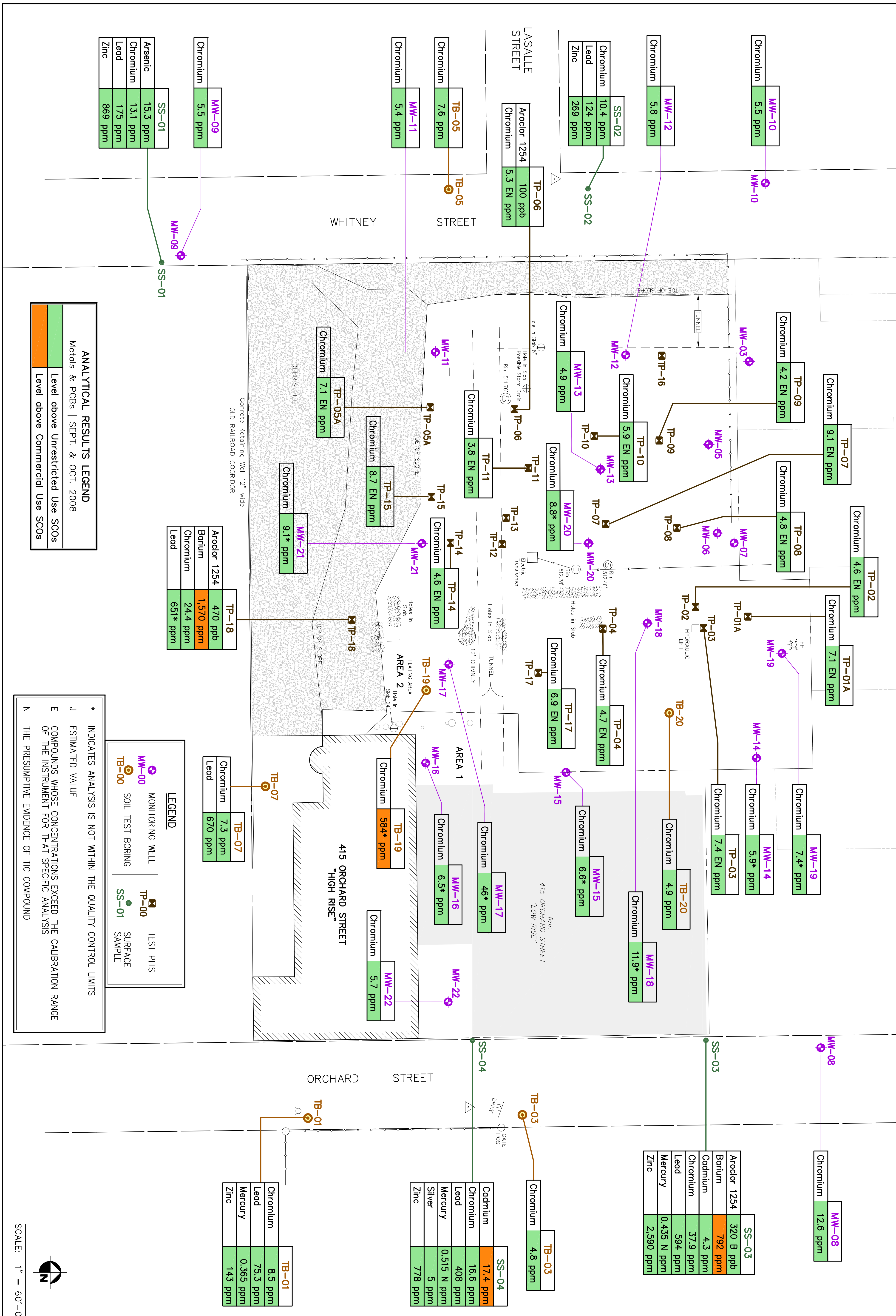

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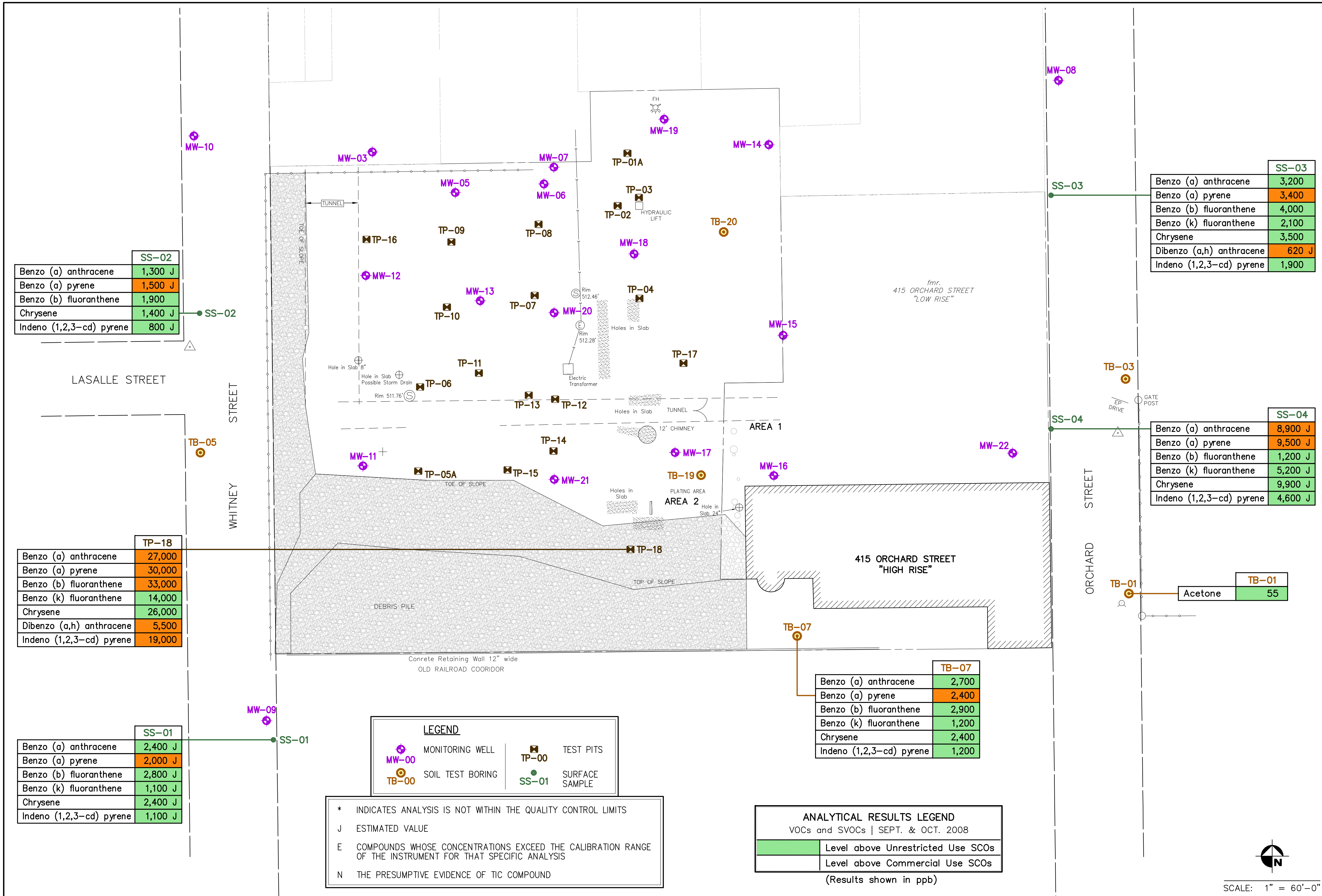
FIGURE 4a.
SOIL ANALYTICAL RESULTS – METALS and PCBs

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010
DESIGNED/DRAWN: GLA/DLS
MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.



	SS-02
Benzo (a) anthracene	1,300 J
Benzo (a) pyrene	1,500 J
Benzo (b) fluoranthene	1,900
Chrysene	1,400 J
Indeno (1,2,3-cd) pyrene	800 J

	TP-18
Benzo (a) anthracene	27,000
Benzo (a) pyrene	30,000
Benzo (b) fluoranthene	33,000
Benzo (k) fluoranthene	14,000
Chrysene	26,000
Dibenzo (a,h) anthracene	5,500
Indeno (1,2,3-cd) pyrene	19,000

	SS-01
Benzo (a) anthracene	2,400 J
Benzo (a) pyrene	2,000 J
Benzo (b) fluoranthene	2,800 J
Benzo (k) fluoranthene	1,100 J
Chrysene	2,400 J
Indeno (1,2,3-cd) pyrene	1,100 J

	SS-03
Benzo (a) anthracene	3,200
Benzo (a) pyrene	3,400
Benzo (b) fluoranthene	4,000
Benzo (k) fluoranthene	2,100
Chrysene	3,500
Dibenzo (a,h) anthracene	620 J
Indeno (1,2,3-cd) pyrene	1,900

	SS-04
Benzo (a) anthracene	8,900 J
Benzo (a) pyrene	9,500 J
Benzo (b) fluoranthene	1,200 J
Benzo (k) fluoranthene	5,200 J
Chrysene	9,900 J
Indeno (1,2,3-cd) pyrene	4,600 J

	TB-01
Acetone	55

	TB-07
Benzo (a) anthracene	2,700
Benzo (a) pyrene	2,400
Benzo (b) fluoranthene	2,900
Benzo (k) fluoranthene	1,200
Chrysene	2,400
Indeno (1,2,3-cd) pyrene	1,200

LEGEND

- MW-00 MONITORING WELL
- TP-00 TEST PITS
- TB-00 SOIL TEST BORING
- SS-01 SURFACE SAMPLE

- * INDICATES ANALYSIS IS NOT WITHIN THE QUALITY CONTROL LIMITS
- J ESTIMATED VALUE
- E COMPOUNDS WHOSE CONCENTRATIONS EXCEED THE CALIBRATION RANGE OF THE INSTRUMENT FOR THAT SPECIFIC ANALYSIS
- N THE PRESUMPTIVE EVIDENCE OF TIC COMPOUND

ANALYTICAL RESULTS LEGEND
VOCs and SVOCs | SEPT. & OCT. 2008

- Level above Unrestricted Use SCOs
- Level above Commercial Use SCOs

(Results shown in ppb)

SCALE: 1" = 60'-0"

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FIGURE 4b.
SOIL ANALYTICAL RESULTS - VOCs and SVOCs
415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010
DESIGNED/DRAWN: GLA/DLS
MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

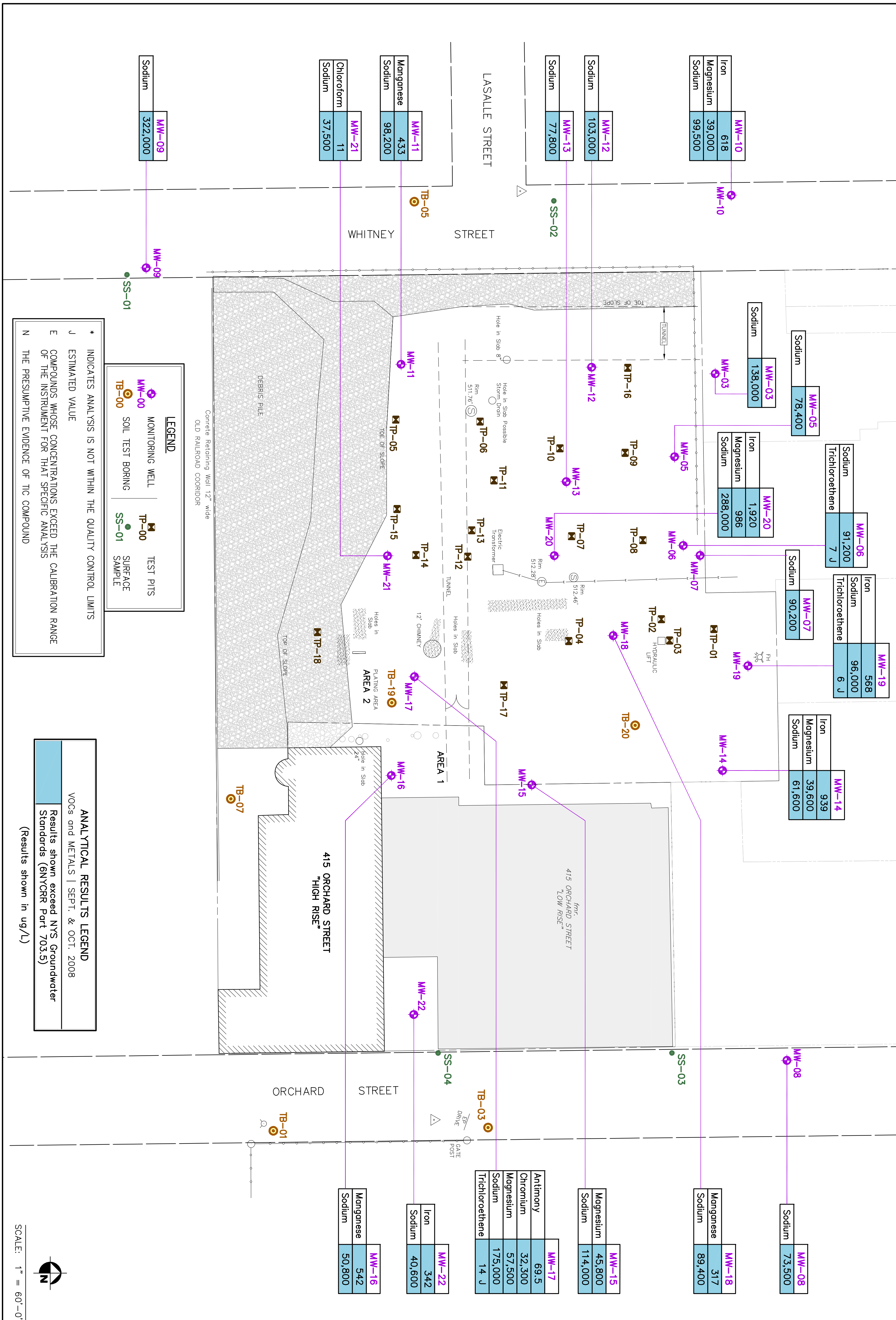

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FIGURE 5a.

GROUNDWATER ANALTICAL RESULTS – FALL 2008

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010

DESIGNED/DRAWN: GLA/DLS

MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

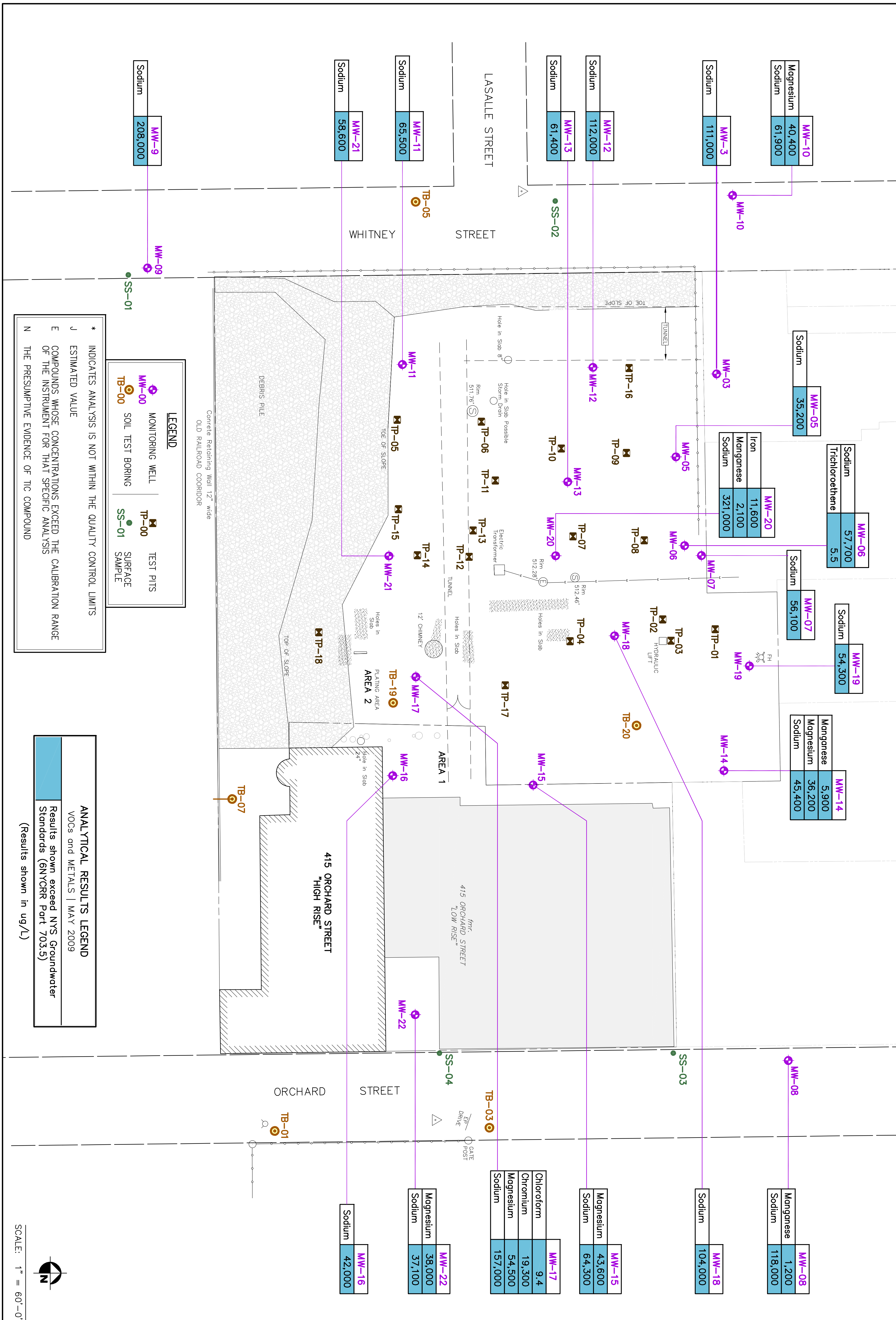

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FIGURE 5b.

GROUNDWATER ANALYTICAL RESULTS – SPRING 2009

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010

DESIGNED/DRAWN: GLA/DLS

MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

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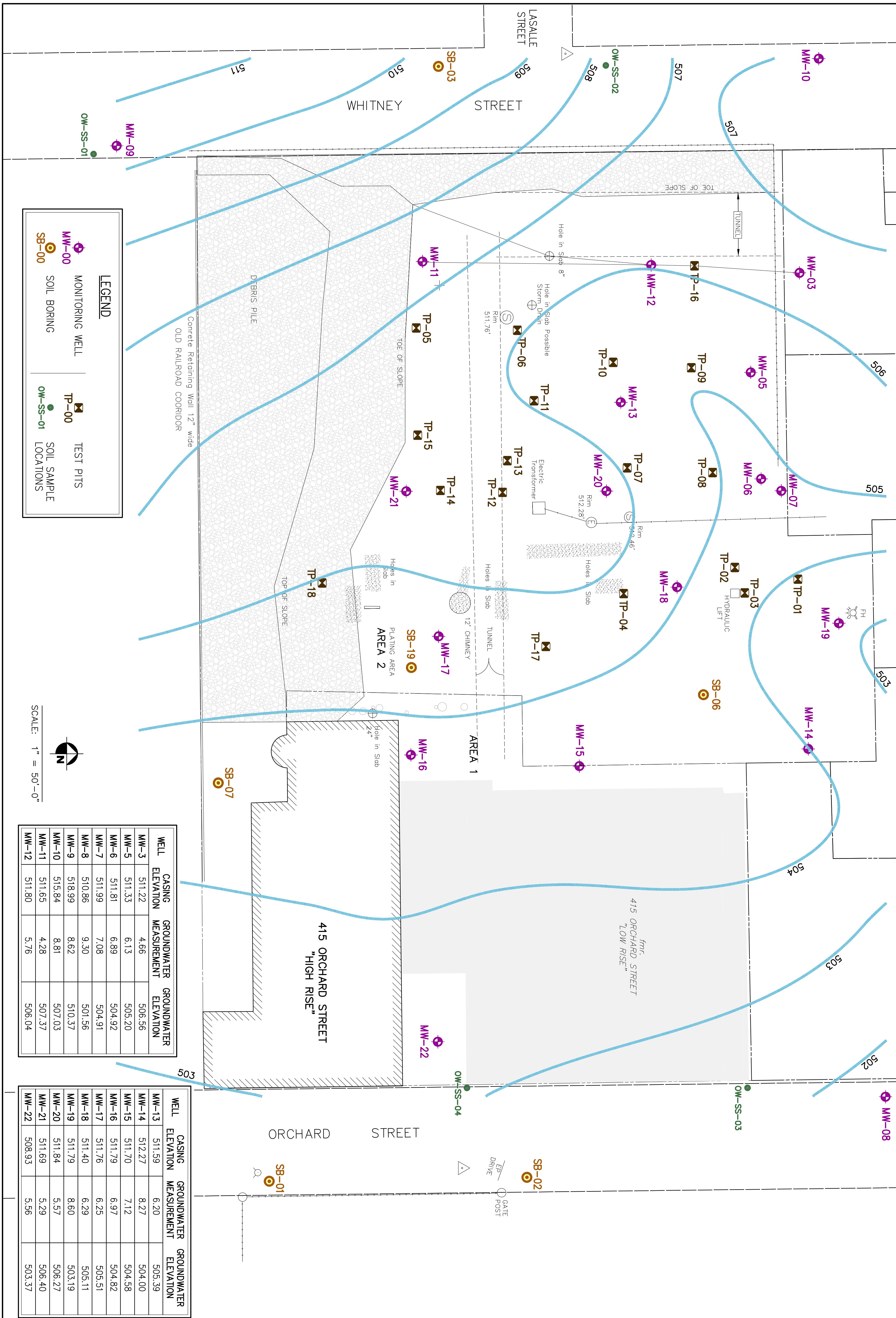

WELL	CASING ELEVATION	GROUNDWATER MEASUREMENT	GROUNDWATER ELEVATION
MW-3	511.22	4.66	506.56
MW-5	511.33	6.13	505.20
MW-6	511.81	6.89	504.92
MW-7	511.99	7.08	504.91
MW-8	510.86	9.30	501.56
MW-9	518.99	8.62	510.37
MW-10	515.84	8.81	507.03
MW-11	511.65	4.28	507.37
MW-12	511.80	5.76	506.04

WELL	CASING ELEVATION	GROUNDWATER MEASUREMENT	GROUNDWATER ELEVATION
MW-13	511.59	6.20	505.39
MW-14	512.27	8.27	504.00
MW-15	511.70	7.12	504.58
MW-16	511.79	6.97	504.82
MW-17	511.76	6.25	505.51
MW-18	511.40	6.29	505.11
MW-19	511.79	8.60	503.19
MW-20	511.84	5.57	506.27
MW-21	511.69	5.29	506.40
MW-22	508.93	5.56	503.37

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FIGURE 6.
GROUNDWATER CONTOURS

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010

DESIGNED/DRAWN: GLA/DLS

MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

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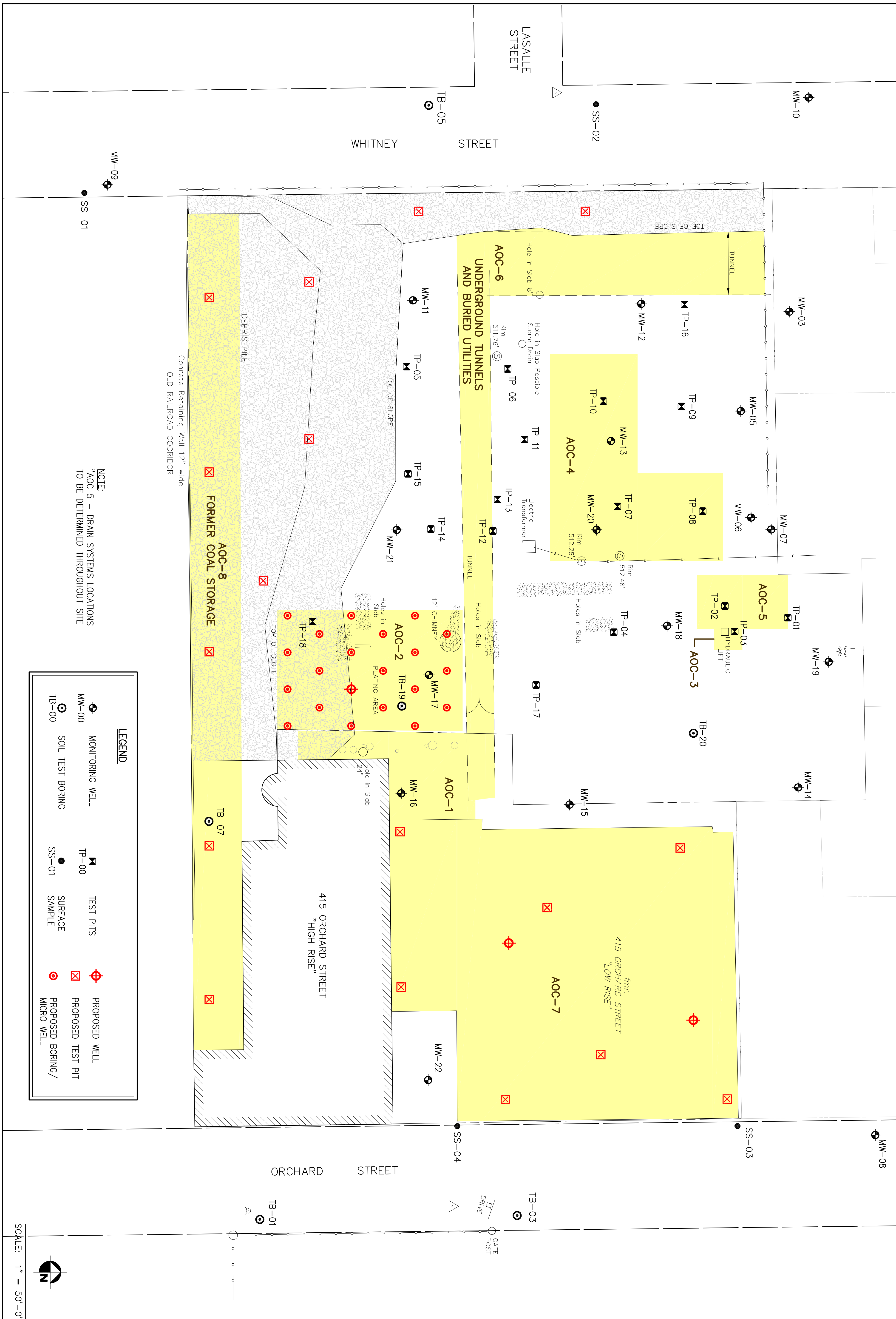

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CITY OF ROCHESTER, N.Y. • FLOWER CITY •

FIGURE 7a.
RI/IRM SITE PLAN

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010

DESIGNED/DRAWN: GLA/DLS

MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

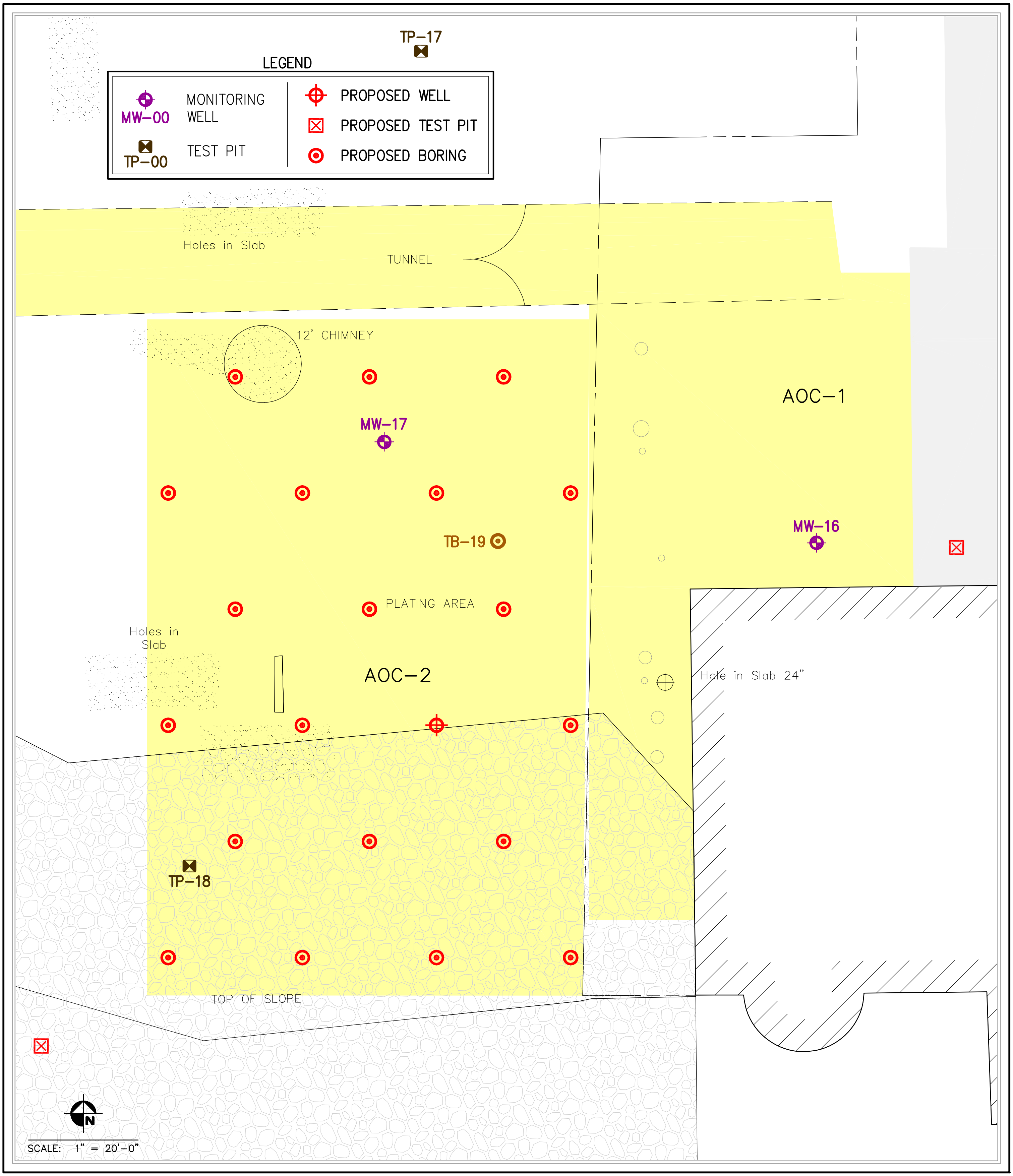

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FIGURE 7b.
IRM DETAIL
415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: JANUARY 2011
SCALE: AS SHOWN
DRAWN BY: DLS
MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008 ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

J:\Projects\4200 Rochester\4216 Orchard-Whitney\Cadd\4216-01 (supplemental IRM)\7b_IRM Detail.dwg, 2/11/2011 1:08:34 PM, diane*AC2009

LASALLE STREET
WHITNEY STREET
ORCHARD STREET
TB-05
SS-02
MW-10
MW-09
SS-01
TOE OF SLOPE
TUNNEL
Hole in Slab 8"
MW-11
MW-12
TP-16
MW-03
DEBRIS PILE
Conrete Retaining Wall 12" wide
OLD RAILROAD COORIDOR
Rim 511.76'
Hole in Slab Possible Storm Drain
TP-05
TP-06
TP-10
TP-09
MW-05
TOE OF SLOPE
TP-11
MW-13
TP-15
TP-13
Electric Transformer
MW-20
TP-07
TP-08
MW-06
MW-07
TP-14
TP-12
MW-21
Rim 512.28'
Rim 512.46'
TUNNEL
Holes in Slab
12' CHIMNEY
Holes in Slab
Holes in Slab
TP-04
MW-18
TP-02
TP-03
HYDRAULIC LIFT
TP-01
FH
MW-19
TP-18
TOP OF SLOPE
PLATING AREA
MW-17
TP-17
TB-20
Hole in Slab 24"
MW-16
MW-15
MW-14
TB-07
415 ORCHARD STREET "HIGH RISE"
fmr. 415 ORCHARD STREET "LOW RISE"
MW-22
SS-03
MW-08
TB-01
EP DRIVE
TB-03
GATE POST

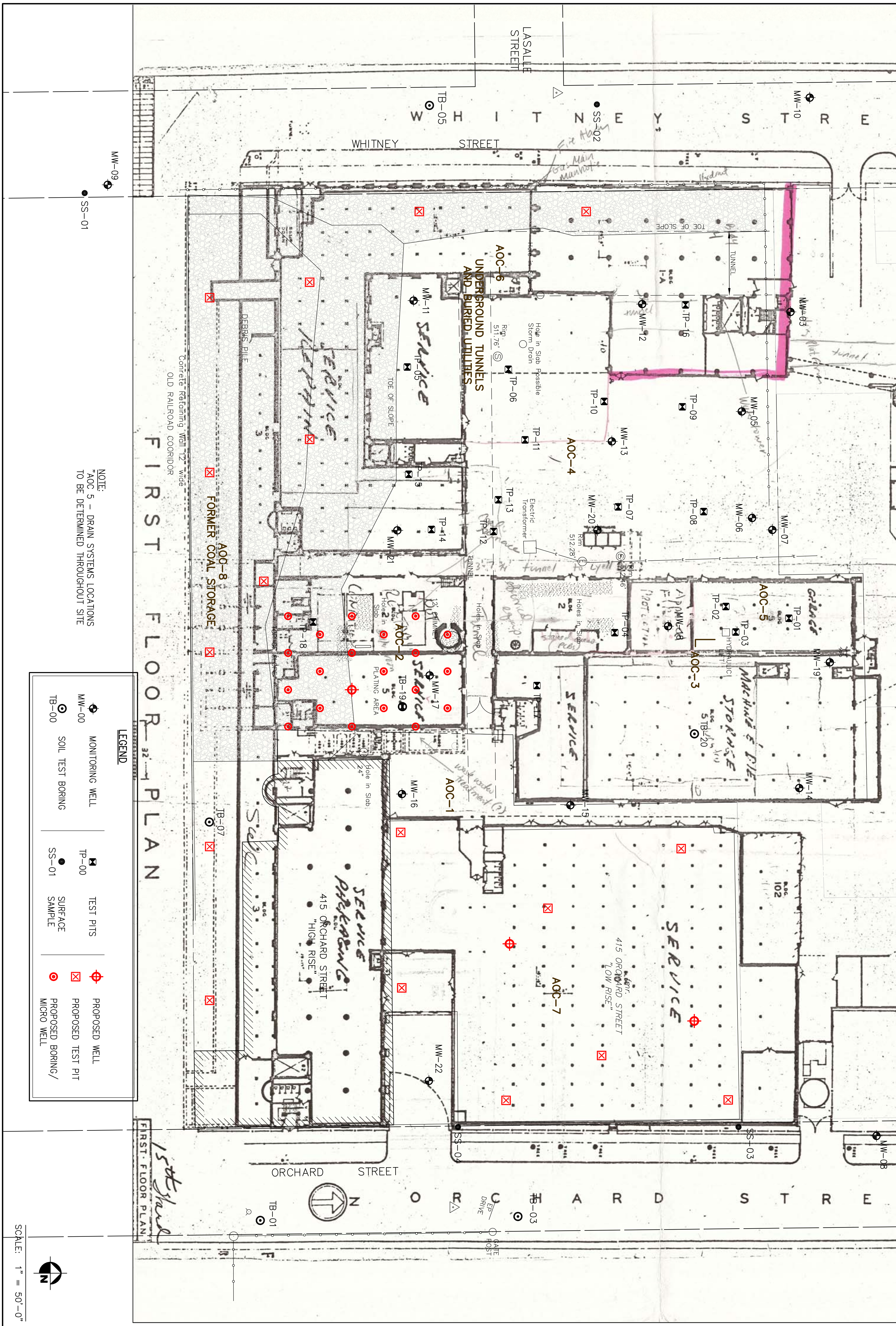

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FIGURE 8B HISTORICAL FLOOR PLAN OVERLAY
SUPPLEMENTAL IRM SITE PLAN

415 ORCHARD / 354 WHITNEY
CITY OF ROCHESTER
NEW YORK

DATE: MARCH 2010 revised February 2011

DESIGNED/DRAWN: GLA/DLS

MAP SOURCE: SURVEYED BY LU ENGINEERS, OCTOBER 2008, ROCHESTER, NY. HORIZONTAL COORDINATES IN NAD 83. ~PROPERTY LINES FROM TAX MAPS AND R.O.W. FROM CITY OF ROCHESTER SURVEY OFFICE.

Appendix A
Analytical Results Tabulation

Table 3-1 -Groundwater Results October 2008

Detected Parameters[1]	NYS Groundwater Standard Class GA[2]	OW-MW-3-10	OW-MW-5-14	OW-MW-5-14-D	OW-MW-6-14	OW-MW-7-9	OW-MW-8-14	OW-MW-09-15	OW-MW-10-13	OW-MW-11-12	OW-MW-12-12	OW-MW-13-11	OW-MW-14-12	OW-MW-15-11	OW-MW-16-15
EPA 8260 - Volatile Organics															
1,1,1-Trichloroethane	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.7 J**	ND
1,2-Dichloroethene (Total)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50*	**1 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	7	ND	**0.7 J**	**0.8 J**	**0.4 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	**0.4 J**	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	**0.6 J**	**2 J**	**3 J**	**7 J**	**4 J**	ND	ND	ND	ND	ND	ND	**1 J**	ND	**0.7 J**
EPA 8270- Semi-Volatile Organics															
Benzo(a)anthracene	0.002*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	50	ND	**0.5 J**	**0.4 J**	**0.3 J**	**0.3 J**	**0.4 BJ**	ND	ND	**0.3 J**	ND	ND	ND	**0.3 BJ**	**0.4 BJ**
Di-n-octyl phthalate	50	**0.3 J**	ND	ND	ND	ND	ND	ND	**0.3 J**	ND	ND	ND	ND	ND	ND
Pyrene	50*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 6010- Metals															
Aluminum	-	ND	ND	ND	ND	ND	ND	ND	**733**	ND	ND	ND	**906**	ND	ND
Antimony	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1,000	**170**	**70.7**	**71**	**65.1**	**73.6**	**141**	**97.7**	**112**	**129**	**77.7**	**75**	**110**	**126**	**85.7**
Cadmium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.6**
Calcium	-	**85,100**	**76,700**	**76,600**	**96,500**	**85,200**	**111,000**	**95,300**	**107,000**	**128,000**	**108,000**	**85,800**	**116,000**	**148,000**	**104,000**
Chromium	100	**6.3**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	300	**76.6**	ND	ND	**134**	**69.4**	**57.2**	**71.4**	**618**	**68.7**	**60.9**	ND	**939**	ND	ND
Magnesium	35,000*	**20,800**	**16,700**	**16,600**	**22,100**	**19,600**	**24,300**	**15,700**	**39,000**	**25,400**	**30,100**	**18,500**	**39,600**	**45,800**	**19,700**
Manganese	300*	**74.7**	**3.6**	ND	**106**	**50.7**	**186**	**104**	**40.7**	**433**	**71.8**	**64.4**	**141**	**97.8**	**542**
Nickel	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**15.4**
Potassium	-	**11,700 E**	**16,200 E**	**16,300 E**	**7,760 E**	**7,060 E**	**10,800 E**	**3210**	**2590**	**7,030 E**	**9,170 E**	**8,610**	**10,300 E**	**4,690 E**	**21,900 E**
Sodium	20,000	**138,000**	**78,400**	**76,900**	**91,200**	**90,200**	**73,500**	**322,000**	**99,500**	**98,200**	**103,000**	**77,800**	**61,600**	**114,000**	**50,800**
EPA 8082 - PCBs (none detected above laboratory detection limits)															

[shaded box] ~ value detected above NYS Ambient Groundwater Standard or applicable NYSDEC Guidance Value

J- not detected above reporting limit

B- compound detected in associated method blank

1 - All values presented in micrograms per liter (ug/l)

2 - 6 NYCRR Part 703.5

Table 3-1 -Groundwater Results October 2008

Detected Parameters[1]	NYS Groundwater Standard Class GA[2]	OW-MW-17-12	OW-MW-18-12	OW-MW-19-13	OW-MW-20-13	OW-MW-21-15	OW-MW-22-13
EPA 8260 - Volatile Organics							
1,1,1-Trichloroethane	5[1]	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (Total)	5	ND	ND	3 J	ND	ND	ND
Acetone	50*	ND	ND	10	ND	ND	ND
Chloroform	7	ND	ND	4 J	3 J	11	0.7 J
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	0.5 J	ND	ND	ND
Trichloroethene	5	14 J	4 J	6 J	ND	2 J	0.5 J
EPA 8270- Semi-Volatile Organics							
Benzo(a)anthracene	0.002*	ND	ND	0.3 J	0.2 J	ND	ND
Di-n-butyl phthalate	50	ND	0.4 BJ	0.5 J	0.5 J	ND	ND
Di-n-octyl phthalate	50	ND	ND	ND	ND	ND	ND
Pyrene	50*	ND	ND	ND	0.2 J	ND	ND
EPA 6010- Metals							
Aluminum	-	241	ND	331	1,890	ND	335
Antimony	3	69.5	ND	ND	ND	ND	ND
Barium	1,000	27.7	108	26.4	210	86	102
Cadmium	10	ND	ND	ND	ND	ND	ND
Calcium	-	224,000	139,000	83,400	103,000	61,300	157,000
Chromium	100	32,300	ND	ND	8.2	ND	ND
Iron	300	246	64.4	568	1,920	79	342
Magnesium	35,000*	57,500	34,100	10,800	20,500	12,300	31,300
Manganese	300*	84.1	317	20.8	986	29.6	111
Nickel	100	ND	ND	ND	ND	ND	ND
Potassium	-	8,180	10,400 E	10,900	8,990	10,200	24,500
Sodium	20,000	175,000	89,400	96,000	288,000	37,500	40,600
EPA 8082 - PCBs (none detected above laboratory detection li							

[shaded box] ~ value detected above NYS A

J- not detected above reporting limit

B- compound detected in associated method blank

1 - All values presented in micrograms per liter (ug/l)

2 - 6 NYCRR Part 703.5

Orchard Whitney Site Ground
Water Analytical Results

Table 3-2 -Groundwater Results March 2009

Detected Parameters[1]	NYS Groundwater Standard Class GA[2]	OW-MW-3-10	OW-MW-5-14	OW-MW-5-14-D	OW-MW-6-14	OW-MW-7-9	OW-MW-8-14	OW-MW-09-15	OW-MW-10-13	OW-MW-11-12	OW-MW-12-12	OW-MW-13-11	OW-MW-14-12	OW-MW-15-11	OW-MW-16-15
EPA 8260 - Volatile Organics															
1,1,1-Trichloroethane	5[1]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (Total)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND		ND	ND	1.2 J	ND	ND		ND	ND	ND	ND	ND
Acetone	50*	ND	1.2 J		ND	5.1 J	3.3 J	ND	1.2 J	1.3 J	1.7 J	ND	1.5 J	1.6 J	1.5 J
Chloroform	7	ND	ND	0.8 J	0.73 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	5	2.2 J	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	-	3.9 J	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	0.82 J	4.0 J	3 J	5.5	ND	2.2 J	ND	ND	ND	3.5 J	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics															
Acenaphthene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	50	ND	ND		ND	ND	ND	2.7 J	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.002*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	5	2.9 JB	ND		ND	ND	ND	2.7 JB	ND	2.8 JB	ND	2.8 JB	ND	ND	ND
Di-n-butyl phthalate	50	2.9 JB	ND	0.4 J	ND	ND	ND	2.8 JB	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methy tert-butyl ether	10*	ND	ND		ND	0.86 J	ND	ND	ND		ND	2.8 JB	ND	0.69 J	ND
Pyrene	50*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 6010- Metals															
Aluminum	-	73 J	ND	ND	32 J	31 J	51 J	ND	ND	ND	ND	ND	ND	ND	26 J
Antimony	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1000*	110	71	71	58	63	200	57	76	110	91	69	110	120	66
Cadmium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5 J
Calcium	-	50,200	72,800	76,600	96,900	83,700	130,000	90,500	104,000	133,000	119,000	102,000	107,000	127,000	98,700
Chromium	100	ND	2.0 J	ND	0.77 J	0.84 J	ND	ND	ND	1.3 J	ND	1.96 J	ND	ND	14
Copper	200	0.93 J	1.7 J		5.3	3.0 J	12	3.3 J	ND	2.4 J	ND	1.8 J	1.2 J	2.1 J	1.8 J
Iron	300	95 J	ND	ND	250	62 J	190	ND	ND	190	ND	ND	ND	ND	ND
Magnesium	35,000*	11,100	14,300	16,600	22,500	19,200	29,100	14,800	40,400	28,100	31,900	22,000	36,200	43,600	18,800
Manganese	300*	61	ND	ND	29	2.5 J	1,200	5.7 J	4.1 J	68	20	9.2	8,900	10	110
Nickel	100	ND	ND	ND	1.8 J	ND	2.1 J	ND	ND	0.74 J	3.6 J	ND	1.2 J	ND	6.2
Potassium	-	10,000	16,300	16,300 E	7,300	7,100	10,500	1,800	2,700	4,900	8,700	7,400	8,900	4,600	17,600
Selenium	10	ND	ND	ND	ND	ND	ND	ND	3.0 J	ND	1.93	ND	ND	ND	ND
Sodium	20,000	111,000	35,200	76,900	57,700	56,100	118,000	208,000	61,900	65,500	112,000	61,400	45,400	64,300	42,000
Vanadium	-	1.6 J	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2,000*	5.6 J	ND		5.6 J	6.5 J	15 J	15 J	ND	16 J	9.6 J	ND	ND	ND	11 J
EPA 8082 - PCBs (none detected above laboratory detection limits)															

1 - All values presented in micrograms per liter (ug/l)
2 - 6NYCRR Part 703.5

[shaded cell] ~ value detected above NYS Ambient Groundwater Standard or applicable NYSDEC Guidance Value

J- not detected above reporting limit

B- compound detected in associated method blank

Table 3-2 -Groundwater Results March 2009

Detected Parameters[1]	NYS Groundwater Standard Class GA[2]	OW-MW-17-12	OW-MW-18-12	OW-MW-19-13	OW-MW-20-13	OW-MW-21-15	OW-MW-22-13
EPA 8260 - Volatile Organics							
1,1,1-Trichloroethane	5[1]	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (Total)	5	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND
Acetone	50*	**1.6 J**	**1.5 J**	**1.9 J**	**2.3 J**	**1.9 J**	**4.9 J**
Chloroform	7	**9.4**	ND	ND	**0.91 J**	ND	ND
Isopropylbenzene	5	ND	ND	ND	ND	ND	ND
Cyclohexane	-	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND
Trichloroethene	5	**2.7 J**	**0.67 J**	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics							
Acenaphthene	-	ND	ND	ND	**0.63 J**	ND	ND
Anthracene	50	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.002*	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	5	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	50	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	50	ND	ND	ND	ND	ND	ND
Methy tert-butyl ether	10*	ND	ND	ND	ND	ND	**6.2**
Pyrene	50*	ND	ND	ND	ND	ND	ND
EPA 6010- Metals							
Aluminum	-	ND	**76 J**	**110 J**	**6,300**	**46 J**	**38 J**
Antimony	3	ND	ND	ND	ND	ND	ND
Arsenic	25	ND	ND	ND	**2.4 J**	ND	ND
Barium	1000*	**19 J**	**89**	**38**	**240**	**140**	**98**
Cadmium	10	ND	ND	ND	ND	ND	ND
Calcium	-	**224,000**	**117,000**	**64,200**	**112,000**	**117,000**	**180,000**
Chromium	100	**19,300**	ND	**1.8 J**	**10**	**3.0 J**	**1.3 J**
Copper	200	**4.0 J**	**1.9 J**	**2.9 J**	**4.6 J**	**1.3 J**	**0.88 J**
Iron	300	ND	**150**	**260**	**11,600**	ND	**52 J**
Magnesium	35,000*	**54,500**	**31,600**	**25,000**	**30,800**	**21,600**	**38,000**
Manganese	300*	**9.8 J**	**55**	**45**	**2,100**	**71**	**22**
Nickel	100	ND	ND	ND	**11**	ND	ND
Potassium	-	**7,000**	**5,200**	**9,100**	**7,700**	**18,200**	**22,400**
Selenium	10	ND	ND	ND	ND	**2.8 J**	ND
Sodium	20,000	**157,000**	**104,000**	**54,300**	**321,000**	**58,600**	**37,100**
Vanadium	-	ND	**0.64 J**	**1.1 J**	**16**	**3.9 J**	ND
Zinc	2,000*	ND	**6.7 J**	**3.9 J**	**27**	ND	ND
EPA 8082 - PCBs (none detected above laboratory detection li							

1- All values presented in micrograms per liter (ug/l)
2- 6NYCRR Part 703.5

(shaded box) ~ value detected above NYS A

J- not detected above reporting limit

B- compound detected in associated method blank

Orchard Whitney Site
Soil Analytical Results

Table 1-1 Subsurface Soil Results

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	OW-S-MW-08	OW-S-MW-09	OW-S-MW-10	OW-S-MW-11	OW-S-MW-12	OW-S-MW-12D	OW-S-MW-13	OW-S-MW-14	OW-S-MW-15	OW-S-MW-16	OW-S-MW-17	OW-S-MW-18	OW-S-MW-19	OW-S-MW-20	OW-S-MW-21	OW-S-MW-22	OW-S-TB-01	OW-S-TB-03
EPA 8260 - Volatile Organics																				
1,2-Dichlorobenzene	1,100	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1,800	130,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	53	ND
Acetone	50	500,000	ND	**7 J**	ND	**8 J**	ND	ND	ND	ND	ND	**21 J**	ND	ND	**9 J**	**30**	**10 J**	**7 J**	**55**	ND
Carbon Disulfide	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1 J**	ND	ND	ND	ND
Chloroform	370	350,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2 J**	ND	ND	ND
Cyclohexane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1,000	390,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	50	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**13 B**	ND	**21**	ND	ND
Tetrachloroethene	1,300	150,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1 J**	ND
Toluene	700	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	470	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**8**	ND	ND	ND	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics																				
2-Methylnaphthalene	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**49 J**	ND
Acenaphthene	20,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**140 J**	ND	ND	ND	ND
Acenaphthylene	100,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	100,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**350**	ND	ND	**13 J**	ND
Benzo(a)anthracene	1,000	5,600	ND	ND	ND	ND	ND	ND	**10 J**	**17 J**	ND	ND	**12 J**	**16 J**	ND	**200 J**	ND	ND	**47 J**	ND
Benzo(a)pyrene	1,000	1,000	ND	ND	ND	ND	ND	ND	ND	**14 J**	ND	ND	ND	**11 J**	ND	**77 J**	ND	ND	**54 J**	ND
Benzo(b)fluoranthene	1,000	5,600	ND	ND	ND	ND	ND	ND	ND	**11 J**	ND	ND	**11 J**	**15 J**	ND	**38 J**	ND	ND	**77 J**	ND
Benzo(ghi)perylene	100,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**41 J**	ND	ND	**49 J**	ND
Benzo(k)fluoranthene	800	56,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**33 J**	ND
Bis(2-ethylhexyl) phthalate	-	-	ND	ND	ND	**82 J**	**76 J**	**66 J**	ND	**120 J**	**100 J**	ND	**170 J**	ND	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**170 J**	ND
Carbozole	-	-																ND		
Chrysene	1,000	56,000	ND	ND	ND	ND	ND	ND	ND	**24 J**	ND	ND	ND	**10 J**	ND	**250**	ND	ND	**62 J**	ND
Di-n-butyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	330	560	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**12 J**	ND	ND	**16 J**	ND
Dibenzofuran	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**89 J**	ND	ND	**11 J**	ND
Fluoranthene	100,000	500,000	ND	ND	ND	ND	ND	ND	**10 J**	**11 J**	ND	ND	**19 J**	**26 J**	ND	**120 J**	ND	**12 J**	**97 J**	ND
Fluorene	30,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**220 J**	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	500	5,600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**15 J**	ND	ND	**46 J**	ND
N-nitrosodiphenylamine	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**710**	ND	ND	ND	ND
Naphthalene	12,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**49 J**	ND
Phenanthrene	100,000	500,000	ND	ND	ND	ND	ND	ND	**8 J**	ND	ND	ND	**16 J**	**26 J**	ND	**14 J**	ND	**14 J**	**78 J**	ND
Pyrene	-	-	ND	ND	ND	ND	ND	ND	**8 J**	**39 J**	ND	ND	**14 J**	**22 J**	ND	**660**	ND	ND	**74 J**	ND

1 - All values presented in micrograms per kilogram (ug/Kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
J- value is estimated
D- all compounds identified in an analysis at secondary dilution factor

Value Exceeds Unrestricted SCOs
Value Exceeds Commercial Use SCOs

Orchard Whitney Site
Soil Analytical Results

Table 1-1 Subsurface Soil Results

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	OW-S-TB-05	OW-S-TB-07	OW-S-TB-19	OW-S-TB-20	OW-S-TP-01A	OW-S-TP-02	OW-S-TP-03	OW-S-TP-04	OW-S-TP-05A	OW-S-TP-06	OW-S-TP-07	OW-S-TP-08	OW-S-TP-09	OW-S-TP-10	OW-S-TP-11	OW-S-TP-14	OW-S-TP-15	OW-S-TP-17	OW-S-TP-18
EPA 8260 - Volatile Organics																					
1,2-Dichlorobenzene	1,100	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1,800	130,000	ND	ND	ND	ND	ND	ND	1 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	500,000	ND	11 J	11 J	ND	ND	ND	47	ND	ND	ND	16 J	ND	ND	ND	14 J	12 J	11 J	8 J	ND
Carbon Disulfide	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	370	350,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1 J	ND	ND	ND
Cyclohexane	-	-	ND	ND	ND	ND	ND	ND	3 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1,000	390,000	ND	ND	ND	ND	ND	ND	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	-	-	ND	ND	ND	ND	ND	ND	8	ND	ND	ND	2 J	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	-	ND	ND	ND	ND	ND	ND	2 J	ND	ND	ND	1 J	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	50	500,000	ND	ND	ND	17	ND	2 J	ND	ND	ND	ND	ND	ND	ND	ND	3 J	ND	3 J	ND	ND
Tetrachloroethene	1,300	150,000	ND	ND	ND	ND	ND	ND	92	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	700	500,000	ND	ND	ND	ND	ND	ND	2 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	-	-	ND	ND	ND	ND	ND	ND	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	470	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics																					
2-Methylnaphthalene	-	-	ND	92 J	ND	ND	ND	ND	2000.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,400 J
Acenaphthene	20,000	500,000	ND	420 J	ND	ND	ND	ND	ND	ND	ND	ND	21 J	ND	ND	ND	ND	ND	ND	13 J	4,000 J
Acenaphthylene	100,000	500,000	ND	68 J	ND	ND	ND	ND	61 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	22 J	16 J	660 J
Anthracene	100,000	500,000	ND	1,200	ND	ND	ND	9 J	130 J	ND	ND	ND	120 J	ND	ND	ND	ND	ND	12 J	44 J	12,000
Benzo(a)anthracene	1,000	5,600	ND	2,700	ND	ND	ND	32 J	160 J	ND	29 J	24 J	54 J	ND	ND	12 J	ND	ND	19 J	130 J	27,000
Benzo(a)pyrene	1,000	1,000	ND	2,400	ND	ND	ND	34 J	ND	ND	30 J	30 J	20 J	ND	ND	12 J	ND	ND	46 J	130 J	30,000
Benzo(b)fluoranthene	1,000	5,600	ND	2,900	ND	ND	10 J	40 J	ND	ND	45 J	36 J	11 J	ND	ND	16 J	ND	ND	210	180 J	33,000
Benzo(ghi)perylene	100,000	500,000	ND	1,200	ND	ND	ND	30 J	260 J	ND	22 J	24 J	9 J	ND	ND	12 J	ND	ND	220	82 J	22,000
Benzo(k)fluoranthene	800	56,000	ND	1,200	ND	ND	ND	18 J	ND	ND	13 J	12 J	ND	ND	ND	ND	ND	ND	41 J	58 J	14,000
Bis(2-ethylhexyl) phthalate	-	-	170 J	ND	ND	ND	ND	ND	1400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbozole	-	-				ND															5100
Chrysene	1,000	56,000	ND	2,400	ND	ND	ND	30 J	140 J	ND	19 J	23 J	55 J	ND	ND	12 J	ND	ND	46 J	120 J	26,000
Di-n-butyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	330	560	ND	300 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	51 J	10 J	5,500
Dibenzofuran	-	-	ND	240 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16 J	3,100 J
Fluoranthene	100,000	500,000	ND	8,200	ND	ND	9 J	59 J	200 J	ND	43 J	48 J	32 J	ND	ND	16 J	ND	ND	41 J	280	65,000
Fluorene	30,000	500,000	ND	360 J	ND	ND	ND	ND	140 J	ND	ND	ND	51 J	ND	ND	ND	ND	ND	ND	13 J	4,100 J
Indeno(1,2,3-cd)pyrene	500	5,600	ND	1,200	ND	ND	ND	26 J	ND	ND	22 J	18 J	ND	ND	ND	10 J	ND	ND	190 J	77 J	19,000
N-nitrosodiphenylamine	-	-	ND	ND	ND	ND	ND	ND	130 J	ND	ND	ND	160 J	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	500,000	ND	180 J	ND	ND	ND	ND	450 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13 J	2,600 J
Phenanthrene	100,000	500,000	ND	4400	ND	ND	10 J	46 J	440 J	8 J	23 J	22 J	180 J	ND	ND	12 J	ND	ND	19 J	200	44,000
Pyrene	-	-	ND	4900	ND	ND	ND	55 J	340 J	ND	38 J	39 J	160 J	ND	ND	17 J	ND	ND	40 J	210	48,000

1 - All values presented in micrograms per kilogram (ug/Kg).

2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Clear

3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanu

ND- Not detected above reporting limit

J- value is estimated

D- all compounds identified in an analysis at secondary dilution factor

Table 1-2 Subsurface Soil Results

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	OW-S-MW-08	OW-S-MW-09	OW-S-MW-10	OW-S-MW-11	OW-S-MW-12	OW-S-MW-12D	OW-S-MW-13	OW-S-MW-14	OW-S-MW-15	OW-S-MW-16	OW-S-MW-17	OW-S-MW-18	OW-S-MW-19	OW-S-MW-20	OW-S-MW-21	OW-S-MW-22	OW-S-TB-01	OW-S-TB-03
EPA 6010- Metals																				
Aluminum	-	-	7,490 EN	3,510 EN	3,390 EN	3,150 EN	3,670 EN	3,870 EN	3,260 EN	3,710	4,770	3,790	3,430	7,870	5,320	5,140	6,500	3,850 N	3,400 EN	2,560 EN
Antimony	-	-	23.4 NU*	16.1 NU*	17.8 NU*	14.9 NU*	17.9 NU*	16.3 NU*	18.6 NU*	17.8 NU	16.2 NU	19.2 NU	17.6 NU	18 NU	17.9 NU	21.4 NU	18 NU	17.4 NU	18.6 NU*	16.9 NU*
Arsenic	13	16	ND	ND	ND	2.4	2.4	2.6	2.7	ND	ND	ND	8.6	8.6	3.8	6.4	3.3	3.6	4.3	2.9
Barium	350	400	24.6 EN*	23.4 EN*	30.8 EN*	23.6 EN*	34.5 EN*	37.8 EN*	22.5 EN*	19.6	18.5	38	19.8	62.8	64.3	36.2	26.6	56.8	31 EN*	16.4 EN*
Beryllium	7.2	2,700	0.38	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.36	0.5	0.24	0.33	0.32	ND	0.32	ND
Cadmium	2.5	9.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	-	-	2,830 E	47,300 E	40,500 E	56,400 E	43,900 E	32,400 E	58,700 E	30,200	6,620	59,700	131,000	158,000	54,600	36,400	38,000	45,00	71,200 E	64,800 E
Chromium	1	400	12.6	5.5	5.5	5.4	5.8	8.2	4.9	5.9 *	6.6 *	6.5 *	46 *	11.9 *	7.4 *	8.8 *	9.1 *	5.7	8.5	4.8
Cobalt	-	-	7.6	3.3	2.8	2.9	3.3	3.2	3.1	3.6	5.1	3.7	2.9	6.6	4.2	5	6.3	3.9	3.9	2.6
Copper	-	-	28.9	7.7	7.1	5.8	9.4	9.6	7.9	9.3 N*	11.5 N*	7.3 N*	9.9 N*	19.7 N*	9.5 N*	16.9 N*	22.9 N*	17.1 *	31.1	13
Iron	-	-	14,700 EN	8,140 EN	7,420 EN	7,740 EN	8,670 EN	8,520 EN	8,110 EN	9,720	10,000	9,300	10,800	18,700	10,600	13,100	12,200	9,380 *	8,410 EN	7,620 EN
Lead	63	1,000	8.4	3.9	2.4	3.6	3.3	3.2	3.3	2.9	4	3.4	13.2	14.2	3.6	10.1	6.3	5.9 *	75.3	9.2
Magnesium	-	-	3,950 E	10,200 E	9,310 E	17,300 E	12,700 E	7,580 E	14,300 E	6,410	4,240	12,300	19,600	42,500	8,850	9,350	7,810	9,670	40,500 E	27,000 E
Manganese	1600	10,000	135 E*	284 E*	267 E*	332 E*	342 E*	316 E*	325 E*	294	142	351	217	531	338	908	299	596 *	219 E*	376 E*
Mercury	0.18	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.365	ND
Nickel	30	310	19.6 E	7 E	6.3 E	6.5 E	6.9 E	7.2 E	6.6 E	8.8	10.9	8.2	5.5	13.6	8.9	9.8	13.3	7.1	9 E	6.2 E
Potassium	-	-	1,560	816	821	844	843	833	760	930	931	1,140	2,470	2,900	1,310	1,490	1,590	1,120 E	1,030	863
Selenium	3.9	1,500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	2	1,500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	-	-	ND	230	ND	ND	ND	167	ND	ND	ND	ND	217	477	296	445	ND	177	ND	ND
Vanadium	-	-	13.7 E	8.2 E	8 E	8.2 E	8.9 E	8.5 E	7.6 E	8.9	9.3	10	8.3	15.9	10.6	14.4	13.1	8.9	7.4 E	7.2 E
Zinc	109	10,000	73.6	17	17.1	13.1	19.4	20.2	14.7	40	45.3	17.2	12.5	38.1	22.5	42.4	47	32.6 E	143	23.6
EPA 8082 - PCBs																				
Aroclor 1254	100	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	66	ND
Aroclor 1260	100	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.5 J	ND
EPA 8081 - Pesticides (none detected above laboratory detection limits)																				

1 - All values presented in micrograms per kilogram (ug/Kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
J- value is estimated
D- all compounds identified in an analysis at secondary dilution factor
M- matrix spike recoveries outside QC limits; matrix bias indicated
E- value is estimated or not reported due to interference (for metals)
N- spike sample recovery is not within QC limits (for metals)
NU- Not detected (for metals)
*- spike or duplicate analysis is not within QC limits (for metals)

Value Exceeds Unrestricted SCOs
Value Exceeds Commercial Use SCOs

Table 1-2 Subsurface Soil Results

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	OW-S-TB-05	OW-S-TB-07	OW-S-TB-19	OW-S-TB-20	OW-S-TP-01A	OW-S-TP-02	OW-S-TP-03	OW-S-TP-04	OW-S-TP-05A	OW-S-TP-06	OW-S-TP-07	OW-S-TP-08	OW-S-TP-09	OW-S-TP-10	OW-S-TP-11	OW-S-TP-14	OW-S-TP-15	OW-S-TP-17	OW-S-TP-18
EPA 6010- Metals																					
Aluminum	-	-	3,710 EN	3,470 EN	3,750	2,820 N	5,240 EN	3,160 EN	4,770 EN	3,180 EN	4,790 EN	3,410 EN	6,480 EN	2,700 EN	3,050 EN	4,320 EN	2,130 EN	2,820 EN	5,110 EN	5,140 EN	10,300 N
Antimony	-	-	16.8 NU*	20.2 NU*	16.8 NU	16.7 NU	17.9 NU*	16.5 NU*	20.4 NU*	17.8 NU*	21.8 NU*	17 NU*	18.8 NU*	17 NU*	16.1 NU*	18.8 NU*	18.2 NU*	17.4 NU*	19.2 NU*	17 NU*	19.6 NU
Arsenic	13	16	ND	9.1	ND	5.4	4.9 N	2.2 NU	5.1 N	3.6 N	2.9 NU	4.7 N	3.1 N	2.3 NU	2.1 NU	3.2 N	2.4 NU	2.3 NU	4.2 N	3.3 N	7.8
Barium	350	400	35 EN*	66.9 EN*	36.8	25.6	42.6 EN	15.8 EN	29.7 EN	18.7 EN	48.9 EN	42.3 EN	30.7 EN	24.6 EN	26.1 EN	35 EN	15.8 EN	18.9 EN	29.7 EN	74.7 EN	1,570
Beryllium	7.2	2,700	ND	0.29	ND	0.27	0.24 NU	0.22 NU	0.27 NU	0.24 NU	0.29 NU	0.23 NU	0.25 NU	0.23 NU	0.21 NU	0.25 NU	0.24 NU	0.23 NU	0.26 NU	0.23 NU	0.52
Cadmium	2.5	9.3	ND	ND	ND	ND	0.24 NU	0.22 NU	0.27 NU	0.24 NU	0.29 NU	0.23 NU	0.25 NU	0.23 NU	0.21 NU	0.25 NU	0.24 NU	0.23 NU	0.26 NU	0.23 NU	1.8
Calcium	-	-	50,200 E	17,800 E	57,300	136,000	1,740 EN	1,690 EN	1,610 EN	102,000 EN	4,850 EN	56,900 EN	22,900 EN	50,000 EN	34,300 EN	28,300 EN	37,800 EN	40,200 EN	2,290 EN	3,380 EN	134,000
Chromium	1	400	7.6	7.3	584 *	4.9	7.1 EN	4.6 EN	7.4 EN	4.7 EN	7.1 EN	5.3 EN	9.1 EN	4.8 EN	4.2 EN	5.9 EN	3.8 EN	4.6 EN	8.7 EN	6.9 EN	24.4
Cobalt	-	-	3.2	2.4	3.6	3.7	5.1 N	2.2 N	5.9 N	2.8 N	3.9 N	3.1 N	6.7 N	2.6 N	2.6 N	4.1 N	1.9 N	2.5 N	5 N	6.1 N	5
Copper	-	-	8.8	24.8	7.7 N*	30.1 *	33.5 N	9.2 N	70.1 N	14.3 N	22.6 N	9.9 N	19.2 N	9.5 N	9.7 N	12.5 N	6.2 N	7.9 N	15.9 N	5 N	455 *
Iron	-	-	7,920 EN	11,600 EN	8,860	13,400 *	11,600 E	6,350 E	13,400 E	8,010 E	10,400 E	8,910 E	14,900 E	6,850 E	6,600 E	9,820 E	5,790 E	7,190 E	15,000 E	11,800 E	16,000 *
Lead	63	1,000	3.8	670	3.2	7.5 *	7.9 N	2.2 N	51.2 N	5 N	11.6 N	5 N	7.1 N	2.2 N	2.4 N	5.9 N	1.8 N	3.4 N	11.9 N	7.7 N	651 *
Magnesium	-	-	10,100 E	2,950 E	11,600	48,200	1,940 EN	1,280 EN	2110 EN	35,300 EN	2,710 EN	11,200 EN	8,200 EN	11,500 EN	6,840 EN	8,210 EN	11,200 EN	12,300 EN	2,150 EN	2,140 EN	14,300
Manganese	1600	10,000	277 E*	345 E*	404	1,170 *	1,080 E*	141 E*	223 E*	282 E*	250 E*	264 E*	236 E*	262 E*	328 E*	397 E*	225 E*	259 E*	177 E*	883 E*	378 *
Mercury	0.18	2.8	ND	0.039	ND	ND	ND	ND	ND	ND	ND	0.031	ND	ND	ND	ND	ND	ND	ND	ND	0.071
Nickel	30	310	7.5 E	7.9 E	7.5	7.3	16.1 EN	7.1 EN	19.2 EN	5.7 EN	7 EN	6.7 EN	15.5 EN	5.9 EN	6.8 EN	8.7 EN	4.2 EN	5.3 EN	10.4 EN	8 EN	14.2
Potassium	-	-	825	683	1,010	1,280 E	1,280 EN	644 EN	1,460 EN	1,180 EN	1,390 EN	920 EN	922 EN	717 EN	751 EN	885 EN	536 EN	796 EN	1,060 EN	829 EN	2,110 E
Selenium	3.9	1,500	ND	ND	ND	ND	4.8 NU	4.4 NU	5.4 NU	4.8 NU	5.8 NU	4.5 NU	5 NU	4.5 NU	4.3 NU	5 NU	4.9 NU	4.6 NU	5.1 NU	4.5 NU	ND
Silver	2	1,500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.83
Sodium	-	-	ND	ND	471	208	ND	ND	ND	ND	ND	ND	209	ND	ND	ND	ND	ND	ND	ND	937
Vanadium	-	-	9 E	10.8 E	9.4	7.4	10.3 EN	6.3 EN	9.1 EN	8 EN	11.2 EN	8.3 EN	11.7 EN	8.1 EN	6.6 EN	9.2 EN	7.1 EN	8 EN	12 EN	11.6 EN	19.7
Zinc	109	10,000	18.6	52.7	16.2	50.5 E	48 EN	21.9 EN	98.8 EN	17.1 EN	50.3 EN	19.4 EN	61.5 EN	12.8 EN	17.5 EN	26.6 EN	11.1 EN	22.8 EN	62.5 EN	32.5 EN	1,150 E
EPA 8082 - PCBs																					
Aroclor 1254	100	-	ND	ND	ND	ND	ND	44	ND	ND	ND	100	ND	ND	ND	ND	ND	ND	15 J	ND	470
Aroclor 1260	100	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 8081 - Pesticides (none detected above laboratory (																					

1 - All values presented in micrograms per kilogram (ug/Kg).

2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Clear

3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanu

ND- Not detected above reporting limit

J- value is estimated

D- all compounds identified in an analysis at secondary dilution factor

M- matrix spike recoveries outside QC limits; matrix bias indicated

E- value is estimated or not reported due to interference (for metals)

N- spike sample recovery is not within QC limits (for metals)

NU- Not detected (for metals)

*- spike or duplicate analysis is not within QC limits (for metals)

Table 2 - Surface Soil Results

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	OW-S-SS-01	OW-S-SS-02	OW-S-SS-03	OW-S-SS-04
EPA 8260 - Volatile Organics						
Methylene chloride	50	500,000	15	ND	ND	3 J
EPA 8270- Semi-Volatile Organics						
Acenaphthene	20,000	500,000	ND	110 J	450 J	930 J
Acenaphthylene	100,000	500,000	ND	190 J	200 J	1,500 J
Anthracene	100,000	500,000	ND	ND	1,100 J	2,900 J
Benzo(a)anthracene	1,000	5,600	2,400 J	1,300 J	3,200	8,900 J
Benzo(a)pyrene	1,000	1,000	2,000 J	1,500 J	3,400	9,500 J
Benzo(b)fluoranthene	1,000	5,600	2,800 J	1900.00	4,000	12,000 J
Benzo(ghi)perylene	100,000	500,000	1,400 J	940 J	2,100	5,000 J
Benzo(k)fluoranthene	800	56,000	1,100 J	780 J	2,100	5,200 J
Bis(2-ethylhexyl) phthalate	-	-	ND	ND	950 J	ND
Butyl benzyl phthalate	-	-	ND	960 J	780 J	ND
Carbozole	-	-	ND	280 J	890 J	2900 J
Chrysene	1,000	56,000	2,400 J	1,400 J	3,500	9,900 J
Di-n-butyl phthalate	-	-	ND	ND	1,200 J	ND
Di-n-octyl phthalate	-	-	ND	95 J	99 J	1,600 J
Dibenzo(a,h)anthracene	330	560	ND	220 J	620 J	ND
Dibenzofuran	-	-	ND	89 J	350 J	1,600 J
Fluoranthene	100,000	500,000	4,800 J	3,200	7,500	23,000
Fluorene	30,000	500,000	ND	ND	480 J	2,100 J
Indeno(1,2,3-cd)pyrene	500	5,600	1,100 J	800 J	1,900	4,600 J
Naphthalene	12,000	500,000	ND	ND	240 J	ND
Phenanthrene	100,000	500,000	2,200 J	2,200	5,800	21,000
Pyrene	-	-	3,600 J	2,300	5,600	16,000 J
Metals						
Aluminum	-	-	2,240	4,480	5,250	5,130
Arsenic	13	16	15.3	3.3	8.4	8.2
Barium	350	400	49.1	70	792	90.8
Beryllium	7.2	2,700	ND	0.23	0.34	0.3
Cadmium	2.5	9.3	1.7	0.86	4.3	17.4
Calcium	-	-	97,800	31,700	19,700	9,650
Chromium	1	400	13.1	10.4	37.9	16.6
Cobalt	-	-	2.8	3.9	5.5	5.4
Copper	-	-	68	52.4	159	83.7
Iron	-	-	15,600	13,700	15,000	18,600
Lead	63	1,000	175	124	594	408
Magnesium	-	-	40,200	11,500	7,620	3,790
Manganese	1600	10,000	296	325	535	388
Mercury	0.18	2.8	0.081 N	0.093 N	0.435 N	0.515 N
Nickel	30	310	10.7	10	15.7	14.1
Potassium	-	-	703	806	1,100	535
Silver	2	1,500	1.1	0.59	1.6	5
Sodium	-	-	268	ND	241	ND
Vanadium	-	-	14.3	10	16.3	17.6
Zinc	109	10,000	869	269	2,590	778
EPA 8082 - PCBs						
Aroclor 1254	100	-	70 B	55 B	320 B	ND
Aroclor 1260	100	-	ND	ND	ND	ND
EPA 8081 - Pesticides (none detected above laboratory detection limits)						

1 - All values presented in micrograms per kilogram (ug/Kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
J- value is estimated
M- matrix spike recoveries outside QC limits; matrix bias indicated
N- spike sample recovery is not within QC limits (for metals)

Value Exceeds Unrestricted SCOs (green)
Value Exceeds Commercial Use SCOs (orange)

Appendix B
Site-Specific Health and Safety Plan

Environmental Restoration Program
Orchard-Whitney Site (#E828123)
415 Orchard Street – 354 Whitney Street
City of Rochester
Monroe County, New York

Remedial Investigation and Interim Remedial Measures

HEALTH AND SAFETY PLAN

Prepared For:

City of Rochester
Department of Environmental Services
Division of Environmental Quality
30 Church Street
Rochester, New York 14614

Prepared By:

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL
2230 Penfield Road
Penfield, New York 14526

February 2011

Project No: 4216-01

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LU ENGINEERS
SITE SAFETY PLAN

A. GENERAL INFORMATION

Project Title:	Orchard/Whitney Site	Lu Project No.	4216-01
	City of Rochester		
	Environmental Restoration Program		
	Remedial Investigation and Interim Remedial Measure Work Plan Addendum		
Project Manager:	Gregory L. Andrus, CHMM	Project Director:	Steven A. Campbell, CHMM
Location:	415 Orchard Street and 354 Whitney Street		
	City of Rochester, Monroe County, New York		
Prepared by:	Janet M. Bissi, CHMM	Date Prepared:	December 2009
Revised by:	Janet M. Bissi, CHMM	Date Revised:	April 2010/February 2011
Approved by:		Date Approved:	
Site Safety Officer Review:	Sue Hilton	Date Reviewed:	

Scope/Objective of Work: Remedial Investigation (RI) activities at Site include completing a Ground Penetrating Radar (GPR) survey, excavating test pits, advancing soil borings, installing monitoring wells to sample the groundwater and soil to further delineate the Site and provide sufficient information to adequately evaluate all remedial alternatives. Interim Remedial Measure (IRM) activities at the Site include the removal of approximately four (4) underground storage tanks (USTs), a hydraulic lift, soil removal in the former plating area, and stabilization and/or disposal of contaminated soil and groundwater.

- Task 1: Site Preparation
- Task 2: Evaluation of Tunnels and UFPO using a GPR and a hoe-ram for tunnel access
- Task 3: UST Evaluation with GPR and hoe-ram to verify tank number, size, and orientation
- Task 4: Investigation and of Former Plating Area by soil borings, micro-well installation, test pit excavation as well as soil and groundwater sampling
- Task 5: Work Plan Addendum for review and approval- not a field task, but may require on-Site time for map verification
- Task 6: UST closure
- Task 7: Hydraulic lift closure
- Task 8: Test Pit excavation at 415 Orchard Street
- Task 9: Plating Area source removal and contaminated soil stabilization
- Task 10: Permanent groundwater monitoring well installation and groundwater sampling

Proposed Date of Field Activities: Summer 2011

Background Information: [X] Complete [X]* Preliminary (limited analytical data)
* Background information provided by NYSDEC and City of Rochester

Overall Chemical Hazard: [ ] Serious [X] Moderate
[ ] Low [ ] Unknown

Overall Physical Hazard: [ ] Serious [X] Moderate
[ ]Low [ ] Unknown

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):
[X] Liquid [X] Solid [X] Sludge [ ] Gas/Vapor

Characteristic(s):
[ ] Flammable/Ignitable [X] Volatile [ ] Corrosive [ ] Acutely Toxic
[ ] Explosive (moderate)[ ] Reactive [X] Carcinogen [ ] Radioactive
Other: ______

Physical Hazards:

[X] Overhead	[ ] Confined Space	[ ] Below Grade	[X] Trip/Fall
[X] Puncture	[X] Burn	[X] Cut	[X] Splash
[X] Noise	[X] Other: Heat Stress/Cold Stress		

Site History/Description and Unusual Features:
The Orchard-Whitney Site (Site) has been used for various commercial and industrial uses since the early 1900s. From 1915 to 1922, the North East Electric Company operated on the Site. General Motors occupied the Site from 1930 to 1967. Industrial activities including the production of electrical equipment, heat treating, plating, coal storage, boiler operations, petroleum fuel storage and industrial wastewater treatment were performed on the Site.

After General Motors closed operations, other industrial operations took place at the Site including; metal finishing, synthetic foam production, printing, plastics manufacturing and warehousing. These operations took place at the Site until the early 1990s.

The Site is located at 415 Orchard Street and 354 Whitney Street in the City of Rochester, New York (Figure 1 of the RI/IRM Measures Work Plan Addendum). The Site has a combined area of 3.9 acres and is located approximately 1/16 mile west of the intersection of Lyell Avenue and Broad Street. One multi-story structure of approximately 371,600 square feet is located on the Orchard Street parcel. Other large industrial structures existed in the past, but have been demolished.

Previous environmental investigations have revealed that volatile organic compounds (VOCs), several metals, and semi-volatile organic compounds (SVOCs) have been detected in subsurface soils and groundwater above New York State Department of Environmental Conservation (NYSDEC) Soil Guidance Values on the Whitney Street parcel. Information on the Orchard Street parcel is limited. There are no local private wells in the area of the Site and the surrounding community is on public water and sewer service.

Locations of Chemicals/Wastes: Soil, sediment, surface water and/or groundwater.

Estimated Volume of Chemicals/Wastes: Unknown.

Site Currently in Operation: [ ] Yes [X] No [ ] Not Applicable

C. HAZARD EVALUATION

PHYSICAL HAZARD EVALUATION:		
TASK	**HAZARD(S)**	**HAZARD PREVENTION**
Tasks 1-10	General physical hazards associated with drill rig and geoprobe operations (spinning, augers, overhead equipment, noise, and, drill rig movement). Physical hazards also associated with demolition equipment.	Hard hats, eye protection, and steel-toed boots required at all times while working around drill rig. Hearing protection required during sampling (hammering). Keep safe distance from rig and all moving parts.
	Contact with or inhalation of contaminants, potentially in high concentration in sampling media and/or fire and explosion.	To minimize exposure to chemical contaminants, a thorough review of suspected contaminants should be completed and implementation of an adequate protection program. Under-ground vaults to be ventilated during inspections.
	Contact with or inhalation of decontamination solutions.	Material Safety Data Sheets for all decon solutions. First aid equipment available.
	Overhead Hazards/ Falling Objects	**See Appendix B**
	Back strain and muscle fatigue, ergonomic stress due to lifting.	Use proper lifting techniques and limit load to prevent back strain.
	Heat stress/ cold stress exposure	Implement heat stress management techniques such as shifting work hours, increasing fluid intake, and monitoring employees**. See Appendix A.**
	Slip/ tripping/ fall	Observe terrain and drilling equipment while walking to minimize slips and falls. Steel-toed boots provide additional support and stability. Use adequate lighting. Inspect Site and mark existing hazards.
	Medical Waste (Sharps)	Carefully observe terrain while walking and any on-Site materials before handling. Gloves should be worn for any contact with on-Site materials.
	Noise	**See Appendix B**
	Native wildlife presents the possibility of insect bites and associated diseases	Avoid wildlife when possible.
	Sunburn	Apply sunscreen, wear appropriate clothing.
	Utility Lines	**See Appendix B**
	Weather Extremes	Establish Site-specific contingencies for severe weather situations. Discontinue work in severe weather.

Physical Hazard Evaluation: Basic health and safety protection (steel-toed boots, work clothes, and safety glasses or goggles) will be worn by all personnel at all times. Any allergies should be reported to the Site Safety Officer prior to the start of the project.

D. SITE SAFETY WORK PLAN

Site Control: Site perimeter is fenced and gated, though continued evidence of vandalism suggests Site is not fully secure.

Perimeter Identified?	**[Y]**	**Site Secured?**	**[Y]**
Work Areas Designated?	**[Y]**	**Zone(s) of contamination identified?**	**[Y]**

Anticipated Level of Protection (cross-reference task numbers in Section C):

	A	B	C	D
Tasks 1-10			Available	X

All Site work will be performed at Level D (steel-toed boots, work clothes, eye protection, gloves and hard hats) unless monitoring indicates otherwise. Gloves will be worn if contact with Site soil, sediment or water is anticipated, due to concerns of polychlorinated biphenyl (PCB) contamination. Level C will be available, and used when indicated by photoionizaton detector (PID) of 10 parts per million (ppm) or greater above ambient air.

Air Monitoring:

Contaminant	Monitoring Device	Frequency
Organic Vapors	MiniRAE 2000 PID	Continuous
Ignition Sources	O_2/Explosimeter	Continuous
Particulate	MiniRam	Continuous

Continuous perimeter air monitoring for VOCs and particulates will performed during intrusive activities and is described in the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP) (Appendix B of the RI/IRM Work Plan Addendum).

Lu Engineers will also conduct continuous air monitoring of worker breathing zone air during intrusive investigations. If action levels are exceeded during intrusive investigation, appropriate precautions will be taken, as described below.

Action Levels:
PID readings of **10 ppm** above background in the breathing zone or greater, sustained for greater than 1 minute
Action: Hault work activities and move away from the vapor source. Consider upgrading to Level C protection. If PID readings drop to within 5 ppm above background, work may resume with continuous air monitoring.

PID readings of **10 ppm to <25 ppm** above background at breathing zone, sustained for greater than 1 minute
Action: Upgrade to Level C protection.

PID readings of **>25 ppm** above background at breathing zone, sustained for greater than 1 minute
Action: Stop work.

O_2 readings must remain between 19.5% and 22.0%. Explosivity must be above 10% lower explosive level (LEL). The area must be evacuated and ignition sources eliminated if levels are not within their standard. These atmospheric factors will be measured at a position that would give the earliest indication of a hazardous condition forming not at the breathing zone. Appropriate actions, initially evacuation of the immediate work area, will be taken if established action levels area exceeded.

If particulate levels exceed a level of 2.5 times background (upwind levels subtracted from downwind concentration) or a level of 150 mcg/m^3, dust control measures will be initiated and the dust generating activity suspended until levels decrease below the action level. Perimeter monitoring will be conducted if the action level is obtained at the work area.

All air monitoring results as well as wind direction and speed (estimates) will be documented in the Site specific log book.

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:
Disposable sampling equipment will be used where possible. If decon is necessary, distilled or deionized water and alconox will be used. A 10% nitric acid rinse will be added if metals sampling is to be conducted.

Personnel Decon Protocol:
Personal protective clothing will be removed in a manner that will minimize the potential of contaminant to skin contact. Visible contamination will be removed from protective clothing prior to the individual doffing the articles. Soap, water and paper towels will be available for all personnel and will be used before eating, drinking or leaving the Site. Personnel will shower upon return to home or hotel. Disposable personal protection equipment (PPE) will be double-bagged and disposed of as non-hazardous waste unless PCBs are detected. If PCBs are detected, the PPE will be disposed of accordingly.

Decontamination Solution Monitoring Procedures, if Applicable:
All decontamination procedures will take place in a well ventilated area. Decontamination solutions will be collected and sampled for proper disposal.

Special Site Equipment, Facilities or Procedures
(Sanitary Facilities and Lighting Must Meet 29CFR 1910.120):
All personnel will be required to maintain the Buddy System at all times. A portable toilet and potable water will be available on Site. All parties will be required to attend an on-Site briefing, which will identify the roles of each organization’s personnel and will integrate emergency procedures for all Site participants.

Site Entry Procedures and Special Considerations:
Entry to the Site should be limited through the Whitney Street gate. The gate should be closed and locked when not in use both when personnel are on or off site in order to restrict unauthorized individuals. The Buddy System should be employed at all times onsite and entering and exiting the Site, along with the work zone areas.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:
All work will be completed during daylights hours. Severe inclement weather may be cause to suspend outdoor activities. Heat stress protocol will dictate work/rest regimen. Heavy equipment will not be used during electrical storms.

General Spill Control, if Applicable:
Absorbent material will be available to control spills during the removal of the USTs.

Investigation Derived Material (i.e., Expendables, Decon Waste, Cuttings) Disposal:
It is not anticipated that Investigation Derived Materials will be generated as part of the proposed RI/IRM activities at the Site.

Sampling Handling Procedures Including Protective Wear:
Samples collected from soil and groundwater will be handled with neoprene outer gloves prior to decontamination. At minimum nitrile surgical gloves will be worn while handling samples during labeling, documentation and packaging.

Team Member*	**Responsibility**
Steven Campbell	Project Director
Greg Andrus, CHMM	Project Manager
Sue Hilton	Quality Assurance and Site Safety Officer
Eric Detweiler	Field Team Leader/Geologist
Laura Neubauer	Alternate Field Team Leader
Janet Bissi, CHMM	Field Technician
Cliff Rigerman, L.S.	Team Member-Survey

* All entries into the work zone require "Buddy System" use. All Lu’ field staff participate in a medical monitoring program and have completed applicable training per 29 Code of Federal Regulations (CFR) 1910.120. Respiratory protection program meets requirements of 29CFR 1910.134.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	911
Hospital Emergency Room:	Strong Memorial Hospital (585) 275-4551
	601 Elmwood Avenue, Rochester, New York
Poison Control Center:	911
Police (include local, county sheriff, state):	911
Fire Department:	911
Airport:	N/A
Laboratory:	Paradigm Environmental Services, Inc. (585)647-2530
UPS/Federal Express:	N/A

SITE RESOURCES

Site Emergency Evaluation Alarm Method:	Sound vehicle horn.
Water Supply Source:	Gallons of water will be available in vehicles.
Telephone Location, Number:	None available
Cellular Phone, if Available:	TBD
Radio:	TBD
Other:	TBD

EMERGENCY CONTACTS

1.	Fire/Police:	911
2.	Lu Engineers, Project Manager:	(585) 385-7417 Ext. 215(Office) (585) 732-5789 (Cell)
3.	Lu Engineers, Steve Campbell	(585) 385-7417 Ext. 223 (Office) (585) 737-5204 (Cell)

EMERGENCY ROUTES

Note: Field team must know route(s) prior to start of work.

Directions from the Site to Strong Memorial Hospital (map on following page):

Turn right onto Whitney Street.

Take a right onto Lyell Avenue

Turn right onto Broad Street (1 mile)

Stay straight to go onto Ford Street.

Turn slight right onto South Plymouth Avenue NY-383 (1.6 miles).

Turn left on Elmwood Avenue, the hospital is at 601 Elmwood Avenue.

On-Site Assembly Area: At Site entry point at Whitney Street Gate.

Off-Site Assembly Area: The intersection of Whitney Street and Lyell Avenue.

Emergency egress routes to get off-Site: N/A .

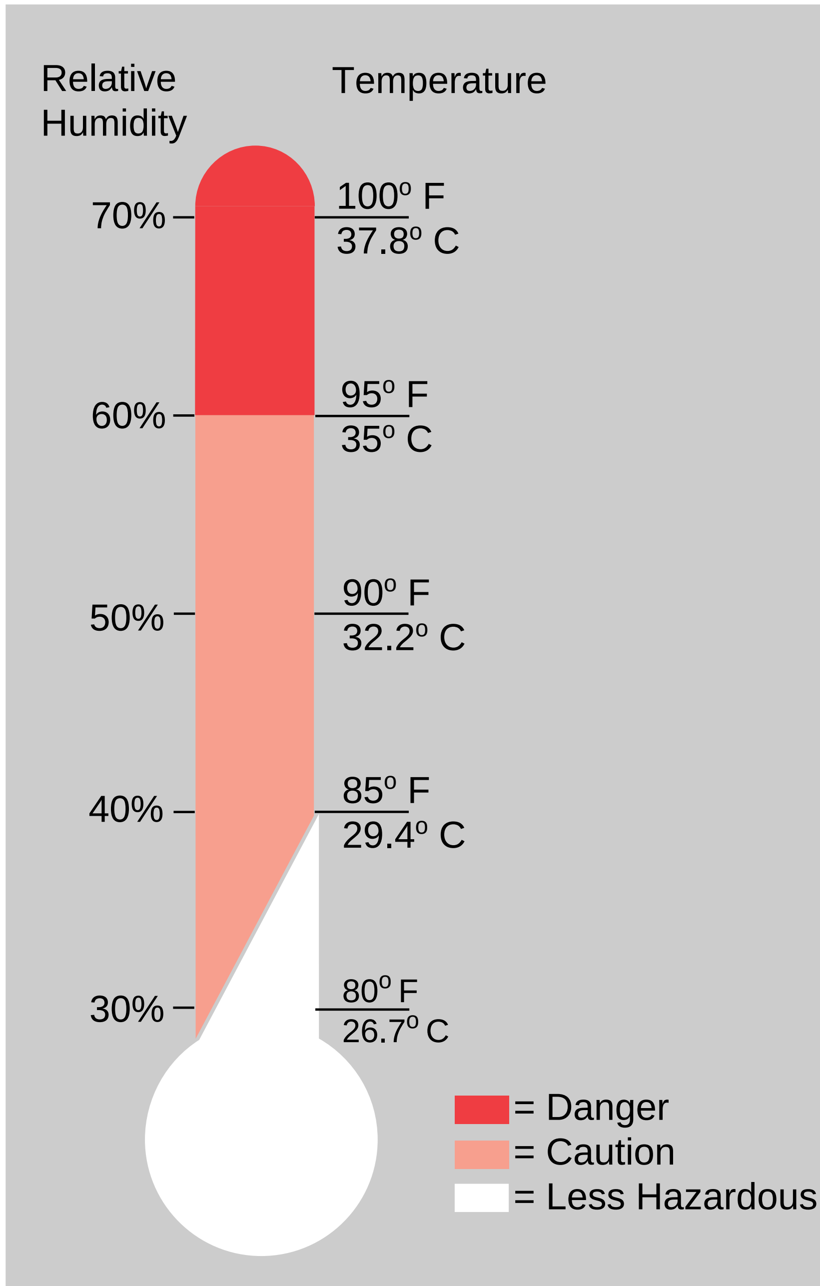
APPENDIX A

HEAT STRESS AND COLD EXPOSURE

THE HEAT EQUATION

HIGH TEMPERATURE + HIGH HUMIDITY + PHYSICAL WORK = HEAT ILLNESS

When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are **heat exhaustion** and **heat stroke**. If actions are not taken to treat heat exhaustion, the illness could progress to heat stroke and possible **death**.



U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3154
1998

HEAT EXHAUSTION

What Happens to the Body:

HEADACHES, DIZZINESS/LIGHT HEADEDNESS, WEAKNESS, MOOD CHANGES (irritable, or confused/can't think straight), FEELING SICK TO YOUR STOMACH, VOMITING/THROWING UP, DECREASED and DARK COLORED URINE, FAINTING/PASSING OUT, and PALE CLAMMY SKIN.

What Should Be Done:

- Move the person to a cool shaded area to rest. Don't leave the person alone. If the person is dizzy or light headed, lay them on their back and raise their legs about 6-8 inches. If the person is sick to their stomach lay them on their side.
- Loosen and remove any heavy clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if they are not feeling sick to their stomach.
- Try to cool the person by fanning them. Cool the skin with a cool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (Ambulance or Call 911).

(If heat exhaustion is not treated, the illness may advance to heat stroke.)

HEAT STROKE—A MEDICAL EMERGENCY

What Happens to the Body:

DRY PALE SKIN (no sweating), HOT RED SKIN (looks like a sunburn), MOOD CHANGES (irritable, confused/not making any sense), SEIZURES/FITS, and COLLAPSE/PASSED OUT (will not respond).

What Should Be Done:

- Call for emergency help (Ambulance or Call 911).
- Move the person to a cool shaded area. Don't leave the person alone. Lay them on their back and if the person is having seizures/fits remove any objects close to them so they won't strike against them. If the person is sick to their stomach lay them on their side.
- Remove any heavy and outer clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if they are alert enough to drink anything and not feeling sick to their stomach.
- Try to cool the person by fanning them. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs under the arm pits and groin area.

How to Protect Workers

- Learn the signs and symptoms of heat-induced illnesses and what to do to help the worker.
- Train the workforce about heat-induced illnesses.
- Perform the heaviest work in the coolest part of the day.
- Slowly build up tolerance to the heat and the work activity (usually takes up to 2 weeks).
- Use the buddy system (work in pairs).
- Drink plenty of cool water (one small cup every 15-20 minutes)
- Wear light, loose-fitting, breathable (like cotton) clothing.
- Take frequent short breaks in cool shaded areas (allow your body to cool down).
- Avoid eating large meals before working in hot environments.
- Avoid caffeine and alcoholic beverages (these beverages make the body lose water and increase the risk for heat illnesses).

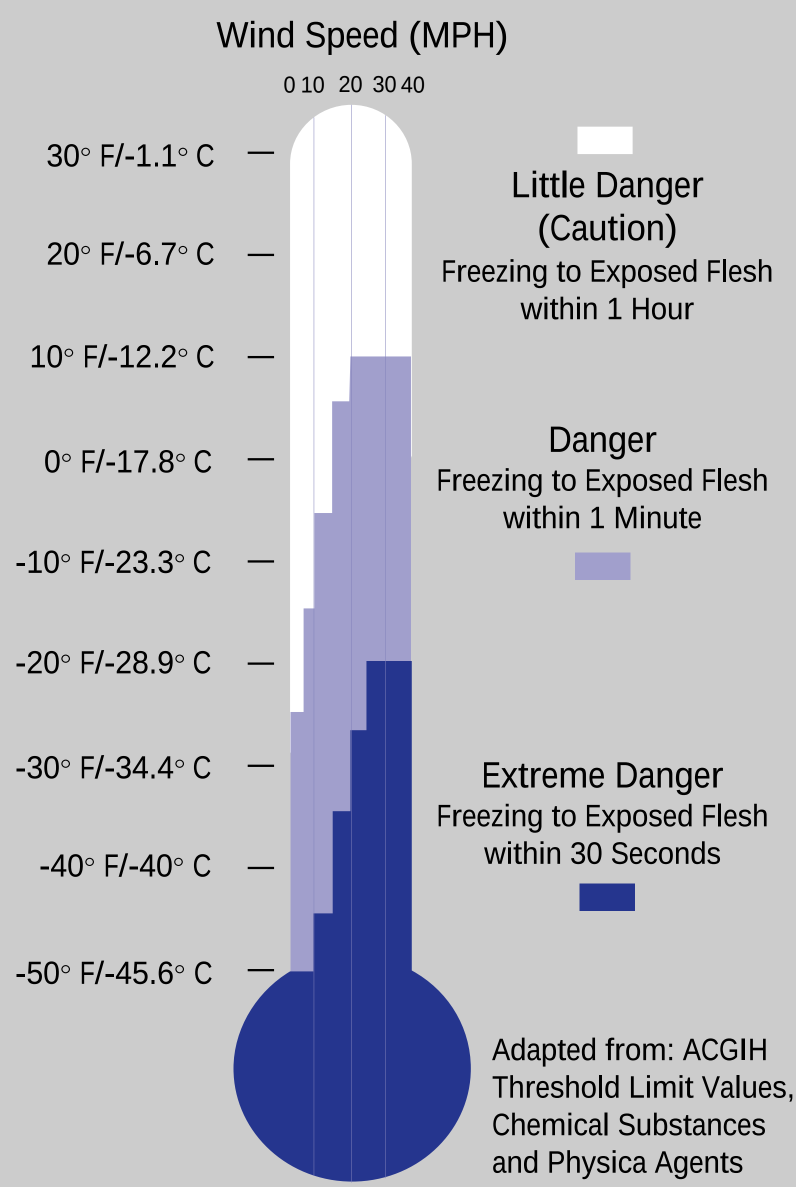
Workers Are at Increased Risk When

- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you when working in hot environments).
- They have had a heat-induced illness in the past.
- They wear personal protective equipment (like respirators or suits).

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



Adapted from: ACGIH Threshold Limit Values, Chemical Substances and Physica Agents Biohazard Indices, 1998-1999.

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3156
1998

FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6° F/37°C) DROPS TO OR BELOW 95°F (35^0 C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When…

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

APPENDIX B

ADDITIONAL POTENTIAL PHYSICAL AND CHEMICAL HAZARDS

ADDITIONAL POTENTIAL PHYSICAL AND CHEMICAL HAZARDS	
POTENTIAL PHYSICAL HAZARDS	**CONTROL METHODS**
Overhead Hazards/Falling Objects	Overhead hazards will be identified prior to each task (i.e., inspecting drill rig mast, building structure). Hard hats will be required for each task that poses an overhead hazard.
Contact with Utilities	Prior to initiating site activities, all utilities will be located by the appropriate utility company and will be marked and/or barricaded to minimize the potential of accidental contact. A minimum distance of 25 feet between the derrick and overhead power lines must be maintained at all times.
Noise Exposure	Areas of potentially high sound pressure levels (>85 dBA) will be restricted to authorized personnel only. Engineering controls will be used to the extent possible. Hearing protection will be made available to all workers on site. Exposure to time-weighted average levels in excess of 85 dBA is not anticipated.
Contaminant Inhalation	Direct reading instruments will be used to monitor airborne contaminants. Established Lu Engineers' action levels will limit exposure to safe levels. Respiratory protection will be used as appropriate.
Contaminant Ingestion	Standard safety procedures such as restricting eating, drinking, and smoking to the support zone and utilizing proper personal decontamination procedures will minimize ingestion as a potential route of exposure.
Dermal Contaminant Contact	The proper selection and use of personal protective clothing and decontamination procedures will minimize dermal contaminant contact.
Potential contact with waste and naturally occurring contaminants (i.e., methane)	Dermal contact with contaminants will be minimized by proper use of the following PPE: • Tyvex coveralls • Neoprene gloves • Booties (latex) or over-boots.
Falls (into slab penetrations and/or excavations)	• Unauthorized personnel prohibited • Open holes filled quickly • Existing open holes filled prior to Site Work Task 1 (Preparation) • Construction fencing as appropriate

APPENDIX C

HAZARD EVALUATION SHEETS / MSDS

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	1,2-Dichlorobenzene	50 ppm	---	---	Y	Inh, Ing, Con	Irritation to eyes, skin	2 ppm	---	---
1-10	1,4-Dichlorobenzene*	75 ppm	---	10 ppm	Y	Inh, Abs, Con, Ing	Irritation to eyes, nose, throat, skin, coughing/wheezing, shortness of breath, headache, nausea, burning sensation, vomiting	Mothball odor	---	8.98
1-10	2-Butanone (Methyl Ethyl Ketone-MEK)	200 ppm	200 ppm	200 ppm	Y	Inh, Ing, Con	Irritation to eyes, nose; skin, dizziness, nausea, drowsiness, CNS depression, unconsciousness	Mint or acetone-like	0.9	9.51
1-10	Acenaphthene	N/A	---	N/A	Y	Abs, Ing, Con	Irritation to eyes, skin, digestive tract, respiratory tract	---	---	---
1-10	Acenaphthylene									
1-10	Acetone	1000 ppm	250 ppm	500 ppm	Y	Inh, Ing, Con	Irritation to eyes, nose, or throat, skin, skin burns, loss of coordination and equilibrium	Sharp penetrating odor, mint like	1.1	9.69
1-10	Anthracene	0.2 ppm	---	0.2 ppm	Y	Inh, Ing, Con	May cause irritation to the respiratory and gastro-intestinal tracts, skin and eyes	Faint aromatic odor	---	---
1-10	Arsenic*	0.010 mg/m^3	---	0.01 mg/m^3	Y	Inh, Ing, Abs, Con	Coughing, irritation to eyes, nose, throat, respiratory tract, inflammation of mucous membranes, dyspnea (labored breathing), cyanosis, and rales (rattle breathing), vomiting, bloody diarrhea, cold clammy skin, low blood pressure, weakness, headache cramps, convulsions, coma, redness, burns to skin	Odorless/silver gray or tin white brittle (metal, inorganic), also can be in solution (clear & odorless)	---	---

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Barium	0.5 mg/m^3	---	0.5 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, nose, throat, or skin; stomach pains, slow pulse, irregular heart beat	Odorless	---	---
1-10	Benzo(a) anthracene	N/A	N/A	N/A	Y	Inh,Ing, Con, Abs	Irritation to eyes, skin, digestive tract, respiratory tract (prevent contact to skin and eyes)	Yellow to green	---	---
1-10	Benzo (a) pyrene	0.2 mg/m^3	---	A2	Y	Ing, Inh, Abs, Con	Irritation to eyes, skin, lungs harmful if swallowed (all hazards and toxic properties not fully known)	Yellow green powder		
1-10	Benzo (b) fluoranethene	0.2 mg/m^3	0.1 mg/m^3	A2	Y	Inh, Ing, Con	No signs or symptoms of acute exposure to benzo(b)fluoranthene have been reported in humans	Colorless		
1-10	Benzo (ghi) perylene	---	---	---	---	---	---	---	---	---
1-10	Benzo(k) fluoranthene*	N/A	N/A	N/A	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin upper respiratory tract, and digestive tract. Could cause lung damage. Fatal if absorbed through skin, swallowed or inhaled.	Yellow solid,odorless	---	---
1-10	Bis(2-Ethyl-hexyl) Phthalate (di-sec octyl phthalate)	5 mg/m^3	---	5 mg/m^3	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin; headaches, diarrhea	Slightly amine Odorless	---	---
1-10	Butylbenzyl phthalate	---	---	---	N	Inh, Ing, Con	Adverse effects of the central nervous system	Slight odor	---	---

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Cadmium*	0.005 mg/m^3	LFC	0.01 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, nose, throat, cough, tight chest/pain, dyspnea, pulmonary edema, sweating, chills, slow pulse, muscle aches, weakness, death	Silvery/white (blue tinged) lustrous solid, odorless	---	N/A
1-10	Carbon Disulfide	20 ppm	---	10 ppm ^{sk}	Y	Inh, Ing, Abs, Con	Severe irritation or burns of nose, throat, mucous membranes, headache, nausea, vomiting, dizziness, GI irritation, peripheral nerve damage, convulsions, respiratory failure, unconsciousness	Colorless to faint yellow liquid, unpleasant/foul or sweet ether like	1.2	10.07
1-10	Carbazole	---	---	---	---	Inh, Ing, Con	Suspected carcinogen	---	---	---
1-10	Chloroform*	50 ppm	---	10 ppm	N	Inh, Abs, Ing, Con	Irritation to eyes, skin, throat, headache, drowsiness, vomiting, dizziness, pain, unconsciousness, irregular heartbeat, liver, kidney damage, death	Colorless liquid pleasant odor	NR	11.37
1-10	Chromium (metal)	1.0 mg/m^3	0.5 mg/m^3	0.5 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, skin and respiratory tract (lungs), ulceration of skin and mucous membranes, rash, electrolyte disturbances	Blue-white to steel gray lustrous brittle hard, odorless solid	---	N/A
1-10	Chrysene* Polynuclear Aromatics)	0.2 mg/m^3	---	0.2 mg/m^3	Y	Inh, Ing, Con	Irritation to eyes, skin, GI with nausea; vomiting, diarrhea, respiratory irritation	Very light beige solid	---	---
1-10	Cyclohexane	300 ppm	---	300 ppm	N	Inh, Ing, Con	Irritation to respiratory tract, lungs, chest pain, edema (may be fatal), GI disturbances, irritation to mucous membranes, eyes and skin	Colorless liquid, sweet chloroform like odor	1.4	9.86

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Dibenzo (ah) anthracene	N/A	N/A	N/A	Y	Inh,Ing, Con, Abs	Irritation to eyes, skin, digestive tract, respiratory tract (prevent contact to skin and eyes)	---	---	---
1-10	Di-n-butyl phthalate	5 ppm	5 ppm	5 ppm	N	Inh, Ing, Con	Dizziness, nausea	Weak aromatic odor	---	---
1-10	Di-n-octyl phthalate	---	---	---	---	Inh, Con	Eye and skin irritation	Mild odor	---	---
1-10	Dibenzofuran	---	---	---	Y	Inh, Abs	Irritation to skin, eyes, nose and throat	0.7752 mg/cu m	---	---
1-10	Ethylbenzene	100 ppm	---	100 ppm	Y	Inh, Ing, Con	Irritation to eyes, skin, mucous membranes; dermatitis, narcosis, , trouble breathing, paralysis, headache, nausea, headache, dizziness, coma	Colorless liquid, aromatic odor	0.5	8.77
1-10	Fluoranthene	N/A	N/A	N/A	Y	Inh, Ing, Abs,Con	Irritation to eyes, skin respiratory tract. Prevent contact with skin and eyes.	Yellow, fine, fluffy powder		
1-10	Fluorene	---	---	---	Y	Inh, Ing, Abs	Moderate to severe redness and edema, nausea and vomiting. Possibly toxic if swallowed, inhaled or absorbed.	White powder	---	---
1-10	Indeno (1,2,3-cd)pyrene	0.2 mg/m^3	0.1 mg/m^3	0.1 mg/m^3	Y	Inh, Ing,	N/A	Yellow Crystals	---	---

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Isopropylbenzene	50 ppm	50 ppm	50 ppm	Y	Inh, Inj, Con	Irritation, nausea, difficulty breathing, headache, drowsiness, dizziness, and loss of coordination. Skin and eye irritation. Vomiting, stomach pain, drowsiness, aspiration, and central nervous system depression.	1.2 ppm Colorless liquid, distinct odor, pungent odor	---	---
1-10	Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	Y	Inh, Ing, Con	Poison, abdominal pain, spasms, nausea, vomiting, headache, irritation to eyes; skin, weakness, metallic taste, anorexia/loss of appetite, insomnia, facial pallor, colic, anemia, tremor, “lead line” in gums, constipation, abdominal pain, paralysis in wrists and ankles, encephalopathy (inflammation of brain)	Odorless	---	---

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Mercury	0.1 sk mg/m^3 ceiling	0.1 mg/m^3 ceiling 0.05 mg/m^3 ceiling	0.025 sk mg/m^3	Y	Inh, Abs, Ing, Con	Severe respiratory tract damage, sore throat, coughing, pain, tightness in chest, breathing difficulties, headache, muscle weakness, anorexia, GI disturbances, ringing in ear, liver changes fever, bronchitis, pneumonitis, burning in mouth, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea, weak & rapid pulse, paleness, exhaustion, tremors, collapse, thirst, burns and irritates skin, eyes, blurred vision, pain in eyes	Silver-white, heavy, odorless liquid metal	---	N/A
1-10	Methylene chloride* (Dichloromethane)	500 ppm	---	50 ppm	Y	Inh, Ing, Con, Abs	Irritation to eyes, skin, fatigue, weakness, light headedness, tingle in limbs, sleepiness, nausea, loss of coordination & equilibrium, unconsciousness, possible death	Colorless liquid, sweet chloroform like odor (205-307 ppm)	---	11.32
1-10	Methylcyclohexane	500 ppm	---	400 ppm	Y	Inh, Ing, Con	Irritation to mucus membrane and upper respiratory tract, dizziness, drowsiness, nausea, high concentrations may cause unconsciousness or death, abdominal pain, irritation to skin and eyes	Faint benzene like odor	---	---

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Naphthalene; 2-Methylnaphthalene	10 ppm	10 ppm-	10 ppm	Y	Inh, Ing, Abs, Con	Irritation to eyes; headache, confusion, excitement, nausea, vomiting, abdominal pain, irritation to bladder, profuse sweating, jaundice, corneal injury, blurred vision, renal shutdown	Colorless to brown solid/crystals, moth ball odor	0.4	8.12
1-10	N-Nitro-sodiphenylamine	Not established	---	Not established	Y	Inh, Ing, Abs, Con	Irritation to eyes, skin; lungs, vomit, diarrhea (suspect of cancer tumors in sinuses, lungs, brain, esophagus, stomach, liver, bladder, kidneys)	Green crystals/solid	---	---
1-10	Phenanthrene	0.2 mg/m^3	---	0.2 mg/m^3	Y	Inh, Ing, Con	Irritation to eyes, digestive and respiratory tracts; photosensitization	Brown solid, odorless	---	---
1-10	Pyrene*	0.2 mg/m^3	---	0.2 mg/m^3	Y	Inh, Ing, Con, Abs	Irritation to eyes, skin, digestive & respiratory tract;(may be fatal if inhaled), weight loss, dermatitis	Yellow odorless powder	---	---
1-10	Selenium	0.2 mg/m^3	---	0.2 mg/m^3	Y	Inh, Ing, Con	Severe irritation to respiratory system, mouth, throat, eyes, skin, itching pain, redness to skin, coughing, labored breathing, nausea, dermatitis	Crystalline amorphous red to gray solid, odorless	---	N/A
1-10	Silver	0.01 mg/m^3	---	0.1 mg/m^3	Y	Inh, Ing, Con	Blue gray eyes, irritation to nasal septum, throat, skin, ulcerations to skin, GI disturbances	White to gray lustrous/ metallic solid, odorless	---	---

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-10	Tetrachloroethylene (PCE)	100 ppm	---	25 ppm	Y	Inh, Abs, Ing, Con	Irritation to eyes, nose, upper respiratory tract, throat; skin, flush face, dizziness, giddiness, headache, intoxication, nausea, vomiting, abdominal pain, diarrhea, systemic effects	Colorless liquid, mild chloroform odor	---	9.32
1-10	Trichloroethene* (TCE)	100 ppm (per 6/97 NIOSH Pocket Guide)	---	---	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin, mucous membranes and GI, headache, vertigo, fatigue, giddiness, tremors, vomiting, nausea, may burn skin, visual disturbance, paresthesia, cardiac arrhythmias	Colorless liquid, sometimes dyed blue, chloroform odor	---	9.45
1-10	Toluene	200 ppm	---	50 ppm	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin, nose; upper respiratory tract, fatigue, weak, confusion, dizziness, headache, drowsiness, abdominal spasms, dilated pupils, euphoria	Colorless liquid, sweet pungent, benzene like odor	0.5	8.82
1-10	Xylene(s)	100 ppm	100 ppm	100 ppm	Y	Inh, Ing, Abs, Con	Irritation to eyes, nose, throat, skin; nausea, vomiting, headache, ringing in ears, severe breathing difficulties (that may be delayed in onset), substernal pain, coughing hoarseness, dizziness, excited, burning in mouth, stomach, dermatitis (removes oils from skin), corneal burns	Colorless liquid, aromatic odor (solid below 56 F	.5	8.44

KEY:
PEL = Permissible Exposure Limit   Inh = Inhalation   Abs = Skin Absorption
REL = Recommended Exposure Limit   Ing = Ingestion   Con = Skin and/or eye Contact
--- = Information not available mg/m^3 = Milligrams per cubic meter   ppm = Parts per million
TLV = Threshold Limit Value(ACGIH)   * = Chemical is a known or suspected carcinogen   sk = Skin notation

APPENDIX D

EQUIPMENT CHECKLIST

EQUIPMENT CHECKLIST

PROTECTIVE GEAR			
LEVEL A	**N/A**	**LEVEL B**	**N/A**
SCBA		SCBA	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUITE (Type)		PROTECTIVE COVERALL (Type)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type)		GLOVES (Type)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	
LEVEL C		**LEVEL D**	
ULTRA-TWIN RESPIRATOR	X	ULTRA-TWIN RESPIRATOR (available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H)(available)	X
CARTRIDGES (Type GMC-H)	X	5-MINUTE ESCAPE MASK (available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek/Saranax)	X
PROTECTIVE COVERALL (Type Tyvek/Saranax)	X	RAIN SUIT (available)	X
RAIN SUIT	X	NEOPRENE SAFETY BOOTS	
BUTYL APRON		BOOTIES (available)	X
SURGICAL GLOVES	X	NITRILE	X
GLOVES (Type: Nitrite/Neoprene)	X	HARD HAT WITH FACE SHIELD (available)	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS		GLOVES (Type: Surgical)	X
HARD HAT WITH FACE SHIELD	X	WORK GLOVES (Type: Neoprene/Nitrile)(available)	X
BOOTIES	X	SAFETY BOOTS	X
HARD HAT	X	BLAZE ORANGE VEST	X

EQUIPMENT CHECKLIST

INSTRUMENTATION	NO.	**FIRST AID EQUIPMENT**	NO.
OVA	X	FIRST AID KIT	X
THERMAL DESORBER		OXYGEN ADMINISTRATOR	
O_2/EXPLOSIMETER W/CAL.KIT (Drilling)	X	STRETCHER	
PHOTOVAC TIP		PORTABLE EYE WASH	
PID	X	BLOOD PRESSURE MONITOR	
MAGNETOMETER		FIRE EXTINGUISHER	X
PIPE LOCATOR			
WEATHER STATION		**DECON EQUIPMENT**	
DRAEGER PUMP, TUBES ( )		WASH TUBS	
BRUNTON COMPASS		BUCKETS	X
MONITOX CYANIDE		SCRUB BRUSHES	X
HEAT STRESS MONITOR		PRESSURIZED SPRAYER	
NOISE EQUIPMENT		DETERGENT (Type: Alconox) = TSP	X
PERSONAL SAMPLING PUMPS		SOLVENT (HEXANE)	
MINI-RAM (Particulates) (Drilling)	X	PLASTIC SHEETING	X
NITON XL3t 600 Series analyzer(X-ray fluorescence (XRF)	X	TARPS AND POLES	
		TRASH BAGS	X
RADIATION EQUIPMENT		TRASH CANS	
DOCUMENTATION FORMS		MASKING TAPE	
PORTABLE RATEMETER		DUCT TAPE	X
SCALER/RATEMETER		PAPER TOWELS	X
NaI Probe		FACE MASK	
ZnS Probe		FACE MASK SANITIZER	
GM Pancake Probe		FOLDING CHAIRS	
GM Side Window Probe		STEP LADDERS	
MICRO R METER		DISTILLED WATER	X
ION CHAMBER			
ALERT DOSIMETER			
MINI-RAD			

EQUIPMENT CHECKLIST

SAMPLING EQUIPMENT	**NO.**	**MISCELLANEOUS (cont.)**	**NO.**
4-OZ BOTTLES	X	BUNG WRENCH	X
1 LITER AMBER BOTTLES	X	SOIL AUGER	X
VOA BOTTLES	X	PICK	
SOIL SAMPLING (CORING) TOOL	X	SHOVEL	X
SOIL VAPOR PROBE		CATALYTIC HEATER	
THIEVING RODS WITH BULBS	X	PROPANE GAS	
SPOONS	X	BANNER TAPE	X
GENERAL TOOL KIT	X	SURVEYING METER STICK	X
FILTER PAPER		CHAINING PINS AND RING	
PERSONAL SAMPLING PUMP SUPPLIES		TABLES	
4-OZ JARS	X	WEATHER RADIO	
		BINOCULARS	
VAN EQUIPMENT		MEGAPHONE	
TOOL KIT		PORTABLE RADIOS (4)	X
HYDRAULIC JACK		CELL PHONE	X
LUG WRENCH		CAMERA	X
TOW CHAIN		HEARING PROTECTION	X
VAN CHECK OUT			
GAS		**SHIPPING EQUIPMENT**	
OIL		COOLERS	X
ANTIFREEZE		PAINT CANS WITH LIDS, 7 CMIPS EACH	
BATTERY		VERMICULITE	
WINDSHIELD WASH		SHIPPING LABELS	X
TIRE PRESSURE		DOT LABELS: “DANGER”, “UP”;	
		“INSIDE CONTAINER COMPLIES...”;	
MISCELLANEOUS		“HAZARD GROUP”	
PITCHER PUMP		STRAPPING TAPE	X
SURVEYOR’S TAPE	X	BOTTLE LABELS	X
100 FIBERGLASS TAPE	X	BAGGIES	X
300 NYLON ROPE		CUSTODY SEALS	X
NYLON STRING	X	CHAIN-OF-CUSTODY FORMS	X
SURVEYING FLAGS	X	FEDERAL EXPRESS FORMS	X
FILM		CLEAR PACKING TAPE	X
WHEEL BARROW			

Appendix C

Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

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

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

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

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m$_3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m$_3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m$_3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m$_3$ of the upwind level and in preventing visible dust migration.

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

Source: DRAFT DER-10 Technical Guidance for Site Investigation and Remediation, December 2002- Appendix 1A

Appendix D
Quality Assurance Project Plan

Environmental Restoration Program
Orchard-Whitney Site (#E828123)
415 Orchard Street – 354 Whitney Street
City of Rochester
Monroe County, New York

Remedial Investigation and Interim Remedial Measures

QUALITY ASSURANCE PROJECT PLAN

Prepared For:

City of Rochester
Department of Environmental Services
Division of Environmental Quality
30 Church Street
Rochester, New York 14614

Prepared By:

Lu Engineers
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2230 Penfield Road
Penfield, New York 14526

February 2011

Project No: 4216-01

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1.0 Introduction

This Quality Assurance Project Plan (QAPP) was prepared as an integral part of the Remedial Investigation and Interim Remedial Measures (RI/IRM) Work Plan for the Orchard-Whitney Site (Site) and is subject to the review and approval by the New York State Department of Environmental Conservation (NYSDEC). The project work will be performed by Lu Engineers, or conducted under their discretion by NYSDEC-approved contractors. Project-specific descriptions can be found in the RI/IRM Work Plan.

This QAPP presents the policies, organization, objectives, functional activities, and specific quality assurance (QA) and quality control (QC) activities that will be implemented by Lu Engineers for this project. This QAPP is designed to ensure that all technical data generated by Lu Engineers is accurate, representative, and will ultimately withstand judicial scrutiny.

All QA/QC procedures are implemented in accordance with applicable professional technical standards, NYSDEC and the United States Environmental Protection Agency (USEPA) requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared in accordance with all NYSDEC and USEPA QAPP guidance documents.

This QAPP incorporates the following activities:

- Sample Management and chain of custody;
- Document control;
- Laboratory quality control; and
- Review of project deliverables.

Analytical samples will be collected in the field utilizing standard operating procedures (SOPs) and sent to the contracted New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) Contract Laboratory Protocol (CLP)-certified laboratory for analysis. Field data compilation, tabulation, and analysis will be checked for accuracy. Calculations and other post-field tasks will be reviewed by field personnel and the project manager.

Equipment used to take field measurements will be maintained and calibrated in accordance with established procedures. Records of calibration and maintenance will be kept by assigned personnel. Field testing and data acquisition will be performed in standard fashion following strict guidelines.

Document control procedures will be used to coordinate the distribution, coding, storage, retrieval, and review of all data collected during all sampling tasks. These include, but are not limited to, the sampling of soil/sediment, groundwater, and wastes.

In addition, the laboratory has developed SOPs for individual analytical methods and internal QC procedures. These documents are an important aspect of their QA program and are available for review upon request.

2.0 Project Objectives

The intent of this RI portion of this project is to further delineate the nature and extent of contamination at the Site. Sampling of soil and groundwater will be used to identify potential exposure pathways and evaluate the Site for future use. The identification of significant Site characteristics, extent of contamination, and exposure pathways (if completed exposure pathways are indicated) will provide the basis for developing remedial alternatives. The goal of this IRM portion of this project is to remove approximately four (4) underground storage tanks (USTs), one (1) hydraulic lift, and chromium and arsenic impacted soils to meet Restricted Commercial soil cleanup objectives (SCOs) in the Former Plating Area. Groundwater will also be handled and possibly disposed of as part of this effort. The Scope of Work is described in the RI/IRM Work Plan Section 3.0.

A complete project description, including Site history and background information, is given in Section 1.0 of the RI/IRM Work Plan and the Remedial Investigation Work Plan (RIWP) dated August 2006.

3.0 Project Organization and Responsibility

In accordance with Lu Engineers' QA program, experienced senior technical staff will be assigned to the project QA/QC functions. The management structure provides for direct and constant operational responsibility, clear lines of authority, and the integration of QA activities. The various QA functions are explained below.

QA contacts include Lu Engineers Project Manager and Quality Assurance Officer. Qualifications of key personnel are included in Appendix A.

Paradigm Environmental Services, Inc., a NYSDOH ELAP-CLP certified laboratory, will provide analytical services for the project. A list of their certifications and accreditations is attached in Appendix A.

Project Director
The project director for this project will be Steven Campbell. As project director, Mr. Campbell will have overall responsibility for ensuring that the project meets client objectives and Lu Engineers' quality standards. In addition, the project director will be responsible for technical quality control and project oversight and will provide the project manager with access to upper management.

Project Manager
The project manager for this project will be Gregory Andrus, CHMM. As project manager, he will be responsible for implementing the project and will have the authority to commit the resources necessary to meet project objectives and requirements. The project manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved. The project manager will provide the major point of contact and control for matters concerning the project. The project manager will:

- Work directly with the City of Rochester and the NYSDEC Regional Office to complete and implement a work plan for the project;
- Define project objectives and schedule;
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;
- Acquire and apply technical managerial resources as needed to ensure performance within budget and schedule constraints;
- Orient all staff concerning the project's special considerations;
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product;
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness;
- Review and analyze overall task performance with respect to planned requirements and authorizations;
- Approve all external reports (deliverables) before their submission to the client;
- Ultimately be responsible for the preparation and quality of interim and final reports; and
- Represent the project team at meetings.

Quality Assurance Officer (QAO)
The QAO is Susan Hilton, P.E. She will be responsible for maintaining QA for a specific program and the projects within that program. Specific functions and duties include:

- Providing an external and, thereby, independent QA function to the project;
- Responsibility for field and sampling audits conducted by qualified QA personnel;
- Coordinating with client personnel, Lu Engineers' project manager, laboratory management, and staff to ensure that QA objectives appropriate to the project are set and that personnel are aware of these objectives;
- Coordinating with project management and personnel to ensure that QC procedures appropriate to demonstrating data validity sufficient to meet QA objectives are developed and in place;
- Interfacing with the data validator (if necessary) and development of a project specific data usability report;
- Coordinating with QA personnel to ensure that QC procedures are followed and documented;
- Requiring and/or reviewing corrective actions taken in the event of QC failures;

- Reporting non-conformance with QC criteria or QA objectives, including an assessment of the impact on data quality or project objectives, to the project manager.

Technical Staff
The technical staff (team members) for this project will be drawn from Lu Engineers' pool of resources. The technical team staff will be utilized to gather and analyze data and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization; training and technical competences required to effectively and efficiently perform the required work.

Data Validation and QA Staff
If necessary, data validation and QA staff will include data validation chemists, QA auditors, and other technical specialists who remain independent of the laboratory and project management. The staff will independently validate analytical data to assess and summarize their accuracy, precision, and reliability and determine their usability. The staff will also perform audits and document the historical record of project activities, including any factors affecting data usability, such as data discrepancies and deviations from standard practices. The staff will act under the direction of the QA officer and project manager in accordance with specific project requirements. A third party data validation staff is to be determined.

4.0 Sampling Procedures

4.1 Sampling Design

The sampling for this project is designed to further delineate the nature and extent of contamination at the Site. Soil borings, test excavations, and groundwater monitoring wells will be used to evaluate Site conditions.

Approximately twenty (20) test pit excavations, twenty (20) soil borings, twenty (20) micro-well installations, and three (3) groundwater monitoring wells are planned for the investigation phase of this project. Four (4) USTs and one (1) hydraulic lift removal, as well as contaminated soil removal and ex-situ remediation of the Former Plating Area are planned for the IRM portion of this project.

Soil and groundwater samples from the RI portion, UST and hydraulic lift removal will be analyzed for:

- Target Compound List (TCL) volatile organic compounds (VOCs) (USEPA Method 8260);
- Semi-volatile organic compounds (SVOCs) Base/neutrals (B/N) (USEPA Method 8270)
- Resource Conservation and Recovery Act (RCRA) Metals (USEPA Method 6020).

Soil waste characterization samples from the RI portion will be analyzed for:

- Polychlorinated biphenyl (PCBs) (USEPA Method 8082)

Soil waste characterization samples from the UST and Former Plating Area soil removal will be analyzed for:

- Toxicity Characteristic Leaching Procedure (TCLP) Metals (USEPA Method 1311)
- TCLP VOCs (USEPA Method 1311)
- TCLP SVOCs (USEPA Method 1311)
- Flash Point
- PCBs (USEPA Method 8082)
- Cyanide (Former Metal Plating area only)
- pH (Former Metal Plating area only)

Groundwater waste characterization samples from the Former Plating soil removal will be analyzed for:

- Hexium Chromium
- Cyanide
- pH

Continuous perimeter and work zone air monitoring for VOCs will also be conducted during all soil removal and staging activities using a photoionization detector (PID) to ensure health and safety of workers and the public. Monitoring for particulates, methane and oxygen (O_2)/lower explosive limit (LEL) will also be conducted as appropriate during R and IRM activities.

A Site map showing sample locations is provided as Figure 2 of the RI/IRM Work Plan.

4.2 QC Samples

Various types of field QC samples are used to check the cleanliness and effectiveness of field handling methods. They are analyzed in the laboratory as samples, and their purpose is to assess the sampling and transport procedures as possible sources of sample contamination and document overall sampling and analytical precision. Rigorous documentation of all field QC samples in the site logbooks is mandatory.

- **Trip Blanks** are similar to field blanks with the exception that they are not exposed to field conditions. Their analytical results give the overall level of contamination from everything except ambient field conditions. Trip blanks are prepared at the lab prior to the sampling event and shipped with the sample bottles. Trip blanks are prepared by adding organic-free water to a 40-ml volatile organic analysis (VOA) vial. One trip blank will be used with every batch of water samples shipped for volatile organic analysis. Each trip blank will be transported to the sampling location, handled like a sample, and returned to the laboratory for analysis without being opened in the field.
- **Field Equipment/Rinsate Blanks** are blank samples designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross-contamination. Rinsate blanks are prepared by passing analyte-free water over sampling equipment and

analyzing the samples for all applicable parameters. If a sampling team is familiar with a particular site, its members may be able to predict which areas or samples are likely to have the highest concentration of contaminants. Unless other constraints apply, these samples should be taken last to avoid excessive contamination of sampling equipment. Rinsate blanks are not required if dedicated sampling equipment is used for sample collection.

- **Field Duplicates** consist of a set of two (2) samples collected independently at a sampling location during a single sampling event. Field duplicates can be sent to the laboratory so that they are indistinguishable from other analytical samples and personnel performing the analysis are not able to determine which of the samples field duplicates are. Field duplicates are designed to assess the consistency of the overall sampling and analytical system.

Field QC samples and the frequency of analysis for this project are summarized in Table 1.

4.3 Decontamination Procedures

All decontamination will be performed in accordance with NYSDEC-approved procedures. Sampling methods and equipment have been chosen to minimize decontamination requirements and prevent the possibility of cross-contamination. All drilling equipment will be decontaminated prior to drilling, after drilling each boring/monitoring well, and after the completion of all drilling. Special attention will be given to the drilling assembly, augers, split-spoons, and polyvinyl chloride (PVC) casing. Split-spoons will be decontaminated prior to and following each use.

Split-spoons and other non-disposable sampling equipment, and stainless steel spoons will be decontaminated using the following procedure:

- Disassembling the split spoon or other sampling equipment if necessary;
- Cleaning equipment of all foreign matter;
- Scrubbing equipment with brushes in alconox solution;
- Rinsing equipment with distilled water; and
- Rinsing equipment with 10% nitric acid (when sampling for metals only);
- Triple-rinsing equipment with distilled water; and
- Allowing equipment to air dry.

All drill cuttings and water generated during drilling boring and monitoring well installation will remain on-Site. All waters generated by decontamination or by developing, purging, or pumping the monitoring wells will be stored in drums or an on-Site holding tank.

A temporary decontamination pool will be established in a secure area on Site using 6-mil polyethylene sheeting. The drill rig and associated tooling will be decontaminated using steam-cleaning methods at the designated location. Fluids generated during decontamination will be collected in the plastic-lined pool. All decontamination wastes will be transferred into drums or an on-Site holding tank for appropriate staging and disposal. It is not anticipated that investigation derived waste needing off-Site disposal will be generated as part of this investigation.

4.4 Sampling Methods

This section describes the sampling procedures to be utilized for each environmental medium that will be collected and analyzed in accordance with the RI/IRM Work Plan and Tables 1 and 2 of this plan. All sampling procedures described are consistent with USEPA sampling procedures as described in SW-846, third edition and the NYSDEC Analytical Services Protocols (ASP), or equivalent.

4.4.1 Test Pit Investigations

Test pits will be excavated to bedrock, if possible in each location, using a backhoe or equivalent. All materials removed from the pit will be returned and the pit will be completely filled before the backhoe leaves the Site. A PID will be used to continuously monitor gases exiting the test pits during excavation and sampling operations. Prior to initiating excavation activities and between test pits, the backhoe will be cleaned and decontaminated according to procedures outlined in Section 4.3.

Lu Engineers will provide continuous perimeter and work zone air monitoring during excavation activities using a PID to ensure that workers and the public are not exposed to elevated concentrations of VOCs. As indicated by prior sampling and testing, Thermo Scientific NITON XL3t 600 Series analyzer (X-ray fluorescence (XRF) testing) will be considered and used as an additional screening method for arsenic and chromium for the test pit investigation process. Testing to evaluate the possible occurrence of methane will also be conducted as part of this process. XRF testing will also be used in areas where metal contamination was previously identified or is suspected.

A Site specific Community Air Monitoring Plan (CAMP) is included in Appendix C of the RI/IRM Work Plan. To address potential fugitive dust, odors, and vapors, the contractor will have emergency controls (dust and vapor suppression equipment) available for use during excavation activities. The requirements and procedures for use of these controls are established in the CAMP.

During excavation, all applicable Occupational Safety and Health Administration (OSHA) standards (1910 and 1926) will be strictly followed. The excavation contractor will be responsible for using safe excavation techniques (sloping, stepping, etc.) to complete the excavation.

Field screening with the PID, XRF, and observations made during excavation activities will be used to isolate any VOC contamination boundaries. Soil samples will be obtained according to the RIWP and as described below.

Test pits will be backfilled upon completion of sampling with excavated material and concrete from each test pit and related location.

Erosion and Sediment Control

Erosion and sediment control measures will be employed at the Site. These measures will be adequately maintained in accordance with the Storm Water Pollution Prevention Plan (SWPP) for the Site. Storm water pollution prevention measures were employed at the Site prior to the removal of building slabs. Silt fencing is installed along the shore. These measures will be periodically inspected and maintained.

Dewatering

There is a significant lack of overburden water at the Site. If encountered the excavation contractor shall minimize non-dewatering liquid wastes through proper use of erosion and sediment control measures to mitigate surface water runoff into the excavation area, covering an open excavation area to mitigate the generation of potentially VOC impacted precipitation, etc. Water that is generated during the excavation activities, dewatering activities, and decontamination activities shall be collected and containerized by the excavation contractor. The water will be sampled/characterized as necessary based on observations by Lu Engineers' on-Site representative. Temporary water storage capacity will be provided on-Site by means of frac tanks.

Decontamination

As part of the excavation contractor's mobilization activities, a decontamination area for trucks, equipment, and personnel will be constructed. The decontamination area will serve to prevent tracking of contaminated residuals from the Site and follow the procedures outlined in Section 4.3.

To further eliminate the tracking of petroleum contaminated soils, the excavation contractor will follow designated truck routes to contain traffic within a limited area. If materials accumulate outside the excavation and staging areas, they will be addressed to the satisfaction of the Field Team Leader.

Upon completion of the work activities, the contractor will remove the decontamination facilities and associated materials, decontamination fluids, equipment, etc. All decontamination wastes will remain on-Site.

The excavator and associated equipment will be decontaminated as necessary. All decontamination residues will be collected in a decontamination pool lined with 6-mil polyethylene sheeting. Prior to completion of the project, all decontamination wastes will be transferred into drums for appropriate staging and disposal by the City.

Sampling

Soil samples will be obtained using a stainless steel spoon or trowel. Grab samples will be collected, in order to represent discrete areas of the excavation, from the walls of the test pit or from the backhoe bucket if appropriate. Soil samples will be placed in 8-ounce wide-mouth glass jars. In locations where concrete covers the ground surface, a hoe-ram will be used to break up concrete needed. If certain sample results are unfavorable, additional excavation activities can be limited to specific sections of the original excavation. Samples will be collected from the bottom of the excavation (unless bedrock is encountered) and all sidewalls and analyzed for parameters described in Section 4.1.

A log of the test pit will be maintained similar to a borehole log, indicating such information as distinctive soil horizons, soil texture, color, groundwater, PID, XRF testing, and Organic Vapor Analyzer (OVA) readings, and location of soil samples.

4.4.2 Subsurface Soil Samples

Soil borings will be advanced using a CME-75 or equivalent drill rig equipped with hollow stem augers. A four (4) foot sample barrel lined with a new acetate sleeve will be used for all subsurface soil sampling in this area. If shallow (less than approximately 15- feet below grade) refusal is encountered as a result of buried concrete, building foundations or similar materials, coring or roller bit drilling will be considered to attain target depths at each location. Borings will be advanced to bedrock or auger refusal, which is anticipated to be approximately 15-feet below grade in this location. Non-disposable sampling equipment will be decontaminated between sampling locations as detailed in Section 4.3.

Each soil sample will be described at the time it is retrieved, and a subsurface log will be produced by an on-Site geologist based upon visual examination and other field observations. Soil descriptions will be based the Burmister Soil Classification System.

All soil samples will be screened at one foot intervals for the presence of VOCs with a PID and for arsenic and chromium with and XRF. Screening will be performed by placing a representative soil sample into a Ziploc™ (or equivalent) plastic bag, sealing the bag, and then allowing the sample to volatilize for at least 15-minutes. The concentration of VOCs will then be measured by inserting the tip of the PID or equivalent device into the sample's headspace and taking a reading. VOC measurements will be entered on the boring log. The soil borings will be constructed into micro-monitoring wells.

The field geologist will also evaluate soil samples for the presence of staining or other unusual observations. Samples noted to have these characteristics may require analysis, for parameters described in Section 4.1, even though no PID or XRF testing readings may have been observed.

4.4.3 Groundwater Investigation

The groundwater sampling plan outlined in this subsection has been prepared in general accordance with RCRA Groundwater Monitoring Technical Enforcement Guidance Document 9950.1 (September 1986), Office of Solid Waste and Emergency Response as modified by NYSDEC-specific request.

Well Installation

Prior to initiating drilling activities, the drilling rig, augers, rods, split spoons, pertinent equipment, well pipe and screens will be steam cleaned. These activities will be performed in a designated decontamination area. Throughout and after the cleaning processes, direct contact between the equipment and the ground surface will be avoided. Plastic sheeting and/or clean support structures (i.e., pallets, sawhorses) will be used. The drilling rig and all equipment will be steam cleaned upon completion of the investigation and prior to leaving the Site.

Monitoring wells will be installed in borings advanced using 4.25 inch ID hollow stem augers through overburden, driven by truck-, track-, or trailer-mounted drilling equipment. Alternative methods of drilling or equipment may be allowed or requested for Site-specific criteria, but must be approved by NYSDEC. Drilling fluids, other than water from a NYSDEC-approved source, will not be allowed without special consideration and agreement from NYSDEC. The use of lubricants is also not allowed unless approved by the NYSDEC representative. During the drilling, a portable VOC monitor (i.e., PID), and an O_2/explosimeter will be used to monitor the gases exiting the hole.

Continuous split spoon samples will be collected continuously in 4-foot intervals as the augers are advanced and screed with a PID as detailed in Section 4.4.5. The boring will be advanced approximately 5-feet into groundwater. Upon reaching competent bedrock, the borehole will be advanced using rotary drilling techniques and coring. HQ rock cores will be obtained from all well bores in order to develop an accurate profile of Site wide surface bedrock hydrology. All borings will be advanced 10-feet into bedrock where the groundwater monitoring wells will be installed. Water for coring will be obtained from a nearby fire hydrant under a permit issued by the City.

The sampler will be decontaminated between sampling locations as described in Section 4.3.

Well Casing (Riser)

The well riser shall consist of 2-inch diameter, threaded flush-joint PVC pipe installed 5-feet into the groundwater, followed by a 2-inch PVC riser casing to 2-feet above ground surface. All well risers will conform to the requirements of American Society of Testing and Materials (ASTM)-D 1785 Schedule 40 pipe, and shall bear markings that will identify the material as that which is specified. All materials used to construct the wells will be National Science Foundation (NSF)/ASTM approved.

Well Screen

Generally, wells will be constructed with 10-foot 0.01-inch slot machine-slotted screens, unless otherwise specified in the work plan or dictated by field conditions (i.e., screens of less than 10-feet in length may be used, depending on the characteristics of the well). Screen and riser sections shall be joined by flush-threaded coupling to form watertight unions that retain 100% of the strength of the casing. Solvent PVC glues shall not be used at any time in the construction of the wells. The bottom of the screen shall be sealed with a treated cap or plug. No lead shot or lead wool is to be employed in sealing the bottom of the well or for sealant at any point in the well. All wells will be completed in accordance with applicable industry standards and NYSDEC requirements.

Artificial Sand Pack

Granular backfill will be chemically and texturally clean inert, siliceous, and of appropriate grain size for the screen slot size and the host environment. The well screen and riser casing will be installed, and the sand pack placed around the screen and casing to a depth approximately 2-feet above the top of the well screen.

Bentonite Seal

A minimum 2-foot thick seal of bentonite pellets/chips and water slurry will be placed directly on top of the sand pack, and care will be taken to avoid bridging. The seal will be measured immediately after placement, without allowance for swelling.

Grout Mixture

Upon completion of the bentonite seal, the well will be grouted with a non-shrinking cement grout mix to be placed from the top of the bentonite seal to the ground surface. The cement grout shall consist of a mixture of Portland cement (ASTM-C 150) and water, in the proportion of not more than 7-gallons of clean water per bag of cement (1 cubic foot or 94 pounds). Additionally, 5% by weight of bentonite powder shall be added, if permitted.

Surface Protection

At all times during the progress of the work, precautions shall be used to prevent tampering with or the entrance of foreign material into the well. Upon completion of the well, a suitable vented cap shall be installed to prevent material from entering the well. The PVC well riser shall be flush mount or surrounded by a steel casing rising 24 to 36-inches above ground level and set into a concrete pad. The steel casing shall be provided with a cap and lock. A concrete pad, sloped away from the well, shall be constructed around the well casing at ground level. The steel protective casing shall be painted with permanent high-visibility paint. The ground immediately around the top of the well shall be sloped away from the well. There shall be an opening in the protective casing wall at the top of the cement pad to allow for internal drainage.

Any well that is to be temporarily removed from service or left incomplete due to delay in construction, shall be capped with a watertight cap and equipped with a “vandal-proof” cover, satisfying applicable NYSDEC regulations or recommendations.

Surveying
Coordinates and elevations will be established by a New York State (NYS) licensed land surveyor for each boring, monitoring well, sampling location, and other key contour points. A map of each site will be prepared for inclusion into the final report.

Elevations (0.01-foot) will be established for the ground surface at each boring, monitoring well, sampling location, the top of each monitoring well casing (T.C), and at least one other permanent object (i.e., property corner markers, corners of buildings, bridges, etc.) in the vicinity of the borings and wells. Elevations will be relative to a regional, local, or project specific datum.

United States Geological Survey (USGS) benchmarks will be used if within ½ mile of the Site being surveyed and will take precedence over the use of a project specific datum. Unsurveyed data, (i.e., approximate Site and property boundaries), developed through the use of current tax maps and initial Site visits, also will be shown on the survey map. The location and extent of filled areas, buried tanks and drums, other items pertinent to Site usage will be indicated on the survey maps based on the best available data.

Well Development
After completion of the well, but not sooner than 48-hours after grouting is completed, development will be accomplished using air surging, surge blocking, pumping, or bailing. The air-lift surge method may be supplemented with a bottom-filling bailer if a well has an extremely low yield. No dispersing agents, acids, disinfectants, or other additives will be used during development nor be introduced into the well at any other time. During development, water will be removed throughout the entire water column by periodically lowering and raising the pump intake (or bailer stopping point).

Well development will include washing the entire well cap and the interior of the well casing above the water table, using only water from the well itself. As a result of the operation, the well casing will be free of extraneous materials (grout, bentonite, and sand) inside the riser, well cap, and blank casing between top of the well casing and water table. This washing will be conducted before and/or during development; not after development. Development water will be properly contained and treated as waste until the results of chemical analysis of samples are obtained.

The development process will continue until a stabilization of pH, specific conductance, temperature, and clarity (goal of <50 Nephelometric Turbidity Unit NTUs) of the discharge is achieved or for a maximum of 2 hours. If, after 2 hours, substantial improvement has been noted through the development process but the goal of 50 NTUs has not been met, an additional one to two hours may be authorized by the NYSDEC on-Site representative to achieve the 50 NTU goal. Prior to the commencement of this additional development, entries will be made detailing the request in the site project logbook and countersigned by both NYSDEC's on-Site representative and Lu Engineers' Field Team Leader.

Geologic Logging and Sampling

At each well location, the boring will be advanced through overburden using a drill rig and hollow-stem auger, and soils will be visually inspected for stains and monitored with a PID, XRF, and/or OVA. Soil samples will be collected continuously over the entire depth of the well as detailed in Section 4.4.2. The sampling device will be decontaminated according to procedures outlined in Section 4.3.

If split spoon sampling is necessary due to failure of other direct push method to attained desired results, the split-spoon sampler will be driven into the soil using a 140-pound safety hammer and allowed to free-fall 30 inches, in accordance with ASTM-D 1586-84 specifications. The number of blows required to drive the sampler each 6-inches of penetration will be recorded. Soil samples will be screened in the field for volatile organic vapors using a PID, and will be classified in accordance with the Burmister Soil Classification System, and logged. Samples will be stored in glass jars until they are needed for testing or the project is complete.

Information regarding analytical requirements for soil borings is found in Section 4.1.

Monitoring well borings will be installed to a depth determined through the examination of boring logs and water levels encountered as well as on-Site discussions and agreement between the NYSDEC representative and Lu Engineers' Field Team Leader. All significant discrepancies between the prepared RI/IRM Work Plan and actual Site conditions will be noted and countersigned by both parties in the project's on-Site logbook.

If hydrogeologic conditions are favorable for well installation at a depth less than design, the well will be installed at the boring or coring termination depth. In the even that maximum design depth is reached and hydrogeologic conditions are not suitable for well installation, the maximum drilling depth will be revised. Hydrogeologic suitability for well emplacement will be determined by the supervising geologist in consultation with NYSDEC, based on thickness and estimated hydraulic conductivity to the saturated zone encountered. If necessary, the borehole will be advanced to water or abandoned.

Drilling logs will be prepared by an experienced geologist who will be present during all drilling operations. One copy of each field boring log, well construction log and groundwater data will be submitted as part of the report. Information provided in the logs shall include, but not be limited to, the following:

- Date, test hole identification, and project identification;
- Name of individual developing the log;
- Name of driller and assistant(s);
- Drill, make and model, auger size;
- Identification of alternative drilling methods used and justification thereof (i.e., rotary drilling with a specific bit type to remove material from within the hollow stem augers);
- Standard penetration test (ASTM D-1586) blow counts;
- Field diagram of each monitoring well installed with the depth to bottom of screen, top of screen, and pack, bentonite seal, etc.;
- Reference elevation for all depth measurements;
- Depth of each change of stratum;
- Thickness of each stratum;
- Identification of the material of which each stratum is composed, according to the Burmister Soil Classification system;
- Depth interval from which each sample was taken;
- Depth at which hole diameters (bit sizes) change;
- Depth at which groundwater is encountered;
- Depth to static water level;
- Total depth of completed well;
- Depth or location of any loss of tools or equipment;
- Location of any fractures, joints, faults, cavities, or weathered zones;
- Depth of any grouting or sealing;
- Nominal hole diameters;
- Amount of cement used for grouting or sealing;
- Depth and type of well casing;
- Description of well screen (to include depth, length, location, diameter, slot sizes, material, and manufacturer);
- Any sealing-off of water-bearing strata;
- Static water level upon completion of the well and after development;
- Drilling date or dates;
- Construction details of well; and
- An explanation of any variations from the RI/IRM Work Plan.

Groundwater Sampling Procedures

Static water levels will be measured to within 0.01-foot prior to purging and sampling. Purging and sampling of each well will be accomplished using precleaned dedicated PVC bailers on new polypropylene line. All wells will be purged a minimum of three (3) volumes of water standing in the casing or to dryness. Temperature, pH, conductivity, and turbidity will be measured and recorded during purging. After purging, the turbidity of each well will be measured. If the well water exhibits turbidity above the 50 NTU limit, sampling of the well water for metals only will be delayed for 24-hours. Sample volumes for all other parameters will be collected immediately following purging, with the volatile sample collected first. Upon returning to the well, the turbidity will be remeasured and recorded. No additional purging will be performed. Groundwater samples will be collected according to the following procedures.

- Water clarity will be quantified during sampling with a turbidity meter;
- When transferring water from the bailer or pump line to sample containers, care will be taken to avoid agitating the sample, since agitation promotes the loss of volatile constituents;
- Any observable physical characteristics of the groundwater (i.e., color, sheen, odor, turbidity) at the time of sampling will be recorded; and
- Weather conditions (i.e., air temperature, sky condition, recent heavy rainfall, drought conditions) at the time of sampling will be recorded.

All groundwater samples and their accompanying QA/QC samples will be analyzed as specified in the RIWP and the RI/IRM Work Plan. A total of three (3) complete rounds of groundwater sampling events will be performed throughout the Site investigation and analyzed for parameters described in Section 4.1.

4.4.4 UST Confirmatory Soil Sampling

Approximately four (4) USTs will be removed, cleaned, and disposed of in accordance with NYSDEC protocols DER-10 Section 5.5, Petroleum Bulk Storage (PBS) regulations in 6 New York Codes, Rules, and Regulations (NYCRR) Part 6.13.9 and all other applicable regulations. It is assumed that two (2) 8,000-gallon, one (1) 5,000-gallon, and one (1) 1,000-gallon USTs will be removed from the Site by a subcontracted qualified and licensed tank removal firm. Lu Engineers will provide oversight and health and safety monitoring, including air monitoring, during tank removals. Dewatering, dust suppression, and decontamination will be conducted in accordance with section 4.4.1.

Lu Engineers will provide continuous perimeter and work zone air monitoring during removal activities using a MiniRAE 2000 PID (10.2 eV lamp or equivalent) to ensure that workers and the public are not exposed to elevated concentrations of VOCs. A Site specific CAMP is included in Appendix C of the RI/IRM Work Plan.

Upon excavation, Lu Engineers will screen the sidewalls and floor of the tank pit/s with a PID.

Sampling
Soil samples will be obtained using a stainless steel spoon or trowel. Grab samples will be collected, in order to represent discrete areas of the excavation, from the walls of the tank pit or from the backhoe bucket if appropriate, within suspect areas of greatest contamination based on olfactory, visual, and PID screening. Soil samples will be placed in 8-ounce wide-mouth glass jars.

Confirmation soil samples will be collected from excavation sidewalls and floors (unless bedrock is encountered) to verify remaining soil conditions and analyzed for parameters described in Section 4.1. Additional samples will be collected at the discretion of the Field Team Leader based on observations in the field. All samples selected for potential analysis will be containerized, labeled, and immediately stored on ice in a cooler.

All samples will be obtained, handled and characterized in accordance with NYSDEC ASP methods as detailed in Section 5.0.

In the event that residual contamination exists that will not be removed, the area will be physically marked and located with a Global Position System (GPS) unit. The location, depth and concentrations of residual contamination will be documented. Residual contamination will either be delineated at the time with excavation equipment or after the IRM with supplemental soil sampling.

The open excavation left by the removal of the USTs will be back filled using crushed brick material located on-Site, adjacent to the excavations. Disposal of contaminated soil or groundwater are not anticipated as part of this IRM.

4.4.5 Hydraulic Lift Closure

The hydraulic lift located in the former automotive shop at the northwestern corner of the former 354 Whitney Street building will be closed in accordance with applicable protocols and regulations.

The lift will be partially excavated with a backhoe by the contractor concurrently with the UST closures process. The lift will be pulled from its sleeve and decontaminated.

The cylinder, sleeve, associated piping and oil reservoir will be excavated and rendered free of oil and contaminated residues such that the steel will be acceptable for scrap metal recycling. Oils and contaminated soils will be containerized and disposed of as appropriate. Available construction/demolition debris will be used to backfill the hydraulic lift excavation. Soil or groundwater disposal are not anticipated to be necessary for closure of the hydraulic lift.

Sampling
One confirmatory soil sample will be obtained from the bottom of the excavation once the lift has been removed to verify remaining soil conditions and analyzed for parameters described in Section 4.1. All samples will be obtained, handled and characterized in accordance with NYSDEC ASP methods as detailed in Section 5.0.

The open excavation left by the removal of the hydraulic lift will be back filled using crushed brick material located on-Site, adjacent to the excavations. Disposal of contaminated soil or groundwater are not anticipated as part of this IRM.

4.4.6 Plating Area Source Removal

Contaminated soil and groundwater will be removed from the Former Metal Plating Area (AOC-2) for treatment and/or disposal at approved facilities. An appropriately qualified contractor will be used to conduct all excavation, stabilization and dewatering activities under the direction of the City.

During removal of affected soils, excavated materials and the excavation floor and sidewalls will be examined for any physical evidence of contamination and screened with a PID and XRF along transects no more than 5-feet apart. Sampling will be biased to suspected areas of greatest contamination. To the extent possible, soils will be removed for stabilization and disposal if XRF readings exceed 400 ppm (or equivalent) for chromium and/or 16 ppm for arsenic. (It is noted that the 6NYCRR Part 375 Restricted Commercial SCOs is 400 ppm for chromium and 16 ppm for arsenic.)

During excavation clean soil, as identified by screening, will be stockpiled and reused as backfill material. Soils exhibiting evidence of contamination (XRF readings >400 ppm for chromium and >16 ppm for arsenic) will be staged in a designated area of the Site for stabilization. For estimating purposes, it is assumed that 1,000 tons of soil will require removal, stabilization and off-Site disposal. It is noted that the target XRF readings will be adjusted as necessary based on the results of screening and laboratory analytical results during the detailed investigation planned at AOC-2.

In the event that residual contamination exists that will not be removed, the area will be physically marked and located with a Global Position System (GPS) unit. The location, depth and concentrations of residual contamination will be documented. Residual contamination will either be delineated at the time with excavation equipment or after the IRM with supplemental soil sampling.

Dewatering
Water from the excavation will be pumped directly into a 20,000 gallon frac tank for staging prior to transportation off-Site and disposal. For estimating purposes, a total of 40,000 gallons of hazardous waste-level, chromium-contaminated water will be generated and require disposal during this task. The water will be profiled for disposal before work begins using the existing groundwater data obtained from this area of the Site. It is assumed that this water will require disposal as a hazardous waste due to the elevated levels of chromium observed at MW-17. However, after settling, the water contained in the frac tank(s) will be tested for RCRA metals to verify proper disposal options. Disposal as either hazardous or non-hazardous waste will be determined by the findings of this analysis. Likewise, any sludges generated by this process that are retained in storage tanks will require proper disposal as indicated by appropriate testing to be determined based on potential analytical findings, volumes, and other relevant factors.

Sampling
Soil and groundwater waste characterization samples will be collected for laboratory analysis as described in Section 4.1.

The excavation will be back filled while excavation is in progress to limit the amount of groundwater infiltration requiring disposal. The excavation will be back filled using crushed brick material located on-Site, adjacent to the excavations. Crushed concrete generated during the excavation process will also be used for backfill.

Decontamination will be conducted in accordance with Section 4.4.1.

4.5 Sample Documentation

4.5.1 Logbooks

All field activities will be documented in a field logbook. This logbook will provide a record of activities conducted at the Site. All entries will be signed and dated at the end of each day of fieldwork. The field logbook will include the following: date and time of all entries; names of all personnel on Site; weather conditions (temperature, precipitation, etc.); location of activity; and description of activity. In addition, Lu Engineers will complete the following standard field forms as necessary:

- Test boring/probing logs;
- Groundwater elevations, development, sampling and conductivity logs;
- Field sampling records; and
- Chain of custody for all analytical laboratory sampling.

As with any data logbooks, no pages will be removed for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside it. The correction must be initialed and dated. Most corrected errors will require a footnote explaining the correction.

4.5.2 Sample Identification

All containers of samples collected by Lu Engineers from the project will be identified using a format identified in the field on a label affixed to the sample container (labels are to be covered with Mylar tape). Generally, the format will include two (2) letters identifying the Site (OW –Orchard Whitney), two (2) letters identifying the type of sample (GW – Groundwater), two (2) numbers identifying a sample location, two to four (2-4) additional numbers identifying a sample depth if appropriate, and additional letters identifying special parameters (MS/MSD – Matrix Spike, Matrix Spike Duplicate) if applicable.

Each sample will be labeled and sealed immediately after collection. To minimize handling of sample containers, labels will be filled out prior to sample collection. The sample label will be filled out using waterproof ink and will be firmly affixed to the sample containers and protected with Mylar tape. The sample label will give the sample number, the date of the collection, analysis required, and pH and preservation, if appropriate. The laboratory sample number will appear on a barcode label affixed to each sample, extract, or digestate.

4.6 Field Instrumentation

All instruments and equipment used during sampling and analysis will be operated, calibrated and maintained according to manufacture’s guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of calibration information will be maintained in the appropriate log book or reference file and will be available upon request. Instruments will be calibrated before each use.

Lu Engineers will provide continuous perimeter and work zone air monitoring during test pit excavations, UST, hydraulic lift, and contaminated removal using a MiniRAE 2000 PID to ensure that workers and the public are not exposed to elevated concentrations of VOCs. A TSI Dustrak Aerosol Monitor Model 8520 or equivalent will also be used continuously during all intrusive work activities to measure airborne particulate levels. A Site specific CAMP is included in Appendix C of the RI/IRM Work Plan to address potential fugitive dust, odors, and vapors, the contractor will have emergency controls, (dust and vapor suppression equipment) available for use during excavation activities. The requirements and procedures for use of these controls are established in the CAMP.

5.0 Sample Handling and Custody

This section describes procedures for sample handling and chain-of-custody to be followed by Lu Engineers sampling personnel and the analytical laboratory. The purpose of these procedures is to ensure that the integrity of the samples is maintained during their collection, transportation, storage, and analysis. All chain-of-custody requirements comply with SOPs indicated in USEPA sample-handling protocol.

All samples will be obtained, handled and characterized in accordance with NYSDEC ASP methods. Samples will be relinquished to Lu Engineers' contract accredited NYSDEC ELAP CLP and certified analytical laboratory. All chain of custody requirements will be strictly adhered to for designated analyses.

Sample identification documents will be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents include field notebooks, sample labels, custody seals, chain-of-custody records, and laboratory sample log-in and tracking forms.

The primary objective of the chain-of-custody procedures is to provide an accurate written record that can be used to trace the possession and handling of a sample from the moment of its collection through it analyses. A sample is in custody if it is:

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

5.1 Sample Containers and Preservation

For sampling performed by Lu Engineers, prewashed sample containers obtained from a reliable supplier will be provided by the analytical laboratory. All containers provided by the laboratory are precleaned (Level 1), with certificates of analysis available for each bottle type. Certifications of Analysis provided by the vendor are kept on file by the laboratory.

All samples will be stored on ice pending delivery to the laboratory. In addition, all water samples for volatile analysis will be preserved with HCl to a pH of less than 2. All water samples for metals analysis will be preserved by adding concentrated nitric acid until the sample pH is lowered to 2.0 standard units or less. Sample pH will be checked in the field using indicator paper. A list of preservatives and holding times for each type of analysis is included on the attached Table 2.

Sample preservation will be verified at the lab just prior to extraction, digestion, and/or analysis and the pH will be recorded in the extraction/digestion logbook. The pH may be checked upon arrival, if desired. If the samples are improperly preserved, a QA/QC discrepancy form will be submitted to the lab manager and QA coordinator for appropriate follow-up action (i.e., evaluation of the data during the data validation process and, if necessary, additional instruction of personnel regarding proper procedures).

5.2 Field Custody Procedures

- Sample bottles must be obtained precleaned from the laboratory or directly from an approved retail source. All containers will be prepared in a manner consistent with the NYSDEC ASP 1991 bottle-washing procedures. Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use.
- All containers will have assigned lot numbers to ensure traceability through the supplier.
- As few persons as possible should handle samples.
- The sample collector is personally responsible for the care and custody of samples collected until the samples are transferred to another person or dispatched properly under chain-of-custody rules.
- The sample collector will record sample data in the field notebook.
- The project manager will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

5.2.1 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. A custody seal is placed over the cap of individual sample bottles by the sampling technician. Sample shipping containers (coolers, cardboard boxed, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. Strapping tape should be placed around the lid to ensure that seals are not accidentally broken during shipment and in a manner that allows easy removal by laboratory personnel. On receipt at the laboratory, the custodian must check (and certify, by completing logbook entries) that seals on boxes and bottles are intact.

5.2.2 Chain-of-Custody Record

The chain-of-custody record must be fully completed in duplicate, using black carbon paper where possible, by the field technician who has been designated by the project manager as responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (i.e., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints in the “Remarks” section of the custody record.

5.3 Sample Handling, Packaging and Shipping

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample but also prevents any detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the United States Department of Transportation (DOT) in the Code of Federal Regulations, 49 CFR 171 through 177.

5.3.1 Sample Packaging

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers.
- The sample bottle should never be completely filled except for VOA bottles. At a minimum, a 10% void space should be left in the bottle to allow for expansion. The sample volume level should be marked with a grease pencil or by placing the top of the label at the appropriate sample height.
- All sample bottles must be sealed around the neck or the jar lid with clear tape. Any custody seals should be affixed prior to sealing the bottle.
- All sample bottles shall be placed in plastic Ziploc™ bags to minimize contact with inert packing material, unless foam inserts are used.
- Foam inserts should be used as inert packing material when shipping low hazard water samples via a common carrier to the laboratory.
- Low-hazard environmental samples are to be cooled. "Blue ice" or some other artificial icing material, or ice placed in plastic bags, may be used. Ice will not be used as a substitute for packing material.
- A duplicate custody record must be placed in a plastic bag and taped to the inside of the cooler lid. Custody seals are affixed to the sample cooler.
- The cooler will be labeled as containing a hazardous material if it contains medium or high-hazard samples. Labeling requirements differ depending on the type of material being shipped; the majority of soil samples may be shipped as a class "9" hazardous material with the proper shipping name "OTHER REGULATED SUBSTANCES (ENVIRONMENTAL SAMPLES)."
- A hazardous material shipping manifest will be completed for each cooler of medium to high-hazard samples and affixed to the lid of the cooler.
- Low-hazard environmental samples do not require a hazardous material shipping manifest. The words "LABORATORY SAMPLES" should be printed on the top of the cooler for low-hazard samples.
- Samples packaged and shipped as limited-quantity radioactive material must comply with NYSDOT and shipper regulations for package contamination limits, surface exposure rate, and airbill completion.

5.3.2 Shipping Containers

Environmental samples will be properly packaged and labeled for transport and dispatched for analysis to the appropriate subcontracted laboratory for geotechnical analyses. A separate chain-of-custody record must be prepared for each container. The following requirements for marking and labeling of shipping containers will be observed:

- Use abbreviations only where specified;
- The words “This End Up” or “This Side Up” must be clearly printed on the top of the outer package. Upward-pointing arrows should be placed on the sides of the package. The words “Laboratory Samples” should also be printed on the top of the package; and
- After a container has been closed, two custody seals are placed on the container—one on the front and one on the back. The seals are protected from accidental damage by placing strapping tape over them.

Field personnel will make timely arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will telephone the laboratory custodian to inform him of the expected time of arrival of the sample shipment and to advise him of any time constraints on sample analysis.

5.3.3 Shipping Procedures

- The coolers in which the samples are packed must be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them must sign, date, and note the time on the record. This record documents sample custody transfer.
- Samples must be dispatched to the laboratory for analysis with a separate chain-of-custody record accompanying each shipment. Shipping containers must be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information are entered in the “Remarks” section of the chain-of-custody record.
- All shipments must be accompanied by the chain-of-custody record identifying their contents. The original record accompanies the shipment, and the yellow copy is retained by Lu Engineers’ Field Team Leader.
- If sent by mail, the package is registered with return receipt requested. If sent by common carrier, a bill of lading is used. Freight bills, Postal Service receipts, and bills of lading are retained as part of the permanent documentation.
- Samples must be shipped to the analytical laboratory within 24 to 48-hours from the time of collection.

5.4 Laboratory Custody Procedures

The designated sample custodian at the laboratory will be responsible for maintaining the chain-of-custody for samples received at the lab. Among other things, the custodian must adhere to the following basic requirements:

- When the sample arrives at the lab, the custodian will complete a Cooler Receipt & Preservation Form for each cooler/package container.
- Upon receipt, the coolers are examined for the presence and condition of custody seals, locks, shipping papers, etc. Shipping labels are removed and placed on scrap paper and added to the receiving paper work. The custodian then completes the chain-of-custody record by signing and recording the date and time the package is opened.
- Acceptance criteria for cooler temperature is 0-6^{o}C. If a cooler exhibits a temperature outside this range, the anomalies are noted on the Cooler Receipt & Preservation Form.
- The custodian will then unload the samples from the cooler(s)/container(s), assign an identification number to each sample container, and affix a barcode label to each sample container for logging in and out of the Laboratory Information Management System (LIMS) system.

Adherence to this procedure will ensure that all samples can be referenced in the computer tracking system. All sample control and chain-of-custody procedures applicable to the analytical laboratory are presented in laboratory SOPs available for review.

6.0 Analytical Methods

All laboratory analyses will be performed by Paradigm Environmental Services, Inc., an accredited and appropriately (NYSDEC ELAP CLP) certified analytical laboratory. Inorganic, general analytical and organic methods to be performed by the laboratory for this project are listed in Table 1 of this QAPP.

6.1 Analytical Capabilities

The analytical laboratory is fully equipped for analysis of all types of water, air, and soil samples for chemical contaminants, bacteriological quality, and general characterization. Proven and approved analytical techniques are used, backed up by a rigorous system of QC and QA checks to ensure reliable and defensible data. All laboratory work is performed in accordance with guidelines established by USEPA, the NYSDOH, and the National Institute of Occupational Safety and Health (NIOSH).

Organic analysis is accomplished by gas chromatography (GC), high performance liquid chromatography (HPLC), and or GC/mass spectrometry (MS). Liquid, soil, and air samples are analyzed routinely for pesticides, polychlorinated biphenyls (PCBs), volatile organics, extractable organics, and other groups of compounds, as necessary. The laboratory uses two types of instruments for analysis of metals in various matrices: Atomic Absorption Spectrometry (AAS) and Inductively Coupled Plasma (ICP).

Laboratory procedures to be utilized for sample preparation and analysis are referenced in the NYSDEC ASP.

Method Detection Limits

Method detection limits are determined according to procedures outlined in 40 CFR Part 136, Appendix B or USEPA CLP. General analytical detection limits are usually determined by the lowest point on the curve. Detection limits are determined at least annually for all appropriate analytical methods. A listing of the laboratory's method detection limits is available upon request.

6.2 Quality Control Samples

Laboratory QC consists of analysis of laboratory blanks, duplicates, spikes, standards, and QC check samples as appropriate to the methodology. These laboratory QC samples are described below.

6.2.1 Laboratory Blanks

Three (3) types of laboratory blanks, one or more of which will be utilized depending on the analysis are described below:

- Method blanks consist of analyte-free water and are subjected to every step of the analytical procedure to determine possible contamination.
- Reagent blanks are similar to method blanks but incorporate only one of the preparation reagents in the analysis. When a method blank indicates significant contamination, one or more reagent blanks are analyzed to determine the source.
- Calibration blanks consist of pure reagent matrix and are used to zero an instrument's response, thus establishing the baseline.

6.2.2 Calibration Standards

A calibration standard may be prepared in the laboratory by dissolving a known amount of a pure compound in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. The results obtained from these standards are used to generate a standard curve and thereby quantitative the compound in the environmental sample. A minimum of three (3) calibration standards will be used to generate a standard curve for all analyses.

6.2.3 Reference Standard

A reference standard is prepared in the same manner as a calibration standard but from a different source. Reference standards may be obtained from the USEPA. The final concentration calculated from the known quantities is the “true” value of the standard. The important difference in a reference standard is that it is not carried through the same process used for the environmental samples, but is analyzed without digestion or extraction. A reference standard result is used to validate an existing concentration calibration standard file or calibration curve.

6.2.4 Spike Sample

A sample spike is prepared by adding to an environmental sample (before extraction or digestion) a known amount of pure compound of the same type that is to be assayed for in the environmental sample. Spikes are added at 1 to 10 times the expected sample concentration or approximately 10 times the method detection limit. These spikes simulate the background and interferences found in the actual samples, and the calculated percent recovery of the spike is taken as a measure of the accuracy of the total analytical method.

A blank spike is the same as a spike sample except the spike is added to analyte-free water. The blank spike is used to determine whether the sample preparation and analysis are under control.

6.2.5 Surrogate Standard

A surrogate is prepared by adding a known amount of pure compound to the environmental sample; the compound selected is not one expected to be found in the sample, but is similar in nature to the compound of interest. Surrogate compounds are added to the sample prior to extraction or digestion. Surrogate spike concentrations indicate the percent recovery of the analytes and, therefore, the efficiency of the methodology.

6.2.6 Internal Standard

Internal standards are similar to surrogate standards in chemical composition but are used to quantify the concentration of analytes sampled based on the relative response factor. Internal standards are added to the environmental sample just prior to instrumental analysis.

6.2.7 Laboratory Duplicate or Matrix Spike Duplicate

Laboratory duplicates are aliquots of the same sample that are split prior to analysis and treated exactly the same throughout the analytical method. Spikes and duplicates for the batch are normally aliquots of the same sample. For organics, spikes are added at approximately 10 times the method detection limit. The relative percent difference (RPD) between the values of the matrix spike and matrix spike duplicate for organics or between the original and the duplicate for inorganics is taken as a measure of the precision of the analytical method.

In general, the tolerance limit for RPDs between laboratory duplicates should not exceed 20% for validation in homogeneous samples.

6.2.8 Check Standard/Samples

Inorganic and organic check standards or samples are prepared with reference standards or are available from the USEPA. They are used as a means of evaluating analytical techniques of the analyst. Check standards or samples are subjected to the entire sample procedure, including extraction, digestion, etc., as appropriate for the analytical method utilized. The check standard or sample can provide information on the accuracy of the analytical method independent of various sample matrices.

6.3 Laboratory Instrumentation

Laboratory capabilities will be demonstrated initially for instrument and reagent/ standards performance as well as accuracy and precision of analytical methodology. A discussion of reagent/standard procedures and brief descriptions of calibration procedures for major instrument types follow.

All standards are obtained directly from USEPA or through a reliable commercial supplier with a proven record for quality standards. All commercially supplied standards will be traceable to USEPA or National Institute of Standards and Technology (NIST) reference standards and appropriate documentation will be obtained from the supplier. In cases where documentation is not available, the laboratory will analyze the standard and compare the results to a known USEPA-supplied or previous NIST-traceable standard.

All sections of the laboratory will have SOP for standard and reagent procedures to document specific standard receipt, documentation, and preparation activities. In general, the individual SOPs incorporate the following items:

- Documentation and labeling of date received, lot number, date opened, and expiration date;
- Documentation of traceability;
- Preparation, storage, and labeling of stock and working solutions; and
- Establishing and documenting expiration dates and disposal of unusable standards.

Each laboratory instrument will be labeled clearly with a unique identifier that relates to all laboratory calibration documentation. Laboratory SOPs and calibration procedures are detailed in the laboratory's Quality Assurance Manual, available upon request.

7.0 Data Reporting and Validation

7.1 Deliverables

Once the contract laboratory has provided all analytical data and hydrogeologic information has been evaluated, Lu Engineers will develop a report on the findings of the investigation and remedial measures. The report will be prepared as indicated by the following outline:

1.0 INTRODUCTION
2.0 INVESTIGATION and IRM ACTIVITIES
3.0 PHYSICAL SITE CHARACTERISTICS
4.0 NATURE AND EXTENT OF CONTAMINATION
5.0 CONTAMINANT FATE AND TRANSPORT
6.0 EXPOSURE ASSESSMENT
7.0 SUMMARY AND CONCLUSIONS

The report will carefully document all findings of the investigation and will be supplemented with photographic documentation, subsurface soil logs, cross sections, and study area plans indicating groundwater flow direction and subaerial contaminant distribution.

7.1.1 Category B Data Package

All analytical data will be reported by the laboratory with NYSDEC ASP Category B deliverables. The Category B data package includes:

1. A detailed summary of the report contents and any quality control outliers or corrective actions taken.
2. Chain of Custody documentation
3. Sample Information including: date collected, date extracted, date analyzed, and analytical methods.
4. Data (including raw data) for:
   - samples
   - laboratory duplicates
   - method blanks
   - spikes and spike duplicates
   - surrogate recoveries
   - internal standard recoveries
   - calibrations
   - any other applicable QC data
5. Method detection limits and/or instrument detection limits
6. Run logs, standard preparation logs, and sample preparation logs
7. Percent solids (where applicable).

7.1.2 Quality Assurance Reports

For the laboratory, a general QA report summarizing problems encountered throughout the laboratory effort, including sample custody, analyses, and reporting, is provided to Lu Engineers' project QA management by the QA coordinator. This report identifies areas of concern and possible resolutions in an effort to ensure data quality.

Upon completion of a project sampling effort, analytical and QC data will be included in a comprehensive report that summarizes the work and provides a data evaluation. A discussion of the validity of the results in the context of QA/QC procedures will be made, as well as a summation of all QA/QC activity.

Serious analytical or sampling problems will be reported to NYSDEC. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol. All corrective actions will be implemented after notification and approval of NYSDEC.

In addition to the laboratory report narrative, QA data validation reports that include any contractual requirements will also be provided to NYSDEC. These QA reports will be submitted with the analytical data, on a monthly basis, or at the conclusion of the project.

7.2 Data Validation and Usability

Prior to the submission of the report to NYSDEC, all data will be evaluated for precision, accuracy, and completeness.

QA/QC requirements from both methodology and company protocols will be strictly adhered to during sampling and analytical work. All data generated will be reviewed by comparing and interpreting results from instrumental responses, retention time, determination of percent recovery of spiked samples or blanks, and reproducibility of duplicate sample results. All calculations and data manipulations are included in the appropriate methodology references. Control charts and calibration curves will be used to review the data and identify outlying results.

7.2.1 Data Validation

If necessary, a third-party validator will be responsible for an independent review of all analytical work performed under the NYSDEC ASP-CLP protocol. The functions will be to assess and summarize the quality and reliability of the data for the purpose of determining its usability and to document for the historical record of each Site any factors affecting data usability, such as discrepancies, poor laboratory practices, and Site locations that are difficult to analyze. The data validator will be responsible for determining completeness and compliance. Lu Engineers' QAO will be responsible for determining data usability and overseeing the work of the data validator.

Information available to the data validator and the QAO for performance of these functions include the NYSDEC ASP Category B data package, information from the sampling team regarding field conditions and field QA samples, chain-of-custody and shipping forms. The data package is designed to provide all necessary documentation to verify compliance with NYSDEC ASP CLP protocol and the accuracy and reliability of the reported results.

The laboratory will deliver the data package to the project QA coordinator for processing prior to submission to the data validator. The project QA coordinator will review the report for immediate problems, summarize the data for in-house use, and process the work order for the third-party data-validation subcontract within five working days.

In order to effectively review the data package, the data validator will obtain a general overview of each case. This includes the exact number of samples, their assigned numbers, and their matrix. The data validator will deliver the data validation report within 30 days of receipt of the data package.

If a problem arises between the data validator and the laboratory, the data validator must submit written questions to the laboratory. The laboratory will be required to respond in writing within 10 working days to correct any deficiencies. If the data validator does not receive a written response from the laboratory within the specified time period, the data in question shall be considered noncompliant.

Sampling locations will be obtained from the sampling records, such as the chain-of-custody forms. This information is necessary for preparation of the data summary, evaluation of adherence to sample holding times, discussion of matrix problems, and discussion of contaminants detected in the samples.

The following is a brief outline of the data validation process:

- Compilation of all samples with the dates of sampling, laboratory receipt, and analysis;
- Compilation of all QC samples, such as field blanks, field duplicates, MS/MSD samples, laboratory blanks, and laboratory replicates;
- Review of chain-of-custody documents for completeness and correctness;
- Review of laboratory analytical procedure and instrument performance criteria;
- Qualification of data outside acceptable QC criteria ranges;
- Preparation of a memorandum summarizing any problems encountered and the potential effects on data usability;

- Preparation of a data summary, including validated results, with sample matrix, location, and identification; and
- Tabulation of field duplicates, laboratory replicate, and blank results.

Copies of all data validation and usability reports, as well as all data summary packages, will be provided to the NYSDEC project manager. In addition, copies of all analytical raw data will be provided to NYSDEC upon request.

7.2.2 Data Usability

A Data Usability Summary Report (DUSR) will be provided after review and evaluation of the analytical data package. The DUSR will contain required elements listed in Appendix 2B of *Department of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation*.

The DUSR will include a description of the samples and analytical procedures used. Any data deficiencies, protocol deviations, or quality control problems will be discussed as to their effect on data results. The report will also include any suggestions for resampling or reanalysis.

Tables

Table 1
Proposed Sampling and Analysis Summary

Analyte	Location	Media	Number	QA/QC	Total
RCRA Metals	TPs, Borings, UST and Hyd Lift Confirm., and Groundwater	Soil and Groundwater	87	15	102
TCLP Metals	UST and Plating Area Waste Characterization	Soil	3	0	3
TCL VOCs	TPs, Borings (3 only), UST and Hyd Lift Confirm. and Groundwater	Soil and Groundwater	47	9	56
TCLP VOCs	UST and Plating Area Waste Characterization	Soil	3	0	3
SVOCs (B/Ns)	TPs, Borings (3 only), UST and Hyd Lift Confirm. and Groundwater	Soil and Groundwater	47	9	56
TCLP SVOCs	UST and Plating Area Waste Characterization	Soil	3	0	3
Flash Point	UST and Plating Area Waste Characterization	Soil	3	0	3
PCBs	UST and Plating Area Waste Characterization, TPs and New MWs	Soil	16	3	19
Hex. Chromium	Plating Area Waste Characterization	Groundwater	2	0	2
Cyanide and pH	Plating Area Waste Characterization	Soil and Groundwater	2	0	2

Table 2
Sample Preservation and Holding Times

Parameter	Method Number	Container Type and Size	Preservation	Holding Time*
Soil Samples				
VOCs	8260C	2 x 4 oz. wide mouth glass jar with Teflon-lined cap	Cool to 4°C; minimize headspace	14 days
SVOCs	8270C	2 x 4 oz. amber wide mouth glass jar with Teflon-lined cap	Cool to 4°C	12 days to extract; analyze 40 days from extraction
RCRA Metals	200.7/ 6010B	2 x 4 oz. glass jar	None required (cool to 4°C preferred)	6 months
PCBs	8082	2 x 4 oz. glass jar	Cool to 4°C	12 days to extract; analyze 40 days from extraction
Groundwater				
VOCs	8260C	3 x 40-ml. glass VOA vial with Teflon-lined cap	Cool to 4°C; minimize headspace; HCl to pH<2	5 days unpreserved / 12 days preserved
SVOCs	8270C	2 x ½ L. amber bottles with Teflon-lined cap	Cool to 4°C	5 days to extract; analyze 40 days from extraction
RCRA Metals	200.7/ 6010B	1 x 250 ml. polyethylene or glass bottles	HNO_3 to a pH <2	6 months
PCBs	8082	1 x ½ L. amber bottles	Cool to 4°C	5 days to extract; analyze 40 days from extraction

* Holding times are based on verified time of sample receipt (VTSR) at the laboratory

Appendix A- Qualifications